THE BIOLOGICAL PERSON

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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?

KEY IDEAS

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

1. Although there are a variety of ways that we can think about our bodies, the approach proposed here locates understandings of the body within theories of environments, in this case, the interior environment. Environment is defined as a "set of conditions" and thus interior environment theories are concerned with the description and explanation of embodied organic conditions, such as internal organ systems, genetics, interior psychological structures, processes, and so forth (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 all biological systems. No biological system operates in isolation from others.

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 comprised of both internal and external structures that are different for males and females.

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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 in 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 three weeks.

Miraculously, over a six-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, Cheryl was not so lucky. She was able to read but could not retain what she had just read a minute ago. She lost all of her previous knowledge of math and could not do the simplest addition and subtraction problems. Copying her name from a piece of paper to another page would take her at least five minutes. Sometimes she would astound and even hurt her friends with blunt, tactless remarks, and she would occasionally become irritated out of all proportion to the stimulus.

Because of her observable recovery, everyone expected Cheryl to return to active duty, but two years after the accident, her family knows, in their hearts, 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. Everyone who knew Cheryl before the accident cannot understand why her personality has markedly changed, and they even say, “She’s a completely different person!” Helping her will require that her social worker understand what has happened to Cheryl’s body and how it affects her behavior.

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 her social worker met her. The youngest of her three children had married six 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. The coworker and neighbor 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 elder 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 now her dreams were coming true. All the plans had been made, invitations sent out, bridesmaids’ dresses bought and measured, and 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 two months before her wedding. As she does with all of her patients, the doctor 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. 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 eight o’clock in the 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 three 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 has 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 three years, ever since she moved away from New York.

Case Study 3.4

Lifestyle Changes for Thomas

Thomas is 30 years of age and lives with his parents. Both of his parents 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. Thomas will need his social worker’s help to adopt some major lifestyle changes.
Max, who was diagnosed with polio, is from an Eastern European immigrant family that settled in a mid-western 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 any involvement in his arms. In fact, after six months in the hospital and another six 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.

Now, 43 years later, Max has developed the symptoms of postpolio syndrome. He has noticed 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 postpolio 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 two young children.

Juan and Belinda, now both 17 years old, grew up in the same neighborhood 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 Hispanic 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 is a dominant exterior environment 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, at that time, yet unborn 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.
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 what an important dimension of their behavior biology is. But despite growing agreement that biology is an important dimension of human behavior and of the work that social workers do, the profession is struggling to articulate exactly what social workers need to know about the interior environment of human biology. Because social workers deal with people, social workers deal with biological conditions and related interior and exterior environmental conditions such as poverty, chronic illness, addictions, violence, reproductive problems, and child abuse. In 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 helpful, their 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 capable of discussing intimate details of biological functioning (Johnson et al., 1990; Saleebey, 1985, 1992; Tangenberg & Kemp, 2002; Weick, 1986).

It is not enough for social workers to think about specific organs, or even an entire physiological system. As social workers, we need to place that understanding within a theoretical context that assists us in describing, explaining, and responding to the full range of human activity (what people do and do not do and how they do what they do), appearance, and experience (DePoy & Gilson, 2004).

It is important to remember that social work’s biopsychosocial-spiritual model of human behavior is an interdependent systems model; a model that sees the biological dimension of human behavior intertwined with and inseparable from psychological, social, and spiritual dimensions. Social work’s growing interest in human
biology as an integral part of human behavior coincides with an expanding scientific literature about the interactions of biological, psychological, and social dimensions and with heightened attention in the popular culture to “mind-body interactions.”

At this point, we have strong conceptual, theoretical, and empirical evidence of relationships among physical health, psychological health, and social experiences (Epel et al., 2006; Weitz, 2000). But this is a rapidly emerging area of study, and it is difficult for social workers to sift through the contradictions and overstatements often found in popular media presentations of “new findings” and “advancements.”

A word of caution is in order before we begin our discussion of specific biological systems. Although it is possible, for instructive purposes, to distinguish interior from exterior environments on the basis of organicity, DePoy and Gilson (2007) would suggest that in tackling the question of what is and is not embodied (an aspect of bodily experience), you might consider how interior and exterior divisions are somewhat arbitrary and less clear as they relate to embodied functionality. 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?

In March 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), bringing together some of the best mind-body researchers in the world to evaluate the state of knowledge in this area. They reported on several topics focusing on the interaction of exterior and interior environments that have been receiving intense research scrutiny in the past decade: 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. Presentations at this conference revealed further evidence of the critical connections between these environments. Throughout the three-day conference, presenters emphasized the “integrative mechanisms” that link social and psychological dimensions to the brain and the rest of the body. They were clear that we are just beginning to understand these mechanisms, and we need to be cautious about overstating what is empirically supported. Much of the current evidence is based on animal studies. Yet, most of the scientists who presented at the conference were reporting on decade-long
research endeavors, and they were optimistic that they are making real progress in developing scientific knowledge to help medical specialists think of people as biopsychosocial-spiritual wholes.

Although these attempts to understand mind-body connections have led to many important theories about health and illness, they may also unintentionally lead us to reduce biological issues to a simple faith in mind over matter. Social workers therefore would be advised to heed Gerald Fischbach’s warning that “the march of medicine is having profound effects on how we think of mental life . . . but there is a danger in biologizing complex phenomena and claiming too much too soon” (McArthur Network on Mind-Body Interactions, 2001, p. 10). The danger is that we will fail to consider the full range of exterior environmental influences on health and blame individuals for their illnesses or diagnoses. We cannot forget that health and illness are also influenced by social, political, cultural, and economic environmental conditions (DePoy & Gilson, 2007; Saleebey, 2001). Political and economic arrangements have an impact not only on resource availability but also on the interpretation, adaptation, and response to external environment conditions on the part of different population subgroups.

Likewise, although social workers need to take physical health into account, we must avoid the temptation to view the social problems of individuals within a disease framework. Efficiency is an advantage of a disease framework, because medical researchers typically develop detailed evidence-based diagnostic and treatment guidelines for diseases, which can easily be activated (Mechanic, 1995, p. 1209). However, focusing on evidence-based disease approaches may be mechanistic and reductionistic, and may obfuscate the uniqueness and strengths of individuals who have problematic biological interior conditions. Such thinking may thus limit our ability to expansively identify the nature of problems, needs, and appropriate interventions to resolve the problems (DePoy & Gilson, 2003).

The experience of a physically disabling medical condition, such as paralysis or low vision, receives much of its meaning from political, social, cultural, and economic exterior environments (Albrecht, Seelman, & Bury, 2001; Barnes, Mercer, & Shakespeare, 1999; Barnett & Scotch, 2002; DePoy & Gilson, 2004; Gilson & DePoy, 2000, 2002; Gilson, Tusler, & Gill, 1997; Thomson, 1996). For example, the experience of having atypical low vision is influenced by shared cultural understandings of the “expected roles” for persons with atypical vision and by actions or inactions of political institutions to secure their 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 in effect has his or her life well organized and functions well in all chosen living and working environments. Thus, rather than being caused 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 employees, accessible transportation, and welcoming, universally accessible communities (DePoy & Gilson, 2004).

Although social workers do not diagnose medical explanations for embodied conditions in the scope of our practice, our assessments of individuals help us determine whether referrals to biomedical professionals may be indicated. And in our ongoing work, we should be able to assess what type of advocacy may better
ensure that biological needs and issues are addressed. For example, 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). Jane Lowe (1997) has proposed a social-health model that calls for us to view health not only as an individual experience but one within the context of the community, group, and organization. Lowe recommends a model of social work practice that promotes healthy communities as well as working with individuals, families, and groups to identify and advocate for their own health needs if they so choose. DePoy and Gilson (2004) advance this model by proposing a model of inclusive communities that practice acceptance of ideas and appreciate and respond to the full range of human diversity.

A Look at Six Systems

To adequately integrate interior and exterior environments, with specific attention to the biological dimension, into our understanding of human behavior, social workers need a basic understanding of biological systems and their interactions. Six biological systems are 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 the six described here are commonly involved in many of the biologically based issues that social workers encounter, and they can serve as a model for our thinking about other systems.

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

Nervous System

In the first case study, you met Cheryl, who is like the more than 230,000 people in the United States hospitalized each year with a brain injury (BI). For Cheryl, we are referring to what is commonly termed a traumatic brain injury. A traumatic brain injury (TBI) is 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, 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, 2002), approximately 1.5 million individuals sustain traumatic brain injury in the United States each year, creating $48.3 billion yearly in hospital and injury-related costs. 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, traumatic brain injury 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 one in four adults with TBI is unable to return to work within one year after the injury. The direct and indirect annual costs, each year, to the United States as a result of traumatic brain injury are about $56.3 billion.

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, 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 (ambulation), 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; these include 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

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 (Carey, 1990). 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 I 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. The cerebral cortex 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.

**Exhibit 3.1** Selected Areas of the Brain

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 (Carpenter, 1991; 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.

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 (nearly 70 years ago) 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 gland 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 play an important role 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 (Carey, 1990; Kaplan & Sadock, 1998).

Biologically, behavior is affected by not only the levels of a neurotransmitter but also the balance between two or more neurotransmitters. Psychotropic medications affect 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 (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, 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, 2001; 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 nonendocrine 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.

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, 2001).

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.

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 glucose by promoting the uptake of glucose by tissues. In individuals with insulin deficiency, muscle cells are deprived of glucose. As an alternative,
Effect

Targets pituitary gland, which affects many hormonal activities

Stimulates adrenal cortex

Stimulates cell division, protein synthesis, and bone growth

Stimulates water reabsorption by kidneys

Stimulates milk production in mammary glands

Stimulates development of sex organs, skin, muscles, bones, and sperm

Stimulates development and maintenance of secondary male sex characteristics

Stimulates development of sex organs, skin, muscles, bones, and uterine lining

Stimulates development and maintenance of secondary female sex characteristics

Stimulates fight-or-flight reactions in heart and other muscles

Raises blood glucose levels

Stimulates sex characteristics

Targets liver, muscles, adipose tissues

Lowers blood glucose levels

Promotes formation of glycogen, proteins, and fats

Triggers development of T lymphocytes, which orchestrate immune system response

Maintains circadian rhythms (daily cycles of activity)

Plays role in growth and development

Stimulates metabolic rate of all organs

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. Continued 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 20.8 million persons (7% of the population) in the United States who have diabetes. There are 14.6 million persons who have been diagnosed with diabetes, with an estimated 6.2 million persons
having undiagnosed diabetes (National Institute of Diabetes and Digestive and Kidney Diseases, 2005). 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 I) is found in children and young adults; maturity-onset diabetes (Type II) most commonly arises in individuals over the age of 40 who are also obese. Type I diabetes may be an autoimmune disease and does not appear to have genetic or familial traits. Type II diabetes shows a strong familial association.

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.

**Immune System**

Melissa is far from alone in testing positive for HIV. Nearly 1 out of every 250, or about 1 million Americans, are infected with human immunodeficiency virus (HIV), the virus that causes AIDS—acquired immunodeficiency syndrome.
At the end of 2004, an estimated 39.4 million adults and children were living with HIV/AIDS globally, 25 million in the continent of Africa. It is estimated that, worldwide, an average of 14,000 new infections occur per day, with 95% of new infections occurring in low and middle-income countries (UNAIDS, 2005). Between 1,039,000 and 1,185,000 people in the United States are infected with HIV, with 24% to 27% undiagnosed and not aware of their infection (Glynn & Rhodes, 2005). The U.S. Department of Health and Human Services (2006) indicates that more than 944,305 cases of AIDS had been reported by the end of 2004, and nearly 410,800 people had died from HIV disease or AIDS.

Cumulatively, 756,399 of AIDS cases reported in the United States by the end of 2004 had occurred in males, 178,463 cases in females, and 9,344 cases in children under age 13. 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 2004 include 375,155 cases of AIDS among whites (not Hispanic), 379,278 cases among blacks (not Hispanic), 177,164 cases among Hispanics, 7,317 cases among Asian/Pacific Islanders, and 3,084 cases among American Indians/Alaska Natives. The rate of diagnosed AIDS cases among African Americans is 11 times that of whites in general; broken down by gender, it is 9 times that of white men and 23 times that of white women (CDC, 2005a).

HIV/AIDS is a relatively new disease, and early in the history of the disease, it was assumed to be a terminal disease. The introduction of highly active antiretroviral therapy (HAART) that became widespread in the United States in 1996 altered the perception of the disease. It had been considered terminal; thereafter it was considered a chronic disease. While 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 (Anderson, 2002). In 2004, an UNAIDS update delivered the sad news that the AIDS pandemic is driving the life expectancy down in 23 African countries, down below 40 years in seven countries and as low as 33 years in some countries (Pavon, 2004).

According to the CDC, the fastest growing groups of persons reported with AIDS 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 protects itself or does not 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; Sarafino, 2001). When operating in an optimal manner, the immune system is able to distinguish our own cells and organs from foreign elements (Sarafino, 2001). 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 (Sarafino, 2001). Organs of the immune system are located throughout the body. They have primary involvement in the development of lymphocytes, or white blood cells (Sarafino, 2001). The main lymphatic organs include the following:

- **Bone marrow**: The largest organ in the body. It is the soft tissue in the core of bones. There are two types of bone marrow, red and yellow. Yellow bone marrow is inactive. 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**: Small oval or round spongy masses distributed throughout the body (Sarafino, 2001). Lymph nodes are connected by a network of lymphatic vessels that contain a clear fluid called lymph. As the lymph passes through a lymph node, it is purified of infectious organisms. These vessels ultimately empty into the bloodstream.

- **Spleen**: An organ 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 (Sarafino, 2001). An injured spleen can be removed, but the individual becomes more susceptible to certain infections (Mader, 2001).

- **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, 2001).

The immune system's response to antigens occurs in both specific and nonspecific ways (Safyer & Spies-Karotkin, 1988; Sarafino, 2001). **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; Sarafino, 2001). 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 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—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. Memory T cells 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.

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 (Sarafino, 2001). But there are far more serious problems 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 diagnosis of 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 the diagnosis. 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 new medications, 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, the U.S. Department of Health and
Human Services (2000) estimates that the lifetime costs of health care associated with HIV may be more than $155,000 per person. 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 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 the Melissas, 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.

Cardiovascular System

According to current estimates, 71,300,000 people in the United States, or more than one in five, have one or more types of cardiovascular disease (CVD), the most common cause of death in this country (American Heart Association, 2006a).

An estimated 66 million people in the United States ages 6 and over have high blood pressure, nearly 14 million have a history of coronary heart disease (“heart attack”), and 5.5 million have a history of having had a stroke. Preliminary estimates for 2003 are that CVD claimed 910,614 lives (37.7% of all deaths). The preliminary death rates from CVD per 100,000 population in the United States in 2003 were 359.1 for white males, 479.6 for black males, 256.2 for white females, and 354.8 for black females (American Heart Association, 2006b). There were an estimated 700,000 strokes in the United States in 2003, resulting in about 158,000 deaths; stroke is the third leading cause of death (American Heart Association, 2006b; U.S. Department of Health and Human Services, 2000). In 2003, the rates of stroke for individuals age 20 years and older were 2.3% for non-Hispanic white males, 2.6% for non-Hispanic white females, 4.0% for non-Hispanic black males, and 3.9% for non-Hispanic black females. Among Mexican Americans, the rates 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, 2006b). 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 whites (U.S. Department of Health and Human Services, 2000). 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, 2006b).

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, 2000). The prevalence of hypertension among blacks in the United States is among the highest HBP prevalence rates in the world.
In 2003, the overall death rates related to high blood pressure in the United States were 14.9 per 100,000 for white males and 14.5 for white females versus 49.7 for black males and 40.8 for black females. From 1993 to 2003 the age-adjusted death rate from high blood pressure increased 29.3%; the 2003 overall death rate from high blood pressure was 18.1 per 100,000 (American Heart Association, 2006a). High blood pressure also tends to be more common in people with lower education and income levels (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 (2006b), 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 is made up of the heart and the blood circulatory system (Kapit et al., 2000; Mader, 2001). 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**: 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, as 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 absorb carbon dioxide and other wastes from the cells.

3. **Veins**: 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 block any backward flow when they are closed (Kapit et al., 2000; Mader, 2001).

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. 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, 2001).

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 into the left ventricle. The blood is then sent through a valve into the aorta for distribution around the body (Kapit et al., 2000; Mader, 2001).

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. 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 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 pulse rate is normally about 70 times per minute, the rate of the heartbeat.

**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 of mercury systole over 80 mm of mercury diastole, or 120/80 (Kapit et al., 2000; Mader, 2001).

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.

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. Because these health issues have been shown to be related to exterior environment experiences of discrimination and prejudice, the social worker should pay attention to the external environment issues that negatively affect groups and individuals.

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 twentieth century, the disease was much
more common, and it temporarily or permanently paralyzed both children and adults. Of the 440,000 people living with polio in the United States, about 25% to 50% may be affected by **postpoliomyelitis syndrome** (PPS), progressive atrophy of muscles in those who once had polio (National Institute of Neurological Disorders and Stroke, 2006). Case Study 3.5 involves Max, who has PPS. While I noted that confirmed cases of newly diagnosed polio have largely been eliminated in industrialized counties, unfortunately this is not the case for some developing countries. According to the World Health Organization (WHO) (2006a), 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. Three WHO regions were certified polio free by the end of the year 2003. The region of the Americas was certified polio free in 1994; the Western Pacific region was certified polio free in 2000, and the European region in 2002 (WHO, 2006a).

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 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 provides 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.

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 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 nerve 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, 2001).
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 the arm and leg bones, 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, 2001).

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 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, 2001). 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, 2001).

The bones in a joint are held together by ligaments; 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 sacs called bursae. Inflammation of 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 postpolio 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 believed that working to “overcome” challenges was a helpful approach in adjusting to or working with atypical function were well meaning. But hidden within this belief system was the impression that being labeled as “disabled” ascribed deficiency that made an individual less than whole, less than competent, and less than capable. Having attended school before the Rehabilitation Act of 1973, the Individual 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 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 postpolio 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. She or he 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 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 eight years for women and ten years for men between first intercourse and first marriage (Alan Guttmacher Institute, 2006). Findings from a 2001 study of high school students in Illinois revealed that among males, 68.8% of African Americans, 53.0% of Latinos, and 45.1% of whites reported having had sexual intercourse; among females, 53.4% of African Americans, 44.0% of Latinos, and 41.3% of whites reported having had sexual intercourse. The same study reported differences based on rural/urban geography. Among high school students living in rural Illinois, 33% reported having had sexual intercourse as compared to a reported 68.1% of high school students living in Chicago (Dillard, 2002).

Contraception use has been increasing among sexually active teens in the United States. In 2006, 74% of sexually active females and 82% of sexually active males used contraception during the first experience with sexual intercourse (Alan 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 (Alan Guttmacher Institute, 2002a). 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 CDC estimates that nearly 19 million new STD infections occur each year, with nearly half of those infections occurring among youth and young adults ages 15 to 24 (CDC, 2004).

Sex education is very much related to these statistics. As of 2002, two out of three 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 sexuality education teachers believe that students should receive instruction on contraception, but one in four report that they are prohibited from providing such instruction. At least 75% of parents report that sexuality 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 (Alan Guttmacher Institute, 2002b).

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 their schools or community activity centers, and for others 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 here.

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 (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).

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) (Davies, 2006), and then 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 and 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.

Exhibit 3.8 The Male Reproductive System

![Male Reproductive System Diagram](image-url)
Externally, one can view the shaft and the glans (often referred to as the head or tip) of the penis. 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 testes, or male gonads, are best known for their functions in producing sperm (mature germ cells that fertilize the female egg) and in secreting 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 retaining 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 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 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 (three to five 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 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 excretion 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 articulates with the external sexual structures. Composed of three layers and shaped cylindrically, the vagina both receives the penis during intercourse and is the 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 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 nine 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 that they will ever possess. Less than half of the 2 million ova mature sufficiently to be maintained in the ovaries past puberty. Of the approximately 400,000 that remain, only 400 are released in the monthly cycle.

Estrogen facilitates sexual maturation and regulates the menstrual cycle in premenopausal women. The benefits of estrogen in postmenopausal women, who can only obtain it from taking a supplement, are debatable. Some argue that estrogen maintains cognitive function and cardiac well-being in older women. However, estrogen supplements (also called hormone replacement therapy) 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 touched in a sexual context. 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, youth 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 practice.

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, 2001; 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 (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 (Adler, 2006).

The relationship between SES and health is turning out to involve complex interactions of interior and exterior environments, and the 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 (Singh & Hiatt, 2006). This increase may be at least partially explained by U.S. immigration policies that have been favoring immigrant populations with skill sets that are well suited for contemporary global capitalism.

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 (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, in 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 (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:

◆ **Persons with lower incomes engage in riskier 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 (Jackson, 2006). Researchers are also noting that persons with low incomes who live in geographic areas with a high concentration of low-income families are less likely 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 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 drivers with hypertension did not take prescribed medications because the diuretics would increase 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 to be exposed to carcinogens, pathogens, and other hazards in the physical environment.** There is evidence that toxic waste sites are more 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 are exposed to more stressors, and have fewer resources for coping with stress. Persons with lower 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 cellular aging is associated with high levels of stress (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 size of the difference in wealth among a population has a greater effect than low SES alone. Similarly, 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. An important social work domain is, therefore, public health research and practice. One recent study found that governmental policies aimed at reducing social inequalities result in lower infant mortality rates and increased life expectancy at birth (Navarro et al., 2006).

**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 environment 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 socioemotional 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 one’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.
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**KEY TERMS**

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

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**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 postpolio 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 and/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.

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**WEB RESOURCES**

**National Center for Health Statistics**
www.cdc.gov/nchs

Site presented by the National Center for Health Statistics contains FASTATS on a wide range of health topics as well as news releases and publication listing.

**Explore the Brain and Spinal Cord**
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.

**American Diabetes Association**
www.diabetes.org/main/application/commercewf

Site maintained by the American Diabetes Association contains basic diabetes information as well as specific information on Type I diabetes, Type II diabetes, community resources, and healthy living.
Centers for Disease Control and Prevention (CDC)  
Division of HIV/AIDS Prevention  
www.cdc.gov/hiv  
Site maintained by the CDC Division of HIV/AIDS Prevention contains basic science information on HIV/AIDS, basic statistics, fact sheets, and links to other sites.

American Heart Association  
www.americanheart.org  
Site maintained by the American Heart Association contains information on diseases and conditions, healthy lifestyles, news, and a heart and stroke encyclopedia.

Postpolio Syndrome Central  
www.skally.net/ppsc  
Site maintained by a group of volunteers contains a postpolio syndrome (PPS) survey and links to other Web resources about PPS.

Alan Guttmacher Institute  
www.agi-usa.org  
Site presented by the Alan Guttmacher Institute, a nonprofit 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, prevention and contraception, sexual behavior, sexually transmitted infections and HIV, and sexuality and youth.

MacArthur Network on SES & Health  
www.macles.ucsf.edu  
Site presented by the MacArthur Network on SES & Health has overviews of questions of interest to four working groups: social environment group, psychosocial group, allostatic load group, developmental group.