Epidemiology of HIV

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Section 1: Screening and Diagnosis
Topic 1: Epidemiology of HIV

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HIV Prevalence

Definition of HIV Prevalence

The HIV prevalence is defined as the number (or percent) of persons in a population living with HIV infection. The HIV prevalence rate is the number of persons living with HIV per 100,000 population. The HIV prevalence statistics typically reported by the Centers for Disease Control and Prevention (CDC) are based on persons with diagnosed HIV infection in the United States,[1] which is a slight underestimation of total number of persons living with HIV infection, since approximately 13% remain undiagnosed.[2] The estimated prevalence for the total number of persons living with HIV in the United States takes into account the number living with diagnosed HIV infection and the estimated number of persons living with undiagnosed HIV.[2, 3]

Estimated HIV Prevalence

The CDC estimates that 1,242,400 persons 13 years of age and older were living with HIV infection in the United States at the end of 2013, including 1,080,800 persons with diagnosed HIV infection and 161,200 with undiagnosed HIV infection.[2, 3] The number of persons living with HIV (prevalence) in the United States increased each year from 2007 to 2012 (Figure 1), because the number of new HIV infections per year outpaced the number of persons with HIV/AIDS who died per year.[2, 3, 4]

HIV Prevalence by Sex and Transmission Category

The CDC estimates that among persons living with diagnosed and undiagnosed HIV infection in the United States 77% are male and 23% are female.[2, 4] Overall, among persons living with diagnosed and undiagnosed HIV infection in the United States, an estimated 55% acquired HIV through male-to-male sexual contact, 26% via heterosexual contact, 14% by injection drug use, and 5% had combined risk factors for male-to-male sexual contact and injection drug use; these HIV transmission category prevalence data have also been broken out for men and women, but do not include data for transgender persons (Figure 2).[2] Among males living with a diagnosis of HIV infection, 72% became infected through male-to-male sexual contact, 11% through injection drug use, 10% by heterosexual contact, 7% had risk factors for both male-to-male sexual contact and injection drug use, and less than 1% acquired HIV via other routes (perinatal, hemophilia, transfusion, or no reported risk factor).[2] Among females living with diagnosed HIV infection, 75% acquired HIV through heterosexual contact, 24% via injection drug use, and 1% through other routes (perinatal, transfusion, or no reported risk factor).[2]

HIV Prevalence by Race/Ethnicity

Among persons living with HIV infection in the United States, approximately 40% are black/African American, 34% white, 21% Hispanic/Latino, and 5% are of other races, including American
Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islander and multiple races.\cite{2,4} It is striking to note that although blacks/African Americans comprise approximately 12% of the United States population, they account for more than 40% of persons living with HIV. The HIV prevalence rate is by far the highest among blacks/African Americans (1561.2 per 100,000 population), a rate 2.4 times higher than in Hispanic/Latinos, and 6.4 times higher than in whites (Figure 3).\cite{2} These statistics clearly illustrate how the HIV epidemic has disproportionately affected black/African American and Hispanic/Latino populations.

**HIV Prevalence by Age**

In the United States, the three age groups that account for the largest number of persons living with diagnosed or undiagnosed HIV are (in order) persons 45-54, 35-44, and 55-64 (Figure 4); these three age groups also had the highest HIV prevalence rate.\cite{2} Overall, 60% of persons living with HIV in 2013 were 45 years of age or older (Figure 5).\cite{2,4}

**HIV Prevalence by Region of Residence**

In the United States, based on data for persons living with diagnosed HIV infection at end of 2014, more persons with HIV infection resided in the South (422,314) than any other region; note the total number included in this analysis (955,081) did not include persons with undiagnosed HIV infection (Figure 6).\cite{1} Overall, at year end 2014, 44% of persons with diagnosed HIV infection resided in the South, 25% in the Northeast, 19% in the West, and 12% in the Midwest (Figure 7).\cite{1} The highest HIV prevalence rate (persons living with HIV per 100,000 population) was in the Northeast and second highest in the South.\cite{1}
Newly Diagnosed with HIV Infection

Reporting of New HIV Diagnoses

The CDC annually provides updated information on new diagnoses of HIV infection in the United States. Note that new HIV diagnoses are not the same as new HIV infections (HIV incidence), since a significant proportion of persons newly diagnosed with HIV infection may have acquired HIV years prior to their HIV diagnosis. The rates of new HIV diagnosis are given as rates per 100,000 population. The United States data for new HIV infections typically includes all 50 states, the District of Columbia, and 6 United States dependent areas (American Samoa, Guam, the Northern Mariana Islands, Puerto Rico, the Republic of Palau, and the U.S. Virgin Islands).

New HIV Diagnosis in United States

In the United States, for the year 2015, an estimated 39,513 persons were newly diagnosed with HIV infection (any stage of HIV disease).[1] The number of new HIV diagnoses has declined 10% from 2010 to 2015, suggesting a true trend in declining new infections (Figure 8).[1] The rate of new HIV diagnosis in 2015 was 12.3 per 100,000 population.[1]

New HIV Diagnosis by Sex and Transmission Category

Among the new HIV infections diagnosed in the United States in 2015, an estimated 81% occurred in males and 19% in females.[1] The proportion of infections in males and females has been relatively consistent in the past 5 years. Among the newly diagnosed HIV infections in 2015, an estimated 67% were attributed to male-to-male sexual contact, 24% to heterosexual contact, 6% to injection-drug use, 3% to both male-to-male sexual contact and injection drug use, and less than 1% to other transmission categories, such as maternal-to-child transmission, occupational exposure, or receipt of contaminated blood products; these transmission category data have also been reported separately for men and women, but data on transgender persons is not included (Figure 9).[1] The proportion of newly diagnosed HIV infections involving male-to-male sexual contact has increased in recent years from 55% in 2008 to 67% in 2015.[1,5] This statistic is particularly startling given that men who have sex with men account for about 2% of the United States population.[6]

New HIV Diagnosis by Race/Ethnicity

Of the persons diagnosed with HIV infection in 2015, 45% were black/African American, 27% white, 24% Hispanic/Latino, 2% Asian, 2% persons of multiple races, and less than 1% each American Indian/Alaska Native and Native Hawaiian/other Pacific Islander.[7] The number of new HIV diagnoses was highest in blacks/African Americans, then whites, then Hispanics/Latinos. The rate of new diagnosis (new HIV diagnosis per 1000,000 population) was by far highest in blacks/African Americans) and second highest in Hispanics/Latinos; the new diagnosis rate for blacks/African Americans (44.3) was approximately 8 times higher than in whites (5.3) (Figure 10).

New HIV Diagnosis by Age

The total number of new HIV diagnoses was highest among persons aged 25 to 29 followed by those 20 to 24 years old and then 30 to 34 years old (Figure 11).[1] The new diagnosis rate (new HIV diagnosis per 100,000 population) was highest in persons aged 25 to 29 (33.4 per 100,000).[1] Among new HIV diagnoses in 2015, 25% occurred in persons 45 years of age or older.

New HIV Diagnosis by Region

The overall rate of new HIV diagnosis in the United States in 2015 was 12.3 per 100,000 population, but the rate of new HIV diagnosis in different geographic regions varied significantly.[1] The highest
rates were in the South (16.8), followed by Northeast (11.6), then West (9.8), with the lowest rates in the Midwest (7.6). Overall, approximately 52% of new HIV diagnoses occurred in persons with residence in the South at the time of HIV diagnosis (Figure 12).[1] The five states with the highest rates of new HIV diagnoses were Louisiana (29.2), Georgia (28.3), Florida (27.9), Maryland (26.7), and Mississippi (20.6). The District of Columbia (Washington, D.C) had an extremely high HIV diagnosis rate (66.1).[1]
Undiagnosed HIV Infection

Undiagnosed HIV in the United States

Using back-calculation methods,[8] the CDC estimated at the end of 2013, 13% of persons living with HIV infection had undiagnosed HIV.[2] From 2003 to 2006 the percentage of persons with undiagnosed HIV infection in the United States declined from approximately 25% to 17%; since 2007 the undiagnosed fraction of persons living with HIV has continued to further decline, although in the last several years the undiagnosed fraction has leveled off at approximately 13% (Figure 13).[2,3,8,9,10] Persons unaware of their HIV status are unable to benefit from treatment of their HIV infection and are more likely to transmit HIV to others.

Undiagnosed HIV by Age, Race, and Risk Factor

In general, the younger the age group, the higher the percentage of undiagnosed HIV infection (Figure 14).[2,4] Among persons aged 18 to 24 living with HIV in the United States in 2013, an estimated 51% have undiagnosed HIV infection.[2] The percentage of persons with undiagnosed HIV infection varies among different racial/ethnic groups, from a high of 21.6% in Asians to a low of 10.8% in whites.[2] Among different transmission categories, heterosexual males (17.3%) and men who have sex with men (15.3%) had the highest undiagnosed fraction, with the lowest undiagnosed fraction in persons who inject drugs (5.1% in males and 5.0% in females).[2]

Undiagnosed HIV and Risk of Transmission

Studies have shown that persons with HIV infection who are not aware of their HIV status are responsible for a disproportionate number of new HIV infections, with a transmission rate approximately two-fold higher than persons with HIV infection who are aware of their HIV status.[10,11,12] Data from 2009 showed an estimated 30% of new HIV infections were attributed to the 18% of individuals who were unaware of their infection at that time.[11] Several studies have also shown that high-risk sexual behaviors and the prevalence of sexually transmitted diseases decreases among persons who become aware they have HIV infection.[13,14,15,16] Persons who become aware of their HIV infection can lower their risk of transmitting HIV to others by practicing risk reduction strategies and taking antiretroviral therapy.[17,18,19] For example, a meta-analysis of 11 studies evaluating unprotected anal or vaginal intercourse in the United States, found a 68% reduction in these high-risk behaviors among individuals who became aware of their HIV serostatus.[14]

Late Diagnosis of HIV

Unfortunately, despite improvement in HIV screening and knowledge of status, among persons newly diagnosed with HIV infection in 2014, 23% had stage 3 HIV disease (AIDS) at the time of diagnosis.[2] Nearly one-third of HIV diagnoses occur late (defined as an AIDS diagnosis made within 12 months of initial HIV diagnosis).[20] For these individuals, late diagnosis represents missed opportunities to obtain medical care and to prevent transmission of HIV to others. Even among individuals who do not meet criteria for late diagnosis of HIV, there is still a need for overall earlier diagnosis. A study assessing the immune status of patients at initial presentation for HIV care from 1997 to 2007 in 13 United States and Canadian cohorts found the mean CD4 cell count at time of diagnosis had remained below 350 cells/mm³.[21]

Awareness of HIV Status and HIV Care Cascade

Increasing awareness of HIV status represents the first step in improving the HIV care cascade, also called the HIV care continuum, which is a model for identifying issues and opportunities related to the delivery of HIV services to people living with HIV in the United States.[4,22] Early HIV diagnosis
and prompt linkage to care, retention in care, and receipt of effective antiretroviral therapy are all essential in reducing morbidity and mortality, minimizing disparities in care and treatment, and lowering the risk of HIV transmission to others.[11,17,22]
**HIV Incidence Estimates**

**Definition of HIV Incidence**

The incidence of HIV is defined as the number of new infections in a designated region over a specific time period. The CDC typically defines the HIV incidence in the United States as the number of new HIV infections that occur per year. The incidence rate is defined in the CDC statistics as the number of cases per 100,000 population per year. Note that the yearly CDC statistics report the number of persons newly diagnosed with HIV, which is distinct from the number of persons who acquired HIV that year. The persons newly diagnosed with HIV could have been infected recently or many years prior, whereas the true number of new infections represents the number of persons who acquired HIV infection during that year.

**Estimates of HIV Incidence**

Using available epidemiological data and a two-step laboratory algorithm (blood samples are tested with a conventional enzyme-linked immunoassay and positive samples are then tested with the BED HIV-1 Capture Immunoassay, which can distinguish between longstanding HIV infections and those acquired within the past 6 months), CDC experts create complex statistical models to generate HIV incidence estimates for the United States.[5] More recently, the CDC has utilized a new model that incorporates data from the HIV case surveillance system and CD4 cell count test results to estimate the HIV incidence.[23] Based on this new model, the CDC estimated the number of new HIV infections in the United States decreased from 48,300 in 2007 to 39,000 in 2013 (Figure 15).[23] In a separate analysis, CDC investigators estimated HIV incidence from 2008-2013 using a biomarker for recency of infection (stratified extrapolation approach) and 2 back-calculation models (CD4 and Bayesian hierarchical models).[24] With this approach, estimated new HIV infections per year decreased approximately 4% per year from a high of 48,309 in 2008 to a low of 39,270 in 2013.[24] Overall, five major trends in HIV incidence have occurred in the United States since the onset of the HIV epidemic: (1) a dramatic rise in the early 1980's, (2) a peak in the mid-1980's, (3) a marked decline in the late 1980's, (4) stabilization and leveling off in the 1990's, and (5) a gradual decline in new infections from 2007 to 2013.[23,24,25,26,27]
Social Determinants of Health and HIV

Role of Social Determinants of Health in the HIV Epidemic

Social determinants of health play an important role in driving the HIV epidemic in the United States. The term "social determinants of health" refers to the overlapping social, cultural, environmental, and economic factors that are responsible for most health inequities; in the case of HIV, examining such factors can help to explain the disproportionate burden of HIV in certain populations, such as in African Americans.[28] Some examples of social determinants of health are safe housing, access to health care services, transportation options, quality of education, literacy, culture, and access to job opportunities. Importantly, many socioeconomic variables, such as income, education, and occupation, will indirectly impact health and therefore serve as proxies for other determinants of health, which may not always be exactly clear.[29,30] Analyzing data for key social determinants of health in populations living with HIV could inform strategies related to HIV testing, treatment, and prevention.

CDC Report on Social Determinants of Health and HIV

The CDC has identified significant gaps in knowledge regarding the relationship between social determinants of health and HIV, and to this end, the CDC released a report based on data collected from 2009 to 2013 that summarizes numbers and rates of HIV diagnoses among adults according to five social determinants of health: federal poverty level, education level, median household income, employment status, and health insurance coverage status.[28] Although the intersection of social determinants of health and individual-level factors, such as race/ethnicity and behavioral HIV risk factors, is complex, the CDC report suggests the rate of HIV diagnosis increases as the rate of poverty, unemployment, and lack of health insurance increases, and is highest in areas with lower median household income and lower educational attainment.[28] Notably, for both men and women, the HIV diagnosis rates decreased as the median household income increased (Figure 16).[28] Such indicators underscore that HIV risk is informed by a confluence of factors that go beyond individual-level attributes and have population-level consequences.
Deaths in Persons with HIV Infection

Deaths of Persons Diagnosed with HIV Infection or AIDS

With the availability of potent combination antiretroviral therapy in the mid-1990s, the annual number of HIV-related deaths in the United States dramatically decreased.\cite{25,31,32} Subsequently, from 2000 to 2010 the number of annual deaths of persons ever diagnosed with AIDS continued to decline.\cite{1,7} More recently, CDC surveillance data revealed that during 2010 to 2014 the annual number of deaths of persons diagnosed with HIV infection decreased from 17,688 to 15,591 and deaths of persons with HIV infection ever classified as stage 3 (AIDS) deaths decreased from 14,396 to 12,688 (Figure 17).\cite{1} Note, however, that deaths of persons with HIV (with or without AIDS), as reported, may be due to any cause and may be unrelated to HIV infection or AIDS. Recent analysis suggests that persons with HIV infection who take antiretroviral therapy have a life expectancy of 71 years.\cite{33}

Deaths in Persons with HIV by Categories

During 2010-2014, the annual death rate in persons with HIV increased in persons aged 60 and older, remained stable in those 55-59, and decreased in all age groups of persons aged 20-54.\cite{1} Death rates in 2010-2014 decreased in American Indians/Alaska Natives, Asians, blacks/African Americans, Hispanics/Latinos, whites, and persons of multiple races; in 2014 the death rate in persons with HIV was highest in blacks/African Americans (Figure 18).\cite{1} Survival at 12, 24, and 36 months after HIV diagnosis was similar in blacks/African Americans, whites, and Hispanics/Latinos.\cite{1} Survival at 36 months after HIV diagnosis was lower among individuals with HIV infection attributed to injection drug use than among persons with HIV infection attributable to other transmission categories.\cite{1}

Causes of Death

For persons diagnosed with HIV infection who take effective antiretroviral therapy, more than 50% of deaths are now due to non-AIDS causes.\cite{34,35,36} The cause and frequency of death was analyzed in the Data Collection on Adverse Events of Anti-HIV Drugs (D:A:D) study, a collaborative, observational study that prospectively followed 23,441 persons with HIV infection for 5 years in Europe, the United States, and Australia; all patients enrolled had access to combination antiretroviral therapy.\cite{37} In this study, liver disease was the most frequent non-AIDS-related cause (14.5%); other causes of death included cardiovascular disease (11%) and non-AIDS malignancies (9.4%). More recent data from the Antiretroviral Therapy Cohort Collaboration (ART-CC) found that among persons with HIV in North America and Europe who started combination antiretroviral therapy between 1996-1999 and survived for more than 10 years, the leading causes of non-AIDS-related deaths were malignancy, cardiovascular disease, and liver-related causes.\cite{36}
Global HIV-1 Epidemiology

HIV-1 Groups and Subtypes (Clades)

Strains of HIV-1 can be classified into four groups: the "major" group M, the "outlier" group O, and two additional groups, N and P (Figure 19). Group M is responsible for most of the global HIV pandemic, and has at least 9 distinct subtypes of genetically-related HIV, which are often referred to as clades. Group N has been found in a small number of individuals in Cameroon. Group O is responsible for tens of thousands of infections in West and Central Africa. Group P is a new group identified in two individuals in Cameroon. Viral subtypes can mix genetic material and create a hybrid virus and, if the recombinant virus is capable of transmission, it is designated as a "circulating recombinant form". As an example, the circulating recombinant form created from subtypes B and F has been designated circulating recombinant form B/F, which is commonly found in Latin America.

Global Distribution of HIV-1 Subtypes

Three HIV-1 subtypes are responsible for 71% of all HIV-1 infections globally: subtype A (common in West and Central Africa, and Russia), subtype B (common in Europe, the Americas, Australia, and Japan), and subtype C (common in Southern and Eastern Africa, India, and Nepal). Presently, subtype B accounts for 12% and subtype C accounts for about 48% of infections globally, though infections with non-subtype B clades have been increasing in Western Europe and North America due to immigration from sub-Saharan Africa, Asia, and Eastern Europe.

HIV-1 Clades and Impact on HIV Outcomes

There may be differences in disease progression among the different subtypes, though studies on this question have been limited by confounders such as access to medical therapy, nutritional status, host genetic factors, and mode of viral transmission.[38] There do not seem to be major differences in response to antiretroviral therapy based on subtype, but subtype-specific pathways to resistance may exist and are being studied. Similarly, the diversity of HIV subtypes may have implications for future antiretroviral therapy and for vaccine development.

HIV Global Prevalence

At the end of 2015, an estimated 36.7 million people were living with HIV infection globally, including 34.9 million adults and 1.8 million children younger than age 15 (Figure 20).[39,40] More than 25 million (approximately 70% of the total) live in sub-Saharan Africa, including 19 million in Eastern and Southern Africa and 6.5 million in Western and Central Africa.[39,40] In sub-Saharan Africa, the HIV prevalence increased from 23.5 million in 2010 to 25.5 million in 2015.[39] In Eastern Europe and Central Asia, the number of people living with HIV infection increased by about 55% between 2001 and 2015 (970,000 to 1.5 million), fueled by a significant injection drug use epidemic; in this region of the world, men who have sex with men have played a relatively minor role in the transmission of HIV.[39,41] In the Asia and Pacific regions, the HIV prevalence increased from 4.7 to 5.1 million between 2010 and 2015. The HIV prevalence rates are highest in Sub-Saharan Africa, with an HIV prevalence rate of 7.1% in Eastern and Southern Africa and 2.2% in Western and Central Africa.[39]

HIV Global Incidence

Based on the 2016 Joint United Nations Program on HIV/AIDS (UNAIDS) Global AIDS Update, an estimated 2.1 million new HIV infections occurred globally in 2015, which represented a 38% decline in new global HIV infections since 2001 and a slight decline from the 2.2 million new global HIV infections in 2010 (Figure 21).[39] Although most major regions have seen a decline in new annual HIV infections since 2010, two major regions have experienced an increase—Eastern Europe and
Central Asia (58% increase) and the Middle East and North Africa (5% increase).[39]

Global AIDS-Related Deaths

In 2015, there were an estimated 1.1 million AIDS-related deaths, including 800,000 in sub-Saharan Africa and 180,000 in the Asia and Pacific region.[39] The 1.1 million AIDS-related deaths in 2015 represent a 27% decline from the 1.5 million deaths in 2010. Globally, tuberculosis remains the most common cause of death in persons with HIV infection, accounting for approximately one-third of all global AIDS-related deaths.[42] The global decline in AIDS-related deaths has been attributed to the expanded availability and use of antiretroviral therapy in many regions of the world.[39] Overall, AIDS-related deaths have fallen by about 45% since the peak of 2 million deaths in 2005.[42]

Global Antiretroviral Therapy Coverage

During the first half of 2016, an estimated 18.2 million persons living with HIV infection globally were taking antiretroviral therapy, representing almost one-half of all people living with HIV infection; this represents a substantial ramp up from the 7.5 million persons receiving antiretroviral therapy in 2010 (Figure 22).[39,42] The UNAIDS has advocated an aggressive global scale-up of antiretroviral therapy and in recent years the antiretroviral therapy roll out has exceeded expectations.[39,42]
HIV-2

HIV-2 on a Global Scale

Of the 36.7 million individuals living with HIV worldwide, approximately 1 to 2 million are infected with HIV-2. Most persons infected with HIV-2 reside in West Africa, or in countries, particularly France, Spain, and Portugal, after migrating from West Africa. In addition, HIV-2 has been reported in several former Portuguese colonies, including Angola, Mozambique, and the Indian states of Goa and Maharashtra. Since 1996, HIV-2 prevalence has declined in several West African countries. For example, Guinea-Bissau, which has the highest prevalence of HIV-2 globally, has seen a drop in HIV-2 prevalence from 7.4% in 1996 to 4.4% in 2006, but during this same time period the prevalence of HIV-1 increased from 2.3% to 4.6%. Several reports have documented small cohorts of HIV-2 in North America, West and Central Europe, the Middle East, North Africa, Southern Africa, Asia, and Oceania. Although current or past residence in a country where HIV-2 is endemic is the strongest risk factor for acquiring HIV-2 infection, other risk groups include sexual or needle-sharing partners of persons known to be infected with HIV-2, persons who received a blood transfusion or a non-sterile injection in a country where HIV-2 is endemic, and children born to women with HIV-2 infection.

HIV-2 in United States

Fewer than 1% of HIV infections in the United States are caused by HIV-2. The number of HIV-2 infections reported to the CDC between 1988 and June 2010 was 242, though only 166 met the CDC's strict working case definition. The reported number of HIV-2 infections may significantly underestimate the actual number of cases, due to unrecognized infections, unreported infections, limited access to diagnostic tests, and the strict working definition for the diagnosis of HIV-2. Regardless, HIV-2 remains uncommon in the United States and primarily is seen in persons who emigrated from an HIV-2 endemic region, or with exposure to a person from an HIV-2 endemic region. Among cases of HIV-2 infection reported to the CDC, approximately two-thirds were concentrated in the Northeast, including 46% in New York City alone. Overall, 81% of the HIV-2 cases occurred in persons from West Africa, with Ivory Coast as the most common country of origin.
Summary Points

- In the United States at the end of 2013, an estimated 1,242,000 people were living with HIV infection, including 1,080,800 with diagnosed HIV infection and 161,200 with undiagnosed HIV infection.
- The number of people living with HIV in the United States has steadily increased as the number of new infections per year has outpaced the number of people dying with HIV.
- Key HIV prevalence data in the United States include 55% of persons infected had male-to-male sex as their transmission category, blacks/African Americans) account for approximately 40% of all people living with HIV, and 60% of persons living with HIV are 45 years of age or older.
- Among persons newly diagnosed with HIV infection in 2015 in the United States, 67% were infected by male-to-male sex, 45% were black/African American, and 52% resided in the South at the time of the diagnosis.
- The HIV incidence (estimated actual new HIV infections) in the United States has declined 19% between 2007 and 2013, from 48,300 to 39,000.
- The proportion of persons living with HIV infection in the United States who are unaware of their HIV status has decreased from 25% in 2003 to 13% in 2013; however, among persons aged 13 to 24 living with HIV infection, 51% are undiagnosed.
- Persons who are aware of their HIV status can benefit from HIV treatment and are less likely to transmit the virus to others.
- Black males have the highest age-adjusted death rates from HIV/AIDS in the United States, though the rate of death has been decreasing across all racial/ethnic groups.
- The annual number of deaths for persons diagnosed with HIV infection dropped nearly 10% between 2010 and 2014, from 17,688 to 15,591. Most deaths that occur in persons with HIV infection who took antiretroviral therapy are due to non-AIDS causes, particularly liver disease, cardiovascular disease, and non-AIDS malignancies.
- Strains of HIV can be classified into four groups: of these, group M is responsible for the bulk of the global HIV pandemic.
- Globally, an estimated 36.7 million people are living with HIV infection and 25.5 million (70%) reside in sub-Saharan Africa.
- Globally, in 2015, an estimated 2.1 million new HIV infections occurred and an estimated 1.1 million persons with HIV infection died. In 2016, an estimated 18.2 million persons were receiving antiretroviral therapy.
- An estimated 1 to 2 million persons are living with HIV-2 infection globally, with the highest prevalence rates in West Africa.
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Figures

Figure 1 Estimated HIV Prevalence in United States, 2007-2013*

This graph shows CDC estimates for persons ≥13 years old living with diagnosed or undiagnosed HIV infection in the United States during the years 2007-2013.

Figure 2 (Image Series) - Persons Living with Diagnosed and Undiagnosed HIV in U.S., 2013*—HIV Transmission Category (Image Series) - Figure 2 (Image Series) - Persons Living with Diagnosed and Undiagnosed HIV in U.S., 2013*—HIV Transmission Category Image 2A: Males and Females

These data show transmission categories for HIV acquisition for persons ≥13 years old living with diagnosed and undiagnosed HIV in the United States.


*Other = hemophilia, blood transfusion, or perinatal exposure, and risk factor not reported or identified.
*Estimate for persons ≥13 years of age living with diagnosed or undiagnosed HIV infection
Figure 2 (Image Series) - Persons Living with Diagnosed and Undiagnosed HIV in U.S., 2013*—HIV Transmission Category
Image 2B: Males

This pie chart shows transmission categories for HIV acquisition for males ≥13 years old living with diagnosed and undiagnosed HIV in the United States.


*Estimate for persons ≥13 years of age living with diagnosed or undiagnosed HIV infection
This pie chart shows transmission categories for HIV acquisition for females ≥13 years old living with diagnosed and undiagnosed HIV in the United States.


*Estimate for persons ≥13 years of age living with diagnosed or undiagnosed HIV infection
**Figure 3** Persons Living with Diagnosed and Undiagnosed HIV in U.S., 2013*—Prevalence Rates by Race/Ethnicity

This bar graph shows HIV prevalence rates based on race/ethnicity for persons ≥13 years old living with diagnosed and undiagnosed HIV in the United States. Blacks/African-Americans have by far the highest prevalence rate.


*Estimate for persons ≥13 years of age living with diagnosed or undiagnosed HIV infection
Figure 4 Persons Living with Diagnosed and Undiagnosed HIV in U.S., 2013*—Age Categories

This bar graph shows the breakdown by age group for persons ≥13 years old living with diagnosed and undiagnosed HIV in the United States.


*Estimate for persons ≥13 years of age living with diagnosed or undiagnosed HIV infection
Figure 5 Persons Living with Diagnosed and Undiagnosed HIV in United States, 2013*—Age Categories (Percent)

This pie chart shows that 60% of persons living with diagnosed and undiagnosed HIV infection in the United States are 45 years of age or older.


*Estimate for persons ≥13 years of age living with diagnosed or undiagnosed HIV infection
Figure 6 Persons Living with Diagnosed HIV Infection in United States, year end 2014—by Region of Residence for

This graph shows that at year-end 2014, more persons with diagnosed HIV infection resided in the South than any other region of the United States. These estimates do not include persons with undiagnosed HIV infection.

Figure 7 Persons Living with Diagnosed HIV Infection in United States, year end 2014 by Region of Residence (Percent)

This pie chart shows the geographic region of residence for persons living with diagnosed HIV infection. Persons living in the South account for 44% of all people living with HIV in the United States. These estimates do not include persons with undiagnosed HIV infection.

Figure 8 New HIV Diagnoses in the United States, 2010-2015

Figure 9 (Image Series) - New HIV Diagnoses in the United States in 2015, by Transmission Category
Image 9B: Males

Figure 9 (Image Series) - New HIV Diagnoses in the United States in 2015, by Transmission Category
Image 9C: Females


Total for Females = 7,402

- Heterosexual Contact: 86.3%
- Injection Drug Use: 13.2%
- Other: 0.4%
Figure 10 New HIV Diagnoses (Rate) in the United States in 2015, by Race/Ethnicity

Figure 11 New HIV Diagnoses in the United States in 2015, by Age Group

Figure 12 New HIV Diagnosis in the United States in 2015, by Region of Residence

Figure 13 Proportion of Persons with Undiagnosed HIV Infection in United States, 2007-2013

Figure 14 Proportion of Persons with Undiagnosed HIV Infection in United States in 2013, by Age

Figure 15 Estimate of HIV Incidence in United States, 2007-2013

Investigators from the Centers for Disease Control and Prevention incorporated data from the HIV case surveillance system and CD4 cell count test results to estimate the HIV incidence in the United States.

Figure 16 New HIV Diagnosis (Rate) in the United States in 2015, by Income Bracket

Figure 17 Deaths in Persons Diagnosed with HIV Infection, with or without AIDS, by Year—United States, 2010-2014

Figure 18 Deaths in Persons Diagnosed with HIV Infection, by Race/Ethnicity—United States, 2014

Figure 19 HIV-1-Groups


*CRFs = Circulating Recombinant Forms
### Figure 20 Global HIV Prevalence by Region, 2015


<table>
<thead>
<tr>
<th>Region</th>
<th>Total No.</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Global Total</strong></td>
<td>36.7 million</td>
<td>0.8</td>
</tr>
<tr>
<td>Eastern and Southern Africa</td>
<td>19.0 million</td>
<td>7.1</td>
</tr>
<tr>
<td>Western and Central Africa</td>
<td>6.5 million</td>
<td>2.2</td>
</tr>
<tr>
<td>Asia and the Pacific</td>
<td>5.1 million</td>
<td>0.2</td>
</tr>
<tr>
<td>Western and Central Europe and North America</td>
<td>2.4 million</td>
<td>0.3</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>2.0 million</td>
<td>0.5</td>
</tr>
<tr>
<td>Eastern Europe and Central Asia</td>
<td>1.5 million</td>
<td>0.9</td>
</tr>
<tr>
<td>Middle East and North Africa</td>
<td>230,000</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Figure 21 Global HIV Incidence by Region, 2015


<table>
<thead>
<tr>
<th>Region</th>
<th>Newly Infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Total</td>
<td>2.1 million</td>
</tr>
<tr>
<td>Eastern and Southern Africa</td>
<td>960,000</td>
</tr>
<tr>
<td>Western and Central Africa</td>
<td>410,000</td>
</tr>
<tr>
<td>Asia and the Pacific</td>
<td>300,000</td>
</tr>
<tr>
<td>Western and Central Europe and North America</td>
<td>91,000</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>100,000</td>
</tr>
<tr>
<td>Eastern Europe and Central Asia</td>
<td>190,000</td>
</tr>
<tr>
<td>Middle East and North Africa</td>
<td>21,000</td>
</tr>
</tbody>
</table>
Figure 22 Persons Living with HIV on Antiretroviral Therapy—Global, 2010-2016