CHAPTER 3

The Biological Person

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Opening Questions

What do social workers need to know about the interior environment of human biology?

How does knowledge of biology contribute to important roles that social workers play in individual and community health and illness?

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Key Ideas

As you read this chapter, take note of these central ideas:

1. One way to think about our bodies is as the interior environment, with environment defined as a "set of conditions" (DePoy & Gilson, 2007).
2. There is strong evidence of relationships among physical health, psychological health, and exterior environmental conditions. Biological functioning is the result of complex transactions among interior and exterior systems. No biological system operates in isolation from these other phenomena.
3. The nervous system is responsible for processing and integrating incoming information, and it influences and directs reactions to that information. It is divided into three major subsystems: central nervous system, peripheral nervous system, and autonomic nervous system.
4. The endocrine system plays a crucial role in growth, metabolism, development, learning, and memory.
5. The immune system is made up of organs and cells that work together to defend the body against disease. Autoimmune diseases occur when the immune system mistakenly targets parts of the interior environment.
6. The cardiovascular system is made up of the heart and the blood circulatory system. The circulatory system supplies cells of the body with the food and oxygen that they need for functioning.
7. The musculoskeletal system supports and protects the body and its organs and provides motion. The contraction and relaxation of muscles attached to the skeleton is the basis for voluntary movements.
8. The reproductive system is composed of both internal and external structures that are different for males and females.

CASE STUDY 3.1

Cheryl's Brain Injury

Cheryl grew up in rural Idaho in a large extended family of Anglo heritage and enlisted as a private in the army just after she finished her third year of high school. After basic training, she was deployed to Iraq for active combat duty. Traveling en route to Baghdad, Cheryl's Humvee contacted an improvised explosive device (IED), causing Cheryl to sustain a closed head injury and multiple fractures. She was in a coma for 3 weeks.

Over a 6-month period, all of Cheryl's external bodily injuries, including the fractures, healed, and she was able to walk and talk with no apparent residual impairments. Cognitively and socially, however, Cheryl experienced change. Although able to read, she could not retain what she had just read a minute ago. She did not easily recall her previous knowledge of math and was not able to compute basic math such as addition and subtraction without the use of a calculator. She was slow in penmanship, taking at least 5 minutes to write her own name. Dissimilar to her social behavior prior to the accident, Cheryl was often blunt in her comments, even to the point of becoming confrontational with friends without provocation.

Because of her observable recovery, everyone expected Cheryl to return to active duty, but 2 years after the accident, her family knows that she is not going to return to military service. Cheryl's ex-boyfriend, Sean, is about to get engaged to another woman, but Cheryl thinks that she is still dating Sean and thinks that he will soon marry her. People who knew Cheryl before the accident cannot understand why her personality has changed so markedly, and they even say, "She's a completely different person!"

CASE STUDY 3.2

A Diabetes Diagnosis for Bess

Bess, a 52-year-old Franco-American woman who lives in rural Maine, was enjoying her empty nest just before the social worker met her. The youngest of her three children had married 6 months ago, and although Bess was proud of what she had accomplished as a single mother, she was now ready to get on with her life. Her first order of business was to get her body back into shape, so she started on a high-carbohydrate, low-fat diet that she had read about in a magazine. Drinking the recommended eight glasses of water or more each day was easy, because it seemed that she was always thirsty. But Bess was losing more weight than she thought possible on a diet, and she was always cheating! Bess had thought that she would have to get more exercise to lose weight, but even walking to and from her car at the grocery store tired her out.

One morning, Bess did not show up at the country store where she worked. Because it was very unusual for her not to call and also not to answer her phone, a coworker went to her house. When there was no response to the knocking, the coworker and one of Bess's neighbors opened the door to Bess's house and walked in. They found Bess sitting on her couch, still in her nightclothes, which were drenched with perspiration. Bess was very confused, unable to answer simple questions with correct responses. Paramedics transported Bess to the local community hospital.

In the emergency room, after some blood work, a doctor diagnosed diabetes mellitus (diabetes). Because diabetes is common among middle-aged and older Franco Americans in this poor rural town, a social worker had already established an educational support group for persons with diabetes that Bess now attends.

CASE STUDY 3.3

Melissa's HIV Diagnosis

Melissa's "perfect life" has just fallen apart. As a young, Jewish, urban professional who grew up in a middle-class suburb, Melissa had always dreamed of a big wedding at her parents' country club, and her dreams were coming true. All the plans had been made, invitations sent out, bridesmaids' dresses bought and measured, and

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her wedding dress selected. All that remained was finalizing the menu and approving the flower arrangements. Because Melissa and her fiancé planned to have children soon after their marriage, she went to her physician for a physical exam 2 months before her wedding. As the doctor does with all of her patients, she asked if Melissa had ever been tested for HIV. Melissa said no, and gave her permission for an HIV test to be run with all the other routine blood work.

One week after her physical, the doctor's office called and asked Melissa to return for more blood work because of what was thought to be an inaccuracy in the report. Melissa went back to the office for more blood tests. Another week passed, but Melissa did not think again about the tests because she was immersed in wedding plans. Her physician called her at home at 8:00 one morning and asked her to come to her office after work that day. Because she was distracted by the wedding plans and a busy schedule at work, Melissa did not think anything of the doctor's request.

When she arrived at the doctor's office, she was immediately taken to the doctor's private office. The doctor came in, sat down, and told Melissa that two separate blood tests had confirmed that she was HIV positive. Melissa spent over 3 hours with her physician that evening, and soon thereafter she began to attend an HIV support group.

Melissa has never used illicit drugs, and she has only had two sexual partners. She and her fiancé had decided not to have unprotected intercourse until they were ready for children, and because they used a condom, he was not a prime suspect for passing along the infection. Melissa remembered that the man with whom she was involved prior to meeting her fiancé would not talk about his past. She has not seen this former lover for the past 3 years, ever since she moved away from New York.

CASE STUDY 3.4

Lifestyle Changes for Thomas

Thomas is a 30-year-old African American man who lives with his parents, both of whom are obese, as are his two older sisters. Thomas loves his mom's cooking, but some time ago realized that its high-fat and high-sodium content was contributing to his parents' obesity and high blood pressure.

In contrast, Thomas takes pride in watching his diet (when he isn't eating at home) and is pretty smug about being the only one in the family who is not obese. Being called "the thin man" is, to Thomas, a compliment. He also boasts about being in great physical shape, and exercises to the point of being dizzy.

After one of his dizziness episodes, a friend told him that he should get his blood pressure checked. Although Thomas knew of the high incidence of heart disease among African Americans, he never considered that he would have a problem. After all, he is young and in good physical shape. Out of curiosity, the next time Thomas stopped at his local drug store, he decided to use one of those self-monitoring blood pressure machines to check his blood pressure. To his astonishment, the reading came back 200/105, which is quite high. Thomas now seeks a social worker's help to adopt some major lifestyle changes.

CASE STUDY 3.5

Max's Post-Polio Syndrome

Max is from an Eastern European immigrant family that settled in a midwestern city in the United States. When he was 2 years old, he contracted polio that affected only his legs. He never had any breathing difficulties, nor was there any involvement in his arms. In fact, after 6 months in the hospital and another 6 months of therapy when he returned home, Max appeared to be "cured." Afterward, as he was growing up, there were no visible signs of previous illness. He clearly could keep up with his friends, except he could never run very long distances.

Forty-three years later, Max developed early symptoms of post-polio syndrome. He began to notice increasing weakness in his legs, unusual fatigue, and a lot of pain all over his body. A recent evaluation at a university clinic confirmed the diagnosis of post-polio syndrome, and the clinicians who saw him recommended that he consider getting the type of brace that is inserted in his shoes to support both ankles, as well as use forearm crutches for walking long distances. Max has earned his living all his life as a house painter. He needs help figuring out how to cope with these new developments and how to support his growing family.

CASE STUDY 3.6

Juan and Belinda's Reproductive Health

Juan and Belinda, now both 17 years old, grew up in the same neighborhood of a southwestern city in the United States and attend the same church, St. Joseph's Catholic Church. They do not attend the same school, however. Belinda has received all of her education at the schools at St. Joseph's; Juan attended J. F. Kennedy Elementary School and John Marshall Junior High, and he now attends Cesar Chavez High School. Since seventh grade, Juan has met Belinda after school and walked her home.

They both live in small, well-kept homes in a section of the community that is largely Spanish speaking with very strong influences from the wide variety of countries of origin represented by community residents: Mexico, Honduras, El Salvador, and Nicaragua, among others. The Catholic Church here is a dominant exterior environmental force in shaping community social, political, economic, and personal values and behaviors.

Both Juan's and Belinda's parents immigrated to the United States from Mexico, seeking to improve the opportunities for their future families. Juan's mother found a job as a housekeeper at a local hotel, where she now manages the housekeeping staff. His father began as a day laborer and construction worker, eventually moving up to become foreman of the largest construction company in the area. He anticipates beginning his own construction company within the next year. Belinda's mother was a skilled seamstress and was able to start her own tailoring business shortly after immigrating. Belinda's father, with a background in diesel mechanics, was able to find work at a large trucking company where he continues to work today.

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Like many teenagers today, Juan and Belinda face the difficulties of seeking to sort out the complexities and the intricacies of their relationship. They feel very much in love, knowing in their hearts that they want to get married and raise a family. At 17, they are at a crossroads, because they face conflicts about their future sexual intimacy with limited information and strong prohibitions against premarital sex. Following many of the teachings of their church and the urgings of their parents, Juan and Belinda have avoided much physical contact except for kissing and holding each other.

Like many communities in the United States, their community struggled with the question of just what information should be given to students about physical health and sexuality. Their community's school board decided to limit the amount and type of information to the basics of female and male sexual anatomy and physiology. The result of this decision for Juan and Belinda was that they learned very little about sexual response and behavior, conception, pregnancy, childbirth, contraception, safe sex practices, or other areas that are critical in today's world. The decision by the school board was based on a belief that it was the families' responsibility to provide this information to their children. The school social worker at Cesar Chavez High School is aware of the moral conflicts that arise for youth in this community that in part result from limited sex education.

AN INTEGRATIVE APPROACH FOR UNDERSTANDING THE INTERSECTION OF INTERIOR BIOLOGICAL HEALTH AND ILLNESS AND EXTERIOR ENVIRONMENTAL FACTORS

As we think about the stories of Cheryl, Bess, Melissa, Thomas, Max, Juan, and Belinda, we can see that biology is an important dimension of their behavior. But despite growing agreement of the importance of biology in influencing human behavior and thus the need for social workers to be well informed in this arena, the profession is struggling to articulate exactly what social workers need to know about human biology, or what DePoy and Gilson (2008) refer to as a substantial part of the interior environment. Because social workers deal with people, and people comprise the corpus of human biology, social workers encounter biology and its reciprocal influence with exterior environment conditions such as poverty, chronic illness, addictions, violence, reproductive problems, and child abuse each time they interact with individuals. For instructive purposes, we distinguish interior from exterior environments on the basis of corporeality, or material that relates to the body (DePoy & Gilson, 2007). However, the division between the corporeal and non-corporeal is not always clear. Consider for example a knee replacement. While it is not organic in composition, it is located beneath the skin and functions as integral to body stability and movement. But is it interior or exterior? What about eyeglasses, prostheses, or even clothes that preserve body temperature?

Returning to the cases of Cheryl, Bess, Melissa, Thomas, Max, Juan, and Belinda, their interior environments are the central reason they are seeking social work assistance. To be effective in meeting professional goals, social workers must have a working knowledge of the body's systems and the ways these systems interact with each other and with other interior and exterior environmental dimensions. Social workers also must be sufficiently informed about interior environment theory and knowledge in order to discuss details of biological functioning with clients when indicated (H. C. Johnson, 2001; Tangenberg & Kemp, 2002).

While the knowledge of biological structures and their function is foundational to understanding the interior environment, it is insufficient for social workers, in that social work professional decision making and activity require a complex mastery of knowledge about the interactions of interior and exterior environments. Moreover, understanding of how the interior environment contributes to human behavior (what people do and do not do and how they do what they do), appearance, and experience (DePoy & Gilson, 2004) is critical for informed social work practice as exemplified by each of the case studies above.

Approaching social work practice from well accepted explanatory models such as biopsychosocial-spiritual and legitimacy (DePoy & Gilson, 2008) requires depth of knowledge not only of interior parts, but also of their complex, context-embedded interaction. Consistent with post-postmodern thinking, which colocates multiple fields of knowledge adjacent to and informing one another (DePoy & Gilson, 2008), social work's growing interest in human biology is essential for framing effective social work responses that consider the interstices of "mind–body interactions."

Systems frameworks describe and explain human phenomena as a set of interrelated parts. There are many variations and applications of systems approaches ranging from those that look at embodied or interior systems, to those that examine human systems composed of both humans and their exterior environments, and even extending to systems that do not contain embodied elements (DePoy & Gilson, 2008). At this point, there is a well-developed theory supported by rigorously conducted empirical evidence of the complex relationships among physical health, psychological health, and social experiences (DePoy & Gilson, 2008; Epel et al., 2006; Weitz, 2009). This is an exciting and rapidly changing knowledge base.

Systems perspective

In March of 2001, the National Institutes of Health sponsored a conference titled Vital Connections: The Science of Mind–Body Interactions (MacArthur Network on Mind–Body Interactions, 2001). This event was one of the most important in influencing new theory and knowledge linking interior and exterior systems and environments. Renowned scholars reported on several topics focusing on the interaction of exterior and interior environments that have been receiving and continue to receive intense research scrutiny—for example, the neurobiology of human emotions, early care and brain development, the biology of social interactions, socioeconomic status (SES) and health, neuroendocrinology of stress, and the role of sleep in health and cognition. Scholarship at this conference revealed further evidence of the critical connections between external environmental conditions and embodied phenomena, which were previously thought to be only tangentially related to one another. Throughout the 3-day conference, presenters theorized about the "integrative mechanisms" that link social and psychological dimensions to the brain and the rest of the body. Researchers were clear that we are just beginning to understand these mechanisms, and we need to be cautious not to exceed our data in any claims or beliefs about systems interactivity. Much of the current evidence emerged from animal studies and is now conducted with advanced computer modeling software. Its accuracy in explaining the human body remains probable but cautiously applied.

Although these attempts to understand mind–body connections have led to many important theories about health and illness, they may also be misinterpreted. Social workers therefore would be advised to heed the warning of a number of medical researchers and social critics against explaining behavior and emotion through a medicalized lens (see Conrad, 2007; Fischbach, quoted in MacArthur Network on Mind–Body Interactions, 2001; Lane, 2007; Watters, 2010). Such a reductionist perspective may undermine our ability to consider the full range of exterior environmental influences on embodied phenomena. Moreover, medicalization serves to pathologize typical daily experience.

On the flipside of this caution, over attribution of physical experiences to psychological and social conditions fails to consider the interior environmental causes of illness. While we cannot forget that health and illness are influenced by

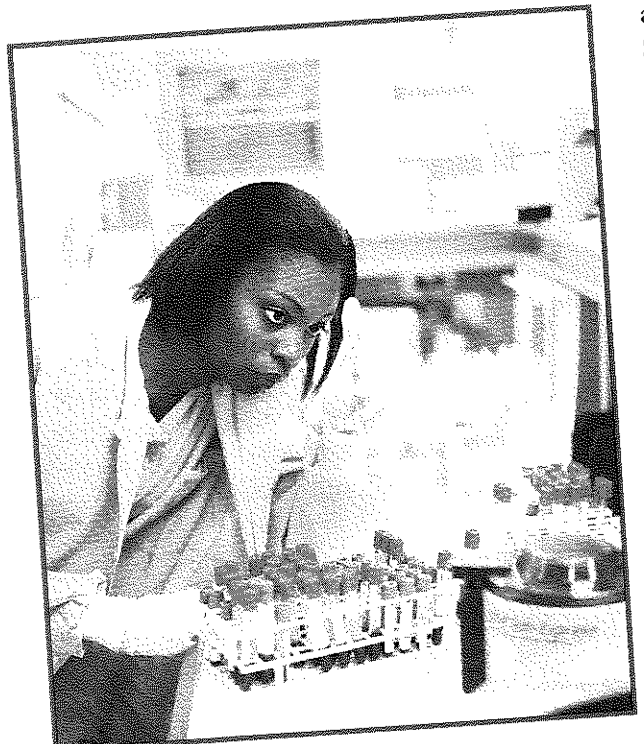


Photo 3.1 A medical researcher examines data to test a hypothesis.

exterior social, political, cultural, and economic environmental conditions (DePoy & Gilson, 2007; Saleebey, 2001), these are often invoked as one-way streets rather than being seen as part of a more complex interactive picture. While the efficiency of a single framework is seductive, such thinking may limit our ability to expansively identify the broad nature of problems, needs, and a range of appropriate interventions to resolve the problems (DePoy & Gilson, 2004, 2010).

The social constructionist perspective suggests that human phenomena are pluralistic in meaning. As an example, rather than being a singular scientifically supported entity, through the lens of social construction, a physically disabling medical condition, such as paralysis or low vision, is defined in large part by its meaning from interior views as well as from political, social, cultural, and economic exterior environments (Albrecht, Seelman, & Bury, 2001; Barnett & Scotch, 2002; DePoy & Gilson, 2004; Gilson & DePoy, 2000, 2002). Thus, using social construction as explanatory, the experience of having atypical low vision can be interpreted as influenced by shared cultural understandings of the "expected roles" for persons with atypical vision, or by actions or inactions of political institutions to promote or impede this subpopulation's access to physical and social environments. We may automatically assume that an individual with atypical low vision is in need of professional intervention, when that person may in fact have his or her life well organized and function well in all chosen living and working environments. Thus, rather than being explained by the biological condition itself, limitation associated with an atypical biological condition may be a function of the exterior environment; the characteristics of the task; personal attitude; and available resources such as technology; assistance from family, friends, or employers; accessible transportation; and welcoming, fully accessible communities (DePoy & Gilson, 2010).

Social constructionist perspective

As an example, although social workers do not diagnose medical explanations for embodied conditions in the scope of our practice, the social work administrator who is developing or operating a shelter, a food kitchen, or an advocacy center may integrate medical and mental health services with employment, housing, financial, and companionship services (Gelberg & Linn, 1988; Nyamathi, Leake, Keenan, & Gelberg, 2000) within the larger considerations of the meaning of those services to the users and community context. Lowe (1997) has recommended a model of social work practice that promotes healthy communities as well as working with individuals, families, and groups to help them identify and advocate for their own health needs if they so choose. DePoy and Gilson (2004, 2010) have built on this model by proposing *legitimate communities*, defined as those that practice acceptance of ideas and appreciate and respond to the full range of human diversity.

A LOOK AT SIX INTERIOR ENVIRONMENT SYSTEMS

Now we turn to the six biological systems discussed in this chapter: the nervous system, the endocrine system, the immune system, the cardiovascular system, the musculoskeletal system, and the reproductive system. All the other biological systems (such as the digestive system, the respiratory system, and the urinary system) also warrant our attention, but with the limitations of space, we have chosen these six because they are commonly involved in many of the biologically based issues that social workers encounter, and thus can serve as a model for thinking about other systems as well.

As you read the descriptions of these six interior environment systems, keep in mind their connectedness with each other as well as with all environmental conditions. As we emphasize throughout, just as human behavior is a complex transaction of person and environment, biological functioning is the result of complex interactions among all biological systems and the environments in which they function. No one system operates in isolation from other systems.

Systems perspective

Nervous System

In the first case study, you met Cheryl, who is like the more than 235,000 people in the United States hospitalized each year with a brain injury (BI). In Cheryl's case, we are referring to what is commonly termed a *traumatic brain injury* (TBI), defined as an insult to the brain caused by an external physical force that may result in a diminished or altered state of consciousness (Brain Injury Association of America, 2001). Included here are what might be classified as mild brain injuries or concussions. Traumatic brain injuries include head injuries that result from falls, automobile accidents, infections and viruses, insufficient oxygen, and poisoning. Explosions caused by landmines and improvised explosive devices (IEDs) have been identified as one of the primary causes of TBI and interior environment problems in military personnel.

According to the Centers for Disease Control and Prevention (CDC, 2006b), approximately 1.4 million individuals sustain traumatic brain injury in the United States each year, creating $60 billion yearly in hospital and injury-related costs (direct medical costs and indirect costs such as lost economic productivity). It is estimated that 2% of the population in the United States, or 5.3 million people, live with the atypical results of traumatic brain injuries. For children and young adults, TBI is the type of injury most often associated with deaths due to unintended injuries. The rates of TBI among African American children ages 0–4 are about 40% higher than those for White children. It is estimated that 1 in 4 adults with TBI is unable to return to work within one year after the injury.

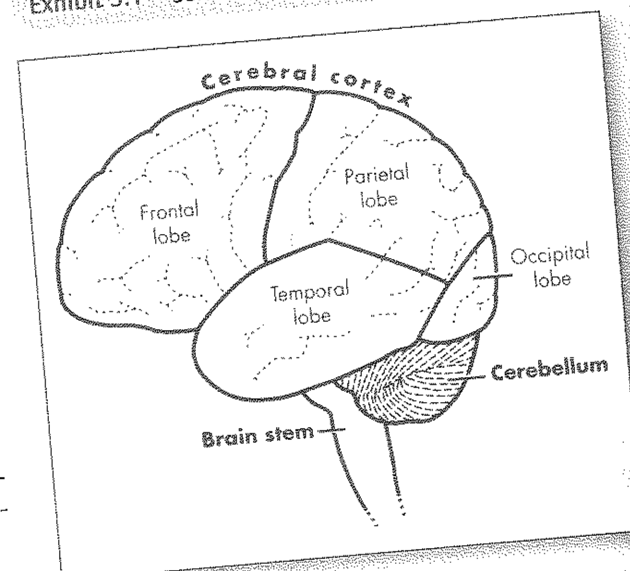
Although the symptoms may be similar, *acquired brain injury* (ABI) is a different classification of brain injury. It does not result from traumatic injury to the head; is not hereditary, congenital, or degenerative; and occurs after birth. Included in this category are oxygen deprivation (anoxia), aneurysms, infections to the brain, and stroke (Brain Injury Association of America, 2001).

Each type of BI may provoke specific atypical issues and behaviors for the individual. However, brain injury in general can affect cognitive, physical, and psychological skills. Atypical cognitive function may present as atypical language and communication, information processing, memory, and perception. Cheryl's atypical writing is an example, as well as a reflection of atypical fine motor skill. Atypical physical functioning often occurs, such as walking differently or not at all, and changes in balance and coordination, strength, and endurance. Atypical psychological changes may come from two different sources. They may be *primary* or directly related to the BI, such as irritability and judgment errors, or they may be *reactive* to the adjustments required to live with the atypical function caused by BI and its consequences, typically resulting in a diagnosis of depression and changes in self-esteem. Cheryl's difficulty in recognizing that Sean is not going to marry her and her misjudgments in other social situations are symptoms of the psychological consequences of her BI.

The **nervous system** provides the structure and processes for communicating sensory, perceptual, and autonomically generated information throughout the body. Three major subsystems compose the nervous system:

1. *Central nervous system* (CNS): the brain and the spinal cord
2. *Peripheral nervous system* (PNS): spinal and cranial nerves
3. *Autonomic nervous system* (ANS): nerves controlling cardiovascular, gastrointestinal, genitourinary, and respiratory systems

Exhibit 3.1 Selected Areas of the Brain



The brain sends signals to the spinal cord, which in turn relays the message to specific parts of the body by way of the PNS. Messages from the PNS to the brain travel back by way of a similar pathway (J. Carey, 1990; R. Carter, 2009). Note that Cheryl's brain injury affects only a part of her nervous system—in fact, only part of the CNS. Damage to other parts of the nervous system can have significant atypical effects, but here we focus on her brain injury because it is so closely linked with behavioral changes.

The human brain, which constitutes only about 2% of total body weight, may contain as many as 10 million neurons. Its three major internal regions are referred to as the forebrain, midbrain, and hindbrain. Viewed from the side (see Exhibit 3.1), the largest structure visible is the *cerebral cortex*, part of the forebrain. The cerebral cortex is the seat of higher mental functions, including thinking, planning, and problem solving. This area of the brain is more highly developed in humans than in any other animal. It is divided into two hemispheres—left and right—that are interconnected by nerve fibers. The hemispheres are thought to be specialized, one side for language and the other for processing of spatial information such as maps and pictures. Each hemisphere controls the opposite side of the body, so that damage to one side of the brain may cause numbness or paralysis of the arm and leg on the opposite side.

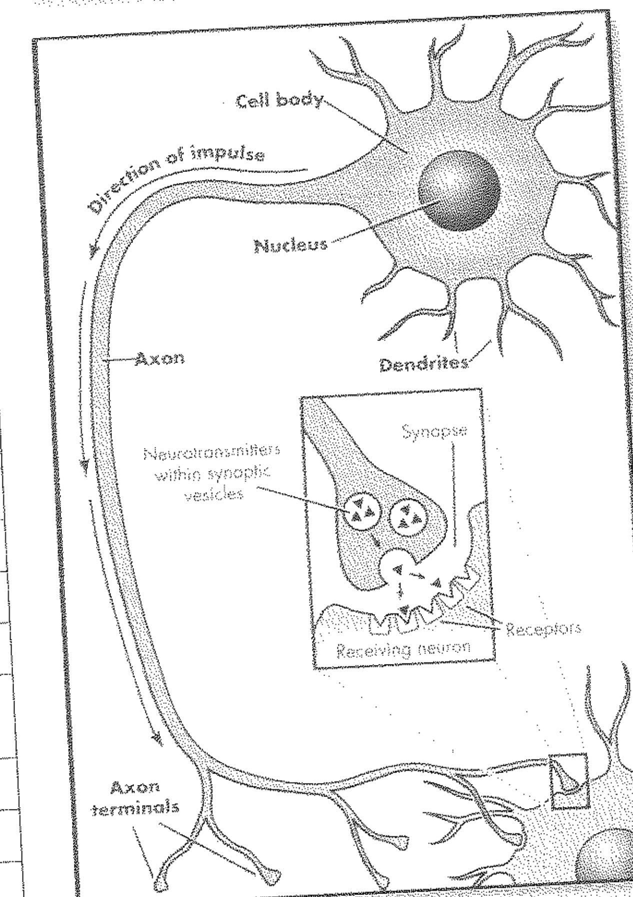
The cerebral cortex has four lobes, which are depicted in Exhibit 3.1. As Exhibit 3.2 explains, functions such as vision, hearing, and speech are distributed in specific regions, with some lobes being associated with more than one function. The frontal lobe is the largest, making up nearly one third of the surface of the cerebral cortex. Lesions of any one of the lobes can have a dramatic impact on the functions of that lobe (M. B. Carpenter, 1991; R. Carter, 2009; Earle, 1987). Other forebrain structures process information from the sensory and perceptual organs and structures and send it to the cortex, or receive orders from cortical centers and relay them on down through central nervous system structures to central and peripheral structures throughout the body. Also in the forebrain are centers for memory and emotion, as well as control of essential functions such as hunger, thirst, and biological sex drive.

The midbrain is a small area, but it contains important centers for sleep and pain as well as relay centers for sensory information and control of movement.

Exhibit 3.2 Regions of the Cerebral Cortex

Brain Region	Function
Frontal lobe	Motor behavior
	Expressive language
	Social functioning
	Concentration and ability to attend
	Reasoning and thinking
	Orientation to time, place, and person
Temporal lobe	Language
	Memory
	Emotions
Parietal lobes	Intellectual processing
	Integration of sensory information
Left parietal lobe	Verbal processing
Right parietal lobe	Visual/spatial processing
Occipital lobe	Vision

Exhibit 3.3 Features of a Typical Neuron



In Exhibit 3.1, part of the hindbrain, including the cerebellum, can also be seen. The *cerebellum* controls complex motor programming, including maintaining muscle tone and posture. Other hindbrain structures are essential to the regulation of basic physiological functions, including breathing, heart rate, and blood pressure. The brain stem connects the cerebral cortex to the spinal cord.

The basic working unit of all the nervous systems is the **neuron**, or nerve cell. The human body has a great diversity of neuronal types, but all consist of a cell body with a nucleus and a conduction fiber, an **axon**. Extending from the cell body are *dendrites*, which conduct impulses to the neurons from the axons of other nerve cells. Exhibit 3.3 shows how neurons are linked by axons and dendrites.

The connection between each axon and dendrite is actually a gap called a **synapse**. Synapses use chemical and electrical **neurotransmitters** to communicate. As the inset box in Exhibit 3.3 shows, nerve impulses travel from the cell body to the ends of the axons, where they trigger the release of neurotransmitters. The adjacent dendrite of another neuron has receptors distinctly shaped to fit particular types of neurotransmitters. When the neurotransmitter fits into a slot, the message is passed along.

Although neurotransmitters are the focus of much current research, scientists have not yet articulated all that positivist research reveals about what neurotransmitters do. Essentially, they may either excite or inhibit nervous system responses.

But medical research has revealed very little about many of the neurotransmitters, and may not yet have identified them all. Here are a few:

- *Acetylcholine* (ACh): The first neurotransmitter identified (in 1914 by Henry Hallett Dale and confirmed as a neurotransmitter by Otto Loewi; they jointly received the Nobel Prize in Physiology or Medicine in 1936) is an excitatory neurotransmitter active in both the CNS and the PNS. Acetylcholine may be critical for intellectual activities such as memory.
- *Dopamine* (DA): This neurotransmitter, which is widely present in the CNS and PNS, is implicated in regulation of the endocrine system. Dopamine is thought to play a role in influencing emotional behavior, cognition, and motor activity.
- *Norepinephrine* (NE): Like dopamine, norepinephrine appears in many parts of the body. It may play a role in learning and memory and is also secreted by the adrenal glands in response to stress or events that produce arousal. Norepinephrine connects the brain stem with the cerebral cortex (Bentley & Walsh, 2006).
- *Serotonin:* Present in blood platelets, the lining of the digestive tract, and in a tract from the midbrain to all brain regions, this neurotransmitter is thought to be a factor in many body functions. Serotonin plays a role in sensory processes, muscular activity, thinking, states of consciousness, mood, depression diagnoses, and anxiety diagnoses (Bentley & Walsh, 2006).
- *Amino acids:* Some types of these molecules, which are found in proteins, are distributed throughout the brain and other body tissues. One amino acid, gamma aminobutyric acid (GABA), is thought to play a critical role in inhibiting the firing of impulses of some cells. Thus, GABA is believed to be instrumental in many functions of the CNS, such as locomotor activity, cardiovascular reactions, pituitary function, and anxiety diagnoses (Bentley & Walsh, 2006).
- *Peptides:* Amino acids that are joined together have only recently been studied as neurotransmitters. Opioids, many of which are peptides, play an important role in activities ranging from moderating pain to causing sleepiness. Endorphins help to minimize pain and enhance adaptive behavior (J. Carey, 1990; Sadock & Sadock, 2007).

Biologically, behavior is affected by not only the levels of a neurotransmitter, but also the balance between two or more neurotransmitters. Psychotropic medications impact behaviors and symptoms associated with diagnoses of mental illness by affecting the levels of specific neurotransmitters and altering the balance among neurotransmitters. Social workers working from a medical diagnostic perspective would be well advised to keep up on medical research about the effects of neurotransmitters on human behavior when working with individuals who are typically referred for medications evaluation and when following up with individuals who have been placed on medication treatment regimens (Bentley & Walsh, 2006).

For Cheryl, as for many people living with traumatic brain injury, her skills, abilities, and atypical changes may be affected by a variety of interior and exterior environment circumstances—including which parts of the brain were injured, her achievements prior to injury, her social and psychological supports, and the training and education that she is offered following her accident. Tremendous advances are being made in rehabilitation following brain injuries (W. Gordon et al., 2006). The better that social workers understand brain functions and brain plasticity, the more they can understand and communicate with medical personnel. We may be able to help with adjustment or adaptation to atypical changes as well as the recovery of functions. Cheryl could benefit from cognitive retraining, support in finding and maintaining employment, family counseling, and individual counseling that will help her end her relationship with Sean. A key to recovery for many individuals who have experienced similar trauma is an opportunity to interact with peers and other individuals with similar experiences. Such peer networks may provide the individual with access to new skills and a key link to exterior environment social support. A social worker working with Cheryl may fill several roles: case manager, advocate, counselor, resource coordinator, and referral source.

Endocrine System

Remember Bess, the middle-aged woman diagnosed with diabetes? If you had first met her in a nonhospital setting, you might have interpreted her behaviors quite differently. Because of the recent rural health initiative in Bess's town, which has a number of residents who have relocated from French Canada, it was not unusual to hear women speaking in both French and English about their diets and exercises, and initially you may have been quite pleased for Bess's success. If Bess had told you that she was tired, you might have suggested that she slow down and get more rest, or perhaps that she include vitamins in her diet. Sitting in the morning in her nightclothes on her couch and missing work might suggest alcohol or other drug use. Confusion, switching back and forth between speaking French and English in the same sentence, and inability to answer simple questions could signal stroke, dementia, or a diagnosis of mental illness such as schizophrenia. But only a thorough medical assessment of her interior environment revealed the cause of Bess's behaviors: a physical health condition traceable to a malfunction in the endocrine system.

The **endocrine system** plays a crucial role in our growth, metabolism, development, learning, and memory. It is made up of *glands* that secrete hormones into the blood system; those hormones bind to receptors in target organs, much as neurotransmitters do in the brain, and affect the metabolism or function of those organs (Besser & Thorner, 1994; Kapit, Macey, & Meisami, 2000; Mader, 2003; Rosenzweig, Breedlove, & Watson, 2004; Rosenzweig & Leiman, 1989). Distinguishing differences between hormones and neurotransmitters are often the distance of travel from the point of release to the target, as well as the route of travel. Hormones travel long distances through the bloodstream; neurotransmitters travel shorter distances from cell to cell, across the synaptic cleft.

Endocrine glands include the pineal, pituitary, thyroid, parathyroid, pancreas, and adrenal. Endocrine cells are also found in some organs that have primarily a non-endocrine function: the hypothalamus, liver, thymus, heart, kidney, stomach, duodenum, testes, and ovaries. Exhibit 3.4 lists some of the better-known glands and organs, the hormones they produce, and their effects on other body structures.

Exhibit 3.4 Selected Endocrine Glands and Their Effects

Gland	Hormone	Effect
Hypothalamus	Releasing and release-inhibiting factors	• Targets pituitary gland, which affects many hormonal activities
Pituitary	Adrenocorticotropic (ACTH) Growth (GH, somatotropic) Vasopressin Prolactin	• Stimulates adrenal cortex • Stimulates cell division, protein synthesis, and bone growth • Stimulates water reabsorption by kidneys • Stimulates milk production in mammary glands
Testes	Androgens (testosterone)	• Stimulates development of sex organs, skin, muscles, bones, and sperm • Stimulates development and maintenance of secondary male sex characteristics

(Continued)

Exhibit 3.4 (Continued)

Ovaries	Estrogen and progesterone	• Stimulates development of sex organs, skin, muscles, bones, and uterine lining • Stimulates development and maintenance of secondary female sex characteristics
Adrenal	Epinephrine Adrenal Cortical Steroids	• Stimulates fight-or-flight reactions in heart and other muscles • Raises blood glucose levels • Stimulates sex characteristics
Pancreas	Insulin Glucagon	• Targets liver, muscles, adipose tissues • Lowers blood glucose levels • Promotes formation of glycogen, proteins, and fats
Thymus	Thymosins	• Triggers development of T lymphocytes, which orchestrate immune system response
Pineal	Melatonin	• Maintains circadian rhythms (daily cycles of activity)
Thyroid	Thyroxin	• Plays role in growth and development • Stimulates metabolic rate of all organs

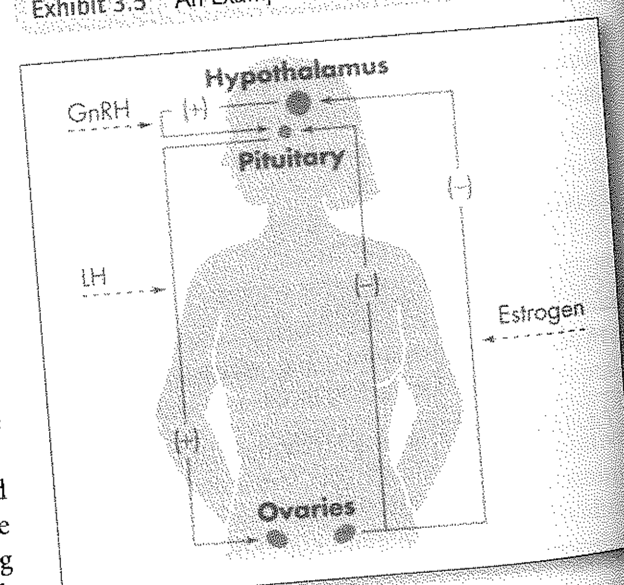
The most basic form of hormonal communication is from an endocrine cell through the blood system to a target cell. A more complex form of hormonal communication is directly from an endocrine gland to a target endocrine gland.

The endocrine system regulates the secretion of hormones through a **feedback control mechanism**. Output consists of hormones released from an endocrine gland; input consists of hormones taken into a target tissue or organ. The system is self-regulating. Similar to neurotransmitters, hormones have specific receptors, so that the hormone released from one gland has a specific target tissue or organ (Mader, 2003).

A good example of a feedback loop is presented in Exhibit 3.5. The hypothalamus secretes the gonadotropin-releasing hormone (GnRH), which binds to receptors in the anterior pituitary and stimulates the secretion of luteinizing hormone (LH). LH binds to receptors in the ovaries to stimulate the production of estrogen. Estrogen has a negative effect on the secretion of LH and GnRH at both the pituitary and hypothalamus, thus completing the loop. Loops like these allow the body to finely control the secretion of hormones.

Systems perspective

Exhibit 3.5 An Example of a Feedback Loop



Another good way to understand the feedback control mechanism is to observe the results when it malfunctions. Consider what has happened to Bess, who has been diagnosed with the most common illness caused by hormonal imbalance: **diabetes mellitus**. Insulin deficiency or resistance to insulin's effects is the basis of diabetes. Insulin and glucagon, which are released by the pancreas, regulate the metabolism of carbohydrates, the source of cell energy. They are essential for the maintenance of blood glucose levels (blood sugar). High blood glucose levels stimulate the release of insulin, which in turn helps to decrease blood sugar by promoting the uptake of glucose by tissues. Low blood sugar stimulates the release of glucagon, which in turn stimulates the liver to release glucose, raising blood sugar. In individuals with insulin deficiency, muscle cells are deprived of glucose. As an alternative, those muscle cells tap fat and protein reserves in muscle tissue as an energy source. The results include wasting of muscles; weakness; weight loss; and *metabolic acidosis*, a chemical imbalance in the blood. The increase in blood acidity suppresses higher nervous system functions, leading to coma. Suppression of the respiratory centers in the brain leads to death (Kapit et al., 2000).

Epidemiologists report a dramatic increase in the incidence of diabetes worldwide in recent years (Zimmet, Alberti, & Shaw, 2001). There are currently 25.8 million persons (8.3% of the population) in the United States who have diabetes. There are 18.8 million persons who have been diagnosed with diabetes, with an estimated 7.0 million persons having undiagnosed diabetes (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2011). Nearly 800,000 new cases of diabetes are diagnosed each year, or 2,200 per day. The number of persons who have been diagnosed with diabetes has shown a steady increase over the past 15 years. It is estimated that $1 out of every $10 spent on health care in the United States is spent on diabetes and its consequences (American Diabetes Association, n.d.). Juvenile-onset diabetes (type 1) is found in children and young adults; risk factors may be autoimmune, genetic, or environmental. Non-Hispanic Whites are at greater risk of developing type 1 diabetes than other racial and ethnic groups. No known way to prevent type 1 diabetes exists. Maturity-onset diabetes (type 2), non-insulin-dependent diabetes mellitus, most commonly arises in individuals over the age of 40 who are also obese. Type 2 diabetes is associated with older age, obesity, family history of diabetes, history of gestational diabetes, impaired glucose metabolism, physical inactivity, and race/ethnicity. Latinos, Native Americans, Asian Americans, and non-Hispanic Blacks are twice as likely to have type 2 diabetes as non-Hispanic Whites. Gestational diabetes is a third type, a form of glucose intolerance diagnosed during pregnancy. This form of diabetes occurs more frequently among African Americans, Hispanic/Latino Americans, and Native Americans, than among other populations (NIDDK, 2011).

For Bess, as for many individuals with symptoms indicating the presence of a medical condition, a crucial role for the social worker is to facilitate access to and comprehension of information and knowledge about the symptoms and the diagnosed condition. Social workers can also aid in the translation of this information, so clients such as Bess, whose first language is French and who might not understand medical jargon, can grasp what is happening to them. The social worker may also help Bess begin to examine the lifestyle changes that may be suggested by this diagnosis. What might it mean in terms of diet, exercise, home and work responsibilities, and so forth? Bess may need assistance in working with her insurance company to plan how her care will be financed. She may also need counseling as she works to adjust to life with this new medical diagnosis.

Rational choice perspective

Immune System

Melissa (Case Study 3.3) is far from alone in testing positive for HIV. The Centers for Disease Control and Prevention (2009c) estimated that approximately 56,300 people were newly infected with HIV in 2006 (the most recent year that such diagnostic data was recorded). Nearly 1 out of every 250, or about 1 million Americans, is infected with the **human immunodeficiency virus (HIV)**, the virus that causes **acquired immunodeficiency syndrome (AIDS)**. In 2005, Glynn and Rhodes estimated that 24% to 27% of the people in the United States infected with HIV are not aware of their infection. It is estimated that the number of diagnoses of AIDS through 2007 in the United States and dependent areas was 1,051,875; the estimated number of people newly diagnosed with AIDS in 2007 in the United States and dependent areas was 35,962 (CDC, 2009c).

It has been estimated that 33.4 million (31.1–35.8 million) people are living with HIV worldwide, that 2.7 million (2.4–3.0 million) people were newly infected in 2008, and that 2 million (1.7–2.4 million) people died of AIDS-related illness in 2008 (Joint United Nations Programme on HIV/AIDS [UNAIDS], 2009). The good news is that, according to the 2009 AIDS epidemic update by UNAIDS, new infections of HIV have been reduced 17% over the past 8 years. In addition, the number of AIDS-related deaths has declined 10% over the past 5 years.

Cumulatively, the estimated number of adults and adolescents diagnosed with AIDS in the United States and dependent areas is 1,009,200, with 810,676 cases in males, 198,544 cases in females, and 9,200 cases estimated in children under age 13. These numbers represent point estimates, which result from adjustments of reported case counts (CDC, 2009c). Persons of all ages and racial and ethnic groups are affected. The cumulative estimates of the number of AIDS cases from the beginning of the epidemic through 2007 include 404,465 cases of AIDS among Whites (not Hispanic), 426,003 cases among Black African Americans (not Hispanic), 169,138 cases among Hispanic/Latinos, 7,511 cases among Asian/Pacific Islanders, 3,492 cases among American Indians/Alaska Natives, and 721 among Native Hawaiians/Other Pacific Islanders.

HIV/AIDS is a relatively new disease, and early in its history, it was assumed to be terminal. The introduction of highly active antiretroviral therapy (HAART) that became widespread in the United States in 1996 altered the perception of AIDS. It came to be seen as a chronic instead of terminal disease. The reality is that, although some are living longer with the disease, others are still dying young. In 2002, HIV/AIDS was the leading cause of death in the United States for Black (not Hispanic) females ages 25–44 (R. Anderson, 2002). The CDC estimated that cumulative number of deaths due to AIDS in the United States and dependent areas through 2007 was 583,298. This report further states that when considering only the 50 states and the District of Columbia, cumulative estimated number of deaths included 557,902 adults and adolescents, and 4,891 children under age 13 (CDC, 2009c).

The Centers for Disease Control and Prevention (2009c) has reported that the six common transmission categories for HIV are male-to-male sexual contact, injection drug use, male-to-male sexual contact *and* injection drug use, high-risk heterosexual (male-female) contact, mother-to-child (perinatal) transmission, and other (includes blood transfusions and unknown causes). According to the CDC (2005a), the fastest growing groups of persons reported with HIV have been men and women who acquire HIV through heterosexual contact, a group to which Melissa now belongs. Although HIV is more easily transmitted from men to women, it can be transmitted from women to men. Heterosexual transmission occurs mainly through vaginal intercourse.

Once a person is infected with HIV, the disease-fighting immune system gradually weakens. This weakened immune system lets other diseases begin to attack the body. Over the next few years, Melissa will learn a great deal about how her body does or does not protect itself against disease and infection. The **immune system** is made up of organs and cells that work together to defend the body against disease (Kennedy, Kiecolt-Glaser, & Glaser, 1988; E. P. Sarafino, 2008). When operating in an optimal manner, the immune system is able to distinguish our own cells and organs from foreign elements (E. P. Sarafino, 2008). When the body recognizes something as exterior or foreign, the immune system mobilizes body resources and attacks. Remember that we cautioned you about the arbitrary distinction between exterior and interior environments? Here is a good example. The foreign substance (which may be organic in composition and thus fit the definition of interior environment) that can trigger an immune response may be a tissue or organ transplant or, more commonly, an antigen. **Antigens** include bacteria, fungi, protozoa, and viruses.

Sometimes, however, the immune system is mistakenly directed at parts of the body it was designed to protect, resulting in **autoimmune diseases**. Examples include rheumatoid arthritis, rheumatic fever, and lupus erythematosus. With rheumatoid arthritis, the immune system is directed against tissues and bones at the joints. In rheumatic fever, the immune system targets the muscles of the heart. With lupus erythematosus, the immune system affects various parts of the interior environment, including the skin and kidneys (E. P. Sarafino, 2008).

Organs of the immune system are located throughout the body. They have primary involvement in the development of **lymphocytes**, or white blood cells (E. P. Sarafino, 2008), which fight infection. The main lymphatic organs include the following:

- *Bone marrow:* This is the soft tissue in the core of bones. There are two types of bone marrow, red and yellow. Yellow bone marrow stores fat, which the body consumes only as a last resort in cases of extreme starvation. At birth, all bone marrow is red, but as the body ages, more and more red bone marrow is converted to yellow. In adults, red bone marrow is found in the sternum, ribs, vertebrae, skull, and long bones. The bone marrow produces both red (erythrocytes) and white (leukocytes and lymphocytes) blood cells.

- *Lymph nodes:* These are small oval or round spongy masses distributed throughout the body (E. P. Sarafino, 2008). Lymph nodes are connected by a network of lymphatic vessels that contain a clear fluid called *lymph*, whose job is to bathe cells and remove bacteria and certain proteins. As the lymph passes through a lymph node, it is purified of infectious organisms. These vessels ultimately empty into the bloodstream.

- *Spleen:* This organ is located in the upper left quadrant of the abdomen. The spleen functions much like a very large lymph node, except that instead of lymph, blood passes through it. The spleen filters out antigens and removes ineffective or worn-out red blood cells from the body (E. P. Sarafino, 2008). An injured spleen can be removed, but the individual becomes more susceptible to certain infections (Mader, 2003).

- *Thymus:* Located along the trachea in the chest behind the sternum, the thymus secretes *thymosins*, hormones believed to trigger the development of T cells. *T cells*, white blood cells that mature in the thymus, have the task of slowing down, fighting, and attacking antigens (Mader, 2003).

The immune system's response to antigens occurs in both specific and nonspecific ways. **Nonspecific immunity** is more general. "Scavenger" cells, or *phagocytes*, circulate in the blood and lymph, being attracted by biochemical signals to congregate at the site of a wound and ingest antigens (Safyer & Spies-Karotkin, 1988; E. P. Sarafino, 2008). This process, known as *phagocytosis*, is quite effective but has two limitations: (1) Certain bacteria and most viruses can survive after they have been engulfed, and (2) because our bodies are under constant attack and our phagocytes are constantly busy, a major assault on the immune system can easily overwhelm the nonspecific response. Thus, specific immunity is essential (Safyer & Spies-Karotkin, 1988).

Specific immunity, or acquired immunity, involves the lymphocytes. They not only respond to an infection, but they also develop a *memory* of that infection and allow the body to make rapid defense against it in subsequent exposure. Certain lymphocytes produce **antibodies**, protein molecules designed to attach to the surface of specific invaders. The antibodies recruit other protein substances that puncture the membrane of invading microorganisms, causing the invaders to explode. The antibodies are assisted in this battle by T cells, which destroy foreign cells directly and orchestrate the immune response. Following the *primary response*, the antibodies remain in the circulatory system at significant levels until they are no longer needed. With reexposure to the same antigen, a *secondary immune response* occurs, characterized by a more rapid rise in antibody levels—over a period of hours rather than days. This rapid response is possible because, during initial exposure to the antigen, memory cells were created. *Memory T cells* store the information needed to produce specific antibodies. They also have very long lives (Safyer & Spies-Karotkin, 1988; Sprent & Surth, 2001).

The immune system becomes increasingly effective throughout childhood and declines in effectiveness in older adulthood. Infants are born with relatively little immune defense, but their immune system gradually becomes more efficient and complex. Thus, as the child develops, the incidence of serious illness declines. During adolescence and most of adulthood, the immune system, for most individuals, functions at a high level of effectiveness. As we age, although the numbers of lymphocytes and antibodies circulating in the lymph and blood do not decrease, their potency diminishes.

Developmental perspective

The functioning of the immune system can be hampered by a diet low in vitamins A, E, and C and high in fats and cholesterol, and by excess weight (E. P. Sarafino, 2008). There are also far more serious problems that can occur with the immune system, such as HIV, that are life-threatening. HIV, like other viruses, infects "normal" cells and "hijacks" their genetic machinery. These infected cells in essence become factories that make copies of the HIV, which then go on to infect other cells. The hijacked cells are destroyed. A favorite target of HIV is the T cells that tell other cells when to start fighting off infections. HIV thus weakens the immune system and makes it increasingly difficult for the body to fight off other diseases and infections. Most of us host organisms such as fungi, viruses, and parasites that live inside us without causing disease. However, for people with HIV, because of the low T cell count, these same organisms can cause serious infection. When such a disease occurs or when the individual's number of T cells drops below a certain level, the person with HIV is considered to have AIDS (Cressey & Lallemant, 2007).

Melissa's life may undergo significant changes as symptoms of HIV infection begin to emerge. Melissa may be at increased risk of repeated serious yeast infections of the vagina, and she may also be at increased risk for cancer of the cervix and pelvic inflammatory disease. Both men and women are vulnerable to opportunistic diseases and infections such as Kaposi's sarcoma, cytomegalovirus (CMV), AIDS retinopathy, pneumocystis carinii pneumonia (PCP), mycobacterium tuberculosis, and Candida albicans (thrush); atypical functioning such as AIDS dementia, loss of memory, loss of judgment, and depression; and other symptoms such as gastrointestinal dysfunction/distress, joint pain, anemia, and low platelet counts. The social worker may help to educate Melissa about these increased risks. In order to protect her health and the health of others, Melissa will most likely be advised to take special precautions. She can be supported in staying well by getting early treatment, adopting a healthy lifestyle, and remaining hopeful and informed about new treatments (Patterson et al., 1996).

The social worker also may have a role to play in working with Melissa as she tells her family and fiancé about her diagnosis. Melissa and her fiancé may need advice about how to practice safe sex. The social worker should also be available to work with Melissa, her fiancé, and her family as they adjust to her diagnosis and the grief frequently associated with it. The social worker may explore reactions and responses of Melissa, her fiancé, and her parents to this health crisis.

Because of the tremendous costs for medications, particularly HAART, the social worker may link Melissa to sources of financial support. This aid will become increasingly critical if she gets sicker, her income declines, and her medical expenses increase. Given recent advances in medical diagnostics and therapeutics, recent estimates indicate that the lifetime costs of health care associated with HIV may be more than $385,200 per person who is diagnosed as an adult (Schackman et al., 2006). Treatment with HAART is not a cure, but it allows the individual with HIV to fight off other infections and live longer (Markowitz, 1997). However, side effects of some of the drugs are just as debilitating as the effects of AIDS.

In addition to providing Melissa with information about her immune system, HIV, AIDS, and other physical health issues, the social worker can advise Melissa of the protections she qualifies for under the Americans with Disabilities Act of 1990. Melissa has joined an HIV support group, but the social worker may also offer to provide her with or refer her to counseling. The social worker may also have a role to play on behalf of all people with HIV/AIDS, working to address prevention and public health in part by providing HIV/AIDS education to business groups, schools, civic and volunteer associations, and neighborhood groups and by influencing policy to support public health HIV prevention initiatives.

Critical Thinking Questions 3.1

How important is it for Cheryl, Bess, and Melissa to be well informed about their medical conditions? How would you advise them about possible sources of information for their specific conditions? How should their social workers go about becoming better informed about their medical conditions?

Cardiovascular System

According to current estimates, 80 million people in the United States, or more than 1 in 5, have one or more types of *cardiovascular disease* (CVD), the most common cause of death in this country (American Heart Association, 2009).

An estimated 73,600,000 people in the United States ages 6 and over have high blood pressure, over 17 million (17,600,000) have a history of coronary heart disease ("heart attack"), and 6.4 million have a history of having had a stroke. CVD claimed 831,272 lives (34.3% of all deaths, or 1 of every 2.9) in 2006. Over 151,000 Americans killed by CVD in 2005 were under the age of 65. The final death rates from CVD per 100,000 population in the United States in 2006 were 306.6 for White males, 422.8 for Black males, 215.5 for White females, and 298.2 for Black females (American Heart Association, 2010). In 2006, strokes killed 137,119. Stroke is the third leading cause of death (American Heart Association, 2006, 2009; U.S. Department of Health and Human Services, 2000a). In the United States, stroke is the leading cause of serious, long-term disability (American Heart Association, 2009). The death rates per 100,000 population for stroke in 2006 were 41.7 for White males, 67.1 for Black males, 41.1 for White females, and 57.0 for Black females (American Heart Association, 2009). In 2003, the rates of stroke among Mexican Americans were 2.6% for males and 1.8% for females; among Hispanic persons or Latinos (male and female), the rate was 2.2%; it was 1.8% among Asians (male and female) and 3.1% among American Indians/Alaska Natives (males and females) (American Heart Association, 2006). In the United States, the death rate from heart disease has been consistently higher in males than in females and higher among African Americans than among Whites (U.S. Department of Health and Human Services, 2000a). The rate of nonfatal strokes for Blacks in the United States is 1.3 times that of non-Hispanic Whites, the rate of fatal stroke is 1.8 times greater, and the rate of heart disease death is 1.5 times greater (American Heart Association, 2006).

Thomas's cardiovascular diagnosis is **high blood pressure (hypertension)**, defined as a systolic blood pressure equal to or greater than (≥) 140 mm Hg and/or a diastolic blood pressure ≥ 90 mm Hg (his was 200/105). Blacks, Puerto Ricans, Cubans, and Mexican Americans are all more likely to suffer from high blood pressure than are Whites, and the number of existing cases of high blood pressure is nearly 40% higher among Blacks than among Whites. An estimated 6.4 million Blacks have high blood pressure, with more frequent and severe effects than in other population subgroups (U.S. Department of Health and Human Services, 2000a). The prevalence of hypertension among Blacks in the United States is among the highest rates in the world.

In 2006, it was estimated that 1 in 3 adults had high blood pressure, with 77.6% of those individuals being aware of their condition. In 90% to 95% of the cases of individuals with high blood pressure, the cause is unknown. The death rate from high blood pressure has steadily increased (19.5%) from 1996 to 2006, with the actual number of deaths having risen 48.1%. The death rates per 100,000 population from high blood pressure in 2006 were 15.6 for White males, 51.1 for Black males, 14.3 for White females, and 37.7 for Black females (American Heart Association, 2009). High blood pressure also tends to be more common in people with lower education and income levels (N. Adler, 2006).

The cost of cardiovascular disease and stroke in 2005 was estimated to exceed $394 billion, including $242 billion for health care expenses and $152 billion for lost productivity (CDC, 2005b). According to the American Heart Association (2006), the estimated combined direct and indirect cost associated with high blood pressure for 2006 is $63.5 billion.

To better understand cardiovascular disease, it is first important to gain insight into the functioning of the **cardiovascular system**, which consists of the heart and the blood circulatory system (Kapit et al., 2000; Mader, 2003). The heart's walls are made up of specialized muscle. As the muscle shortens and squeezes the hollow cavities of the heart, blood is forced in the directions permitted by the opening or closing of valves. Blood vessels continually carry blood from the heart to the rest of the body's tissues and then return the blood to the heart. Exhibit 3.6 shows the direction of the blood's flow through the heart.

There are three types of blood vessels:

1. Arteries: These have thick walls containing elastic and muscular tissues. The elastic tissues allow the arteries to expand and accommodate the increase in blood volume that occurs after each heartbeat. *Arterioles* are small arteries that branch into smaller vessels called capillaries.
2. Capillaries: A critical part of this closed circulation system, they allow the exchange of nutrients and waste material with the body's cells. Oxygen and nutrients transfer out of a capillary into the tissue fluid surrounding cells, and blood absorbs carbon dioxide and other wastes from the cells.
3. Veins: These take blood from the capillaries and return it to the heart. Some of the major veins in the arms and legs have valves allowing the blood to flow only toward the heart when they are open and blocking any backward flow when they are closed (Kapit et al., 2000; Mader, 2003).

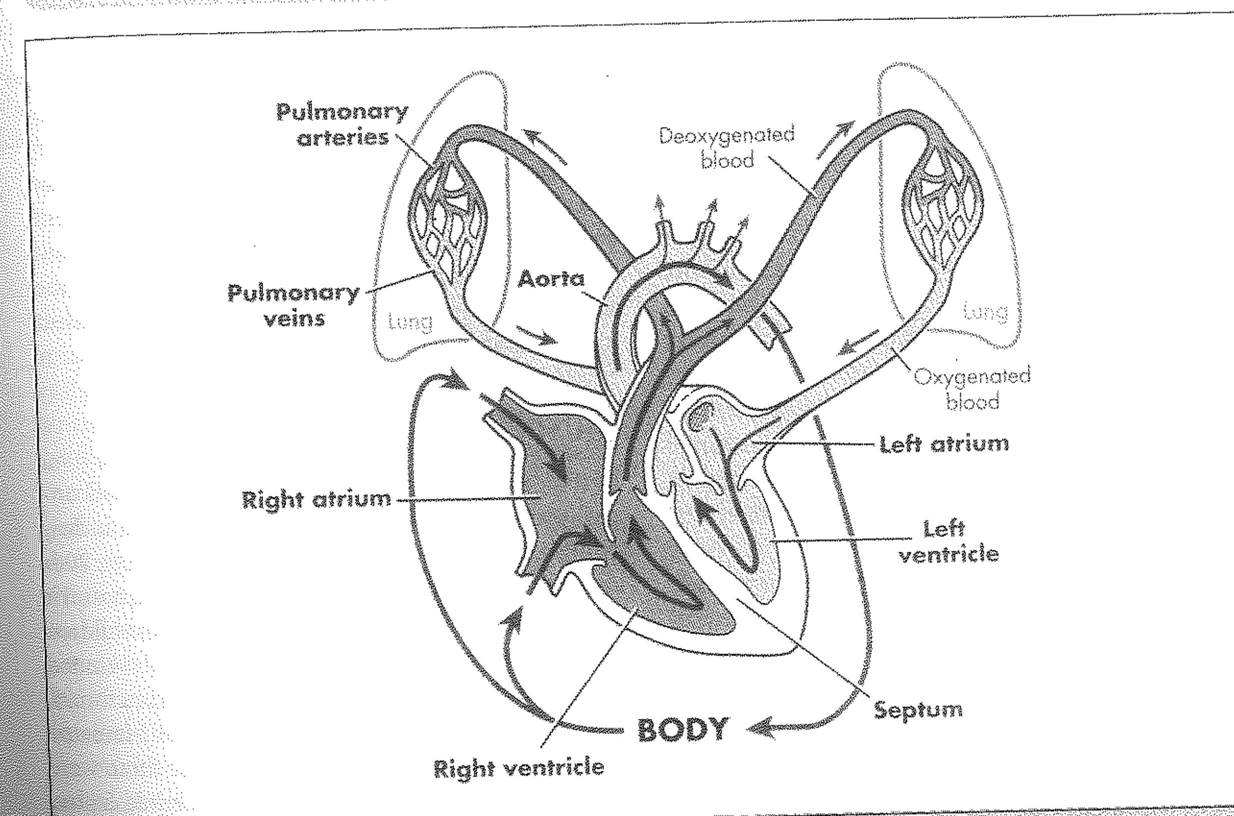
The heart has two sides (right and left) separated by the septum. Each side is divided into an upper and a lower chamber. The two upper, thin-walled chambers are called **atria (singular: atrium)**. The atria are smaller than the two lower, thick-walled chambers, called **ventricles**. Valves within the heart direct the flow of blood from chamber to chamber, and when closed, prevent its backward flow (Kapit et al., 2000; Mader, 2003).

As Exhibit 3.6 shows, the right side of the heart pumps blood to the lungs, and the left side of the heart pumps blood to the tissues of the body. Blood from body tissues that is low in oxygen and high in carbon dioxide (deoxygenated blood) enters the right atrium. The right atrium then sends blood through a valve to the right ventricle. The right ventricle then sends the blood through another valve and the pulmonary arteries into the lungs. In the lungs, the blood gives up carbon dioxide and takes up oxygen. Pulmonary veins then carry blood that is high in oxygen (oxygenated) from the lungs to the left atrium. From the left atrium, blood is sent through a valve to the left ventricle. The blood is then sent through a valve into the aorta for distribution around the body (Kapit et al., 2000; Mader, 2003).

Contraction and relaxation of the heart moves the blood from the ventricles to the lungs and to the body. The right and left sides of the heart contract together—first the two atria, then the two ventricles. The heart contracts ("beats") about 70 times per minute when the body is at rest. The contraction and relaxation cycle is called the *cardiac cycle*. The sound of the heartbeat, as heard through a stethoscope, is caused by the opening and closing of the heart valves.

Although the heart will beat independently of any nervous system stimulation, regulation of the heart is primarily the responsibility of the ANS. *Parasympathetic activities* of the nervous system, which tend to be thought of as normal or routine

Exhibit 3.6 The Direction of Blood Flow Through the Heart



activities, slow the heart rate. *Sympathetic activities*, associated with stress, increase the heart rate. As blood is pumped from the aorta into the arteries, their elastic walls swell, followed by an immediate recoiling. The alternating expansion and recoiling of the arterial wall is the pulse. The normal pulse rate at rest for children ages 6–15 is 70–100 beats per minute; for adults age 18 and over, the normal pulse rate at rest is 60–100 beats per minute (Cleveland Clinic, 2005–2009).

Blood pressure is the measure of the pressure of the blood against the wall of a blood vessel. A *sphygmomanometer* is used to measure blood pressure. The cuff of the sphygmomanometer is placed around the upper arm over an artery. A pressure gauge is used to measure the *systolic blood pressure*, the highest arterial pressure, which results from ejection of blood from the aorta. *Diastolic blood pressure*, the lowest arterial pressure, occurs while the ventricles of the heart are relaxing. Medically desired and healthy blood pressure for a young adult is 120 mm Hg systole over 80 mm Hg diastole, or 120/80 (Kapit et al., 2000; Mader, 2003).

Blood pressure accounts for the movement of blood from the heart to the body by way of arteries and arterioles, but skeletal muscle contraction moves the blood through the venous system. As skeletal muscles contract, they push against the thin or weak walls of the veins, causing the blood to move past valves. Once past the valve, the blood cannot return, forcing it to move toward the heart.

High blood pressure has been called the silent killer, because many people like Thomas have it without noticeable symptoms. It is the leading cause of strokes and is a major risk factor for heart attacks and kidney failure.

Suddenly faced with startling information, such as a dramatic change in what was believed to be good health, Thomas might experience a range of responses, including but not limited to denial, questioning, self-reflection, self-critique, and even anger. The social worker can play many critical roles with Thomas. Perceptions of exterior conditions such as racial discrimination, daily hassles, and stressful life events place him at increased risk for having a stroke or dying as a result of his high blood pressure (Paradies, 2006). Social workers are uniquely positioned to see the links between external environment issues—such as vocational and educational opportunities, economics and income, housing, and criminal victimization—and interior environment health issues.

Conflict perspective

On an individual level, possession of knowledge to access the benefits of medical examination and treatment would be warranted for Thomas. The social worker can participate in medical care by helping Thomas learn the essential elements of effective health practice, including knowledge of what it means to have high blood pressure, the causes, and strategies for decreasing the health risks. If medication is prescribed, the social worker can support the medication regimen and Thomas's decision about how to follow it.

The social worker also can process with Thomas a strategy for identifying and deciding on his preferred lifestyle changes to help lower his blood pressure. These may include examination of sources of stress and patterns of coping, diet, how much exercise he gets on a regular basis, and his social and economic external environmental conditions.

Because high blood pressure has been shown to run in families, the social worker can also work with Thomas's family to discuss lifestyle factors that might contribute to high blood pressure, such as exposure to stress, cigarette/tobacco use, a diet high in cholesterol, physical inactivity, and excess weight.

Because African Americans and some other minorities have been shown to be at increased risk for high blood pressure, the social worker may work with community organizations, community centers, and religious organizations to advance policy and public health practices to support education and prevention programs as well as a physician and health care provider referral program. These health issues have been shown to be related to exterior environment experiences of discrimination and prejudice, and thus the social worker should pay attention to the external environment issues that negatively affect groups and individuals.

Systems perspective

Musculoskeletal System

Today, polio, a viral infection of the nerves that control muscles, has been nearly eradicated in industrialized countries. But in the middle of the 20th century, the disease was much more common, and it temporarily or permanently paralyzed both children and adults. The first outbreak of polio in the United States occurred in 1843 (University of Cincinnati, 2001–2010). According to the College of Medicine at the University of Cincinnati, in 1952 there were 21,000 cases of polio paralysis in the United States, with the last case of wild-virus acquired polio in the United States being diagnosed in 1979. By 1991, new cases of wild-virus acquired poliomyelitis syndrome had disappeared from the Western Hemisphere; by 1997, the Western Pacific was polio free; and by 2002, the European region was polio free (University of Cincinnati, 2001–2010). As of 2008, only four countries remain polio-endemic. This is down from more than 125 countries in 1998. The four remaining countries are Afghanistan, India, Nigeria, and Pakistan (World Health Organization [WHO], 2010). According to the World Health Organization (2006c), the total confirmed cases of polio diagnosed in 2006, as of July 27, were 597 for Africa, 0 for the Americas, 58 for the Eastern Mediterranean, 0 for Europe, 134 for Southeast Asia, and 1 for the Western Pacific (WHO, 2006c). Of the 440,000 people living with polio in the United States, about 25% to 50% may be affected by **post-poliomyelitis syndrome (PPS)**, progressive atrophy of muscles in those who once had polio (National Institute of Neurological Disorders and Stroke, 2006). Case Study 3.5, at the beginning of the chapter, involves Max, who has PPS.

PPS has many causes. Some of the symptoms may be the result of the natural aging of muscles and joints damaged by polio or by overuse of unaffected muscles. Unrelated medical conditions may lead to new symptoms in people who have had polio and a progression of earlier weaknesses. Unexplained atypical muscle atrophy and weakness may also develop. The overuse or repetitive use of weakened muscle fibers and tissues may lead to musculoskeletal pain, which in turn may lead to further atrophy, a need for increased rest, and possibly an increasing level of impairment (Gevirtz, 2006).

For Max, as for many people who have had polio, this onset of new symptoms is unexpected. It may signal increasing physical impairment, which may require new adjustments and adaptations. A social worker who is working with Max should first acquire a knowledge base and then work to identify his strengths, resources, and perceived needs for intervention.

At the center of PPS is dysfunction in the **musculoskeletal system**, which supports and protects the body and enables motion. The contraction and relaxation of muscles attached to the skeleton is the basis for all voluntary movements. Over 600 skeletal muscles in the body account for about 40% of our body weight (Mader, 2003). When a muscle contracts, it shortens; it can only pull, not push. Therefore, for us to be able to extend and to flex at a joint, muscles work in "antagonistic" pairs. As an example, when the hamstring group in the back of the leg contracts, the quadriceps in the front relax; this allows the leg to bend at the knee. When the quadriceps contract, the hamstring relaxes, allowing the leg to extend.

The contraction of a muscle occurs as a result of an electrical impulse passed to the muscle by a controlling nerve that releases acetylcholine. When a single stimulus is given to a muscle, it responds with a twitch, a contraction lasting only a fraction of a second. But when there are repeated stimulations close together, the muscle cannot fully relax between impulses. As a result, each contraction benefits from the previous contraction, giving a combined contraction that is greater than an individual twitch. When stimulation is sufficiently rapid, the twitches cease to be jerky and fuse into a smooth contraction/movement called *tetanus*. However, tetanus that continues eventually produces muscle fatigue due to depletion of energy reserves.

Skeletal muscles exhibit tone when some muscles are always contracted. Tone is critical if we are to maintain body posture. If all the muscle fibers in the neck, trunk, and legs were to relax, our bodies would collapse. Nerve fibers embedded in the muscles emit impulses that communicate to the CNS the state of particular muscles. This communication allows the CNS to coordinate the contraction of muscles (Kapit et al., 2000; Mader, 2003). In its entirety, the musculoskeletal system both supports the body and allows it to move. The skeleton, particularly the large heavy bones of the legs, supports the body against the pull of gravity and protects soft body parts. Most essential, the skull protects the brain, the rib cage protects the heart and lungs, and the vertebrae protect and support the spinal cord.

Bones serve as sites for the attachment of muscles. It may not seem so, but bone is a very active tissue, supplied with nerves and blood vessels. Throughout life, bone cells repair, remold, and rejuvenate in response to stresses, strains, and fractures (Kapit et al., 2000). A typical long bone, such as an arm or leg bone, has a cavity surrounded by a dense area. The dense area contains compact bone; the cavernous area contains blood vessels and nerves surrounded by spongy bone. Far from being weak, spongy bone is designed for strength. It is the site of red marrow, the specialized tissue that produces red and white blood cells. The cavity of a long bone also contains yellow marrow, which is a fat-storage tissue (Kapit et al., 2000; Mader, 2003).

Most bones begin as cartilage. In long bones, growth and calcification (hardening) begin in early childhood and continue through adolescence. Growth hormones and thyroid hormones stimulate bone growth during childhood. Androgens, which are responsible for

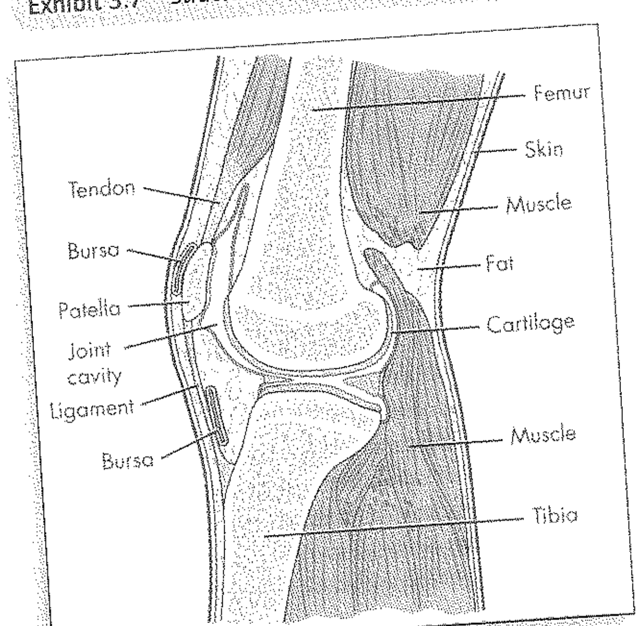
Developmental perspective

the adolescent growth spurt, stimulate bone growth during puberty. In late adolescence, androgens terminate bone growth.

Bones are joined together at joints. Long bones and their corresponding joints are what permit flexible body movement (Mader, 2003). Joints are classified according to the amount of movement they permit. Bones of the cranium, which are sutured together, are examples of immovable joints. Joints between the vertebrae are slightly movable. Freely movable joints, which connect two bones separated by a cavity, are called *synovial joints*. Synovial joints may be hinge joints (knee and elbow) or ball-and-socket joints (attachment of the femur to the hipbone). Exhibit 3.7 shows the structure of the knee joint. Synovial joints are prone to arthritis because the bones gradually lose their protective covering and grate against each other as they move (Mader, 2003).

The bones in a joint are held together by *ligaments*, while *tendons* connect muscle to bone. The ends of the bones are capped by cartilage, which gives added strength and support to the joint. Friction between tendons and ligaments and between tendons and bones is eased by fluid-filled

Exhibit 3.7 Structure of the Knee Joint



sacs called *bursae*. Inflammation of the bursae is called bursitis.

Although overuse is damaging to the musculoskeletal system, underuse is too. Without a certain amount of use, muscles atrophy and bone density declines. Thus, the advice given to many individuals who were diagnosed with polio has been to "use it or lose it." Unfortunately, this advice may have inadvertently contributed to Max's post-polio symptoms.

Because of the commonly held perspective that individual independence is most desirable, it is not unusual for social workers and other health care professionals to discourage a person with a medical explanation for atypical function from using exterior environmental modifications and resources when they are not essential. These may include ramps, elevators, and electrically operated doors or assistive devices. Assistive devices are those products that are designated by the medical community to help a person to communicate, see, hear, or maneuver. Examples that have been used by individuals with atypical activity include manual wheelchairs, motorized wheelchairs, motorized scooters, and other aids that enhance mobility; hearing aids, telephone communication devices, assistive listening devices, visual and audible signal systems, and other aids that enhance an individual's ability to hear; and voice-synthesized computer modules, optical scanners, talking software, Braille printers, and other devices that enhance an individual's ability to communicate.

Those who believe that working to "overcome" challenges is a helpful approach in adjusting to or working with atypical function are well meaning. But hidden within this belief system is the impression that being labeled as "disabled" ascribes deficiency that makes an individual less than whole, less than competent, and less than capable. Having attended school before the Rehabilitation Act of 1973, the Individuals with Disabilities Education Act of 1975, and the Americans with Disabilities Act of 1990, Max's early years were spent in a world with little understanding or acceptance of his atypical gait. For Max, as for many people considered to be "disabled" on the basis of an atypical function,

the pressure was and often is to "overcome" or to succeed in spite of a disability. Possibly, that interior and exterior environment pressure may have contributed to Max's current post-polio exacerbation.

The social worker has many options or none for working with Max. Max may choose to receive a thorough examination by a physician knowledgeable about polio and PPS and stop there. If Max seeks social services, the social worker will then be able to serve as a resource and referral agent. He or she may work with other rehabilitation professionals, such as physical therapists and occupational therapists, in identifying useful adaptations in Max's home and work environment that he could choose to use if he so desired. The social worker can provide counseling but could also refer Max to a PPS peer support group. Because Max may choose to acquire new technology, the social worker may also intervene with insurance companies reluctant to purchase expensive equipment.

Reproductive System

Juan and Belinda are at the age when an understanding of reproduction and sexuality is critical. In the United States, as in many countries around the globe, the typical age for the first experience of sexual intercourse is approximately 17, with 75% of high school seniors reporting having had sexual intercourse. Moreover, on average, there are almost 9 years for women and 10 years for men between first intercourse and first marriage (Guttmacher Institute, 2006). According to the CDC (2007), 47.8% of high school students reported having had sexual intercourse during their life, 45.9% for females and 49.8% for males. For high school students, 43.7% of White students reported that they had ever had sexual intercourse during their life; the percentage among Black students was 66.5%, and 52.0% among Hispanic students.

Contraception use has been increasing among sexually active teens in the United States. In 2006, an estimated 74% of sexually active females and 82% of sexually active males used contraception during the first experience with sexual intercourse (Guttmacher Institute, 2006). This is an encouraging trend, but sexually active U.S. teens still lag behind sexually active teens in other wealthy countries in contraceptive use. This contributes to a higher incidence of teen pregnancy and sexually transmitted disease (STD) in the United States than in other wealthy countries (Guttmacher Institute, 2002b). Annually, between 750,000 and 850,000 teenage females become pregnant in the United States, with between 75% and 95% of the teen pregnancies being unintended (Moss, 2004). The teen pregnancy rate in the United States declined 28% between 1990 and 2002. Among Black teenagers aged 15–19, the pregnancy rate fell by 40% during the same period; among White teenagers 15–19, the rate of decline was 34%; and among Hispanic teenagers 15–19, of any race, the pregnancy rate decreased by 19% (Guttmacher Institute, 2006). The teen birth rate began to rise again for females between the ages of 15 and 19 in 2006 (CDC, 2009i). The CDC (2004) estimates that nearly 19 million new STD infections occur each year, with nearly half occurring among youth and young adults ages 15 to 24.

Sex education is very much related to these statistics. As of 2002, research indicates that 2 out of 3 public school districts in the United States required some education about human sexuality. The great majority, 86%, of school districts that have sex education policies require that abstinence be promoted, and 35% require that abstinence be taught as the *only option*. The remaining school districts require that abstinence be taught as the *preferred option* and permit content on contraception and STDs. Ninety percent of sex education teachers believe that students should receive instruction on contraception, but 1 in 4 report that they are prohibited from providing such instruction. At least 75% of parents indicate they believe that sex education should include information about abstinence, abortion, sexual orientation, pressures to have sex, emotional reactions to having sex, and how to use condoms and other forms of birth control (Guttmacher Institute, 2002a).

If adolescents are to make responsible decisions about their sexuality, they would be wise to develop an understanding of the structures and functions of the reproductive system as well as a value base.

For some individuals, this information may come from the home; for others, from their schools or community activity centers; and for others, from family planning centers where social workers may work. The discussion that follows focuses on the interior environmental aspects of heterosexual sexuality and reproduction, but before beginning this discussion, we raise several important points.

First, recent theory and research have advanced concepts that suggest that gender and sexuality are multifaceted. Some theorists identify ways in which culture influences gender definitions, beliefs, and attitudes about sexuality, as well as sexual behaviors (Rathus, Nevid, & Fichner-Rathus, 1998). Second, many contemporary definitions of gender, and thus of sexuality, move beyond the binary of male and female to the assertion that experience itself is a major element in ascribing gender. Moreover, experience does not have to be consistent with one's biology (S. Davies, 2006; Siragusa, 2001). Third, according to progressive approaches, rather than being a biological phenomenon, gender is considered by some to be a function of comfort as a member of a particular gendered group (Siragusa, 2001).

Social constructionist perspective

Finally, although we may typically think of gender as male or female, more recently the number of biologically described genders has expanded to five (heterosexual male, heterosexual female, homosexual male, homosexual female, and transsexual) (S. Davies, 2006), and six (McDermott, 1997): the feminine, masculine, androgynous, transsexual, cross-dresser, and culturally specific genders (DePoy & Gilson, 2007). It is possible for a person to be a chromosomal male with female genitals or vice versa. Chromosomal, genetic, anatomical, and hormonal aspects of sex are sometimes not aligned (Rudacille, 2005).

Let us now return to our discussion of the interior environment of heterosexual sexuality and gender. In humans, the reproductive system comprises internal and external structures. After conception, the sex-determining chromosome produced by the father unites with the mother's egg, and it is this configuration that determines the child's sex. At birth, boys and girls are distinguished by the presence of specific genitalia.

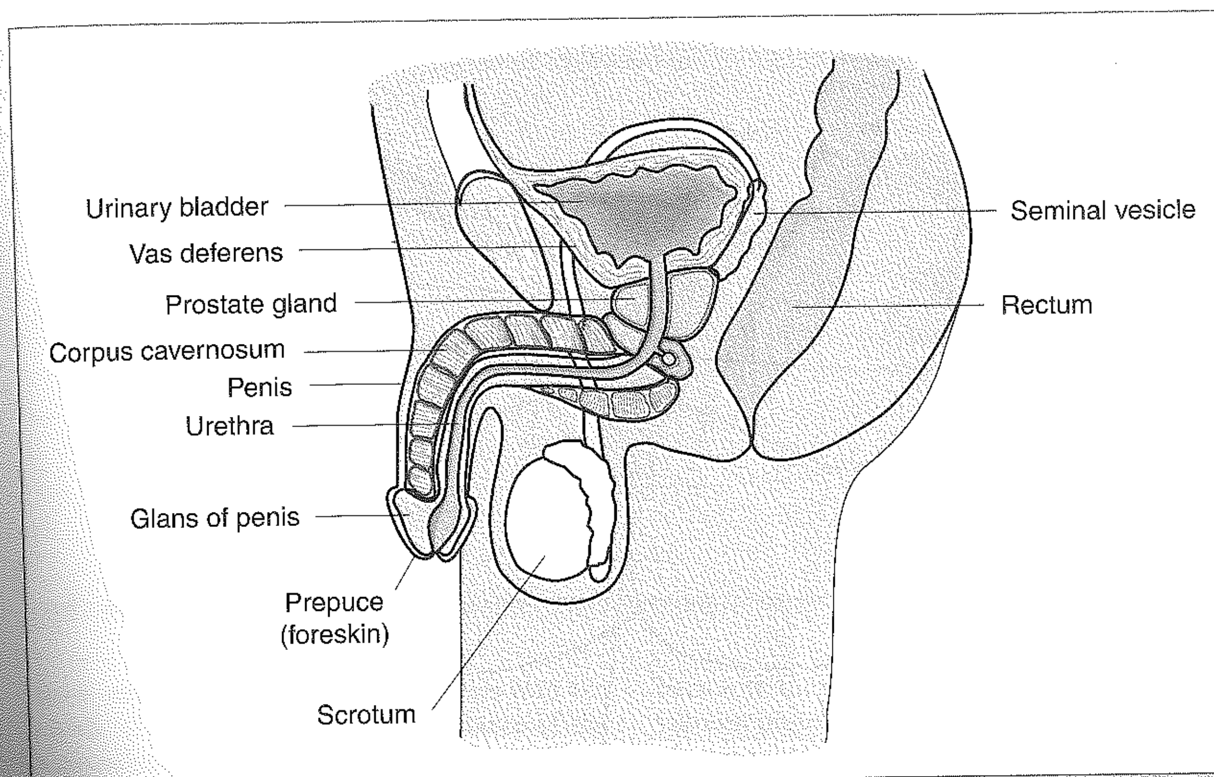
As Exhibit 3.8 shows, the external male organs are the penis and scrotum. Internal organs consist of the testes, the tubes and ducts that serve to transfer the sperm through the reproductive system, and the organs that help nourish and activate sperm and neutralize some of the acidity that sperm encounter in the vagina. The penis functions as a conduit for both urine and semen.

Externally, the shaft and the glans (often referred to as the head or tip) of the penis are visible. The shaft contains three cylinders. The two largest are called the *corpa cavernosa* (singular: corpus cavernosum). During sexual arousal, these become engorged with blood and stiffen. The *corpus spongiosum*, the third cylinder, contains the urethra. It enlarges at the tip of the penis to form a structure called the *glans*. The ridge that separates the glans from the shaft of the penis is called the *corona*. The *frenulum* is the sensitive strip of tissue connecting the underside of the glans to the shaft. At the base of the penis is the *root*, which extends into the pelvis.

Three glands are part of the feedback loop that maintains a constant level of male hormones in the bloodstream. The primary functions of the **testes**, or male gonads, are to produce sperm (mature germ cells that fertilize the female egg) and to secrete male hormones called *androgens*. *Testosterone* is one of the most important hormones in that it stimulates the development of the sex organs in the male fetus and the later development of secondary sex characteristics such as facial hair, male muscle mass, and a deep voice. The two other glands in the feedback loop are the hypothalamus and the pituitary gland. Both secrete hormones that serve a regulatory function, primarily maintaining a constant testosterone level in the blood.

In the early stages of their development, sperm cells are called *spermatocytes*. Each contains 46 chromosomes, including both an X and a Y chromosome that determine sex. As the spermatocytes mature and divide, chromosomes are reduced by half, and only one (either the X or Y) sex-determining

Exhibit 3.8 The Male Reproductive System



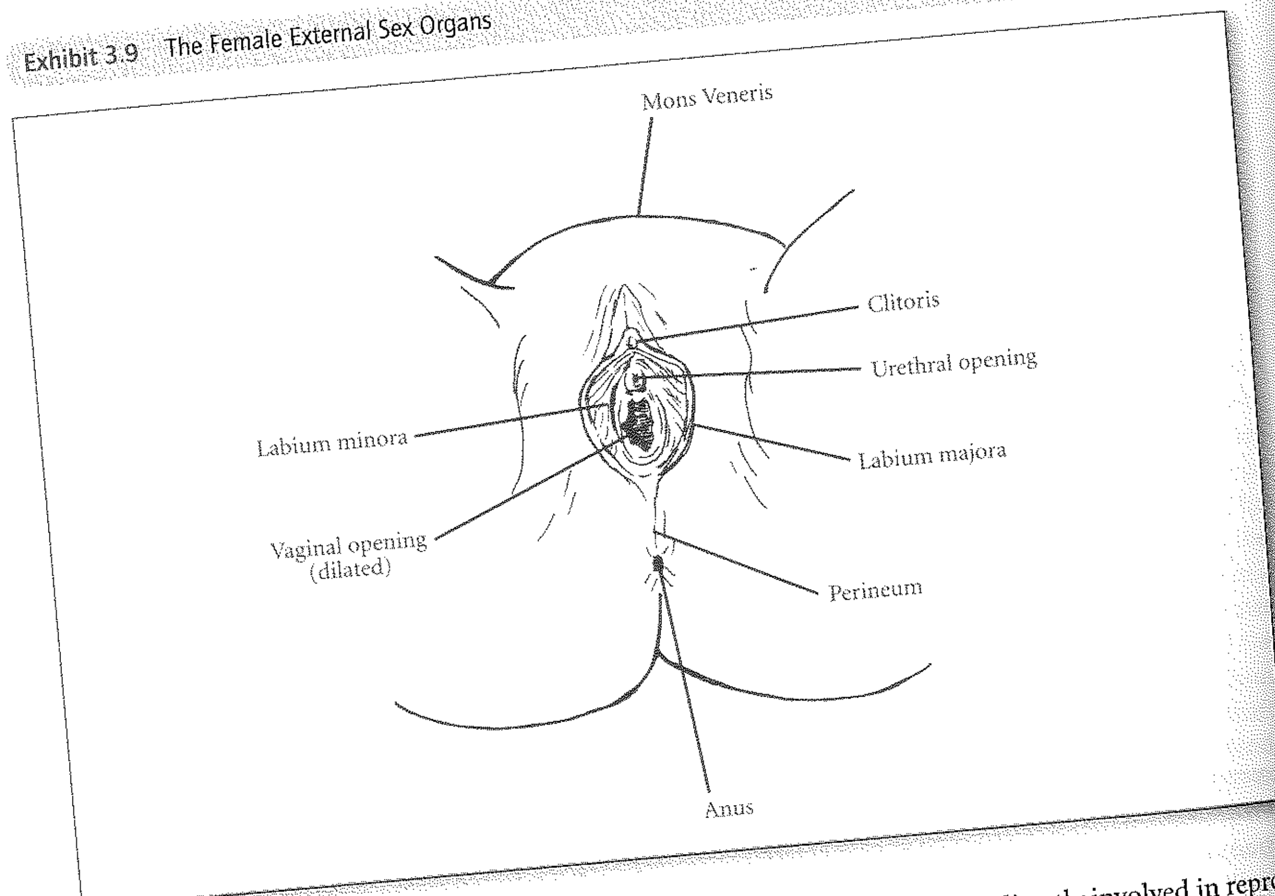
chromosome is retained. The mature sperm cell is called the *spermatozoan*. This cell fertilizes the female egg (ovum), which contains only X chromosomes. Thus, the spermatozoan is the determining factor for the child's sex. (Females have two X chromosomes, and males have one X and one Y chromosome.)

Before ejaculation, the sperm pass through a number of tubes and glands, beginning with a testis, proceeding through a maze of ducts, and then to an epididymis, which is the convergence of the ducts and serves as the storage facility for sperm in a testicle. Each epididymis empties into the vas deferens, which brings the mature sperm to the seminal vesicles, small glands that lie behind the bladder. In these glands, a nourishing and activating fluid combines with the sperm before the mixture is carried through the urethra to the outside of the penis. The *prostate gland*, through which the urethra passes, produces and introduces the milky fluid that preserves the sperm and neutralizes the alkalinity that is met in the female reproductive system. Cowper's glands also make their contribution to the seminal fluid before it leaves the male.

However, even if there is early ejaculation and the Cowper's glands do not have time to secrete fluid, viable sperm exist in the ejaculate and can fertilize the female egg. Early withdrawal of the penis from a woman's vagina therefore does not prevent the passage of some viable sperm cells. It is also important to know that sperm only compose about 1% of the ejaculate (3 to 5 milliliters of fluid total), but that this small percentage contains between 200 million and 400 million sperm. The number of sperm decreases with frequent ejaculation and advancing age.

Exhibit 3.9 shows the external female sex organs. They include the pudendum, also called the vulva, which consists of the mons veneris, the fatty tissue below the abdomen that becomes

Exhibit 3.9 The Female External Sex Organs

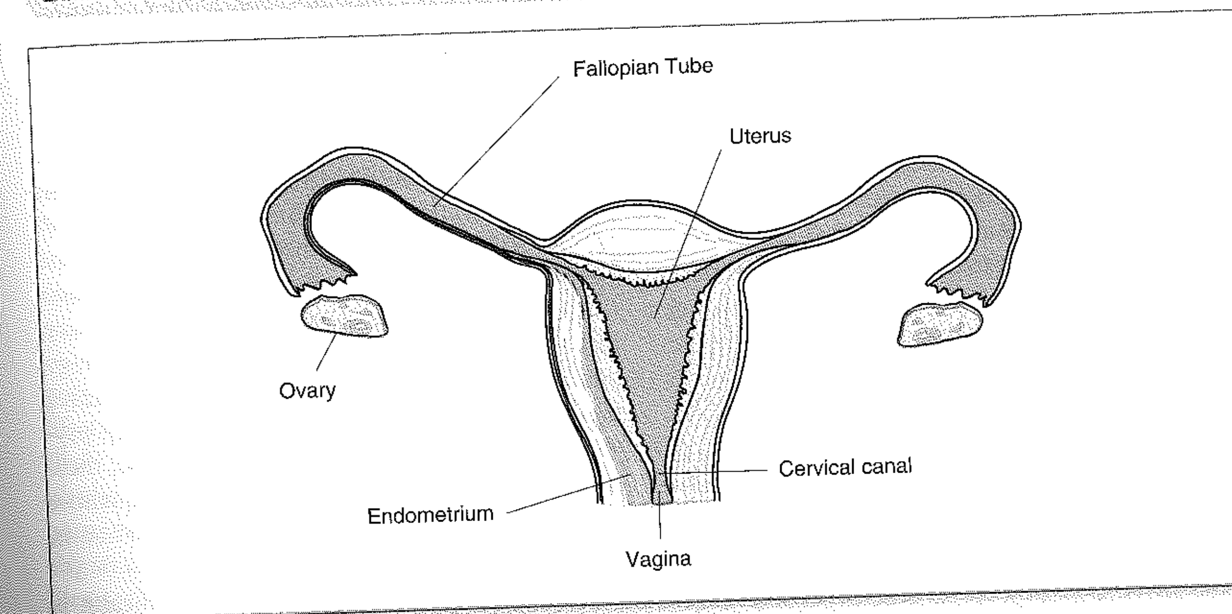


covered with hair after puberty; the labia majora and minora; the clitoris; and the vaginal opening. Unlike the male, the female has a physical separation between excretory and reproductive organs. Urine passes from the bladder through the urethra to the urethral opening, where it is expelled from the body. The urethra is located immediately before the vaginal opening and is unconnected to the vaginal opening.

The labia majora, large folds of skin, contain nerve endings that are responsive to stimulation and protect the inner genitalia. Labia minora join the prepuce hood at the top that covers the clitoris. These structures, when stimulated, engorge with blood and darken, indicating sexual arousal. Resembling the male penis and developing from the same embryonic tissue, the clitoris is about 1 inch long and ¼ inch wide. However, unlike the penis, the clitoris is not directly involved in reproduction but serves primarily to produce sexual pleasure. The vestibule located inside the labia minora contains openings to the urethra and the vagina. It is also a site for arousal because it is rich in nerve endings that are sensitive to stimulation.

Internal structures of the female reproductive system, which are shown in Exhibit 3.10, include the vagina, ovaries, fallopian tubes, cervical canal (cervix), and uterus. The vagina is the structure that connects with the external sexual structures. Composed of three layers and shaped cylindrically, the vagina both receives the penis during intercourse and functions as the birth canal through which the child passes from the uterus to the world outside the mother. Because of its multiple functions, the vagina is flexible in size and changes climate from dry to lubricated. The cervix is the

Exhibit 3.10 The Female Internal Sex Organs



lower end of the uterus and protrudes into the vagina. It maintains the chemical balance of the vagina through its secretions.

The **uterus**, also called the womb, serves as the pear-shaped home for the unborn child for the 9 months between implantation and birth. The innermost of its three layers, the endometrium, is the tissue that builds to protect and nourish the developing fetus. If pregnancy does not occur, the endometrium is shed monthly through the process of menstruation. If pregnancy does occur, the well-muscled middle layer of the uterus produces the strong contractions necessary at birth to move the fetus out of the uterus, into the vaginal canal, and then into the world. The external layer protects the uterus within the body.

The fallopian tubes connect the ovaries to the uterus and serve as a conduit for the ova (egg cells) from the ovaries to the uterus. Located on either side of the uterus, the ovaries have two major functions: the production of ova and the production of the female sex hormones, progesterone and estrogen.

Unlike males, who produce an unlimited number of sperm throughout their lives, females are born with the total number of ova (eggs) that they will ever possess. At birth, the female baby's ovaries contain hundreds of thousands of eggs, but the eggs remain inactive until puberty begins. Toward the end of puberty, girls begin to release one egg each month during ovulation.

Estrogen facilitates sexual maturation and regulates the menstrual cycle in premenopausal women. The benefits of estrogen replacement in postmenopausal women are debatable. Some argue that estrogen maintains cognitive function and cardiac well-being in older women. However, estrogen supplements (also called hormone replacement therapy [HRT]) have been associated with increasing breast and uterine cancer risk, among other problems. Progesterone, though less discussed in the popular media, is critically important in preparing the uterus for pregnancy. It also is a regulator of the menstrual cycle.

Women's breasts are considered to be secondary sex characteristics because they do not have a direct function in reproduction. Mammary glands contained in the breast produce milk that is discharged through the nipple. The nipples are surrounded by the aureoles and become erect when stimulated. The size of the mammary glands is incidental to breast size and milk production. Rather, breast size is a function of the fatty tissue within the breast.

The social worker who is knowledgeable about interior environment mechanisms can clarify the specifics of male and female sexuality for Juan and Belinda. In the school setting or a local community agency, young couples may come to talk about their feelings for each other and ask questions regarding sexual and emotional intimacy. Young people in the United States often have inaccurate information about heterosexual and other types of sexuality and the biological aspects of sexual intimacy. Accurate information about sexuality could provide a basis for Juan and Belinda to make informed decisions about exercising their options related to sexuality.

While it is beyond the scope of this chapter to discuss sexual activity among diverse genders, we urge you to consider this important area of knowledge and social work practice.

> **Critical Thinking Questions 3.2**
>
> What are the available sources of information about the reproductive system in contemporary societies? What sources of information have you used to learn about the reproductive system? At what age did you begin to gather information about the reproductive system? How did you sort out accurate from inaccurate information? How would you like your little sister or brother—or one of your children—to learn about the reproductive system?

EXTERIOR SOCIOECONOMIC ENVIRONMENT/INTERIOR HEALTH ENVIRONMENT

Public health experts have long noted the association of poor health outcomes, in all body systems, with low income, low education, unsanitary housing, inadequate health care, unstable employment, and unsafe physical environments (Auerbach & Krimgold, 2001a; Engels, 1892). Until recently, however, researchers have made little attempt to understand the reasons behind this empirically supported connection of SES and health.

But by the mid-1990s, researchers in several countries began to try to understand how health is related to SES. In the United States, that research effort became much more focused in 1997, when the MacArthur Foundation established the Network on Socioeconomic Status and Health (N. Adler, 2001). This network is interdisciplinary, including scholars from the fields of anthropology, biostatistics, clinical epidemiology, economics, medicine, neuroscience, psychoimmunology, psychology, and sociology. Beginning in 2000, there was a big jump in research on health inequalities related to SES, oppression, and discrimination in the United States (N. Adler, 2006).

The relationship between SES and health is turning out to involve complex interactions of interior and exterior environments, and researchers are finding some surprises. For example, immigrants to the United States have a longer life expectancy than native U.S.–born persons, and this difference increased between 1979 and 2003 (G. Singh & Hiatt, 2006). This increase may be at least partially explained by U.S. immigration policies, which have been favoring immigrant populations with skill sets that are well suited for contemporary global capitalism.

Conflict perspective

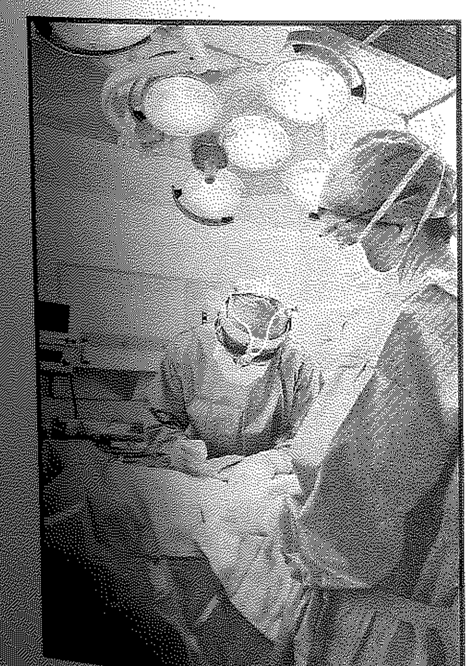
One of the most consistent, but also most controversial, findings is that the level of income inequality in a country, and not purely SES, is associated with health (N. Adler, 2001). Residents in more egalitarian countries, like Sweden and Japan, are healthier on average than residents in countries like Great Britain and the United States, where disparities in the incomes of the poor and the rich are larger (Wilkinson, 2001). Likewise, within the United States, residents in states with the greatest levels of inequality are 25% more likely to report their health to be fair or poor than residents in states with less inequality (Kawachi & Kennedy, 2001). High levels of perceived inequality are particularly associated with heart attack, cancer, homicide, and infant mortality. A significant body of empirical inquiry has suggested that individuals in the lowest SES group are those hardest hit with the negative health effects of inequality (J. Chen et al., 2006).

Recent research is indicating that the mechanisms of this health-and-wealth connection involve a complex interaction of biological, psychological, and social factors. Several factors are consistently showing up in the research, however, including the following:

- Persons with lower incomes engage in disproportionately high-risk health behaviors and lifestyles. Persons with low income may be more likely than higher-SES individuals to smoke, use alcohol excessively, and eat high-fat diets. There is some evidence that these behaviors are used as coping strategies in the face of stress (J. Jackson, 2006). Researchers are also noting that people with low incomes who live in geographic areas with a high concentration of low-income families are less likely than those who live in more affluent areas to have access to health-related information, to health clubs and other facilities that foster good health, and to safe places to walk or jog. They are more likely than their affluent counterparts to be targeted by advertisers for fast food restaurants and to work in jobs with less flexibility. For example, one study of health among a sample of bus drivers found that many with hypertension did not take prescribed medications because the diuretics would increase the frequency of their need to visit a bathroom. Their rigid bus schedules did not allow for bathroom breaks (Ragland, Krause, Greiner, & Fisher, 1998).

- Persons with lower incomes are more likely than those with more substantial incomes to be exposed to carcinogens, pathogens, and other hazards in the physical environment. There is evidence that toxic waste sites are most likely to be located in neighborhoods with a high concentration of low-income residents (Kozol, 2000). Rapid urbanization in Africa and some parts of Asia is producing a number of hazards in the physical environment, including crowding, poor sanitation, and unsafe water (Curtis, 2004).

- Persons with lower incomes as compared to their wealthier counterparts are exposed to more



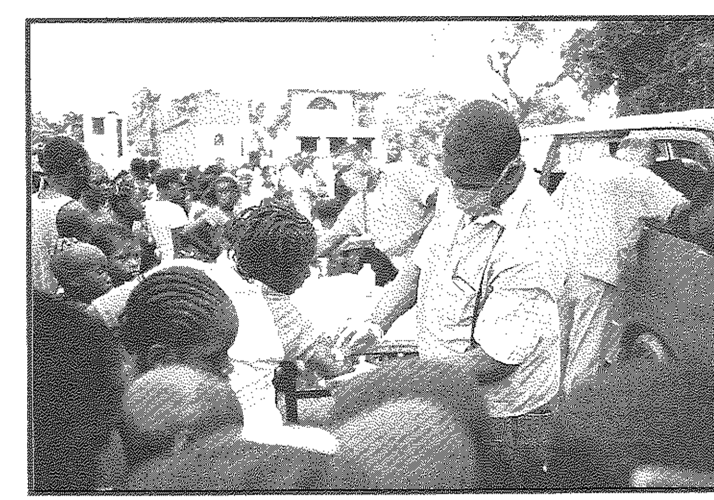


Photo 3.2a & 3.2b Biological health and illness greatly impact human behavior. Here, contrast how medical care is delivered in two very different situations, one in a high-tech operating room in the United States and the other in a temporary clinic in Haiti.

stressors and have fewer resources for coping with stress. Persons with low incomes often have less control over their work situations, a circumstance that has been found to have a powerful negative impact on health (Wilkinson, 2001). It is well documented that stress increases as SES decreases, and recent research indicates that high levels of stress are associated with cellular aging (Epel et al., 2006). It has also been found that "subjective social status," or an individual's evaluation of where she or he stands in the social hierarchy, is strongly related to health status (Sapolsky, 2005; Singh-Manoux, Marmot, & Adler, 2005). The subjective experience of being disadvantaged has been found to be highly correlated with endocrine response to stressors and with respiratory illness when exposed to a virus. These findings are in line with the emerging idea that the degree of the difference in wealth among a population has a greater effect than low SES alone. In addition, perceived racism is associated with ill health (Paradies, 2006).

The research so far supports the notion that the health care system alone cannot offset the effects of other external environment forces on health. Therefore, an important social work domain is public health research and practice. One recent study found that governmental policies aimed at reducing social inequalities result in lowering infant mortality rates and increasing life expectancy at birth (Navarro et al., 2006).

An additional critical factor in health status (positive and negative) involves health literacy. In *Tracking Healthy People 2010*, health literacy was defined by the U.S. Department of Health and Human Services as "The degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (quoted in National Network of Libraries of Medicine, 2008, p. 1). Health literacy involves much more than simply translating health information into multiple languages. It also involves consideration of reading and listening skills; analytic and decision-making skills; and the freedom to be able to engage in dialogue, questioning, and critical evaluation of health information and health care options.

Critical Thinking Questions 3.3

What could be some reasons that the incidence of heart attack, cancer, homicide, and infant mortality increases as the level of societal inequality increases? What are the implications of this for public health policies?

Implications for Social Work Practice

This discussion of the interior biological person suggests several principles for social work assessment and intervention.

- Develop a working knowledge of the body's interior environmental systems, their interconnectedness, and the ways they interact with other dimensions of human behavior.
- In assessments and interventions, recognize that interior environmental conditions of health and illness are influenced by the exterior environmental social, political, cultural, and economic context.
- Recognize that the exterior environmental meanings attached to health and illness may influence not only the physical experience, but also the values and socio-emotional response assigned to health and illness.
- In assessment and intervention activities, look for the ways that behavior affects biological functions and the ways biological systems affect behaviors.
- In assessment and interventions, evaluate the influence of health status on cognitive performance, emotional comfort, and overall well-being.

- In assessment and intervention, consider the ways in which one person's interior environment health status is affecting other people in the person's exterior environment.
- Where appropriate, incorporate multiple social work roles into practice related to the health of the biological system, including the roles of researcher, clinician, educator, case manager, service coordinator, prevention specialist, and policy advocate.

Key Terms

acquired immunodeficiency syndrome (AIDS)
antibodies
antigens
assistive devices
atria (singular: atrium)
autoimmune disease
axon
blood pressure
brain injury (BI)
cardiovascular system
diabetes mellitus
endocrine system
feedback control mechanism
high blood pressure (hypertension)
human immunodeficiency virus (HIV)
immune system
lymphocytes
musculoskeletal system
nervous system
neuron
neurotransmitters
nonspecific immunity
post-poliomyelitis syndrome (PPS)
specific immunity
synapse
testes
uterus
ventricles

Active Learning

1. You have been asked by the local public middle school to teach youth about the experiences of living with one of the following conditions: brain injury, diabetes, HIV, high blood pressure, or post-polio syndrome. Locate literature and web resources on your chosen topic, select the material that you wish to present, and prepare a presentation in lay terms that will be accessible to the youth audience.
2. Working in small groups, prepare two arguments, one supporting and one opposing sex education in public school. Give some consideration to content that should or should not be included in sex education programs in public school and the ages at which such education should occur. Provide evidence for your arguments.

Web Resources

American Diabetes Association
www.diabetes.org

Site contains basic diabetes information as well as specific information on type 1 diabetes, type 2 diabetes, community resources, and healthy living.

American Heart Association
www.americanheart.org

Site contains information on diseases and conditions, healthy lifestyles, health news, and a heart and stroke encyclopedia.

Centers for Disease Control and Prevention (CDC) Division of HIV/AIDS Prevention
www.cdc.gov/hiv

Site contains basic science information on HIV/AIDS, basic statistics, fact sheets, and links to other resource sites.

Guttmacher Institute

www.guttmacher.org

Site presented by the Guttmacher Institute (formerly the Alan Guttmacher Institute), a non-profit organization that focuses on sexual and reproductive health research, policy analysis, and public education, contains information on abortion law and public policy, pregnancy and birth, disease prevention and contraception, sexual behavior, sexually transmitted infections and HIV, and sexuality and youth.

MacArthur Network SES & Health

www.macses.ucsf.edu

Site has overviews of questions of interest to four working groups: social environment group, psychosocial group, allostatic load (physiological wear and tear on the body resulting from chronic stress) group, and developmental group.

National Center for Health Statistics

www.cdc.gov/nchs

Site contains FASTATS on a wide range of health topics as well as news releases and a publication listing.

Neuroscience for Kids

faculty.washington.edu/chudler/introb.html

Site maintained by faculty at the University of Washington, presents basic neuroscience information, including brain basics, the spinal cord, the peripheral nervous system, the neuron, sensory systems, effects of drugs on the nervous system, and neurological and mental disorders.

Post-Polio Syndrome Central

www.skally.net/ppsc

Site maintained by a group of volunteers, contains a post-polio syndrome survey and links to other web resources about PPS.

CHAPTER 4

The Psychological Person

Joseph Walsh