Learning Objectives

Upon conclusion of this HIV epidemiology module, participants should be able to:

1. Identify global trends in HIV transmission.
2. Explain the contribution of different risk groups to the HIV epidemic in the United States.
3. Evaluate the factors contributing to the racial/ethnic disparities in HIV/AIDS.
4. Translate the impact of high rates of incarceration on the HIV epidemic and explain how the disproportionate incarceration of African American males contributes to the health disparity in HIV/AIDS among African men, women and children.
5. Identify the factors that contribute to the disproportionate impact of HIV/AIDS among women worldwide.
Introduction
Initial clinical presentation of HIV/AIDS at the beginning of the AIDS epidemic in the early 1980s was defined by complex cellular immune dysfunctions, characterized by persistent lymphadenopathy, a reduction in CD4-positive T cells, and opportunistic infections that included pneumocystis pneumonia and mucosal candidiasis, as well as a predisposition to develop rare malignancies, such as Kaposi’s sarcoma. The demographic groups in which HIV infection was initially reported include men who have sex with men (MSM), followed by individuals of Haitian origin, injection drug users, hemophilia patients, and female sexual partners of men with the disease. From these initial reports of a handful of cases in select areas and populations, HIV/AIDS has progressed relentlessly to affect every region and country in the world.

Origin of HIV
The origin of the HIV-1 virus is proposed to be a zoonotic infection, transmitted from the common chimpanzee found in the wild to humans. There is evidence that supports the hypothesis that SIVcpz, an HIV-like virus found naturally in wild African chimpanzees, was transmitted to humans by direct contact with blood or blood products.

- It is believed SIVcpz jumped species (infection in chimpanzees transmitted to humans) in Central Africa in the 1930s, possibly via human consumption of bushmeat (slaughtered wild animals).
- After being transmitted to humans, SIVcpz underwent mutations in humans over time, resulting in the HIV-1 virus.
- Recent reports suggest that in the mid 1960s, HIV-1 spread from Africa to Haiti and by the late 1960s HIV had spread from Haiti to the US.

HIV-2 is closely related to SIVsm from sooty mangabeys, a species of monkey in West Africa.

- The crossover from sooty mangabeys to humans is believed to have happened in a similar way as HIV-1.
  - This crossover is believed to have occurred in the 1940s.
I. Global HIV/AIDS

- More than 33 million people are currently living with HIV. The global trend of HIV infection is still increasing in many regions in the world (Figure 1).
- There are approximately 15,000 new infections each day, and 95% of these infections occur in developing countries.
- It is estimated that by 2010, five countries (Ethiopia, China, Nigeria, India, and Russia), representing 40% of the world’s population, will add an additional 50 million to 75 million people to the existing HIV-infected population.
  - With the current HIV/AIDS prevention strategies in place around the world, these estimates are likely to be overstated.
- The number of people living with HIV has risen from around 8 million in 1990 to more than 33 million today, and is still growing.

Sub-Saharan Africa

A disproportionate number of all HIV-infected individuals live in Sub-Saharan Africa, a region where 11% of the world’s population lives.

- Of the 33 million people infected with HIV globally, 67% live in this region and accounted for 75% of AIDS-related mortality in 2007.
- 1.9 million people were estimated to be newly infected with HIV in 2007, leading to a total Sub-Saharan Africa estimate of more than 22 million people living with HIV.
- HIV prevalence varies from below 2% in Western and Central Africa to as much 15% to 26% in Southern Africa (2007).
  - South Africa has the largest number of HIV infections in the world (5.5 million).
  - Swaziland has the largest adult HIV prevalence (26%).
- The main mode of HIV transmission in Sub-Saharan Africa is through heterosexual sex.
- HIV prevention strategies instituted in these regions have resulted in significant reductions in HIV prevalence, particularly in pregnant women.
Asia

Throughout the 1980s, Asia was relatively untouched by the HIV epidemic. By the 1990s, HIV/AIDS appeared in several Asian countries, and by the year 2000, HIV was spreading quickly in several regions in Asia. Overall, the HIV prevalence in Asia is low; however, with such a large population, the number of HIV-infected individuals is substantial.

- Approximately 5 million people are living with HIV in Asia.
- Approximately 25% to 40% of HIV cases are transmitted by commercial and unprotected sex.
• In many regions in Asia, MSM is a significant factor that contributes to the HIV epidemic and serves as a bridge for HIV transmission to the general population.

• Mother-to-child transmission (MTCT) is also a major mode of HIV transmission in Asia, with more than 150,000 children living with HIV in 2007.

Europe

Approximately 1.5 million to 2.2 million people were found to be living with HIV in Europe at the end of 2007.

• Europe has an HIV prevalence rate that varies by region from below 0.1% to about 1%.

Transmission routes for HIV also vary in Eastern, Central, and Western Europe.

• In Western and Central Europe, heterosexual transmission accounts for a little more than 50% of all newly diagnosed cases of HIV.

• In Western Europe, approximately 40% of all newly diagnosed cases of HIV occur among MSM.

• In Central Europe, 30% of all newly diagnosed HIV cases are among MSM.

• Injection drug use (IDU) accounts for only a small percentage of newly diagnosed HIV cases in most Western and Central European countries.
  o However in Eastern Europe, IDU account for approximately 57% of all new HIV infections.

Former Soviet Union states are the fastest-growing segment of the HIV epidemic, exceeding both Africa and China.

• The IDU population appears to be the main source of infection in the general population.

• In 2004, 80% of HIV-infected individuals reported a history of IDU.
  o 79% to 93% of these individuals were reported to be coinfectected with hepatitis C.

• Approximately 40% of new infections occurred in women, most under the age of 25.
Latin America (South and Central America)

It is estimated that there are 1.7 million people in Latin American infected with HIV.

- The overall seroprevalence is below 1%, with prevalence in popular urban cities approaching more than 2%.
- In South America, HIV infection is most often acquired by IDU and among MSM.
- In Central America, IDU is less significant and sexual transmission of HIV (heterosexual sex and MSM) is more prevalent.

HIV in the Caribbean

The Caribbean is second only to sub-Saharan Africa as having the highest HIV prevalence.

- In 2008, more than 230,000 people in the Caribbean were living with HIV.
  - 75% live in the Dominican Republic and Haiti.
- Haiti has the biggest HIV epidemic in the Caribbean.
- The main mode of HIV transmission in the Caribbean is unprotected heterosexual intercourse.
  - MSM are increasingly being recognized as a significant risk group.

II. HIV/AIDS in the United States

A. General Epidemiology

Approximately 1.1 million people in the US are infected with HIV, and more than 500,000 have died of the disease.

- There are approximately 56,000 new infections occurring each year, and ethnic minorities are acquiring HIV at a higher rate than other groups.
- Higher rates of HIV infection are observed among certain high-risk groups that include MSM, IDU, and individuals who participate in high-risk sexual activity.
- HIV in the US is also transmitted by heterosexual transmission, MSM, IDU, and mother-to-child transmission. Figure 2 shows the estimates of new HIV infections in 2006 by race/ethnicity, risk group, and gender.
- It is estimated that approximately 20% of the current pool of HIV-infected individuals remain undiagnosed and therefore represent a significant source for new infections.
Centers for Disease Control and Prevention (CDC) data in 2006 from 5 large US cities estimated that nearly half of infected MSM were unaware that they were HIV positive.

- Highly Active Anti-Retroviral Therapy (HAART), introduced at the height of the AIDS epidemic in 1995-1996, has resulted in a substantial reduction in HIV/AIDS-associated morbidity and mortality.


B. Impact of HIV/AIDS on Various Segments of the US population

Men Who Have Sex With Men

From the beginning of the AIDS epidemic in the US during the early 1980s, the incidence of HIV infection continues to be the highest among gay men, bi-sexual men, and men who have sex with men (MSM). Figure 3 provides an estimate of new HIV infections in MSM by race/ethnicity and age group.

- MSM are among the few high-risk groups in US in which new infections are still increasing.
- MSM account for approximately half of the 1.1 million people living with HIV in the US.
- 46% of African American MSM were found to be HIV positive in a 2005 study of 5 large US cities.
Children

Nearly all children who become infected with HIV acquire the virus from their mothers before or during birth or through breastfeeding. It is suggested that fetal transmission of HIV occurs when maternal blood enters the fetal circulation or by mucosal exposure to the virus during labor and delivery. The exact role of the placenta in HIV transmission is unclear.

- The incidence of pediatric HIV/AIDS in the US has significantly declined since the early 1990s due to the implementation of specific prevention strategies. These strategies include:
  - Routine HIV testing of pregnant women
  - Prophylactic administration of antiretroviral drugs
  - Scheduled cesarean delivery when indicated
  - Avoidance of breastfeeding

Women

At the current rate of HIV infection worldwide, women will surpass men as the gender most affected by HIV/AIDS.

- Of the more than 30 million people worldwide living with HIV, 50% of them are women. (Figure 4)
• Physical differences, gender inequities (social and financial), and sexual violence against women worldwide contribute greatly to the disproportionate impact of HIV/AIDS among women, and especially women of color.

• These factors lead to high-risk behaviors that happen to be compatible with survival for women in cultures where they are marginalized to such a degree that they are unable to negotiate safe sexual practices with their partners.

• The physical portal of entry for HIV, due to the large surface area of vaginal mucosa compared to the penis, and the ease at which micro-lesions or tearing develop on the vaginal mucosal surface during sexual intercourse, may also make women more susceptible to HIV transmission than men.


The proportion of women living with HIV in the US is less than what has been observed globally. However, a substantial increase in the number of HIV infections among women has been noted.

• Worldwide, 90% of all new infections are transmitted by heterosexual sex. In the
US, heterosexual sex accounts for 70% of all new infections.

- Of the 1.1 million people living with HIV in the US, more than 300,000 are women.
- In the US, the number of men living with HIV increased by 7% from 2000 to 2004, while the number of HIV-infected women had increased by 10%.
- Young women of color are more likely to become infected with HIV.
  - Black women in the US account for 2 out of every 3 women newly diagnosed with HIV.
  - Among women 13 to 19 years of age, and women 20 to 24 years of age, women of color account for 79% and 75% of all new HIV infections, respectively.
  - In 2002, HIV was the leading cause of death for African American women aged 25 to 34.

The Elderly
The elderly are becoming a silent population living with HIV in the US.

- 19% of all individuals in the US with HIV/AIDS are age 50 and older.
- The rate of HIV/AIDS among individuals 50 and older in 2005 was 12 times higher in older African Americans, followed by Hispanics with a rate 5 times higher than Whites.
- Because the elderly have not been specifically targeted by awareness and prevention programs, they have less information about HIV/AIDS and other sexually transmitted infections (STIs), which puts them at greater risk for HIV acquisition.
- Older individuals are also less likely to discuss sex, sexual practices, or illicit drug use with their doctors and may not be aware of their overall risk for HIV infection.
- Certain symptoms associated with HIV may mimic the normal aging process in the elderly and evade diagnosis.
- The ever-increasing use of medical interventions to enhance libido and sexual performance, regardless of age, may put the elderly at increased risk for HIV infection.
Incarcerated Populations

Incarceration rates in the US are the highest in the world (724 per 100,000 in 2004). In general, incarcerated populations have higher rates of HIV/AIDS, STIs, tuberculosis, and more risk factors for these diseases than the general population.

- The rate of HIV infection in US prisons is 5 times that of the general population.
- More than 25% of the people living with HIV/AIDS have spent time in jail or prison.
- Ethnic minorities have the highest HIV seropositivity rates of the prison population.
- Female inmates represent only 5% to 10% of the prison population, but have higher HIV seropositivity rates than male inmates (2.8% versus 1.9% in 2003).
- HIV-positive prisoners were more likely to engage in male-male sex in prison, tattooing in prison, be more than 26 years old, have served more than 5 years of current prison sentence, be black, and have a body mass index less than 25.4 kg/m² on entry into prison.
- Coinfection with Hepatitis C virus and tuberculosis are also common in HIV-infected inmates.

African Americans

African Americans make up only 13% of the US population, but are disproportionately affected by HIV/AIDS. (Figure 5)

- Nearly 600,000 African Americans are estimated to be living with HIV, accounting for 51% of all individuals living with HIV/AIDS in the US.
  - Among women, 64% of women living with HIV/AIDS are black.
  - Among youth aged 13 –24, blacks account for 61 percent of HIV diagnoses.
- HIV seroprevalence rates among racial and ethnic minorities in some urban centers within the US parallel those observed in developing countries.
  - Studies conducted in March of 2009 estimated that Washington DC has an HIV prevalence of nearly 3% among people over 12 years of age, similar to rates found in some Sub-Saharan African communities.
- The rate of HIV diagnosis for African Americans is roughly 8 times that of whites
(67.7 per 100,000 vs 8.2 per 100,000).
  - The rate of HIV diagnosis for African American women is 19 times that of white women.

- African Americans also experience increased rates of morbidity and mortality due to HIV infection.
  - 34% percent of African Americans diagnosed with AIDS from 1997 to 2004 have died, compared to 25% of whites diagnosed with AIDS in the same period.
  - For African Americans, HIV/AIDS remains a leading cause of death.

Hispanics

Hispanics comprise 15% of the US population, but are also disproportionately affected by HIV/AIDS.

- Hispanics accounted for 17% of all new HIV infections occurring in the US in 2006.
- The rate of new HIV infections among Hispanics is 2.5 times that of whites.
  - Rates for Hispanic women are 5 times that of white women.
- In 2006, HIV/AIDS was the fourth-leading cause of death among Hispanic men and women aged 35 to 44.

C. Factors Contributing to the Racial/Ethnic Disparities in HIV/AIDS

Poverty

More than 25% of African Americans live in poverty in the US, which limits their access to education and health care, and contributes to health and risk behaviors that predispose them to increased risk for HIV infection. Individuals with HIV from poor communities are more likely to delay health care even when accessible, resulting in increased morbidity and mortality.

HIV Stigma

The reluctance to be tested for HIV is overshadowed only by the social stigma and discrimination associated with having HIV/AIDS. People’s perception of HIV/AIDS and its association with gay and bisexual communities is an ongoing battle. Therefore it is critical to educate future generations about the ongoing struggles of gay and bisexual communities facing social stigma associated with HIV/AIDS.

High Incidence of Sexually Transmitted Infections

It is known that both ulcerative and nonulcerative STIs can facilitate HIV transmission. Untreated STIs can increase an individual’s risk of acquiring HIV infection by a factor of 2 to 5. Therefore, individuals or groups with high rates of STIs have increased risk of HIV acquisition after being exposed to the virus. African American men and women are disproportionately affected by STIs including chlamydia, gonorrhea, primary and secondary syphilis, Trichomonas infections, and genital herpes.
High Rate of Incarceration of African American Males

Incarceration rates fueled by the federal government’s “War on Drugs” resulted in an overall increase in the prison population, disproportionately affecting African American males.

- In the US, African Americans made up 41% of the total prison population in 2005. Incarceration rate of ethnic minorities continues to be disproportionately high.
- Data from 2004 reveal that incarceration rates of African American males were 7 times that of white males and 3 times that of Hispanic males.

The high rate of incarceration of African American males is a critical component for understanding the health disparity observed among African Americans in the general population in the US.

- The increased risk of HIV exposure for prison inmates increases the risk of infected prisoners transmitting HIV upon release and in periods between incarcerations.
- In addition to HIV, a disproportionate number of inmates are also coinfected with Hepatitis C virus, which contributes to the increased HIV-associated morbidity and mortality.

The economic burden placed on the incarcerated and their families is amplified by their return to poverty-stricken communities with poor prospects for job opportunities, housing, health care, and stable personal relationships, resulting in a well-known cycle that contributes to the HIV epidemic.

- This cycle is also linked to high rates of HIV infection observed in African American women and African American children, the latter of which are predisposed to social and health behaviors that can translate into increased risk for HIV acquisition.

Delay in Institution of Antiretroviral Therapy to People of Color

In general, access to antiretroviral therapy has been poor in communities of color. Communities of color have had a long-term battle acquiring access to adequate medical care from underdeveloped healthcare systems. The current global economic crisis will only make the existing problems associated with antiretroviral therapy access targets
more difficult.

- Delays in the institution of antiretroviral therapy to communities of color are often associated with inadequate funding of agencies that target impoverished and economically disadvantaged communities.

- Because of financial constraints in these communities, less-effective antiretroviral therapy regimens are more likely to be employed.

Poor overall access to ART contributes greatly to HIV-associated morbidity and mortality on a global scale. Access targets for antiretroviral therapy have fallen short of expectations, and with more than 2.5 million people infected with HIV annually, substantial improvements have to be made.

**Educational Background**

One’s educational background can be an important deterrent to participating in high-risk behaviors that could predispose them to HIV acquisition.

- Knowing how HIV is transmitted and understanding methods of protection against infection is critical for limiting the risk of becoming infected.

- HIV infection rates are high among the educationally disadvantaged.

**Suggested Reading**


Colombia University 2006.
Questions

1. It is suggested that by 2010, the global trend of HIV transmission in 5 of the largest countries (Ethiopia, China, Nigeria, India, and Russia) will add an additional 50 million to 75 million people to the existing HIV-infected population. What main factor governing HIV transmission would suggest that these estimates are overstated?
   a) A cure for HIV will soon be discovered
   b) Greater access of anti-retroviral drugs
   c) Education, awareness and better global access to healthcare
   d) People will begin to develop immune resistance to HIV
   e) The impact of herbal and holistic therapies

2. There are underlying barriers in all countries associated with under-reporting of HIV/AIDS. One of the most substantial barriers which occurs in all societies and is difficult to combat, but must be targeted in all HIV prevention strategies is:
   a) Resistance to HIV drugs
   b) Health care and social responsibility
   c) Lack of administrative personnel and funding
   d) Social and political stigma
   e) Organized crime

3. One of the main reasons why MSM continue to impact the HIV/AIDS epidemic more than any other high-risk population is because they have:
   a) Genetic predisposition to HIV infection
   b) Hormonal imbalances, making them more susceptible to HIV
   c) High rates of undiagnosed HIV among MSM
   d) High incarceration rates
   e) Social and political inequalities

4. The greatest underlying reason for high rates of HIV/AIDS among ethnic minorities, including men, women, and children is:
   a) Poor access to health care
b) Lack of education and opportunities  
c) Racial discrimination and distrust of the health care system  
d) MSM and high incarceration rates  
e) Genetic predisposition to acquire HIV

5. Elderly populations are becoming increasingly at risk for HIV infection. What is the most important prevention strategy to help reduce the HIV/AIDS disparity that is developing among individuals 50 and over?
   a) HIV prevention and awareness campaigns targeting the elderly  
   b) More affordable health care  
   c) Older doctors that they can trust  
   d) HIV/AIDS screening for the elderly  
   e) Alcohol abstinence

6. The most notable factor that has resulted in the disproportionate rate of HIV infection among African Americans in the prison population is:
   a) Racial and ethnic discrimination  
   b) High rates of injection drug use  
   c) High male incarceration rates due to the “War on Drugs”  
   d) Unusual sexual practices  
   e) Poor access to counseling

7. How does prior injection drug use among HIV-negative prisoners lead to increased morbidity and mortality after becoming infected with HIV?
   a) It increases the risk of coinfection with Hepatitis C virus  
   b) The immune system is weakened by prior IDU  
   c) The body is more susceptible to HIV infection with prior IDU  
   d) CD4 positive T-cells are depleted by prior IDU  
   e) There is a higher rate of STI among HIV-negative inmates

8. The greatest impact of HAART on the HIV epidemic is:
a) It prevented HIV disease
b) Infection rates started to decline
c) It reduced HIV-related morbidity and mortality
d) HIV-infected patients became resistant to the drug over time
e) No HIV drug resistance was observed

9. What is the most critical underlying factor that contributes to the high number of undiagnosed HIV-infected individuals?
   a) HIV infection has delayed symptoms
   b) Lack of individuals at risk being tested
   c) Mistrust of the health care system
   d) Poverty and unstable housing
   e) Racial and ethnic discrimination

10. The origin of the HIV virus that gave rise to the AIDS epidemic in Africa that later spread to the Americas is associated what type of ongoing cultural practice?
    a) Ritualistic practices among rural populations
    b) Adoption of wild animals as pets
    c) The consumption of bushmeat and blood
    d) Sexual violence against women
    e) Reluctance to wear condoms