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In the almost three decades since 1981, when the first cases of AIDS were reported in the United States, HIV/AIDS has become a pandemic, affecting virtually all people of the world, men and women, young and old. An estimated 33 million people worldwide are now living with HIV. Early in the evolution of this pandemic, a diagnosis of HIV infection or of AIDS was a certain death sentence because scientific knowledge of the disease and the means to treat it were limited. In the 1980s, prior to the development of antiretroviral therapy (ART) and highly active antiretroviral therapy (HAART), patients and practitioners encountered “pervasive institutional and professional resistance to caring for persons with AIDS” (Bayer & Oppenheimer, 2006). This resistance stemmed from multiple causes, including denial, homophobia, AIDS-related stigma, discrimination, and fear of contagion. During the first decade of the HIV/AIDS epidemic, acts of extraordinary courage and compassion on the part of the physicians and nurses caring for AIDS patients were common and bound those in the AIDS movement together as a community who, if they couldn’t save those who were infected, could at least bear witness to epidemic.

While our recognition of HIV/AIDS came with its emergence among American gay white men, over the past two decades the epidemic has evolved as a global phenomenon, affecting men and women almost equally in some parts of the world. The epidemiological patterns of HIV/AIDS vary greatly around the globe, with HIV/AIDS now disproportionately affecting the haves and have-nots. For example, in the United States today only a relatively small number of infants are born with an HIV infection because of prenatal testing of their mothers and the availability of ART; however, in some parts of the world, and especially in resource-limited countries, such prenatal testing may not be common, and ART may not be readily available. So in spite of international efforts, hundreds of thousands of HIV-infected children born to
infected mothers do not receive the ART they need. (Only about one-third of infected pregnant women receive ART to prevent transmission.) In addition, many of these children are orphaned and at risk of multiple problems in terms of their development, health, and education. In the United States, AIDS has evolved to have a disproportionate impact on minority communities. While ethnic and racial minorities comprised 34% of the U.S. population in 2006, they accounted for 70% of new AIDS cases that year.

While much is now known about HIV infection, its direct and indirect effects continue to challenge patients, families, communities, and caregivers. A new generation of health care providers is now needed to provide care for persons living with HIV/AIDS (PLWH). Unlike earlier professional caregivers whose armamentarium of treatments was extremely limited and whose interventions often included caring for the dying, the new generation of caregivers must understand HIV/AIDS as a chronic condition that PLWH may live with for several decades. These professional caregivers are in short supply in many resource-limited regions of the world and are often hampered in their caregiving efforts by a lack of facilities, money, drugs, and professional colleagues. Even in resource-rich nations like the United States, projected shortages of health care personnel and a sagging economy threaten to cause setbacks in the progress that has been made to date in the care of PLWH.

Prevention remains the best means to control the HIV/AIDS pandemic; however, only a small portion of the people in the world at risk of HIV have access to effective prevention methods such as HIV testing, education, clean needles and syringes, condoms, and mother-to-child transmission prevention programs. Although new biomedical prevention approaches are being tested (e.g., vaccines, preexposure prophylaxis, HSV-2 suppressive therapy, cervical barriers, topical microbicides, male circumcision), none has yet proven to be the “magic bullet” in preventing HIV transmission. Social and cultural factors continue to have an impact on the epidemic. Stigma, poverty, low literacy, sexual exploitation, and the devalued status of women in some parts of the world present formidable challenges to efforts to implement many prevention strategies. Political ideologies and religious dogma have also hampered prevention efforts in some parts of the world, including the United States. Many of the so-called “hard-to-reach,” marginalized, at-risk populations of the world (e.g., sex workers and transgender persons) have not received effective prevention interventions tailored to their specific needs. More recently, some prevention leaders have called for
“combination HIV prevention,” a more long-term approach to reducing HIV risk and vulnerability by addressing both individual and contextual factors (e.g., environmental, political, social, cultural, attitudinal factors). Speaking to the taboos that have thwarted past prevention efforts, Sepkowitz (2006, p. 2414) concluded:

The prime mover of the epidemic is not inadequate antiretroviral medications, poverty, or bad luck, but our inability to accept the gothic dimensions of a disease that is transmitted sexually. Only when we cease to dodge this fact will effective HIV-control programs be established. Until then, it is no exaggeration to say that our polite behavior is killing us.

In the face of these many challenges, significant progress has been made in efforts to prevent and control the HIV/AIDS pandemic. By the end of 2008, there were about 30 approved drugs (or combination drugs) to treat HIV infection. These drugs have proven remarkable in prolonging the lives of PLWH and in reducing some of the more troublesome symptoms of HIV—at least in those parts of the world where such drugs are available. Even in high-income nations, however, ART and HAART exact a toll on those whose lives depend on this treatment. Toxicity, drug resistance, and side effects commonly occur. In addition, access to treatment may be limited by insurance, income, and a lack of expert providers. Adequate drug treatment and availability of the appropriate medications is necessary for those with HIV infection, especially to interrupt maternal–child transmission.

The crisis that HIV/AIDS wrought in many resource-poor parts of the world resulted in responses aimed at stabilizing those countries or regions. After several failed (or at least less than fully successful) efforts by world bodies, including the World Health Organization (WHO), during the first decade of the HIV/AIDS epidemic, a core of the world’s leaders eventually came to understand that failure to deal with the burgeoning pandemic could destabilize some countries and regions. Building on WHO’s early Global Program on AIDS, the Joint Programme on HIV/AIDS (UNAIDS) was established in 1996 to coordinate a multisectoral global response to the pandemic. While this new world effort faced a variety of challenges and setbacks, by 2000 additional support from the World Bank, increasing awareness of the impact of AIDS on Africa, greater support by religious groups for condom use and sex-related prevention programs, and the increasing spread of HIV led to an enhanced
global response to HIV/AIDS, including a special U.N. session on HIV/AIDS (2001) and the establishment of the Global Fund to Fight AIDS, Tuberculosis and Malaria. In 2003, the United States established the President’s Emergency Plan for AIDS Relief (PEPFAR), which was funded in 2008 for $48 billion for the next five years. These international efforts, as well as new ones supported by foundations and non-governmental organizations, have resulted in greater numbers of people worldwide having access to HIV prevention and treatment programs. Still, only an estimated 20 to 37% of persons in low- and middle-income countries who need ART receive this treatment, and only about 20% of people in these countries even know they are infected.

Nurses have played key roles in responding to the HIV/AIDS epidemic. They were among the first professional caregivers to work at the bedsides of persons with AIDS; and now, as HIV/AIDS has become a more manageable disease, they work in the homes of PLWH, in specialty clinics, and in hospitals—in every setting where the PLWH needs care. They have formed an organization, the Association of Nurses in AIDS Care, dedicated to supporting nurses with an interest and expertise related to HIV/AIDS. Extensive HIV-related research, conducted by nurse-scholars, is now reported in the *Journal of the Association of Nurses in AIDS Care (JANAC)* and other HIV-related publications. Advanced practice nurses with HIV expertise—and especially nurse practitioners—now collaborate closely with other specialists to manage the day-to-day care of PLWH. Nurses have incorporated HIV/AIDS content into undergraduate nursing programs and established graduate programs in HIV/AIDS nursing. While the HIV pandemic will continue to provide many challenges in the future, nurses will remain a constant source of hope and succor for people struggling with HIV/AIDS throughout the world.

REFERENCES


Almost three decades ago the first observations of rare opportunistic infections, immunodeficiency, and Kaposi’s sarcoma (KS) were first made in previously healthy young homosexual men. These observations heralded the beginning of one of the most medically, emotionally, and politically troubling epidemics of this century (Centers for Disease Control [CDC], 1981a, b). In an extremely short period of time, relatively speaking, we have learned more about human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS) than perhaps any other organism and disease in history, and some of what we have learned has been applied to other diseases such as cancer. As a result of these advances and new treatments, HIV/AIDS is now considered a chronic disease.

DEFINITIONS

Case definitions for both HIV and AIDS have undergone several revisions since the onset of the pandemic. The most recent change, reflecting increased knowledge and advances in diagnostic testing, requires laboratory-confirmed evidence of HIV infection (CDC, 2008e). The 2008 surveillance case definition for HIV infection among adults and adolescents (aged ≥13 years) is only for public health surveillance and not for clinical diagnosis. The 2008 surveillance case definition replaces the HIV infection classification system and the HIV infection and AIDS case definitions (CDC, 1987b, 1992, 1999, 2008d). (See Appendix I.)
The 2008 case definition for HIV infection among children aged 18 months to <13 years (CDC, 2008d, p. 5) replaces the 1987 and 1999 definitions (CDC, 1987b, 1999). This case definition is for public health surveillance only and not a guide for clinical diagnosis. This definition also applies to all variants of HIV. Confirmation of HIV infection through the diagnosis of AIDS-defining conditions alone is excluded. Laboratory-confirmed evidence of HIV infection is required in this age group (CDC, 2008d).

The 2008 case definition for HIV infection among children aged <18 months (CDC, 2008d, p. 5) replaces the 1999 definition (CDC, 1999). For surveillance purposes, a child aged <18 months is categorized as definitively or presumptively HIV infected if born to an HIV-infected mother and if the laboratory criterion or at least one of the other criteria is met. The CDC (2008d) states that these categories are for surveillance classification purposes and should not be used to guide clinical practice. Therefore, a child with perinatal HIV exposure should continue to be monitored clinically according to nationally accepted treatment and care guidelines (King, 2004; Public Health Service Task Force, 2008; Working Group on Antiretroviral Therapy and Medical Management of HIV-Infected Children, 2009). (See Appendix I and Chapter 14.)

ETIOLOGY

The etiologic agent of AIDS is the human immunodeficiency virus (HIV). (Also see Chapter 3.) HIV is a retrovirus belonging to the Lentivirus genus of the Retroviridae family. There are two types, type 1 and type 2, which are commonly written as HIV-1 and HIV-2. HIV-1 has several genetic subtypes or clades which are M (main), O (outlier) and N (non-M, non-O). Group M consists of at least nine subgroups or clades (A through H, J and K) and 15 circulating recombinant forms (CRF). More than 95% of global HIV isolates are in the M group. The A and B subtypes of the M group are responsible for most human infections. HIV-2 is mainly found in West Africa and is infrequently found elsewhere (Knipe & Howley, 2007; Smith et al., 2008). A belief by some persons that HIV does not cause AIDS (commonly referred to as “AIDS denialism”) has been refuted by the scientific and medical communities (The Durban Declaration, 2000); however, this belief has delayed early and effective treatment for HIV-infected persons in some parts of the world (e.g., South Africa).
Chapter 1  HIV Infection and AIDS: Etiology, Epidemiology, and Transmission

Historical Background

Clues from epidemiological surveillance first suggested that AIDS was caused by a transmissible agent. These clues included the following: (1) The AIDS epidemic was new; (2) it appeared first in limited geographic areas and then spread; (3) the initial groups of people affected (homosexual men and intravenous drug users) and later identified groups (hemophiliacs and blood transfusion recipients) were prone to communicable diseases but were socially, economically, and geographically disparate; and (4) clustering of cases suggested common links and contacts. Early patterns of the distribution of affected persons were reminiscent of hepatitis B (Curran et al., 1985; Gallo, Shaw, & Markham, 1985; Seale, 1984). By 1982 the most probable virus candidates appeared to be cytomegalovirus, Epstein-Barr virus, certain adenoviruses, a human parvovirus, and the retroviruses (Fauci et al., 1984).

Several lines of thinking began to implicate a retrovirus, particularly one similar to human T-cell lymphotropic viruses (HTLV), which are also known as human T-cell leukemia viruses (HTLV-I causes adult T-cell leukemia in humans). These included the knowledge that (1) T-4 lymphocytes were selectively depleted in AIDS, and HTLV had already been shown to have this tropism; (2) HTLV could be transmitted by intimate contact or blood products; (3) HTLV could cause immunosuppression; (4) the retrovirus known as the feline leukemia virus could cause a type of cancer (leukemia) as well as immunosuppression leading to opportunistic infections in cats; and (5) there was a high incidence of AIDS among Haitians and Africans. (Both Haiti and Africa are endemic areas for HTLV-I.) Later assays of AIDS patients showed that they had evidence of exposure to an HTLV-I related virus (Broder & Gallo, 1985; Essex et al., 1985; Fauci et al., 1984; Lane & Fauci, 1985).

By 1983 and 1984, respectively, three groups of researchers had isolated, identified, and characterized the virus that was established as the cause of AIDS. Gallo and his group at the National Cancer Institute named it “HTLV-III”; Montagnier and his associates at the Pasteur Institute in Paris, in cooperation with the CDC, named it “lymphadenopathy-associated virus” (LAV); and Levy and his group in California named it “AIDS-associated retrovirus” (ARV) (Barré-Sinoussi et al., 1983; Gelman et al. 1983; Levy et al., 1984). A task force sponsored by the International Committee on the Taxonomy of Viruses was assembled to reach a decision on a name (Norman, 1985). The name recommended by this committee in May 1986 was “human immunodeficiency virus” (HIV) (Coffin et al.,
a term that continues in use today. The importance of identifying the cause of AIDS included the ability to identify persons infected with HIV; describe the viral characteristics; epidemiologically characterize viral transmission and patterns; describe the natural history of infection; and develop screening and diagnostic tests, approaches to prevention, treatment, and vaccine development. In 2008, Françoise Barré-Sinoussi and Luc Montagnier shared the 2008 Nobel Prize for physiology or medicine for their discovery of HIV (Françoise Barré-Sinoussi and Luc Montagnier share . . . , 2009). Some scientists took issue with the omission of Gallo from also sharing this recognition (Abbadessa et al., 2009).

**Human Immunodeficiency Virus Type 2 (HIV-2)**

In October, 1985, Clavel, Montagnier, and their colleagues identified a new human immunodeficiency virus in blood samples from persons with AIDS in Portugal who had lived in western Africa. It was also described in asymptomatic West African prostitutes (CDC, 1989; Gallo & Montagnier, 1988). This virus was eventually designated human immunodeficiency virus type 2 (HIV-2). It is closely related to the simian immunodeficiency virus (SIV) (Guerrant, Walker, & Weller, 2006; Wain-Hobson, 1998). HIV-2 has been mainly detected, and is thought to have originated, as a zoonotic disease in western Africa; however, there is a reported decrease in HIV-2 infections in many West African countries concurrently with an increase in HIV-1 infections (Rowland-Jones & Whittle, 2007). The first reported AIDS case in the United States due to HIV-2 was diagnosed in December 1987 in New Jersey in a patient who was originally from western Africa (CDC, 1988). Based on screening for antibody in frozen sera, researchers have concluded that HIV-2 may have been present in western Africa since at least 1966 (Kawamura et al., 1989).

HIV-2 is transmitted in the same ways as HIV-1, but it appears less transmissible sexually and perinatally (Whittle, Ariyoshi, & Rowland-Jones, 1998; World Health Organization [WHO], 2008). Most persons in West Africa with HIV-2 infection exhibit delayed disease progression and are known as long-term nonprogressors (Rowland-Jones & Whittle, 2007), or they are asymptomatic (de Silva, Cotten & Rowland-Jones, 2008). There has been relatively little spread beyond West Africa. Few cases of HIV-2 are detected in the United States; however, in the United States in 2008, there was a report of the emergence of a new strain of HIV-2 in an immunosuppressed person who immigrated to the United States from Sierra Leone (Smith et al., 2008).
Origin of HIV and AIDS

Scientists have remained interested in the origin of HIV for various reasons, including that identifying the origin and how the virus causes disease in other hosts might give clues to control of HIV (Essex & Kanki, 1988; Worobey et al., 2008). Some scientists have postulated that HIV crossed the host–species barrier and spread as a “virgin soil” epidemic. Such an organism may be harmless to its natural host but highly lethal to its new host. For HIV-2, the animal host is considered to be the sooty mangabey monkey (Cercocebus atys) (Van Heuverswyn & Peeters, 2007). The common chimpanzee (Pan troglodytes) has been implicated as the natural reservoir for HIV-1, although the introduction into human populations appears more complex than the route for HIV-2 (Keele et al., 2006).

Various case reports and retrospective analyses of stored serum samples suggest the presence of AIDS in the United States in 1968, and perhaps even earlier, although it has also been suggested that some positive serological results may have been artifacts due to prolonged storage (Garry et al., 1989). The earliest reported case was in a Norwegian merchant seaman who was infected in 1961 or 1962 with HIV-1 group O in Cameroon. He subsequently transmitted HIV to his wife and daughter. Another early reported case in Africa was that of a female Danish surgeon who contracted the disease while working in Zaire in 1976 and who died in 1977 (Bygbjerg, 1983). Other early cases appear to have occurred in Kinshasha in 1959 (Hooper, 1997; Nahmias et al., 1986).

The World Health Assembly stated in 1987 that HIV is a “naturally occurring retrovirus of undetermined geographic origin” (Mann et al., 1988, p. 82). Despite this pronouncement, the subject of the origin of HIV and AIDS became a political issue. One highly publicized theory was that SIV-contaminated African chimpanzee tissue was used in the culturing of oral polio vaccine leading to an unintended iatrogenic disease (Hooper, 1999; 2001). This theory has not been substantiated (Worobey et al., 2004).

TRANSMISSION

To date, HIV has been isolated from a variety of body fluids, cells, and tissues, including peripheral blood, lymph nodes, brain tissue, cere-
brospinal fluid, tears, bone marrow, cell-free plasma, saliva, retina, cornea, ear secretions, bronchial fluid, semen, seminal fluid, breast milk, cervical cells, Langerhans cells of the skin and mucous membranes, synovial fluid, and cervical and vaginal secretions. HIV has not been recovered from sweat (CDC, 1997a,b; Marwick, 1985; Pomerantz et al., 1987; Thiry et al., 1985; Vogt et al., 1986; Withrington et al., 1987; Wofsy et al., 1986). The CDC (2005a), in discussing occupational exposures, has indicated that the following fluids are potentially infected: blood, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, semen, and vaginal secretions, as well as any fluids or tissues containing visible blood. The CDC does not consider feces, nasal secretions, saliva, sputum, sweat, tears, urine, or vomitus to be potentially infectious unless they are visibly bloody (CDC, 2005b). The importance of these fluids, cells, and tissues in transmission varies as does the concentration of HIV within them. Periods of higher infectiousness and transmissibility coincide with higher viral load on the part of the HIV-infected person, certain genetic susceptibility and resistance factors, and increasing immunosuppression. Characteristics of HIV itself such as the viral phenotype, clades and subtypes, its cellular tropism (macrophage or other), and the viral load are also important in degree of transmissibility. Many of the genetic susceptibility and resistance factors (such as HLA type and CCRX variants, and CCL3L1 dose), and characteristics of the virus have been exploited in designing effective tests and therapies, some of which result in specific treatments for specific genotypes but are beyond the scope of this chapter. Transmission efficiency also depends on mode of transmission. For example, transmission by blood transfusion is much more efficient than transmission by oral sex with an infected person.

The CDC has recommended standard precautions be applied for all patient care contact with specific transmission-based precautions applied in addition to standard precautions depending on the particular infectious agent and its mode of transmission. For HIV infection alone, only standard precautions would be used. These precautions replace universal precautions. However, additional precautions may be necessary if coinfection is present. For example, if a person with HIV also has active pulmonary tuberculosis, then airborne precautions would be necessary in addition to standard precautions (Siegel et al., 2007).

The major documented ways that HIV may be transmitted are by intimate sexual contact, both homosexual and heterosexual, with an HIV-infected person; through exposure to contaminated blood or blood products either by direct inoculation, sharing of drug apparatus, transfusion,
or other methods; and through passage of the virus from an infected mother to her fetus or newborn in utero, during labor and delivery, or in the early newborn period. The CDC (2005a,b) has delineated levels of risk for HIV transmission. The highest to lowest risks of acquisition of HIV if HIV contamination is present are the following: blood transfusion, needle sharing with injection drug use, receptive anal intercourse, percutaneous needle stick, receptive penile-vaginal intercourse, insertive anal intercourse, insertive penile-vaginal intercourse, with both receptive oral intercourse and insertive oral intercourse between men representing less per-act risk. Bite injury, while another potential route of transmission, is actually a rare route of actual acquisition of HIV.

Sexual Transmission

Initially in the United States, the most common mode of spread was male-to-male sexual transmission. Male-to-male sexual contact is still cumulatively the major transmission category for U.S. adult men, as discussed below (CDC, 2008b). Heterosexual transmission of HIV can occur both from males to females and from females to males. Male-to-female transmission is a more efficient means of transmission (Powers et al., 2008). Heterosexual transmission can occur during both penile-vaginal and penile-anal intercourse and more rarely through oral-genital contact (Vermund, 1997). The estimated male-to-female transmission probability per incident is between 1 in 200 and 1 in 2,000 (De Jong & Geijtenbeek, 2008). Langerhans cells in genital mucosal tissue have been identified as having potential protective functions (de Jong & Geijtenbeek, 2008). HIV transmission due to artificial insemination from an infected donor has been reported. There have also been a limited number of reports of female-to-female sexual transmission (Greenhouse, 1987; Marmor et al., 1986; Monzon & Capellan, 1987), and women who have sex with women may also have other risk factors such as sex with men or injection drug use. The CDC (2006) has reported that in the United States there are no confirmed cases of female-to-female sexual transmission of HIV. Transmission by oral sex has also been described, but the risk is believed to be very low and to result from blood contact (CDC, 1997a,b; Rozenbaum et al., 1988; Spitzer & Weiner, 1989).

The HIV infection epidemic exposed our ignorance of the type and frequency of various sexual practices in the United States. Sex researchers have estimated that about 25% of American women occasionally engage in anal receptive intercourse and that about 10% do so on a regular basis.
for either pleasure or contraception (Bolling & Voeller, 1987). Acquisition of HIV may be made easier by the presence of genital ulcers, sexually transmitted infections, or trauma, and the presence of inflammation or exudates, which can facilitate virus entry into the cell. Menstruation may facilitate transmission whereas menopause resulting in vaginal dryness may lead to trauma and also facilitate transmission. First sexual experiences may be associated with bleeding, and immature vaginal tissue in young girls may be less resistant to trauma and bleeding. Infectious cells such as lymphocytes or macrophages that enter the genital tract because of the presence of one of the above are believed to increase transmissibility. Lack of circumcision in men is believed to result in higher intraurethral loads of infectious cells that increase transmissibility. Thus sex with an uncircumcised man may be riskier than with one who is circumcised in relation to HIV infection (de Jong & Geijtenbeek, 2008; Vermund, 1997).

In addition to factors mentioned above, sexual transmission of HIV is influenced by the:

- Number of different sexual partners
- Likelihood that the sexual partner is infected (for example, behaviors such as injection drug use)
- Prevalence of HIV infection in the geographic area
- Number of sexual exposures with a HIV-infected person
- Status of rectal and vaginal mucosa (for example, whether it is dry or whether sexually transmitted infections are present)
- Infectiousness of the partner (this may include viral load and use of antiviral drugs)
- Use of barriers during sex (for example, proper use of latex condoms)
- Degree of risky sexual behaviors that are practiced (Vermund, 1997; Vernazza et al., 1999).

Transmission between regular sexual partners, only one of whom is HIV infected (called “HIV discordant couples”) has been of particular interest for many reasons, including the potential for prevention of spread. The transmission rate among such discordant couples has varied. Sexual transmission is further discussed below.

**Bloodborne Transmission**

Transmission of HIV by exposure to HIV-infected blood or blood products occurs mainly through piercing of the skin with a contaminated
needle or sharp object; through sharing of needles or other drug-related apparatus, especially among injection drug users; or transfusion from an infected donor to someone requiring blood because of temporary illness, surgery, or chronic illness such as hemophilia or dialysis as well as through transplantation. Injuries from needles and sharp objects to health care workers also falls in this category of transmission, as do using contaminated needles and equipment used for therapeutic purposes. Tattooing has also been implicated in the spread of HIV (Doll, 1988) as has ear and body piercing. Reports of confirmed HIV transmission during bloody fist fights are rare but possible (Ippolitto, Poggio, & Arici, 1994). Concerns about blood-related spread resulted in various precautions during contact sports. For example, Nevada required a mandatory HIV test for boxers, and if positive the fighter was disqualified. Other states with similar rules include New York, New Jersey, Washington, Oregon, and Arizona, as well as Puerto Rico (Feller & Flanagan, 1997). HIV infection after acupuncture has been described (Vittecoq et al., 1989) as it has from receiving transplanted organs from an HIV-infected person (CDC, 1987a). Although rare, transmission through human bite by a HIV-infected person is theoretically possible and has been described (Bartholomew & Jones, 2006; Oladokun et al., 2008). HIV transmission through blood is discussed further below.

**Perinatal Transmission**

Vertical transmission of HIV from an infected mother to her fetus or child in the perinatal period is the third major transmission mode. This includes the times of pregnancy, delivery, and postpartum. Around the time of delivery, transmission is thought to take place due to contact with infected maternal blood and tissue, and most perinatal transmission is believed to occur close to the time of childbirth. Postdelivery, breastfeeding has been implicated in transmission of HIV, and the virus has been isolated from breast milk, both cell-free and cellular components (CDC, 1998; WHO, 2008).

Major advances have occurred in preventing HIV transmission from a mother to her child, and transmission rates have decreased markedly, especially in developed countries, to lows of under 2% (ACOG, 2008; Fowler et al., 2007). In 1994, the groundbreaking results of the AIDS Clinical Trials Group Study 076 were reported (Connor et al., 1994). This study demonstrated that perinatal transmission of HIV infection could be markedly reduced (nearly 70%) by the administration of zidovu-
dine to HIV-infected women during pregnancy and delivery and to their infant after birth (Connor et al., 1994). Other measures to decrease risk led to changes in obstetric management. Since that time, detailed anti-retroviral protocols have been developed to treat HIV-infected pregnant women and their infants. (Also see Chapters 13 and 14.)

The strongest data implicating breast-feeding in transmission originally resulted from case reports of women who acquired HIV from post-partum blood transfusions and whose infants were subsequently infected (LePage et al., 1987; Ziegler et al., 1985). However, there also were studies that indicated HIV-infected mothers did not transmit HIV to their infants while breast-feeding (Lifson, 1988). This argument was resolved with the recovery of HIV-1 DNA from breast milk (Nduati et al., 1995). Currently it is believed that HIV is associated with both the cell-free and cell-associated breast milk components and that the most likely mode of transmission is through infant gut mucosal surfaces. Without drug treatment, transmission can occur at any time during breast-feeding, and the longer the duration, the greater the cumulative risk. However, at least partly because of the acquisition of immune protection via breast milk, it appears that exclusive breast-feeding is associated with lower rates of HIV transmission to the infant than mixed feedings of both breast milk and formula, although formula feedings alone have lower rates (John-Stewart et al., 2004; WHO, 2008). In one study in South Africa of 137 women, by 15 months of age children who had been exclusively breast fed until at least 3 months had a 25% risk of HIV infection; those who were formula-fed, 19%; and those who were breast fed and received other foods, 36% (Coutsoudis et al., 2001). Transmission is also influenced by duration of breast-feeding, with 68% of transmission occurring after six months of breastfeeding (WHO, 2008).

Both maternal and infant factors are associated with an increased risk of HIV transmission via breast-feeding. Maternal factors include:

- Younger maternal age
- Lower parity
- Increased maternal RNA viral load in plasma
- Increased maternal RNA viral load in breast milk
- Breast clinical conditions such as mastitis and cracked nipples
- Suboptimal maternal nutritional status
- Increased duration of breastfeeding (WHO, 2008)

Local immune factors in breast milk may be protective or, if low, may be associated with a higher risk of transmission. Infant factors include
Interrupted integrity of the mucous membranes; (2) oral thrush; (3) immune system dysfunction; and other factors such as milk stasis and altered sucking (WHO, 2008).

In developed countries such as the United States, the standard recommendations for years have been for women to refrain from breastfeeding if they are HIV infected (CDC, 1985; Public Health Service Task Force, 2008). In resource-poor countries where perinatal transmission is more prevalent, restriction on breast-feeding is more complex and can also be a political issue. In many resource-limited countries, formula feeding carries an increased risk for infant morbidity and mortality (but not HIV transmission), while breastfeeding carries a risk for HIV transmission but has less risk for other severe morbidity and mortality (Coovadia & Kindra, 2008). The WHO has issued the following statement on HIV and infant feeding:

The most appropriate infant feeding option for an HIV-infected mother depends on her individual circumstances, including her health status and the local situation, and should consider the health services available and the counselling and support she is likely to receive. Exclusive breastfeeding is recommended for HIV-infected women for the first six months of life unless replacement feeding is acceptable, feasible, affordable, sustainable, and safe for them and their infants before that time. When replacement feeding is acceptable, feasible, affordable, sustainable and safe, avoidance of all breastfeeding by HIV-infected women is recommended (¶ 2).

The WHO recommends that all “HIV-positive women who need anti-retroviral treatment for their own health should have it, and this is likely to reduce HIV transmission during breastfeeding” (WHO, 2009, ¶ 3).

OCCUPATIONAL TRANSMISSION AND PROPHYLAXIS

Health care workers are exposed to many health and safety hazards in health care settings, especially hospitals. Many of these involve infectious agents such as HIV, hepatitis B, hepatitis C, and others. Thus, nurses and other health care workers need to follow recommended safeguards to protect themselves and need to be assertive in ensuring that such safeguards are available to them. Most of the acquisitions in the occupational arena occur through exposure to blood. HIV seroconversion after an
accident in the work setting has been a source of concern for health care workers. Early information relative to this concern came from the CDC Cooperative Needlestick Surveillance group, which consisted of 335 institutions throughout the United States (Marcus and the Cooperative Needlestick Surveillance Group, 1989). The majority of injuries resulted from needlesticks, and information from these studies resulted in recommended modifications for procedures that would increase safety.

According to current estimates, the average risk for occupational HIV transmission is approximately 0.3% and 0.09% for percutaneous and mucous membrane exposure to HIV-infected blood respectively (CDC, 2005b). Various factors increase the risk for HIV acquisition after occupational exposure, including exposure to a larger quantity of blood from the source patient, source patients with terminal illness reflecting factors such as the presence of syncytia-inducing strains, and presence of visible blood on the injury-causing device used to enter the patient’s blood vessel (Gerberding, 1997), in addition to other host and agent factors discussed earlier. However, low viral loads in source patients do not rule out the possibility of transmission.

The original postexposure prophylaxis regimens were promulgated in 1996 and updated in 1998, 2001, and 2005 (CDC, 1998; 2001; 2005b). Employers are required to have exposure control plans. It is important that health care workers report any exposure immediately. The current recommendations about testing, evaluation, counseling, and postexposure drug regimen prophylaxis are in Appendix I. They include information about counseling, adherence, provision of expert advice when needed, and more.

NONOCCUPATIONAL POSTEXPOSURE PROPHYLAXIS

In 1998, the CDC first published recommendations for the management of persons who had nonoccupational exposures to HIV. These were updated in 2005 to reflect advances in prophylactic treatment with the appropriate drug regimen. Nonoccupational postexposure prophylaxis is abbreviated as nPEP (CDC, 2005a). The information on evaluation and protocol may be found in Appendix I. While people in various categories of potential exposures might take advantage of nPEP, use of it is particularly encouraged in both males and females who have been raped. Another group who might take advantage of nPEP are sex workers
or intravenous drug users (IDUs) who generally practice risk reduction but who have had an exceptional occurrence of high-risk behavior (CDC, 2005a). Children who are sexually abused or assaulted or who are exposed by accident to an HIV-infected person may be candidates for nPEP. (See guidelines from the American Academy of Pediatrics [Havens and Committee on Pediatric AIDS, 2003]). Prophylaxis should not be considered as a “morning-after pill” and not replace prevention of HIV infection. nPEP treatment should begin within 72 hours of actual or potential exposure (CDC, 2005a).

STATISTICS AND PATTERNS IN THE UNITED STATES

HIV Incidence and Prevalence

Incidence refers to new cases of a specified condition within a specific time period, while prevalence is the total number of persons with that condition during a specific time period. Data may also be reported in terms of persons living with HIV (not AIDS), persons living with an AIDS diagnosis, or persons with HIV/AIDS, which can make comparisons confusing. There have also been changes in the number of states reporting, especially in regard to HIV (not AIDS), and in varying methods and definitions used over the years, making comparisons difficult. Early in the epidemic, AIDS was a reportable disease, but HIV infection itself was not. Therefore, statistics on HIV prevalence were somewhat inaccurate and incomplete. In 2008, the CDC published a report stating that the earlier back-calculation methods used to estimate HIV prevalence were no longer deemed valid or reliable (CDC, 2008a). As of April 2008, all 50 states, the District of Columbia, and five dependent areas (American Samoa, Guam, the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands) use the same confidential name-based reporting system to collect HIV and AIDS data. AIDS is reportable by all 50 states and the District of Columbia as well as the U.S. territories (CDC, 2009). A detailed methodological approach using laboratory assays that can differentiate recent HIV infection from older ones and extensive statistical methods, including an extended back-calculation approach, were used (Hall et al., 2008). The results indicate that there were approximately 1,106,400 million U.S. adults and adolescents living with HIV at the end of 2006, with a prevalence rate of 447.8 per 100,000 (CDC, 2008a). Of these, approximately 21% do not know they
are infected (CDC, 2008c). Using new estimates, CDC estimates that the annual rate of new HIV infections is approximately 40% higher than previously estimated (Highleyman, 2008) and that there are approximately 112,000 more persons living with HIV in 2006 than there were in 2003 (CDC, 2008c).

Some of the highlights of the CDC’s epidemiological data reported in 2008 for the United States include the following: Approximately 75% of all persons living with HIV are male; 48.1% fell into the male-to-male sexual contact transmission category, while overall 27.6% of all HIV cases fell into the category of high-risk heterosexual contact, although 72.4% of women were in this category; 18.5% fell into the category of injection drug use overall as did about 26% of women. In regard to race and ethnicity, approximately 46.1% of all persons living with HIV were African American while the data for whites, Hispanic/Latino, Asian/Pacific Islander, and American Indians/Alaska Natives were 34.6%, 17.5%, 1.4%, and 0.4% respectively. Overall, about 70% of persons living with HIV in the United States are between the ages of 25 years and 49 years, while about 25% are 50 years of age and older (CDC, 2008a,b; Highleyman, 2008). The increase in HIV prevalence is due not only to the increase in HIV incidence but also to successful treatment. One of the important aspects of these data lies in their application to planning and prevention efforts.

**Geographic Distribution**

AIDS has been reported in all 50 states plus the District of Columbia (CDC, 2009). The highest number of AIDS cases both in 2007 and cumulatively is New York state while North Dakota reports the lowest number of cases. Looking at the estimated rates per 100,000 population for persons living with AIDS in 2007, the highest rate for both adults/adolescents and children is the District of Columbia, followed by New York state for adults/adolescents and Delaware and Florida for children. In regard to reports of cases of HIV infection (not AIDS), six states (California, Florida, New Jersey, New York, North Carolina, Texas) reported about 51% of the 337,590 cumulative cases of HIV infection (not AIDS) (CDC, 2009). Examining AIDS annual incidence rates per 100,000 population for regions for 2006 cases, the highest rates per 100,000 in adults and adolescents for metropolitan statistical areas of >500,000 (large metropolitan area), 50,000 to 499,999 (medium metropolitan area), and below 50,000 (nonmetropolitan
area) were found in the south (CDC, 2008a). The geographic region with the highest number of persons living with AIDS in 2007 was the south, followed by the northeast (CDC, 2009).

Distribution by Sex

As of December 31, 2007, the number of adult female cases of AIDS reported to the CDC was 201,205, accounting for 19.7% of all reported adult cases. Females also accounted for 49.1% of reported U.S. pediatric cases. The rates of AIDS in U.S. women have continued to rise. For adult women in the United States, the major transmission category is now high-risk heterosexual contact with a person known to have or to be at high risk for HIV infection, accounting for about 45% of all female cases, followed by injection drug use, accounting for about 35%. When the category of IDU and the subcategory under high-risk heterosexual contact of “sex with IDU” is added, then about 48% of all AIDS cases in women are known to be related to IDU in some way (CDC, 2009). From 2004 to 2007, the estimated number of newly diagnosed HIV/AIDS cases increased approximately 8% among females and 18% among males, and about 77% of persons living with AIDS were male. AIDS continues to have a disproportionate impact on minority women, particularly black women, in relation to their proportions in the general population as compared to women with AIDS. In terms of cumulative prevalence, the percentage of AIDS in adult women is as follows: black, non-Hispanic, 59.7%; white, non-Hispanic, 19.6%; and Hispanic, 19.1%, with the remainder in other groups. Black women have an HIV prevalence rate of about 1,122 per 100,000, while Hispanic/Latina women have an HIV prevalence rate of 263 per 100,000, and white women have an HIV prevalence rate of 63 per 100,000 (CDC, 2008a,c; Highleyman, 2008). As discussed below, the proportion of new cases of AIDS in younger women is increasing. These trends indicate directions for future prevention as discussed in Chapter 5. There is no separate transmission category for women who have sex with women, and there is a paucity of information relating to it. The issues related to lesbians and women who have sex with women are discussed in Chapter 11.

Age Distribution

In regard to age, at the end of 2007, the peak age range for reported U.S. AIDS cases at diagnosis cumulatively is 30 to 39 years of age, with about
41.8% falling in that range. About 82% of AIDS cases are in persons between the ages of 25 and 49 years (CDC, 2008b). HIV prevalence estimates in regard to age are discussed above. The reported number of new cases of AIDS in the United States in those <13 years of age has decreased each year between 2002 and 2007. For 2006, adults/adolescents between 13 and 29 years of age accounted for the largest number of new HIV infections (about 34%) followed by those 30 to 39 years of age (31%), 40 to 49 years of age (25%), and 50 years and older (10%) (CDC, 2009).

Approximately 2.8 million persons 50 years of age and older are reported globally as living with HIV/AIDS (Nguyen & Holodniy, 2008). Persons 60 years of age and older accounted for about 4% of both male and female cases of U.S. persons living with AIDS in 2007 (CDC, 2009). This percentage has been increasing. Reasons for this increase include that the improved survival of persons with AIDS has allowed more HIV-infected persons to enter advanced age groups. Although not often discussed, older persons may engage in risky sexual behaviors such as not using condoms for sexual encounters because of lack of concern about birth control, lack of awareness about HIV risks, and difficulties in manipulating protective devices due to disorders associated with aging such as arthritis; the availability of drugs such as sildenafil to treat erectile dysfunction, thereby allowing for increased sexual activity in older people; age-related diminution of immune function; and other changes such as drying of vaginal mucosa in women. These age-related factors potentially make older people more vulnerable to infection once exposed. Older people may also engage in IDU as a means to address discomfort. Their IDU use may also represent a continuation of earlier drug use. Older persons may also have a higher risk of HIV infection as a result of greater medical needs involving transfusion or transplant (Lashley, 2006a). HIV has been reported in a woman of 89 years of age (Rosenzweig & Fillet, 1992). Nonmonogamous sexual relationships are becoming increasingly common in the elderly, who may not be using safer sex. Health care professionals often do not discuss safer sex or assess injection drug use in elderly patients (Lashley, 2006a).

As discussed earlier, adolescents may be at particular risk for HIV acquisition. Adolescence is a time of risky behavior and exploring, with a high use of alcohol and experimentation with drugs and sex as well as feelings of invincibility. Data pertaining to adolescents from the Youth Behavior Survey are discussed later in this chapter (CDC, 2008f). Adolescents who are first recognizing their sexual orientation may engage in more risky behavior, and adolescents who are alienated may engage in risky sex to get money for living or for drugs.
Racial/Ethnic Distribution

According to data from the 2000 census (U.S. Census Bureau, 2001), the approximate racial composition of the United States is about 70% white, 12% black, 12.5% Hispanic, 3% Asian, and the rest “other.” In 2007, in looking at the total number of persons in the United States living with HIV/AIDS, approximately 48% were black non-Hispanic, 33% were white non-Hispanic, 17% were Hispanic/Latino, and less than 1% each were Asian, American Indian/Alaskan Native, or Native Hawaiian/other Pacific Islander. In regard to newly diagnosed HIV/AIDS cases in 2007, the rates per 100,000 were as follows: black/non-Hispanic (47.3); Native Hawaiian/other Pacific Islander (18.3); Hispanic/Latino (15.2); American Indian/Alaska Native (6.9); white population (5.2); and Asian (3.6). Moreover, blacks accounted for 51% of all HIV/AIDS cases diagnosed in 2006 (CDC, 2008a, 2009). This situation has been called a state of emergency for African Americans (Laurencin, Christensen, & Taylor, 2008). For pediatric cases of AIDS, the distribution is as follows: black, non-Hispanic (65.0%), Hispanic (19.3%); and white, non-Hispanic persons (1.4%) (CDC, 2008a); and, again, there are great ethnic differences. Pediatric AIDS is further discussed in Chapter 14. These differences stem more from factors other than race and ethnicity, such as nutritional status, and social and economic conditions, such as access to quality health care. When examined by transmission categories, there is particular disproportion in the category of injection drug use for both men and women who fall into the categories of black non-Hispanic or Hispanic, while for white non-Hispanic about 77% of adult males fall into the male-to-male sexual contact category (CDC, 2009).

TRANSMISSION CATEGORIES FOR AIDS

Terminology to describe epidemiological groupings of AIDS cases in the United States and elsewhere has undergone various changes over the years. For example, with the switch by CDC in March 1989 to a monthly, instead of a weekly, update on AIDS cases, epidemiologic data reporting formerly entitled “transmission categories” became known as “exposure categories.” This shift supersedes a previous revision that occurred in August 1986 when the hierarchy of risk factors for AIDS was revised and entitled “transmission categories” instead of “patient groups.” Currently the term “transmission category” is again being used by the CDC for the classification of cases that summarize the risk factors
most likely responsible for transmission. The transmission categories are still ordered in a hierarchical, mutually exclusive manner—thus cases with multiple characteristics who belong in more than one transmission category are assigned to the group that is listed first. There is one combination group that combines male-to-male sexual contact and injection drug use. In hierarchical order in adults/adolescents, the transmission categories for men currently are male-to-male sexual contact (formerly “men who have sex with men”); injection drug use; male-to-male sexual contact and injection drug use (this category includes men who practice both behaviors and are thus classified only in this category and not the previous two); hemophilia/coagulation disorder; high-risk heterosexual contact; receipt of blood transfusion, blood components, or tissue; and other/risk factor not reported or identified (CDC, 2009). The distribution of all adult and adolescent (age 13 years and over) cases of AIDS according to these categories is shown in Table 1.1. For females, the first transmission category in the hierarchy is injection drug use followed by hemophilia/coagulation disorder and then the remainder, as discussed above. Transmission categories for pediatric cases are discussed later in this section.

The transmission categories have also undergone various changes over the years. Among the major changes that occurred were the removal of Haitians as a separate group in 1985, the change in terminology for “male homosexual, bisexual contact” to “men who have sex with men,” and currently “male-to-male sexual contact”; the addition of the group known now as “high-risk heterosexual contact”; the change from “IV drug use” to “injection drug use”; the inclusion of other coagulation disorders to the group originally designated as “hemophilia A”; and the renaming of the “none of the above” group to “other/undetermined,” with that latter group becoming eventually “other/risk factor not reported or identified.” The separate category of male homosexual/bisexual contacts who were also intravenous drug abusers was added in August 1986. Later the title was changed to “men who have sex with men and inject drugs” and is presently “male-to-male sexual contact and injection drug use.” For a period of time Haitians were considered to be a distinct high-risk group for the development of AIDS, but this category was dropped. In 1985, when Haitians were removed as a separate risk group, they were placed into the “other/none of the above” group. In August 1986 they were placed into the heterosexual cases category, and eventually they were categorized in the same manner as that for other persons because it did not appear that “being of Haitian extraction by itself, in isolation from
### REPORTED CUMULATIVE UNITED STATES ADULT/ADOLESCENT AIDS CASES BY TRANSMISSION CATEGORY FROM BEGINNING OF EPIDEMIC THROUGH DECEMBER 31, 2007

<table>
<thead>
<tr>
<th>TRANSMISSION CATEGORY</th>
<th>NO.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male-to-male sexual contact</td>
<td>445,645</td>
<td>44</td>
</tr>
<tr>
<td>Injection drug use</td>
<td>235,842</td>
<td>23</td>
</tr>
<tr>
<td>Male-to-male sexual contact and injection drug use</td>
<td>67,797</td>
<td>7</td>
</tr>
<tr>
<td>Hemophilia/coagulation disorder</td>
<td>5,567</td>
<td>1</td>
</tr>
<tr>
<td>High-risk heterosexual contact</td>
<td>142,842</td>
<td>14</td>
</tr>
<tr>
<td>Sex with injection drug user</td>
<td>38,766</td>
<td>4</td>
</tr>
<tr>
<td>Sex with bisexual male</td>
<td>5,415</td>
<td>1</td>
</tr>
<tr>
<td>Sex with person with hemophilia</td>
<td>603</td>
<td>0.06</td>
</tr>
<tr>
<td>Sex with HIV-infected transfusion recipient</td>
<td>1,403</td>
<td>0.14</td>
</tr>
<tr>
<td>Sex with HIV-infected person, risk factor not specified</td>
<td>96,665</td>
<td>9</td>
</tr>
<tr>
<td>Receipt of blood transfusion, blood components, or tissue</td>
<td>9,315</td>
<td>1</td>
</tr>
<tr>
<td>Other/risk factor not reported or identified</td>
<td>114,224</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,021,242</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: CDC, 2009, p. 40. Percentages may not add to 100 due to rounding error.
other risk factors, increases the relative risk of being exposed to HTLV-III” (Landesman, Ginzburg, & Weiss, 1985, p. 525). Information about each transmission category is discussed below.

**Male-to-Male Sexual Contact (MSM)**

AIDS was first identified among homosexual men presenting with Kaposi’s sarcoma and *Pneumocystis carinii* pneumonia (CDC, 1981a,b). In 1982, the CDC reported the occurrence of unexplained persistent generalized lymphadenopathy among homosexual males. It was recommended that such individuals be followed periodically (CDC, 1982a). Other clinicians had noted the occurrence of such a syndrome as early as 1977 in some regions and 1979 in others (Abrams et al., 1984; Miller et al., 1984). A cluster of cases of autoimmune thrombocytopenic purpura in homosexual men was diagnosed in New York after November, 1980. These reports suggested that sexually active homosexual men might be developing disorders of immune regulation (Morris et al., 1982).

Why AIDS first surfaced in large numbers among the homosexual population is not known. The first appearance of AIDS in recognizable proportions among this group, however, provoked varying public reactions from lack of interest to condemnation to accusations to feelings that it was deserved. Later in the pandemic, the term “men who have sex with men” was adopted to describe behavior and as part of the efforts to reduce stigmatization related to homosexual, bisexual, transgender, or other males, such as male sex workers, who engage in male-to-male sexual contact. Persons in this exposure category, male-to-male sexual contact (MSM), still comprise the largest percentage of cases of adult AIDS in the United States. As of December 31, 2007, MSM accounted for about 54% of the total cumulative adult male cases of AIDS in the United States and the category of “MSM and injection drug use” for about another 8%, totaling about 62%, and MSM accounted for 44% of all adult AIDS cases, with “MSM and injection drug use” accounting for 7%, for a total of 51% (CDC, 2009).

Studies to identify risk factors for HIV infection identified large numbers of different male sexual partners as the most important risk factor for HIV acquisition. In regard to the sexual practices studied, the ones most frequently associated with increased risk for infection were frequent receptive anal intercourse and “fisting” (a practice involving the insertion of a hand or fist into the rectum) (Vermund, 1997). These studies have provided important information for the develop-
ment of educational programs and counseling aimed at prevention, as described in Chapter 5. Extensive efforts in education and prevention of HIV infection, especially from within the gay community, had notable success. These have involved changes in behavior including less promiscuity and increased condom use (Martin, 1987). But while initially MSM were demonstrating safer sexual behaviors, by the 1990s younger homosexual men were noted to have higher levels of sexual risk taking (DeWit, 1996). With the success of many HIV prevention efforts, in large part from the gay community, a decrease in the number of cases in the MSM category was seen. But, in the period from 2001 to 2005, the estimated number of U.S. cases of HIV/AIDS among MSM in the 33 states and U.S. dependent areas with confidential named-based HIV reporting increased 13%. In this same time period, there was a tenfold increase in primary and secondary syphilis cases reported, an indicator of increasing frequency of unprotected sex. Other studies among MSM found a reported increase in unprotected or unsafe sex (Jaffe, Valdiserri, & De Cock, 2007). Worldwide there appears to be a greater risk of HIV-infection among MSM from low and middle-income countries (Baral, Sifakis, Cleghorn, & Beyrer, 2007). The CDC reported an increase in the number of newly diagnosed HIV/AIDS cases among MSM in 2007, as had been the case in 2006. There were more new HIV infections in black MSM (13 to 29 years of age) than any other group (CDC, 2008b, 2009). There has even been a troubling trend toward conversion or “bug parties” where uninfected men (“bug chasers”), often young, seek to become HIV infected from HIV-infected men (“gift givers”).

Clinically, Kaposi’s sarcoma attributed to the human herpes virus (HHV-8) has a far greater prevalence among HIV-infected MSM than in other HIV-infected groups and also appears to occur in HIV-negative MSM (Lanternier et al., 2008).

Injection Drug Use (IDU)

In 1991, the CDC changed its terminology from “intravenous drug use” to “injecting drug use,” and presently it is known as “injection drug use,” to describe the use of needles for self-injection of drugs not prescribed by a physician (CDC, 2009). These include those who share needles and apparatus, skin pop, and take unprescribed anabolic steroids, vitamins, or other medications by injection. There are approximately 16 million persons who use injection drugs globally, and there is much variation in regard to HIV prevalence (Mathers et al., 2008). However, Mathers and
associates (2008) estimate that of the estimated 16 million injection drug users, an estimated 3 million are HIV positive.

At the end of 2007, approximately 23% of all reported U.S. adult cases of AIDS were in the transmission category of injection drug use. In addition, the category of male-to-male sexual contact and injection drug use accounted for another 7% of all cases, while approximately 4% fell under the category of high-risk heterosexual contact in the subcategory of “sex with injection drug user”; thus, approximately 34% of all reported U.S. adult cases of AIDS at the end of 2007 were directly or indirectly associated with IDU (CDC, 2009). For females, approximately 35% of the cumulative cases of adult U.S. cases of AIDS fall into the IDU category, while about 30% of the total cases in the subcategory of high-risk heterosexual contact fall into the subcategory of “sex with injection drug user” (CDC, 2009). AIDS in IDUs appears to have disproportionately affected blacks and Hispanics. In the United States overall, IDU accounted for 16% and 26%, respectively, of men and women living with HIV—19% overall (CDC, 2008b). In the Youth Risk Behavior Study, 2.0% of adolescents surveyed said they had injected illegal drugs in their lifetime, and 7.2% used some form of cocaine (CDC, 2008e).

IDUs represent a heterogeneous group of people whose behaviors vary, a fact that influences both seroprevalence rates and the success of intervention strategies. In addition to comprising the second largest exposure category for AIDS, IDUs are considered a bridge to persons through sexual contact, often unprotected or for money or drugs, and to HIV-infected children. Of the cumulative U.S. AIDS cases associated with perinatal transmission reported through 2007, the transmission category of mothers who reported injection drug use or who had sex with an injection drug user accounted for 51% of cases in the transmission category of mother with documented HIV infection or one of the specified risk factors (CDC, 2009).

Preventive activities with injection drug users have been difficult. (See Chapter 5.) Drug users tend to be a less conspicuous group than the other groups at high risk for the development of HIV infection. They tend not to have advocates in the general population, nor do they generally form advocacy and support groups among themselves. Needle sharing may have associations with communal feeling and socialization in the drug subculture (Black et al., 1986). There are also economic motivations for sharing injection equipment. Syringe exchange programs have proliferated in the United States and Europe. Many of these programs offer not only needle and syringe exchange but also other services, such
as HIV counseling and testing, TB testing, sexually transmitted infection (STI) screening, and primary health care. IDUs participating in these programs increase the proportion of sterile syringes used for single-use injections, thus decreasing potential transmission. Another approach is to allow purchase of sterile syringes over the counter in pharmacies, as is done in some areas.

**Hemophilia/Coagulation Disorder**

In July 1982 the CDC first published reports of three cases of *Pneumocystis carinii* pneumonia (PCP) among three hemophiliacs who had no other underlying disease. The first case was identified in January 1982, and the others were found through surveillance of the use of drugs to treat the disease. All were heterosexual without a history of intravenous drug abuse, and all had received factor VIII concentrates (CDC, 1982b). The majority had hemophilia A, while the rest had hemophilia B, von Willebrand disease, or other blood coagulation defects.

Hemophilia A or factor VIII deficiency is a genetic disorder of blood coagulation that is inherited in an X-linked recessive manner and is the classical type of hemophilia. Hemophilia B (Christmas disease) is a genetic disorder due to deficiency of clotting factor IX. It is also inherited in an X-linked recessive manner. It is only about one-fifth as frequent as hemophilia A (Lashley, 2006b). They are indistinguishable clinically. Hemophilia B tends to be somewhat less severe than hemophilia A. Von Willebrand disease is a genetic disorder of coagulation that is usually inherited in an autosomal dominant manner but may also be inherited in other ways. Part of the management of these disorders includes the administration of clotting factors. Pooled plasma was traditionally used in making these clotting factor concentrates, and each vial could contain material from between 2,500 to 25,000 blood or plasma donors (Levine, 1985).

The majority of persons with hemophilia in the United States became HIV positive between 1979 and 1982 and before 1985, when the screening of donated blood was implemented. The prevalence of HIV infection in adults with hemophilia A and hemophilia B was about 80% and 50%, respectively, of those who had been treated with factor concentrates (Rosenberg & Goedert, 1998). Older hemophiliacs have been more likely to be HIV infected. Most of this group became infected with hepatitis C as well. The cloning of the factor VIII gene allowed recombinant factor concentrates and monoclonally purified concentrates to be developed. Recombinant factor IX concentrates have become available.
At the end of 2007, for this transmission category, the cumulative number of reported AIDS cases in U.S. adults was 5,567, approximately 0.5% of all adult cases. In children below 13 years of age at diagnosis, the cumulative total of reported AIDS cases is 229 or approximately 2.4% of reported pediatric cases. In the year 2007, only 46 new AIDS cases in this transmission category in adults were diagnosed; and, in children below 13 years of age, no new cases were identified. (CDC, 2009).

Sexual partners of hemophiliacs were at increased risk for infection through sexual activity in the category of high-risk heterosexual contact. The cumulative number of AIDS cases in U.S. adults at the end of 2007 was 603 in this category, or about 0.6% of all adult cases. In 2007, there were only 14 new cases identified in this transmission subcategory. In children <13 years of age, there were 36 cumulative cases identified whose mother had sexual contact with a person with hemophilia, and no such new cases were identified in 2006 or 2007 (CDC, 2009). Persons with hemophilia are among the older group of persons with HIV infection (Gianotten & Heijnen, 2009). Detailed 25-year outcomes of one of the hemophilia cohorts from 1982 to 2007 have been published (Eyster, 2008).

**High-Risk Heterosexual Contact**

The “high-risk heterosexual contact” category is the major one for U.S. women with AIDS, accounting for approximately 45% of all cumulative cases in adult women as of the end of 2007. It accounts for about 6% of cumulative AIDS cases in adult men and about 14% of all U.S. cumulative cases of AIDS. The following subcategories have been identified: (1) sex with injection drug user; (2) sex with bisexual male; (3) sex with person with hemophilia; (4) sex with HIV-infected transfusion recipient; (5) sex with HIV-infected person, risk not specified. As of December 31, 2007, the largest subcategories cumulatively for all adults and for females were “sex with HIV infected person, risk not specified” followed by “sex with injection drug user” (CDC, 2009). In terms of those living with HIV, about 28% overall fell into this category, while for males, high-risk heterosexual contact accounted for 13% and 72% of males and females, respectively, living with HIV (CDC, 2008e).

In January 1983 the CDC published two case reports of women with immunodeficiency who were the sexual partners of males with AIDS. One of these men was an intravenous drug abuser, and one was a bisexual. The women themselves had no recognized risk factors (CDC, 1983). Other case reports began appearing in the literature (Harris et al.,
For example, the previously healthy 71-year-old wife of a 74-year-old hemophiliac who developed *Pneumocystis carinii* pneumonia also developed AIDS. Her only apparent risk factor was infrequent sexual contact with her husband when he was asymptomatic (Pitchenik et al., 1984). Varying percentages of regular sexual partners of HIV-infected persons show evidence of HIV infection depending upon the study and factors related to the host (e.g., viral load) and the virus, as well as whether there has been proper and consistent use of protection such as latex condoms.

The category of heterosexual contact is complex. A woman may be exposed through trading sex for drugs, money, or protection or may be unaware of or choose for a variety of reasons to ignore her partner’s risky sexual practices such as promiscuity, IDU, or bisexuality (Cohen & Durham, 1995). Men may also be unaware of a partner’s risky sexual activities. Men who seek sexual gratification with a commercial sex worker have an increased risk for acquiring HIV infection. Preventive efforts, as discussed in Chapter 5, focus on education, the proper and consistent use of condoms, access to appropriate health care, and women-controlled prevention and empowerment.

**Receipt of Blood Transfusion, Blood Components, or Tissue**

Today, especially in developed countries, blood transfusion is a relatively infrequent transmission category. At the end of 2007, the reported number of cumulative U.S. adult AIDS cases resulting from transfusion was 9,315, or about 1%, while the number of newly diagnosed cases in adults in 2007 was 109, or 0.3% of new cases (CDC, 2009). The first case of AIDS associated with a blood transfusion was reported by the CDC in December 1982. The white male infant, who was delivered by cesarean section in March 1981, had erythroblastosis fetalis resulting in hyperbilirubinemia. He received exchange transfusions, whole blood, platelets, and packed red cells during his month of hospitalization following birth. These blood and blood products were from 19 different donors and had been irradiated. After 1 month, the infant appeared well and was discharged from the hospital. At 4 months of age he showed splenomegaly. By 7 months he developed opportunistic infections and showed evidence of unexplained cellular immunodeficiency. The infant ultimately died of *Pneumocystis carinii* pneumonia at 20 months of age. His parents were heterosexual, not intravenous drug users, and were not
Haitian. Subsequent investigation of the blood products received by this infant revealed that one of the 19 donors of blood and blood products had been reported to the CDC later as having developed AIDS. This donor died in August of 1982. At the time of this initial report the cause of AIDS was unknown, and thus it gave further support to the idea that AIDS was caused by an infectious agent. The case also suggested that the agent could be present in the blood before causing symptomatic illness and that the incubation period could be a long one (CDC, 1982b).

A major concern early in the epidemic was that of protecting the nation’s blood supply. In 1983, as an interim measure to protect transfusion recipients until specific tests were available, the U.S. Public Health Service (USPHS) recommended that blood and/or plasma not be donated by persons with signs and symptoms of AIDS, sexual partners of AIDS patients or of persons at increased risk for AIDS, or by any other members of groups at increased risk for AIDS. The USPHS also recommended that physicians “adhere strictly to the medical indications for transfusion” (p. 103), and they encouraged autologous blood transfusions (CDC, 1983). There was revision of many criteria for administering blood transfusions and more caution in making that decision. Methods were introduced to reduce blood loss during surgery, and more consumers requested autologous blood donation provisions, designated donor programs, or female donors in their efforts to minimize their risk.

In 1985, testing of potential donors by enzyme-linked immunosorbent assay (ELISA) became possible but was also prone to some false-negative and -positive results. For example, the blood of persons who are HIV-infected but who have not yet developed antibody and seroconverted (called the “window period”) would not be identified as HIV infected when using ELISA (or a similar test) for screening. Thus, in 1996, the FDA recommended the use of the p24 antigen assay to screen all donated blood in the United States. In 2000, these problems were solved with the introduction of nucleic acid screening tests for HIV RNA. At present, the estimated risk of acquiring transfusion-transmitted HIV in the United States is approximately one case per 2 million transfusions (Alter & Klein, 2009). In resource-limited countries, this risk is higher.

Other/Risk Factor Not Reported or Identified

Until November 1986 the category “other/risk factor not reported or identified” was known as “none of the above.” Then this category
became “risk not reported or identified.” Persons classified in this group are those with no reported HIV exposure through any of the routes listed in the hierarchy of transmission categories. Cases in this category include those that are under investigation by the local health department personnel; persons whose history is missing because they died, refused to be interviewed, or were lost to follow-up; and cases for whom information is complete but no transmission mode was identified (CDC, 2009). As of December 31, 2007, the cumulative number of U.S. cases of AIDS in adults in this transmission category was 114,224, or approximately 11%. There were 10,005 new cases (approximately 26%) in U.S. adults in this category in 2007. On identification of a transmission mode, persons in this category are reclassified into the appropriate one. Failure to reclassify persons into other transmission categories is probably due to nonrecognition of contributing factors, especially heterosexual contacts. For example, an infected person might not know that his or her sexual partner is bisexual or an IDU or that he or she has had contact with a commercial sex worker or has not been monogamous.

**Transmission Categories for Children**

The current transmission categories for children younger than 13 years of age at diagnosis in hierarchical order are as follows:

- Hemophilia/coagulation disorder
- Mother with documented HIV infection or one of the following risk factors:
  - Injection drug use
  - Sex with injection drug user
  - Sex with bisexual male
  - Sex with person with hemophilia
  - Sex with HIV-infected transfusion recipient
  - Sex with HIV-infected person, risk not specified
  - Receipt of blood transfusion, blood components or tissue
  - Has HIV-infection, risk factor not specified
- Receipt of blood transfusion, blood components or tissue
- Other/risk factor not reported or identified.

The cumulative total for all U.S. pediatric AIDS cases at the end of 2007 was 9,590, or less than 1% of all cumulative U.S. AIDS cases. In 2007, there were only 87 newly diagnosed cases of U.S. pediatric AIDS.
The major transmission category is “mother with documented HIV infection or 1 of the following risk factors” accounting for about 92% of all of the cumulative U.S. pediatric AIDS cases and 84% of those newly diagnosed in 2007. These data are shown in Table 1.2. Perinatal transmission has been discussed earlier and is also discussed in Chapter 14.

WORLDWIDE STATISTICS AND PATTERNS

Accurate reporting of people living with HIV and those with AIDS varies greatly across the globe. However, accuracy has improved over the years. As of December 2007 (the most recent data available), approximately 33 million people were living with HIV. Of these the distribution is as follows:

- Adults: 30.8 million (including 15.5 million women)
- Children under 15 years of age: 2 million

The number of people who were reported as newly infected with HIV in 2007 was 2.7 million. In 2007, the Joint United Nations Programme on HIV/AIDS (UNAIDS) reported approximately 2.0 million deaths from AIDS (UNAIDS/WHO, 2008). Worldwide, about 25 million persons have died of AIDS since the beginning of the epidemic. The number of AIDS orphans (children who lost their mother or both parents to AIDS when they were under the age of 15 years) since the beginning of the epidemic is about 15 million, 11.6 million of whom are in sub-Saharan Africa. This issue is discussed in Chapter 14. Worldwide, UNAIDS/WHO (2008) estimates that women account for about half of the people living with AIDS. Women account for nearly 60% of all HIV infections in sub-Saharan Africa (UNAIDS/WHO, 2008). Globally, those in the age group of 15 to 24 years account for about 45% of new HIV infections, and there is a commitment by WHO to reduce this prevalence by 25% (UNAIDS/WHO, 2008).

Some data are difficult to obtain because of social and cultural norms. For example, in Senegal, West Africa, nine men were arrested for “acts against nature,” and such homophobia and criminalization of adult consenting behavior are major barriers to surveillance, treatment, and prevention (“UNAIDS and broad coalition . . . ,” 2009). Discussion of the global epidemiological patterns of HIV/AIDS is difficult because
**Table 1.2**

<table>
<thead>
<tr>
<th>TRANSMISSION CATEGORY</th>
<th>NO.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemophilia/coagulation disorder</td>
<td>229</td>
<td>2</td>
</tr>
<tr>
<td>Mother with documented HIV infection or one of the following risk factors</td>
<td>8,797</td>
<td>92</td>
</tr>
<tr>
<td>Injection drug use</td>
<td>3,348</td>
<td>35</td>
</tr>
<tr>
<td>Sex with injection drug user</td>
<td>1,535</td>
<td>16</td>
</tr>
<tr>
<td>Sex with bisexual male</td>
<td>214</td>
<td>2</td>
</tr>
<tr>
<td>Sex with person with hemophilia</td>
<td>36</td>
<td>0.38</td>
</tr>
<tr>
<td>Sex with HIV-infected transfusion recipient</td>
<td>26</td>
<td>0.29</td>
</tr>
<tr>
<td>Sex with HIV-infected person, risk factor not specified</td>
<td>1,550</td>
<td>16</td>
</tr>
<tr>
<td>Recipient of blood transfusion, blood components, or tissue</td>
<td>152</td>
<td>2</td>
</tr>
<tr>
<td>Has HIV infection, risk factor not specified</td>
<td>1,936</td>
<td>20</td>
</tr>
<tr>
<td>Recipient of blood transfusion, blood components, or tissue</td>
<td>383</td>
<td>4</td>
</tr>
<tr>
<td>Other/risk factor not reported or identified</td>
<td>181</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9,590</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

different agencies that collect and report data may not use the exact same groupings from year to year, and the nature of subgroups sampled may vary. The number of countries contributing information to the most recent UNAIDS report has increased almost every year, but this information is still incomplete or missing for some countries. Selected regional information will be discussed briefly below. The number of AIDS cases reported is shown in Table 1.3.

Sub-Saharan Africa

Sub-Saharan Africa continues to bear a disproportionate burden in terms of the number of persons living with HIV. The number of persons living with HIV in 2007 in this region was about 22 million, or two-thirds of the total number of persons living with HIV/AIDS worldwide. This region accounted for 75% of all AIDS deaths in 2007. In some countries, HIV prevalence in adults appears to be stabilizing, but there is significant variation. In 2007, UNAIDS/WHO reported that HIV prevalence in adults exceeded 15% in Botswana, Lesotho, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe. However, in Zimbabwe in 2007, it was reported that HIV prevalence in pregnant women decreased from 26% in 2002 to 18% in 2006 (UNAIDS/WHO, 2008). High-risk heterosexual contact is the most important route of transmission in this area, and one result is that the world’s largest population of children living with HIV is in this area. UNAIDS/WHO (2008) estimates that the probability that one’s sexual partner is HIV infected is 1 in 4 to 1 in 6. Quinn and Overbaugh (2005) note that, by 22 years of age, 1 in 4 women in South Africa is infected with HIV. In some countries, injection drug use is a factor. For example, in the cities of Mombassa and Nairobi in Kenya, approximately half of the injection drug users tested were HIV positive. In addition, unprotected anal sex between men in sub-Saharan Africa is now thought to be more important than formerly thought. As in any region, many cultural and social factors influence HIV acquisition. For example, Halperin and Epstein (2004) describe the custom of concurrent multiple sexual partners that results in “extensive interlocking sexual networks” that act to facilitate HIV spread. These relationships are also known as concurrent sexual partnerships (Beyrer, 2007). In these relationships, condoms may not be used because the relationships are not seen as casual and involve trust as well as issues that relate to inequality of women, poverty, gender power, and more (Lashley, 2006c). These relationships may be especially prevalent among those who travel with their jobs to different locales,
such as long-distance truck drivers. Difficulties in obtaining condoms and gender inequality are other contributing factors (Beyrer, 2007). Another factor is circumcision. While many studies have indicated that this procedure can reduce HIV incidence in men by as much as 50% to

<table>
<thead>
<tr>
<th>REGION</th>
<th>NUMBER OF ADULTS AND CHILDREN LIVING WITH HIV</th>
<th>NEWLY INFECTED IN 2007</th>
<th>ADULT HIV PREVALENCE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Total</td>
<td>33.2 million (100%)</td>
<td>2.5 million</td>
<td>0.8%</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>22.0 million (67.8%)</td>
<td>1.7 million</td>
<td>92%</td>
</tr>
<tr>
<td>South and Southeast Asia</td>
<td>4.2 million (12 %)</td>
<td>230,000</td>
<td>35%</td>
</tr>
<tr>
<td>Latin America</td>
<td>1.7 million (4.8%)</td>
<td>150,000</td>
<td>16%</td>
</tr>
<tr>
<td>Eastern Europe and Central Asia</td>
<td>1.5 million (4.8%)</td>
<td>100,000</td>
<td>2%</td>
</tr>
<tr>
<td>North America</td>
<td>1.2 million (3.9%)</td>
<td>46,000</td>
<td>0.38%</td>
</tr>
<tr>
<td>East Asia</td>
<td>740,000 (2.4%)</td>
<td>92,000</td>
<td>0.29%</td>
</tr>
<tr>
<td>Western and Central Europe</td>
<td>730,000 (2.3%)</td>
<td>31,000</td>
<td>16%</td>
</tr>
<tr>
<td>Middle East and North Africa</td>
<td>380,000 (1.1%)</td>
<td>35,000</td>
<td>2%</td>
</tr>
<tr>
<td>Caribbean</td>
<td>230,000 (0.7%)</td>
<td>17,000</td>
<td>20%</td>
</tr>
<tr>
<td>Oceania</td>
<td>74,000 (0.2%)</td>
<td>14,000</td>
<td>4%</td>
</tr>
</tbody>
</table>

60% (White et al., 2008), UNAIDS/WHO (2008) has recommended the provision of services for circumcision in countries with high HIV prevalence, others have not supported this initiative for cultural, religious, and other reasons.

Southeast, South, and East Asia

WHO reports statistics for Asia for the following regions separately: (1) South and Southeast, and East Asia and (2) Central Asia with Eastern Europe, although country-by-country data are also published. The latter are considered separately below. Asia did not experience a major HIV epidemic until the late 1980s or early 1990s (Ruxrungham, Brown, & Phanuphak, 2004). Approximately 5 million persons were living with HIV in 2007 in South, Southeast, and East Asia. Recent trends show declines in HIV prevalence in Cambodia, Myanmar, and Thailand but increases in Indonesia, Pakistan, Viet Nam, Bangladesh, and China. In Vietnam, it is estimated that the number of people living with HIV between 2000 and 2005 more than doubled.

Overall, despite the recent upward trends, China is considered a low HIV-prevalence country (about 0.05%) but with geographic pockets of high transmission. There are indications from surveillance data, which now include provincial sentinel surveillance sites, that HIV prevalence is increasing in China among female sex workers and injection drug users. Risk behaviors have also increased in IDUs, such as sharing needles, but in female sex workers, always using condoms has increased while never using condoms has decreased over the past decade. However, with improved surveillance has come the information that HIV appears to be moving from high-risk groups to the general population (Sun et al., 2007). There is an increase in the number of women who are IDUs in China, and many of these also sell sex (Choi, Cheung, & Chen, 2006). IDUs in both China and Vietnam also frequently purchase sex, and only a small percentage use condoms. In Indonesia, HIV transmission is spreading from IDUs to sex work networks (UNAIDS/WHO, 2008). In Malasia, more than two-thirds of HIV infections fall in the category of IDU (Reid, Kamarulzaman, & Sran, 2007). How culture influences transmission is illustrated by the observation that in Afghanistan narcotics were traditionally either inhaled by smoking or vaporization or ingested orally. Now, injection drug use is spreading, and HIV prevalence is also rising (Todd et al., 2007). In India, a “significant” proportion of HIV-infected women were infected through heterosexual contact with their regular partners who paid for sex
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(UNAIDS/WHO, 2008). In Vietnam, women are said to be increasingly at risk to acquire HIV, but their risk is underreported and underestimated (Nguyen et al., 2008). Male-to-male sexual contact is underreported in Asia as in other areas of the world. In Vietnam, 1 in 3 male sex workers from Ho Chi Minh City were HIV infected (UNAIDS/WHO, 2008).

**Eastern Europe and Central Asia**

An estimated 90% of persons with HIV in this region live in either the Russian Federation or Ukraine. About 1.5 million adults and children were estimated to be living with HIV in this region in 2007. In Ukraine, the annual number of new HIV diagnoses has been estimated as more than doubling since 2001 (UNAIDS/WHO, 2008). In the Russian Federation, the distribution is not equal, and in areas such as Uzbekistan the number of new HIV infections is rising. In this geographic region, the major mode of transmission is injection drug use, with about 62% of the new HIV cases in 2006 resulting from this mode. In a national prevalence study, HIV among the IDUs surveyed in the Ukraine rose from 11% in 2001 to 16% in 2006. There is considerable overlap between IDU and sex work in this region. In parts of the Ukraine, the prevalence of HIV in pregnant women exceeds 1%, and in 2006 about 40% of the newly reported cases in Eastern Europe and Central Asia were among women. It is thought that most of these were due to high-risk sexual contact with men who were IDUs; however, overall, it is estimated that about 35% of HIV-infected women are IDUs and about 50% of HIV-infected women acquired HIV through heterosexual contact with an IDU (UNAIDS/WHO, 2008). There is a relatively low prevalence of reported new cases of HIV among men who have unprotected sex with men, about 1%, but this figure is thought to be an underestimate (UNAIDS/WHO, 2008).

**Latin America**

In 2007, new HIV infections in Latin America were about 140,000, while about 1.7 million persons were living with HIV in this region. Overall levels of HIV infection have remained relatively stable over the last ten years. Transmission of HIV in this region is mainly attributed to male-to-male sexual contact and sex workers and less often to injection drug use. About 57% of the HIV diagnoses in Mexico are attributed to male-to-male sexual contact. In many of these countries, between one-
quarter and one-third of the men who have sex with men also have sex with women. UNAIDS/WHO (2008) has noted that there are “hidden epidemics” of HIV among men who have sex with men in the following Central American countries: Belize, Costa Rica, El Salvador, Guatemala, Mexico, Nicaragua, and Panama. In South America, it is noted that HIV infection prevalence is lower in female sex workers than MSM. In Honduras, condom promotion efforts in female sex workers seem to have resulted in a decline in HIV prevalence among that group. IDU appears to be accounting for a smaller number of new HIV infections. In studies of IDUs in parts of Paraguay and Uruguay, however, 12% and 19% of female sex workers, respectively, were HIV positive. In several South American countries such as Argentina, Brazil, Peru, and Uruguay, high-risk heterosexual contact accounts for an increasing number of women becoming HIV infected. For example, in Uruguay, high-risk heterosexual contact accounts for about two-thirds of newly reported HIV cases (UNAIDS/WHO, 2008).

Caribbean

The Caribbean has the second highest rate of HIV/AIDS in the world, after sub-Saharan Africa (Inciardi, Syvertsen & Surratt, 2005). Approximately 230,000 persons were living with HIV in this area in 2007. About 75% of them resided in the Dominican Republic and Haiti. The major mode of HIV transmission in this region is heterosexual contact. In Haiti, there has been a decline in HIV prevalence among women attending prenatal clinics from 5.9% in 1996 to 3.1% in 2004. Among female sex workers, HIV prevalence rates of 9% in Jamaica and 31% in Guyana have been reported, while in the Dominican Republic data show that HIV prevalence has declined in this group, probably due to the use of barrier protection. In Cuba, male-to-male sexual contact accounted for about 80% of reported HIV cases, and in the Caribbean region generally about 12% of cases occurred via this mode of transmission (UNAIDS/WHO, 2008). Acquisition through IDU is less common overall, except in Bermuda and Puerto Rico. Various sociocultural factors influence patterns here, including lack of accurate epidemiological data about HIV infection, the acceptance of multiple sex partners and frequent sexual contact, machismo, repression of homosexual relations, low condom use, and migration from island to island (Inciardi et al., 2005; UNAIDS/WHO, 2008).
North America and Western and Central Europe

UNAIDS/WHO (2008) considers these regions together because of many shared commonalities in the patterns of HIV infection. In North America, comprising the United States and Canada, approximately 1.2 million adults and children were estimated to be living with HIV in 2007. In Western and Central Europe, there were approximately 730,000 adults and children living with HIV in 2007. Most data pertaining to the United States are considered earlier in this chapter. The main mode of HIV transmission in this region is MSM. In Western Europe, MSM are most at risk of acquiring new HIV infections. For example, in Germany, between 2002 and 2006, the number of new HIV infections rose by 96%. About one-third of new HIV infections in 2006 in the United States and Canada can be attributed to high-risk heterosexual contact. This is also the largest proportion of new HIV diagnoses in Western Europe, accounting for about 42% in 2006. High-risk heterosexual contact is also the main mode of transmission in Central Europe except for Estonia, Latvia, Lithuania, and Poland, where the major mode is IDU. In Croatia, the Czech Republic, Hungary, and Slovenia MSM is the major transmission mode. In many of the European countries, the proportion of cases due to injection drug use both for new cases and existing ones has decreased (UNAIDS/WHO, 2008).

Middle East and North Africa

While an estimated 380,000 people were living with HIV in 2007 in the Middle East and North Africa, there is a paucity of accurate data for this region (UNAIDS/WHO, 2008). While this area is home to 5% of the global population, it has about 1% of people with HIV; thus, overall it is considered a low HIV-prevalence area (Obermeyer, 2006). The major risk factors across the area are through paid sex and injection drug use. However, in the Sudan, high-risk heterosexual contact is the major factor, with an adult HIV prevalence of 1.4%. In many countries women, who are vulnerable because of religious and social customs, become HIV infected as a result of the risky sexual behavior of their husbands (Obermeyer, 2006). IDU is a major factor in Iran, with a prevalence of IDUs in treatment services in Tehran ranging between 15% and 23%, while in countries such as Algeria, Egypt, Lebanon, and Syria, many persons are engaged in both IDU and commercial sex (UNAIDS/WHO, 2008). Information about male-to-male sexual contact is difficult to
ascertain because of stigma and official censorship. Reports from 2006 found that in the studies conducted in parts of Egypt and Sudan 6.2% and 9% of MSM, respectively, were HIV infected (UNAIDS/WHO, 2008).

Oceania
The Oceania region includes Australia, New Zealand, Fiji, and Papua New Guinea. In 2007, about 74,000 persons were living with HIV in this region. In Papua New Guinea (PNG), the reported number of new cases has more than doubled in the period between 2002 and 2006. The primary source of HIV transmission in PNG is through unprotected heterosexual intercourse, particularly unprotected paid sex. It should be noted, however, that about 12% of young males indicated that they had had unprotected sex with males. In Australia and New Zealand, unprotected sexual contact between males is the primary transmission category.

CONCLUSION
Studies of epidemiological aspects of the AIDS pandemic have contributed enormously to the identification of HIV and its transmission. Findings from these studies have allowed for targeted prevention efforts and for planning of treatment and management of health services. Additional research is needed to define and clarify the role of cofactors and their influence on both the development of AIDS and its progression, the determinants and modifiers of rapid and slow progression, and effective methods of education for prevention, coupled with enduring behavior change.

REFERENCES


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