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**Acquired immune deficiency syndrome (AIDS)**
HIV (human immunodeficiency virus) was identified in 1983 by the French scientist Luc Montagier and his staff at the Pasteur Institute in Paris. Ever since that discovery, scientists have been searching for ways to treat those infected with HIV, and to produce a vaccine to prevent its spread. While new antiviral treatments have been developed, a vaccine has yet to be found. HIV causes AIDS (acquired immunodeficiency syndrome), an unpredictable condition that may progress over many years and is characterized by a slow deterioration of the immune system. Once an individual becomes infected (HIV has infected the target cells) it takes a week or more before the virus is spread throughout the body's blood and lymph system. The immune system responds by turning out HIV antibodies in about six to eighteen weeks. The progression of HIV infection to AIDS may take several years. In the initial period, prolonged (2–4 weeks) flu-like symptoms may appear. This is followed by an asymptomatic period (clinical latency) that may last ten or more years. When the immune system becomes further compromised, the patient may experience opportunistic infections, caused by the reduced function of the immune system resulting in a plethora of nonspecific and variable signs and symptoms. The condition known as AIDS is marked by severe compromise of the immune system and the presence of one or more opportunistic infections. Some clinical signs and symptoms may include sweating, diarrhea, malaise (feeling tired), anorexia (loss of appetite), weight loss, wasting (loss of muscle tissue), chest pain, swelling of the lymph nodes, fungal infections, neurological disorders, body-fat accumulations, and increased blood fats. In addition to disease-induced signs and symptoms, medications used to treat HIV/AIDS may produce additional signs and symptoms.

List of abbreviations used in this article

AIDS: Acquired immune deficiency syndrome
HIV: Human immunodeficiency virus
CD4+: CD4+ T helper cells
CCR5: Chemokine (C-C motif) receptor 5
CDC: Centers for Disease Control and Prevention
WHO: World Health Organization
PCP: Pneumocystis pneumonia
TB: Tuberculosis
MTCT: Mother-to-child transmission
HAART: Highly active antiretroviral therapy
STI/STD: Sexually transmitted infection/disease
Acquired immune deficiency syndrome (AIDS) is a disease of the human immune system caused by the human immunodeficiency virus (HIV). This condition progressively reduces the effectiveness of the immune system and leaves individuals susceptible to opportunistic infections and tumors. HIV is transmitted through direct contact of a mucous membrane or the bloodstream with a bodily fluid containing HIV, such as blood, semen, vaginal fluid, preseminal fluid, and breast milk. This transmission can involve anal, vaginal or oral sex, blood transfusion, contaminated hypodermic needles, exchange between mother and baby during pregnancy, childbirth, breastfeeding or other exposure to one of the above bodily fluids.

AIDS is now a pandemic. In 2007, it was estimated that 33.2 million people lived with the disease worldwide, and that AIDS killed an estimated 2.1 million people, including 330,000 children. Over three-quarters of these deaths occurred in sub-Saharan Africa. According to UNAIDS 2009 report, worldwide some 60 million people have been infected, with some 25 million deaths, and 14 million orphaned children in southern Africa alone since the epidemic began.

Genetic research indicates that HIV originated in west-central Africa during the late nineteenth or early twentieth century. AIDS was first recognized by the U.S. Centers for Disease Control and Prevention in 1981 and its cause, HIV, identified in the early 1980s.

Although treatments for AIDS and HIV can slow the course of the disease, there is no known cure or vaccine. Antiretroviral treatment reduces both the mortality and the morbidity of HIV infection, but these drugs are expensive and routine access to antiretroviral medication is not available in all countries. Due to the difficulty in treating HIV infection, preventing infection is a key aim in controlling the AIDS pandemic, with health organizations promoting safe sex and needle-exchange programmes in attempts to slow the spread of the virus.
The symptoms of AIDS are primarily the result of conditions that do not normally develop in individuals with healthy immune systems. Most of these conditions are infections caused by bacteria, viruses, fungi and parasites that are normally controlled by the elements of the immune system that HIV damages.

Opportunistic infections are common in people with AIDS. These infections affect nearly every organ system.

People with AIDS also have an increased risk of developing various cancers such as Kaposi’s sarcoma, cervical cancer and cancers of the immune system known as lymphomas. Additionally, people with AIDS often have systemic symptoms of infection like fevers, sweats (particularly at night), swollen glands, chills, weakness, and weight loss. The specific opportunistic infections that AIDS patients develop depend in part on the prevalence of these infections in the geographic area in which the patient lives.
Pulmonary infections

Pneumocystis pneumonia (originally known as *Pneumocystis carinii* pneumonia, and still abbreviated as PCP, which now stands for *Pneumocystis pneumonia*) is relatively rare in healthy, immunocompetent people, but common among HIV-infected individuals. It is caused by *Pneumocystis jirovecii*.

Before the advent of effective diagnosis, treatment and routine prophylaxis in Western countries, it was a common immediate cause of death. In developing countries, it is still one of the first indications of AIDS in untested individuals, although it does not generally occur unless the CD4 count is less than 200 cells per µL of blood.

Tuberculosis (TB) is unique among infections associated with HIV because it is transmissible to immunocompetent people via the respiratory route, is not easily treatable once identified, Multidrug resistance is a serious problem. Tuberculosis with HIV co-infection (TB/HIV) is a major world health problem according to the World Health Organization: in 2007, 456,000 deaths among incident TB cases were HIV-positive, a third of all TB deaths and nearly a quarter of the estimated 2 million HIV deaths in that year.

Even though its incidence has declined because of the use of directly observed therapy and other improved practices in Western countries, this is not the case in developing countries where HIV is most prevalent. In early-stage HIV infection (CD4 count >300 cells per µL), TB typically presents as a pulmonary disease. In advanced HIV infection, TB often presents atypically with extrapulmonary (systemic) disease a common feature. Symptoms are usually constitutional and are not localized to one particular site, often affecting bone marrow, bone, urinary and gastrointestinal tracts, liver, regional lymph nodes, and the central nervous system.

Gastrointestinal infection

Esophagitis is an inflammation of the lining of the lower end of the esophagus (gullet or swallowing tube leading to the stomach). In HIV infected individuals, this is normally due to fungal (candidiasis) or viral (herpes simplex-1 or cytomegalovirus) infections. In rare cases, it could be due to mycobacteria.

Unexplained chronic diarrhea in HIV infection is due to many possible causes, including common bacterial (*Salmonella, Shigella, Listeria or Campylobacter*) and parasitic infections; and uncommon opportunistic infections such as cryptosporidiosis, microsporidiosis, *Mycobacterium avium* complex (MAC) and viruses, astrovirus, adenovirus, rotavirus and cytomegalovirus, (the latter as a course of colitis).
In some cases, diarrhea may be a side effect of several drugs used to treat HIV, or it may simply accompany HIV infection, particularly during primary HIV infection. It may also be a side effect of antibiotics used to treat bacterial causes of diarrhea (common for Clostridium difficile). In the later stages of HIV infection, diarrhea is thought to be a reflection of changes in the way the intestinal tract absorbs nutrients, and may be an important component of HIV-related wasting.

**Neurological and psychiatrics involvement**

HIV infection may lead to a variety of neuropsychiatric sequelae, either by infection of the now susceptible nervous system by organisms, or as a direct consequence of the illness itself.

Toxoplasmosis is a disease caused by the single-celled parasite called Toxoplasma gondii; it usually infects the brain, causing toxoplasma encephalitis, but it can also infect and cause disease in the eyes and lungs. Cryptococcal meningitis is an infection of the meninx (the membrane covering the brain and spinal cord) by the fungus Cryptococcus neoformans. It can cause fevers, headache, fatigue, nausea, and vomiting. Patients may also develop seizures and confusion; left untreated, it can be lethal.

Progressive multifocal leukoencephalopathy (PML) is a demyelinating disease, in which the gradual destruction of the myelin sheath covering the axons of nerve cells impairs the transmission of nerve impulses. It is caused by a virus called JC virus which occurs in 70% of the population in latent form, causing disease only when the immune system has been severely weakened, as is the case for AIDS patients. It progresses rapidly, usually causing death within months of diagnosis.

AIDS dementia complex (ADC) is a metabolic encephalopathy induced by HIV infection and fueled by immune activation of HIV infected brain macrophages and microglia. These cells are productively infected by HIV and secrete neurotoxins of both host and viral origin. Specific neurological impairments are manifested by cognitive, behavioral, and motor abnormalities that occur after years of HIV infection and are associated with low CD4⁺ T cell levels and high plasma viral loads.

Prevalence is 10–20% in Western countries but only 1–2% of HIV infections in India. This difference is possibly due to the HIV subtype in India. AIDS related mania is sometimes seen in patients with advanced HIV illness; it presents with more irritability and cognitive impairment and less euphoria than a manic episode associated with true bipolar disorder. Unlike the latter condition, it may have a more chronic course. This syndrome is less often seen with the advent of multi-drug therapy.
Tumors

Patients with HIV infection have substantially increased incidence of several cancers. This is primarily due to co-infection with an oncogenic DNA virus, especially Epstein-Barr virus (EBV), Kaposi's sarcoma-associated herpesvirus (KSHV) (also known as human herpesvirus-8 [HHV-8]), and human papillomavirus (HPV).

Kaposi's sarcoma (KS) is the most common tumor in HIV-infected patients. The appearance of this tumor in young homosexual men in 1981 was one of the first signals of the AIDS epidemic. Caused by a gammaherpes virus called Kaposi's sarcoma-associated herpes virus (KSHV), it often appears as purplish nodules on the skin, but can affect other organs, especially the mouth, gastrointestinal tract, and lungs. High-grade B cell lymphomas such as Burkitt's lymphoma, Burkitt's-like lymphoma, diffuse large B-cell lymphoma (DLBCL), and primary central nervous system lymphoma present more often in HIV-infected patients. These particular cancers often foreshadow a poor prognosis. Epstein-Barr virus (EBV) or KSHV cause many of these lymphomas. In HIV-infected patients, lymphoma often arises in extranodal sites such as the gastrointestinal tract. When they occur in an HIV-infected patient, KS and aggressive B cell lymphomas confer a diagnosis of AIDS.

Invasive cervical cancer in HIV-infected women is also considered AIDS-defining. It is caused by human papillomavirus (HPV).

In addition to the AIDS-defining tumors listed above, HIV-infected patients are at increased risk of certain other tumors, notably Hodgkin's disease, anal and rectal carcinomas, hepatocellular carcinomas, head and neck cancers, and lung cancer. Some of these are causes by viruses, such as Hodgkin's disease (EBV), anal/rectal cancers (HPV), head and neck cancers (HPV), and hepatocellular carcinoma (hepatitis B or C). Other contributing factors include exposure to carcinogens (cigarette smoke for lung cancer), or living for years with subtle immune defects.

Interestingly, the incidence of many common tumors, such as breast cancer or colon cancer, does not increase in HIV-infected patients. In areas where HAART is extensively used to treat AIDS, the incidence of many AIDS-related malignancies has decreased, but at the same time malignant cancers overall have become the most common cause of death of HIV-infected patients. In recent years, an increasing proportion of these deaths have been from non-AIDS-defining cancers.
Other infections

AIDS patients often develop opportunistic infections that present with non-specific symptoms, especially low-grade fevers and weight loss. These include opportunistic infection with *Mycobacterium avium-intracellulare* and cytomegalovirus (CMV). CMV can cause colitis, as described above, and CMV retinitis can cause blindness.

Penicilliosis due to *Penicillium marneffei* is now the third most common opportunistic infection (after extrapulmonary tuberculosis and cryptococcosis) in HIV-positive individuals within the endemic area of Southeast Asia.

An infection that often goes unrecognized in AIDS patients is Parvovirus B19. Its main consequence is anemia, which is difficult to distinguish from the effects of antiretroviral drugs used to treat AIDS itself.

Cause

AIDS is the ultimate clinical consequence of infection with HIV. HIV is a retrovirus that primarily infects vital organs of the human immune system such as CD4+ T cells (a subset of T cells), macrophages and dendritic cells. It directly and indirectly destroys CD4+ T cells.

Once HIV has killed so many CD4+ T cells that there are fewer than 200 of these cells per microliter (µL) of blood, cellular immunity is lost. Acute HIV infection progresses over time to clinical latent HIV infection and then to early symptomatic HIV infection and later to AIDS, which is identified either on the basis of the amount of CD4+ T cells remaining in the blood, and/or the presence of certain infections, as noted above.

In the absence of antiretroviral therapy, the median time of progression from HIV infection to AIDS is nine to ten years, and the median survival time after developing AIDS is only 9.2 months or weeks up to 20 years.

Many factors affect the rate of progression. These include factors that influence the body's ability to defend against HIV such as the infected person's general immune function.

Older people have weaker immune systems, and therefore have a greater risk of rapid disease progression than younger people.

Poor access to health care and the existence of coexisting infections such as tuberculosis also may predispose people to faster disease progression. The infected person's genetic inheritance plays an important role and some people are resistant to certain strains of HIV. An example of this is people with the homozygous CCR5-Δ32 variation are resistant to infection with certain strains of HIV. HIV is genetically variable and exists as different strains, which cause different rates of clinical disease progression.
Sexual transmission

Sexual transmission occurs with the contact between sexual secretions of one person with the rectal, genital or oral mucous membranes of another. Unprotected sexual acts are riskier for the receptive partner than for the insertive partner, and the risk for transmitting HIV through unprotected anal intercourse is greater than the risk from vaginal intercourse or oral sex.

However, oral sex is not entirely safe, as HIV can be transmitted through both insertive and receptive oral sex. Sexual assault greatly increases the risk of HIV transmission as condoms are rarely employed and physical trauma to the vagina or rectum occurs frequently, facilitating the transmission of HIV. Drug use has been studied as a possible predictor of HIV transmission. Perry N. Halkitis found that methamphetamine usage does significantly relate to unprotected sexual behavior. As a result of these findings, methamphetamine users are at a higher risk for contracting HIV.

Other sexually transmitted infections (STI) increase the risk of HIV transmission and infection, because they cause the disruption of the normal epithelial barrier by genital ulceration and/or microulceration; and by accumulation of pools of HIV-susceptible or HIV-infected cells (lymphocytes and macrophages) in semen and vaginal secretions. Epidemiological studies from sub-Saharan Africa, Europe and North America suggest that genital ulcers, such as those caused by syphilis and/or chancroid, increase the risk of becoming infected with HIV by about fourfold. There is also a significant although lesser increase in risk from STIs such as gonorrhea, chlamydia and trichomoniasis, which all cause local accumulations of lymphocytes and macrophages.

Transmission of HIV depends on the infectiousness of the index case and the susceptibility of the uninfected partner. Infectivity seems to vary during the course of illness and is not constant between individuals. An undetectable plasma viral load does not necessarily indicate a low viral load in the seminal liquid or genital secretions.

However, each 10-fold increase in the level of HIV in the blood is associated with an 81% increased rate of HIV transmission. Women are more susceptible to HIV-1 infection due to hormonal changes, vaginal microbial ecology and physiology, and a higher prevalence of sexually transmitted diseases.

People who have been infected with one strain of HIV can still be infected later on in their lives by other, more virulent strains.

Infection is unlikely in a single encounter. High rates of infection have been linked to a pattern of overlapping long-term sexual relationships. This allows the virus to quickly spread to multiple partners who in turn infect their partners. A pattern of serial monogamy or occasional casual encounters is associated with lower rates of infection.

HIV spreads readily through heterosexual sex in Africa, but less so elsewhere. One possibility being researched is that schistosomiasis, which affects up to 50% of women in parts of Africa, damages the lining of the vagina.
Exposure to blood-borne pathogens

This transmission route is particularly relevant to intravenous drug users, hemophiliacs and recipients of blood transfusions and blood products. Sharing and reusing syringes contaminated with HIV-infected blood represents a major risk for infection with HIV.

Needle sharing is the cause of one third of all new HIV-infections in North America, China, and Eastern Europe. The risk of being infected with HIV from a single prick with a needle that has been used on an HIV-infected person is thought to be about 1 in 150. Post-exposure prophylaxis with anti-HIV drugs can further reduce this risk.

This route can also affect people who give and receive tattoos and piercings. Universal precautions are frequently not followed in both sub-Saharan Africa and much of Asia because of both a shortage of supplies and inadequate training.

The WHO estimates that approximately 2.5% of all HIV infections in sub-Saharan Africa are transmitted through unsafe healthcare injections. Because of this, the United Nations General Assembly has urged the nations of the world to implement precautions to prevent HIV transmission by health workers.

The risk of transmitting HIV to blood transfusion recipients is extremely low in developed countries where improved donor selection and HIV screening is performed. However, according to the WHO, the overwhelming majority of the world's population does not have access to safe blood and between 5% and 10% of the world's HIV infections come from transfusion of infected blood and blood products.

Perinatal transmission

The transmission of the virus from the mother to the child can occur in utero during the last weeks of pregnancy and at childbirth. In the absence of treatment, the transmission rate between a mother and her child during pregnancy, labor and delivery is 25%.

However, when the mother takes antiretroviral therapy and gives birth by caesarean section, the rate of transmission is just 1%. The risk of infection is influenced by the viral load of the mother at birth, with the higher the viral load, the higher the risk. Breastfeeding also increases the risk of transmission by about 4%.

A number of misconceptions have arisen surrounding HIV/AIDS. Three of the most common are that AIDS can spread through casual contact, that sexual intercourse with a virgin will cure AIDS, and that HIV can infect only homosexual men and drug users. Other misconceptions are that any act of anal intercourse between gay men can lead to AIDS infection, and that open discussion of homosexuality and HIV in schools will lead to increased rates of homosexuality and AIDS.
Pathophysiology

The pathophysiology of AIDS is complex, as is the case with all syndromes.

Ultimately, HIV causes AIDS by depleting CD4\(^+\) T helper lymphocytes. This weakens the immune system and allows opportunistic infections. T lymphocytes are essential to the immune response and without them, the body cannot fight infections or kill cancerous cells. The mechanism of CD4\(^+\) T cell depletion differs in the acute and chronic phases.

During the acute phase, HIV-induced cell lysis and killing of infected cells by cytotoxic T cells accounts for CD4\(^+\) T cell depletion, although apoptosis may also be a factor. During the chronic phase, the consequences of generalized immune activation coupled with the gradual loss of the ability of the immune system to generate new T cells appear to account for the slow decline in CD4\(^+\) T cell numbers.

Although the symptoms of immune deficiency characteristic of AIDS do not appear for years after a person is infected, the bulk of CD4\(^+\) T cell loss occurs during the first weeks of infection, especially in the intestinal mucosa, which harbors the majority of the lymphocytes found in the body. The reason for the preferential loss of mucosal CD4\(^+\) T cells is that a majority of mucosal CD4\(^+\) T cells express the CCR5 coreceptor, whereas a small fraction of CD4\(^+\) T cells in the bloodstream do so.

HIV seeks out and destroys CCR5 expressing CD4\(^+\) cells during acute infection. A vigorous immune response eventually controls the infection and initiates the clinically latent phase. However, CD4\(^+\) T cells in mucosal tissues remain depleted throughout the infection, although enough remain to initially ward off life-threatening infections.

Continuous HIV replication results in a state of generalized immune activation persisting throughout the chronic phase. Immune activation, which is reflected by the increased activation state of immune cells and release of proinflammatory cytokines, results from the activity of several HIV gene products and the immune response to ongoing HIV replication. Another cause is the breakdown of the immune surveillance system of the mucosal barrier caused by the depletion of mucosal CD4\(^+\) T cells during the acute phase of disease.

This results in the systemic exposure of the immune system to microbial components of the gut’s normal flora, which in a healthy person is kept in check by the mucosal immune system. The activation and proliferation of T cells that results from immune activation provides fresh targets for HIV infection. However, direct killing by HIV alone cannot account for the observed depletion of CD4\(^+\) T cells since only 0.01–0.10% of CD4\(^+\) T cells in the blood are infected.

A major cause of CD4\(^+\) T cell loss appears to result from their heightened susceptibility to apoptosis when the immune system remains activated. Although new T cells are continuously produced by the thymus to replace the ones lost, the regenerative capacity of the thymus is
slowly destroyed by direct infection of its thymocytes by HIV. Eventually, the minimal number of CD4+ T cells necessary to maintain a sufficient immune response is lost, leading to AIDS

### Cells affected

The virus, entering through which ever route, acts primarily on the following cells:

- Lymphoreticular system:
  - CD4+ T-Helper cells
  - Macrophages
  - Monocytes
  - B-lymphocytes
- Certain endothelial cells
- Central nervous system:
  - Microglia of the nervous system
  - Astrocytes
  - Oligodendrocytes
- Neurones – indirectly by the action of cytokines and the gp-120

The virus has cytopathic effects but how it does it is still not quite clear. It can remain inactive in these cells for long periods, though. This effect is hypothesized to be due to the CD4-gp120 interaction.

- The most prominent effect of HIV is its T-helper cell suppression and lysis. The cell is simply killed off or deranged to the point of being function-less (they do not respond to foreign antigens). The infected B-cells can not produce enough antibodies either. Thus the immune system collapses leading to the familiar AIDS complications, like infections and neoplasms (vide supra).
- Infection of the cells of the CNS cause acute aseptic meningitis, subacute encephalitis, vacuolar myelopathy and peripheral neuropathy. Later it leads to even AIDS dementia complex.
- The CD4-gp120 interaction (see above) is also permissive to other viruses like Cytomegalovirus, Hepatitis virus, Herpes simplex virus, etc. These viruses lead to further cell damage i.e. cytopathy.

### Molecular basis

- Structure and genome of HIV
- HIV replication cycle
- HIV tropism

### Diagnosis

The diagnosis of AIDS in a person infected with HIV is based on the presence of certain signs or symptoms. Since June 5, 1981, many definitions have been developed for epidemiological surveillance such as the Bangui definition and the 1994 expanded World Health Organization
AIDS case definition. However, clinical staging of patients was not an intended use for these systems as they are neither sensitive, nor specific. In developing countries, the World Health Organization staging system for HIV infection and disease, using clinical and laboratory data, is used and in developed countries, the Centers for Disease Control (CDC) Classification System is used.

**WHO disease staging system**

In 1990, the World Health Organization (WHO) grouped these infections and conditions together by introducing a staging system for patients infected with HIV-1. An update took place in September 2005. Most of these conditions are opportunistic infections that are easily treatable in healthy people.

- **Stage I:** HIV infection is asymptomatic and not categorized as AIDS
- **Stage II:** includes minor mucocutaneous manifestations and recurrent upper respiratory tract infections
- **Stage III:** includes unexplained chronic diarrhea for longer than a month, severe bacterial infections and pulmonary tuberculosis
- **Stage IV:** includes toxoplasmosis of the brain, candidiasis of the esophagus, trachea, bronchi or lungs and Kaposi's sarcoma; these diseases are indicators of AIDS.

**CDC classification system**

There are two main definitions for AIDS, both produced by the Centers for Disease Control and Prevention (CDC). The older definition is to referring to AIDS using the diseases that were associated with it, for example, lymphadenopathy, the disease after which the discoverers of HIV originally named the virus. In 1993, the CDC expanded their definition of AIDS to include all HIV positive people with a CD4+ T cell count below 200 per μL of blood or 14% of all lymphocytes. The majority of new AIDS cases in developed countries use either this definition or the pre-1993 CDC definition. The AIDS diagnosis still stands even if, after treatment, the CD4+ T cell count rises to above 200 per μL of blood or other AIDS-defining illnesses are cured.

**HIV test**

Many people are unaware that they are infected with HIV. Less than 1% of the sexually active urban population in Africa has been tested, and this proportion is even lower in rural populations. Furthermore, only 0.5% of pregnant women attending urban health facilities are counseled, tested or receive their test results. Again, this proportion is even lower in rural health facilities. Therefore, donor blood and blood products used in medicine and medical research are screened for HIV.
HIV tests are usually performed on venous blood. Many laboratories use fourth generation screening tests which detect anti-HIV antibody (IgG and IgM) and the HIV p24 antigen. The detection of HIV antibody or antigen in a patient previously known to be negative is evidence of HIV infection. Individuals whose first specimen indicates evidence of HIV infection will have a repeat test on a second blood sample to confirm the results.

The window period (the time between initial infection and the development of detectable antibodies against the infection) can vary since it can take 3–6 months to seroconvert and to test positive. Detection of the virus using polymerase chain reaction (PCR) during the window period is possible, and evidence suggests that an infection may often be detected earlier than when using a fourth generation EIA screening test.

Positive results obtained by PCR are confirmed by antibody tests. Routinely used HIV tests for infection in neonates and infants (i.e., patients younger than 2 years), born to HIV-positive mothers, have no value because of the presence of maternal antibody to HIV in the child's blood. HIV infection can only be diagnosed by PCR, testing for HIV pro-viral DNA in the children's lymphocytes.

**Prevention**

<table>
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<th>Exposure Route</th>
<th>Estimated infections per 10,000 exposures to an infected source</th>
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<td>Blood Transfusion</td>
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<tr>
<td>Childbirth (to child)</td>
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<tr>
<td>Needle-sharing injection drug use</td>
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<td>Percutaneous needle stick</td>
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<tr>
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<td>1</td>
</tr>
<tr>
<td>Insertive oral intercourse</td>
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</tbody>
</table>

* assuming no condom use
§ source refers to oral intercourse performed on a man

The three main transmission routes of HIV are sexual contact, exposure to infected body fluids or tissues, and from mother to fetus or child during perinatal period. It is possible to find HIV in the saliva, tears, and urine of infected individuals, but there are no recorded cases of infection by these secretions, and the risk of infection is negligible. Anti-retroviral treatment of infected patients also significantly reduces their ability to transmit HIV to others, by reducing the amount of virus in their bodily fluids to undetectable levels.
**Sexual contact**

The majority of HIV infections are acquired through unprotected sexual relations between partners, one of whom has HIV. The primary mode of HIV infection worldwide is through sexual contact between members of the opposite sex.

During a sexual act, only male or female condoms can reduce the risk of infection with HIV and other STDs. The best evidence to date indicates that typical condom use reduces the risk of heterosexual HIV transmission by approximately 80% over the long-term, though the benefit is likely to be higher if condoms are used correctly on every occasion.

The male latex condom, if used correctly without oil-based lubricants, is the single most effective available technology to reduce the sexual transmission of HIV and other sexually transmitted infections. Manufacturers recommend that oil-based lubricants such as petroleum jelly, butter, and lard not be used with latex condoms, because they dissolve the latex, making the condoms porous. If lubrication is desired, manufacturers recommend using water-based lubricants. Oil-based lubricants can be used with polyurethane condoms.

Female condoms are commonly made from polyurethane, but are also made from nitrile and latex. They are larger than male condoms and have a stiffened ring-shaped opening with an inner ring designed to be inserted into the vagina keeping the condom in place; inserting the female condom requires squeezing this ring. Female condoms have been shown to be an important HIV prevention strategy by preliminary studies which suggest that overall protected sexual acts increase relative to unprotected sexual acts where female condoms are available. At present, availability of female condoms is very low and the price remains prohibitive for many women.

Studies on couples where one partner is infected show that with consistent condom use, HIV infection rates for the uninfected partner are below 1% per year. Prevention strategies are well-known in developed countries, but epidemiological and behavioral studies in Europe and North America suggest that a substantial minority of young people continue to engage in high-risk practices despite HIV/AIDS knowledge, underestimating their own risk of becoming infected with HIV.

Randomized controlled trials have shown that male circumcision lowers the risk of HIV infection among heterosexual men by up to 60%. It is expected that this procedure will be actively promoted in many of the countries affected by HIV, although doing so will involve confronting a number of practical, cultural and attitudinal issues. However, programs to encourage condom use, including providing them free to those in poverty, are estimated to be 95 times more cost effective than circumcision at reducing the rate of HIV in sub-Saharan Africa.

Some experts fear that a lower perception of vulnerability among circumcised men may result in more sexual risk-taking behavior, thus negating its preventive effects. However, one randomized controlled trial indicated that adult male circumcision was not associated with increased HIV risk behavior.
Studies of HIV infection rates among women who have undergone female genital cutting (FGC) have reported mixed results.

A three-year study in South Africa, completed in 2010, found that an anti-microbial vaginal gel could reduce infection rates among women by 50% after one year of use, and by 39% after two and a half years. The results of the study, which was conducted by the Centre for the Aids Programme of Research in South Africa (Caprisa), were published in Science magazine in July 2010, and were then presented at an international aids conference in Vienna.

**Exposure to infected body fluids**

Health care workers can reduce exposure to HIV by employing precautions to reduce the risk of exposure to contaminated blood. These precautions include barriers such as gloves, masks, protective eyewear or shields, and gowns or aprons which prevent exposure of the skin or mucous membranes to blood borne pathogens. Frequent and thorough washing of the skin immediately after being contaminated with blood or other bodily fluids can reduce the chance of infection. Finally, sharp objects like needles, scalpels and glass, are carefully disposed of to prevent needlestick injuries with contaminated items. Since intravenous drug use is an important factor in HIV transmission in developed countries, harm reduction strategies such as needle-exchange programmes are used in attempts to reduce the infections caused by drug abuse.

**Mother-to-child transmission (MTCT)**

Current recommendations state that when replacement feeding is acceptable, feasible, affordable, sustainable and safe, HIV-infected mothers should avoid breast-feeding their infant. However, if this is not the case, exclusive breast-feeding is recommended during the first months of life and discontinued as soon as possible. It should be noted that women can breastfeed children who are not their own.

**Education, health literacy and cognitive ability**

One way to change risky behavior is health education. Several studies have shown the positive impact of education and health literacy on cautious sex behavior. Education works only if it leads to higher health literacy and general cognitive ability. This ability is relevant to understand the relationship between own risky behavior and possible outcomes like HIV-transmission. In July 2010, a UNAIDS Inter-Agency Task Team (IATT) on Education commissioned literature review found there was a need for more research into non-Africa (especially non-South African contexts), more research on the actual implementation of sex-education programmes (such as teacher training, access to related services through schools and the community, or parental attitudes to HIV and AIDS education) and more longitudinal studies on the deeper complexities of the relationship between education and HIV.
Treatment

HIV Treatment

Antiretroviral drug.

There is currently no publicly available vaccine for HIV or cure for HIV or AIDS. The only known methods of prevention are based on avoiding exposure to the virus or, failing that, an antiretroviral treatment directly after a highly significant exposure, called post-exposure prophylaxis (PEP). PEP has a very demanding four week schedule of dosage. It also has very unpleasant side effects including diarrhea, malaise, nausea and fatigue.

Antiviral therapy

Current treatment for HIV infection consists of highly active antiretroviral therapy, or HAART. This has been highly beneficial to many HIV-infected individuals since its introduction in 1996 when the protease inhibitor-based HAART initially became available. Current optimal HAART options consist of combinations (or "cocktails") consisting of at least three drugs belonging to at least two types, or "classes," of antiretroviral agents.

Typical regimens consist of two nucleoside analogue reverse transcriptase inhibitors (NARTIs or NRTIs) plus either a protease inhibitor or a non-nucleoside reverse transcriptase inhibitor (NNRTI). Because HIV disease progression in children is more rapid than in adults, and laboratory parameters are less predictive of risk for disease progression, particularly for young infants, treatment recommendations are more aggressive for children than for adults. In developed countries where HAART is available, doctors assess the viral load, CD4 counts, rapidity of CD4 decline and patient readiness while deciding when to recommend initiating treatment. Traditionally, treatment has been recommended for otherwise asymptomatic patients when CD4 cell counts fall to 200-250 cells per microliter of blood. However, beginning treatment earlier (at a CD4 level of 350 cells/microliter) may significantly reduce the risk of death.

Standard goals of HAART include improvement in the patient’s quality of life, reduction in complications, and reduction of HIV viremia below the limit of detection, but it does not cure the patient of HIV nor does it prevent the return, once treatment is stopped, of high blood levels of HIV, often HAART resistant. Moreover, it would take more than the lifetime of an individual to be cleared of HIV infection using HAART.

Despite this, many HIV-infected individuals have experienced remarkable improvements in their general health and quality of life, which has led to the plummeting of HIV-associated morbidity and mortality. In the absence of HAART, progression from HIV infection to AIDS occurs at a median of between nine to ten years and the median survival time after developing AIDS is only 9.2 months. HAART is thought to increase survival time by between 4 and 12 years.

For some patients, which can be more than fifty percent of patients, HAART achieves far less than optimal results, due to medication intolerance/side effects, prior ineffective antiretroviral
therapy and infection with a drug-resistant strain of HIV. Non-adherence and non-persistence with therapy are the major reasons why some people do not benefit from HAART. The reasons for non-adherence and non-persistence are varied. Major psychosocial issues include poor access to medical care, inadequate social supports, psychiatric disease and drug abuse. HAART regimens can also be complex and thus hard to follow, with large numbers of pills taken frequently.

Side effects can also deter people from persisting with HAART, these include lipodystrophy, dyslipidaemia, diarrhoea, insulin resistance, an increase in cardiovascular risks and birth defects. Anti-retroviral drugs are expensive, and the majority of the world's infected individuals do not have access to medications and treatments for HIV and AIDS. However, the costs of anti-retroviral drugs have fallen recently in low-income countries. Moreover, a study in South Africa showed that patients' quality of life indices benefit from anti-retroviral treatment (Bhargava and Booyzen, 2010) especially if healthcare services are adequate. In the absence of a cure for AIDS, anti-retroviral treatment is likely to be a cost-effective strategy for enhancing well-being of AIDS patients and their dependents.

Experimental and proposed treatments

It has been postulated that only a vaccine can halt the pandemic because a vaccine would possibly cost less, thus being affordable for developing countries, and would not require daily treatments. However, even after almost 30 years of research, HIV-1 remains a difficult target for a vaccine.

Research to improve current treatments includes decreasing side effects of current drugs, further simplifying drug regimens to improve adherence, and determining the best sequence of regimens to manage drug resistance. A number of studies have shown that measures to prevent opportunistic infections can be beneficial when treating patients with HIV infection or AIDS. Vaccination against hepatitis A and B is advised for patients who are not infected with these viruses and are at risk of becoming infected. Patients with substantial immunosuppression are also advised to receive prophylactic therapy for Pneumocystis jiroveci pneumonia (PCP), and many patients may benefit from prophylactic therapy for toxoplasmosis and Cryptococcus meningitis as well.

Researchers have discovered an abzyme that can destroy the protein gp120 CD4 binding site. This protein is common to all HIV variants as it is the attachment point for B lymphocytes and subsequent compromising of the immune system.

Researchers from the Hebrew University of Jerusalem have also discovered that a combination of peptides that stimulate integration together with the protease inhibitor Ro 31-8959 caused apoptotic cell death of HIV-infected cells with total extermination of the virus but did not harm healthy cells. It could take several years before a commercial treatment based on this discovery becomes available.

Reactivation of the retrocyclin pseudogene has been proposed as a possible prevention method, as was demonstrated in a proof-of-concept study in tissue culture cells.
In Berlin, Germany, a 42-year-old leukemia patient infected with HIV for more than a decade was given an experimental transplant of bone marrow with cells that contained an unusual natural variant of the CCR5 cell-surface receptor. This CCR5-Δ32 variant has been shown to make some cells from people who are born with it resistant to infection with some strains of HIV. Almost two years after the transplant, and even after the patient reportedly stopped taking antiretroviral medications, HIV has not been detected in the patient's blood.

CAM

Complementary and alternative medicine

Approximately 60% of HIV patients use various forms of complementary or alternative medicine (CAM). Despite the widespread use of CAM by people living with HIV/AIDS, the effectiveness of these therapies has not been established. A 2005 Cochrane review of existing high-quality scientific evidence concluded: "There is insufficient evidence to support the use of herbal medicines in HIV-infected individuals and AIDS patients."e HIV or AIDS.

Vitamin or mineral supplementation has shown benefit in some studies. Daily doses of selenium can suppress HIV viral burden with an associated improvement of the CD4 count. Selenium can be used as an adjunct therapy to standard antiviral treatments, but cannot itself reduce mortality and morbidity. There is some evidence that vitamin A supplementation in children reduces mortality and improves growth. A large Tanzanian trial in immunologically and nutritionally compromised pregnant and lactating women showed a number of benefits to daily multivitamin supplementation for both mothers and children. Dietary intake of micronutrients at RDA levels by HIV-infected adults is recommended by the World Health Organization (WHO). The WHO further states that several studies indicate that supplementation of vitamin A, zinc, and iron can produce adverse effects in HIV positive adults.

Prognosis

Without treatment, the net median survival time after infection with HIV is estimated to be 9 to 11 years, depending on the HIV subtype, and the median survival rate after diagnosis of AIDS in resource-limited settings where treatment is not available ranges between 6 and 19 months, depending on the study. In areas where it is widely available, the development of HAART as effective therapy for HIV infection and AIDS reduced the death rate from this disease by 80%, and raised the life expectancy for a newly diagnosed HIV-infected person to about 20 years.

As new treatments continue to be developed and because HIV continues to evolve resistance to treatments, estimates of survival time are likely to continue to change. Without antiretroviral therapy, death normally occurs within a year after the individual progresses to AIDS. Most patients die from opportunistic infections or malignancies associated with the progressive failure of the immune system. The rate of clinical disease progression varies widely between individuals.
and has been shown to be affected by many factors such as host susceptibility and immune function health care and co-infections, as well as which particular strain of the virus is involved.

Even with anti-retroviral treatment, over the long term HIV-infected patients may experience neurocognitive disorders, osteoporosis, neuropathy, cancers, nephropathy, and cardiovascular disease. It is not always clear whether these conditions result from the infection, related complications, or are side effects of treatment.

The largest cause of AIDS morbidity today, globally, is tuberculosis co-infection, see AIDS#Pulmonary_infections. In Africa, HIV is the single most important factor contributing to the increase in the incidence of TB since 1990.

**Epidemiology**

Estimated prevalence of HIV among young adults (15–49) per country at the end of 2005.

Estimated number of people living with HIV/AIDS by country

Disability-adjusted life year for HIV and AIDS per 100,000 inhabitants.

The AIDS pandemic can also be seen as several epidemics of separate subtypes; the major factors in its spread are sexual transmission and vertical transmission from mother to child at birth and through breast milk. Despite recent, improved access to antiretroviral treatment and care in many regions of the world, the AIDS pandemic claimed an estimated 2.1 million (range
1.9–2.4 million) lives in 2007 of which an estimated 330,000 were children under 15 years. Globally, an estimated 33.2 million people lived with HIV in 2007, including 2.5 million children. An estimated 2.5 million (range 1.8–4.1 million) people were newly infected in 2007, including 420,000 children.

Sub-Saharan Africa remains by far the worst affected region. In 2007 it contained an estimated 68% of all people living with AIDS and 76% of all AIDS deaths, with 1.7 million new infections bringing the number of people living with HIV to 22.5 million, and with 11.4 million AIDS orphans living in the region. Unlike other regions, most people living with HIV in sub-Saharan Africa in 2007 (61%) were women. Adult prevalence in 2007 was an estimated 5.0%, and AIDS continued to be the single largest cause of mortality in this region.

South Africa has the largest population of HIV patients in the world, followed by Nigeria and India. South & South East Asia are second worst affected; in 2007 this region contained an estimated 18% of all people living with AIDS, and an estimated 300,000 deaths from AIDS. India has an estimated 2.5 million infections and an estimated adult prevalence of 0.36%. Life expectancy has fallen dramatically in the worst-affected countries; for example, in 2006 it was estimated that it had dropped from 65 to 35 years in Botswana.

In the United States, young African-American women are also at unusually high risk for HIV infection. African Americans make up 10% of the population but about half of the HIV/AIDS cases nationwide. This is due in part to a lack of information about AIDS and a perception that they are not vulnerable, as well as to limited access to health-care resources and a higher likelihood of sexual contact with at-risk male sexual partners.

There are also geographic disparities in AIDS prevalence in the United States, where it is most common in rural areas and in the southern states, particularly in the Appalachian and Mississippi Delta regions and along the border with Mexico. Approximately 1.1 million persons are living with HIV/AIDS in the United States, and more than 56,000 new infections occur every single year.
AIDS in KENYA

Kenya is home to one of the world’s harshest HIV and AIDS epidemics. An estimated 1.5 million people are living with HIV; around 1.2 million children have been orphaned by AIDS; and in 2009 80,000 people died from AIDS-related illnesses.

Kenya’s HIV prevalence peaked during 2000 and, according to the latest figures, has dramatically reduced to around 6.3 percent. This decline is thought to be partially due to an increase in education and awareness, and high death rates.

Whilst many people in Kenya are still not being reached with HIV prevention and treatment services, access to treatment is increasing. More than half of adults who need treatment are receiving it, with around 100,000 additional adults on treatment in 2010 than in 2009. In comparison, the number of children in need of antiretroviral treatment that are receiving it is extremely low. An estimated 170,000 children are eligible to receive treatment, yet only around 1 in 5 have access to it. This demonstrates Kenya still has a long way to go in providing universal access to HIV treatment, prevention and care.

The history of HIV and AIDS in Kenya

Between 1983 and 1985, 26 cases of AIDS were reported in Kenya. Sex workers were the first group affected – a study from 1985 reported an HIV prevalence of 59 percent amongst a group of sex workers in Nairobi.

Towards the end of 1986 there were an average of four new AIDS cases being reported to the World Health Organization each month. This totalled 286 cases by the beginning of 1987, 38 of which had been fatal.
One of the Kenyan government’s first responses was to publish informative articles in the press and to launch a poster campaign urging people to use condoms and avoid indiscriminate sex. A year later in 1987, the Minister of Health announced a year-long health and education programme, funded by a £2 million donation from Western countries.

By 1987 HIV appeared to be spreading rapidly among the population – an estimated 1-2 percent of adults in Nairobi were infected with the virus, and HIV prevalence among pregnant women in the capital had increased from 6.5 percent to a staggering 13 percent between 1989 and 1991.

The government was criticised for not responding aggressively to the emerging epidemic, unlike governments in its neighbouring countries, such as Uganda. The government was also accused of playing down the threat of AIDS because of the damage it could do to Kenya’s tourism industry.

By 1994 an estimated 100,000 people had already died from AIDS and around 1 in 10 adults were infected with HIV.

In a speech at an AIDS awareness symposium in 1999, Kenyan President Daniel Arap Moi declared the AIDS epidemic a national disaster and announced that a National AIDS Control Council would be established imminently. Critics argued that in the speech the President failed to promote the use of condoms as a preventative measure and a way forward for tackling the epidemic. However, at the end of 1999 President Moi broke his silence surrounding condoms and declared in a speech to students at the University of Nairobi:

“The threat of AIDS has reached alarming proportions and must not be treated casually; in today’s world, condoms are a must.”

In 2000 plans were drawn up to build a condom factory in Nairobi, with the aim of producing 100 million condoms a year. However, by 2001 the company planning the build moved its project to South Africa, apparently due to excessive government regulations and a lack of responsiveness.
HIV prevalence began to decline from its peak of 13.4 percent in 2000 and continued to decrease steadily to 6.9 percent in 2006.

The decrease in prevalence coincided with the rapid expansion of preventative interventions since 2000, which resulted in a change in sexual behaviour and the increased use of condoms. The decline has also been attributed to the large number of people dying from AIDS in Kenya, which totalled 150,000 in 2003 alone.

The current situation in Kenya

Kenya’s HIV epidemic has been categorised as generalised – meaning that HIV affects all sectors of the population, although HIV prevalence tends to differ according to location, gender and age. Nearly half of all new infections in 2008 were transmitted during heterosexual sex whilst in a relationship and 20 percent during casual heterosexual sex.

Various studies have revealed a high HIV prevalence amongst a number of key affected groups, including sex workers, injecting drug users (IDUs), men who have sex with men (MSM), truck drivers and cross-border mobile populations. Some of these groups are marginalised within society – for example, homosexuality is illegal in Kenya and punishable by up to 14 years in prison. Therefore these groups are difficult to reach with HIV prevention, treatment and care, and the extent to which HIV is affecting these groups has not been fully explored.

In 2008, an estimated 3.8 percent of new HIV infections were among IDUs and in the capital, Nairobi, 5.8 percent of new infections were among IDUs. HIV infections are easily prevented in healthcare settings, nevertheless, 2.5 percent of new HIV infections occurred in health facilities during 2008 in Kenya.

Women are disproportionally affected by HIV. In 2008/09 HIV prevalence among women was twice as high as that for men at 8 percent and 4.3 percent respectively. This disparity is even greater in young women aged 15-24 who are four times more likely to become infected with HIV than men of the same age. Kenyan women experience high rates of violent sexual contact, which is thought to contribute to the higher prevalence of HIV. In a 2003 nationwide survey, almost half of women reported having experienced violence and a quarter of women aged between 12 and 24 had lost their virginity by force.

Adult HIV prevalence is greater in urban areas (8.4 percent) than rural areas (6.7 percent) of Kenya. However, as around 75 percent of people in Kenya live in rural areas, the total number of people living with HIV is higher in rural settings (1 million adults) than urban settings (0.4 million adults).

HIV prevention in Kenya

A principle aim of the 2009/10-2013/14 Kenyan National HIV and AIDS Strategic Plan (KNASP III) is to reduce the number of new HIV infections by using evidence-based approaches to HIV prevention. Six main outcomes are outlined to be achieved in the latest Strategic Plan:
• Reduced risky behaviour among the general, infected, most-at-risk and vulnerable populations.
• Proportion of eligible PLHIV (people living with HIV) on care and treatment increased and sustained.
• Health systems deliver comprehensive HIV services.
• HIV mainstreamed in sector-specific policies and sector strategies.
• Communities and PLHIV networks respond to HIV within their local context.
• KNASP III stakeholders aligned and held accountable for results.

Following a study in 2009 it was identified that the epidemic was changing and that transmission between discordant couples, where one partner is positive and one partner is negative, accounted for the majority of new infections. As a result, prevention for positive people is to be a central element of Kenya’s new approach to prevention which will, among other approaches, include couple-based testing and encourage partner disclosure and condom use.

There is also a distinctly new focus on MARPs (MSM, sex workers and injecting drug users) in the KNASP III, following a national study which highlighted that a third of all new infections are among this group.

**HIV testing**

HIV testing has widely expanded across Kenya since the beginning of the millennium. In 2000 there were only three voluntary counselling and testing (VCT) sites nationwide; by 2007 there were almost 1000. HIV testing and counselling facilities increased to 4,438 in 2010. Alongside voluntary testing, provider initiated counselling and testing (PCT) has expanded and is now available in 73 percent of health facilities. PCT is when individuals are offered a HIV test whenever they go to a health facility, rather than patients having to ask for a test.
One of the 2010 targets set in Kenya’s National HIV and AIDS Strategic Plan 2005/06 -2009/10 (KNASP II) was to test 2 million Kenyans for HIV annually. In order to reach the target, international development organisations and the Kenyan government introduced a number of new initiatives. One such programme, launched in late 2009, aimed to provide door-to-door HIV testing and counselling for those living in remote areas with little access to health care. This scheme raised concerns from Human Rights Watch, who urged the government to ensure principles of counselling, consent and confidentiality would be properly adhered to.

The government’s enhanced focus on testing has been reflected by the percentage of adults aged 15-49 years who report ever being tested for HIV. In 2003 only 15 percent had taken a test compared to 37 percent in 2007. Action to improve access to testing facilities and a high-profile media campaign that ran between 2002 and 2005 is thought to have contributed to the increase in HIV testing uptake.

Increased testing rates have meant that record numbers of Kenyans have been tested in recent years. In the year 2010, it is estimated that more than 5.7 million Kenyans aged 15 years and over received HIV testing and counselling. According to the 2009 Demographic and Health Survey, 73.5 percent of women and 58.6 percent of men have been tested at least once.

However, increased rates of testing do not always accurately reflect an increased number of people who know their status. This is because people might become infected after an earlier negative test, or may not have received the results. According to the 2007 Kenyan AIDS indicator survey for example, almost two thirds of HIV infected people surveyed and who thought they knew their status mistakenly thought they were HIV negative.

Often women will be afraid to disclose their status to their husbands because they are worried they may be stigmatised, assaulted or thrown out of the family home. It has even been reported that women fail to seek antenatal care from fear of their HIV status being disclosed during routine HIV testing.

“Men still believe that it is only women who can be a source of HIV in the family, and most of them turn very violent on realizing their HIV status.” Dr Aggrey Ouko – Suba District medical officer

Condom use

The Kenyan government has only actively promoted condom use since 2001, when an estimated 12.8 percent of its population were infected with HIV. That year, the government announced its intention to import 300 million condoms. Since then, condom distribution has been radically scaled up; 10 million were distributed in 2004 and 124.5 million in 2008.

However, there have been a number of obstacles either preventing people from accessing condoms, or preventing people from wanting to use them. In particular, Kenyans have often received conflicting messages about condom use. Many religious leaders have expressed opposition to condom use. Many religious leaders have expressed opposition to condom use.57 58 and in 2006 Kenya’s First Lady said during a visit to some Kenyan schoolgirls:
“I am not telling you to use condoms. I am not in favour of condoms.”

Preliminary results from the 2008/2009 Kenya Demographic and Health Survey revealed that of respondents who in the last 12 months had sex with two or more partners, only 32 percent of women and 37 percent of men reported using a condom. A 2011 study in Kilifi district, found that only 1 percent of married couples regularly used condoms. Reports of people washing and re-using condoms, during condom shortages, indicates that more needs to be done to ensure people have consistent access to condoms.

Female condom uptake has also been low, and in 2009 there was a reported shortage of female condoms in public hospitals in Kenya’s Coast Province. In the same year Kenyan officials banned a brand of UK produced male condoms after tests revealed that some had leaked.

**Education and awareness**

HIV and AIDS education is an essential part of HIV prevention. In Kenya AIDS education is part of the curriculum in both primary and secondary schools, and for a number of years Kenya has delivered educational campaigns to raise nationwide awareness of the issue. As a result, awareness about HIV and AIDS in Kenya is high. In Kenya’s national, population-based survey, nearly all adults aged 15-64 had heard about AIDS, 90 percent knew that a healthy-looking person could be infected with HIV, and most knew how to reduce their chances of becoming infected with the virus. Awareness of the need to use condoms was high with 75 percent of women and 81 percent of men in this age group aware that condoms reduce the risk of HIV infection.

However, one study of 21 primary and 9 secondary schools highlighted the difficulties in implementing AIDS education in public schools. The reasons included; not enough time in the curriculum, a lack of teacher training and support, and reluctance by parents and the Ministry of Education to talk openly about sex and condoms. One recommendation drawn from the study was for the Ministry of Education to have a clearer policy on its stance on condoms.

**Preventing mother-to-child transmission (PMTCT)**

Since 2000 PMTCT efforts in Kenya have rapidly expanded. There are now more than 3,397 health facilities offering PMTCT services. In 2010 an estimated 83 percent of pregnant women were tested for HIV and 43 percent of pregnant women living with HIV received the most effective antiretroviral regimen for preventing the transmission of HIV to their babies. Whilst only half of HIV-exposed infants received ARVs for PMTCT in 2009, testing of HIV-exposed infants improved in 2010 with 64 percent tested by 2 months of age.
Prevention services for pregnant women must continue to grow as HIV transmission from mother-to-child is still high. For example, an estimated 1 in 5 babies born to HIV-infected mothers are infected with HIV and PMTCT services are still only available in half of the country's health facilities.

An estimated 180,000 children were living with HIV in 2009, with approximately 19,000 new child infections in 2010, most of which were probably a result of mother-to-child transmission. It is believed these high rates account for the high infant mortality rate in Kenya.

In August 2009 the Kenyan government introduced the more effective combination therapy to replace single-dose nevirapine to prevent mother-to-child transmission. The government also emphasised the importance of male involvement in PMTCT programmes and in 2010 introduced a Sh240 million campaign to encourage partner testing, exclusive breastfeeding and to deliver antiretroviral treatment to more children who need it.

**Male circumcision**

In light of substantial evidence showing that male circumcision significantly reduces a man’s risk of acquiring HIV during heterosexual intercourse, the Kenyan National AIDS/STD Control Programme has developed a policy on male circumcision. The aim of the policy is to reduce the number of new HIV infections in order to "help create an AIDS free generation". Around 150,000 male circumcisions per year for five years will need to be performed in order for Kenya to reach its target.

In many districts of Kenya circumcision is a cultural process. Voluntary medical male circumcision programmes were therefore concentrated in those districts that did not hold this tradition. Rates of circumcision increased from 10,000 to 90,000 in just over a year in 2009. In 2010, the rate of circumcision continued to rise to an estimated 139,905, falling just below the
annual target. Increasing circumcision among older, sexually active men has been identified as critical if HIV infection is to be reduced among this age group.

Harm reduction and needle exchange services

HIV transmission through injecting drug use is a growing problem, particularly in the capital and in coastal areas. HIV prevalence among injecting drug users (IDUs) reached 21 percent in 2010 and in Nairobi around 1 in 3 IDUs are infected with HIV. Even where IDUs in Kenya know how HIV can be transmitted, needle sharing and unprotected sex is commonplace. Up to 4 percent of all new infections are as a result of injecting drug use.

Although Kenyan drug laws and government policy have hindered the prevention of new infections among IDUs, there has been a recent change of view in the Kenyan government. This follows a similar turnaround by the American initiative PEPFAR (the largest foreign funder of HIV and AIDS programmes in Kenya), which now supports a variety of harm reduction approaches to HIV prevention among IDUs. The 2009/10-2013/14 Kenyan Strategic Plan (KNASP III) highlights the need to prevent new infections among IDUs and to "seek innovative ways to reduce HIV transmission".

“If we want to talk about HIV prevention, then we cannot afford to ignore any group…We want to provide needle exchange, methadone for treatment and condoms” Nicholas Muraguri, head of the National AIDS and STI Control Programme

In 2011, the National AIDS Control Council (NACC) announced a plan to provide free HIV prevention and treatment for IDUs. Included in the plan are previously disallowed harm reduction methods including needle exchange, and neglected services such as psychosocial support for IDUs. Opioid substitution therapy (OST) is not banned in Kenya but the availability of OST has traditionally been severely restricted. As part of the new prevention plan, twelve primary health care centres in Mombasa began to offer opioid substitution therapy in 2011. The Kenyan government also announced that, with funding from the Global Fund, it would be piloting needle exchange programmes in two public hospitals, one in Nairobi and the other in a coastal city.

The recognition by public health leaders that HIV infection risk among IDUs must be addressed through-evidence based approaches, including harm reduction services, is a promising step. However, many problems remain. A 2011 report into HIV prevention among IDUs in Kenya found that there was a high prevalence of HIV in prisons, but no access to addiction treatment or needle exchange for IDUs. It also found that stigma towards IDUs was widespread among the general public and healthworkers. Local NGOs were found to be working on HIV prevention among IDUs but were overstretched and did not provide methadone substitution or needle exchange services. Finally, although needles and syringes are available for purchase from pharmacies and other outlets, it was reported that pharmacists are reluctant to sell syringes to injecting drug users. In 2010, harm reduction services for injecting drug users remained absent in Kenya.

HIV and AIDS treatment in Kenya
In 2003 only 5 percent of people needing ART were receiving antiretroviral therapy. In 2006 Kenya’s President announced that antiretroviral drugs would be provided for free in public hospitals and health centres. In 2007 treatment coverage was low at 42 percent with only 172,000 on treatment. Nevertheless, by 2009 the number of people receiving antiretroviral therapy had significantly increased to 336,980. However, due to a 2010 change in WHO treatment guidelines, which recommend starting treatment earlier, the proportion of people eligible to receive antiretroviral treatment remained at only 48 percent. Under the previous guidelines, treatment coverage would have been 65 percent. By 2010, access to treatment had increased further with 432,621 receiving treatment, around 61 percent of those in need.

“Despite an increase in children accessing treatment, the overall coverage for children remains extremely low.”

Due to the expansion of treatment, the number of people that have died from AIDS has declined since its peak in 2003. In 2011 a Kenyan pharmaceutical company was given the green light by the WHO to start producing antiretroviral drugs. This could result in significant savings for the government’s treatment programme, as ARVs currently have to be imported from India.

Around half of those infected with tuberculosis (TB) are co-infected with HIV in Kenya, although this varies widely according to region. Antiretroviral treatment for co-infected individuals has been found to improve patient survival if it is administered as soon as possible after TB treatment. Therefore, WHO recommend antiretroviral therapy for all HIV and TB co-infected patients, whatever the stage of HIV progression. However, facilities where dual treatment is available are limited and many of those who require ARVs alongside TB treatment are not receiving it.

Despite an increase in access to HIV treatment for children, the overall coverage for children remains extremely low. Of those receiving treatment, most are adults with 74 percent of adults in need of treatment receiving it. In contrast only 21 percent of children living with HIV in need of treatment are receiving it. A child’s access to treatment can sometimes be inhibited by reasons other than the reach of treatment services. According to Human Rights Watch reasons for this include: neglect on part of the children’s caregivers; a lack of accurate information about medical care for children; and the stigma and guilt associated with HIV and AIDS.

“Often, when other family members take in AIDS orphans, they really do not want to associate with that child. They are worried that they and their children could get infected.” Manager of an orphanage for HIV-positive children in Kenya

Adequate nutrition for people living with HIV is essential. Yet, as poverty levels are high in Kenya and food shortages frequent, people living with HIV are often unable to eat a healthy, balanced diet. Evidence shows that malnourished people are less likely to benefit from antiretroviral treatment and are at a higher risk of quicker progression to AIDS. In addition, taking treatment without food can be very painful.
“I eat two or three meals a day, which makes me better off than most, so I share with those who have less… But now, even in my home, things are tight, and sharing my food means that I eat less, so I feel weak when I take my medication.” *Onesmus Mutungi, living with HIV in Kenya*

Obtaining antiretroviral medication for people leading nomadic lifestyles can also be difficult. One report explains how a Maasai family were unable to obtain antiretroviral drugs for their two HIV-infected children, as they had to keep moving for their livestock.

**HIV stigma and discrimination in Kenya**

A video showing the personal story of Jemimah Nindo, a teacher living with HIV in Kenya.

Even though awareness of HIV and AIDS in Kenya is high, many people living with the virus still face stigma and discrimination. Studies have shown that although people are aware of the basic facts about HIV and AIDS, many are not informed of the more in-depth knowledge that addresses issues of stigma.

One report revealed that only a third of healthcare facilities that have policies to protect people living with HIV against discrimination were actually implementing such policies. People are still afraid to disclose their status and will often avoid health centres that provide HIV services, from fear of being seen by neighbours or community members.

Homosexuality is illegal in Kenya and therefore men who have sex with men face significant stigma and discrimination. In an attempt to find out to what extent HIV is affecting the gay community, Kenya has launched a ‘homosexual census’. However, with homosexuality still illegal, it is unlikely that the census results will reflect reality.

**HIV funding in Kenya**

In 2008/09 total funding for HIV/AIDS in Kenya amounted to $687 million. Funding comes from a range of donors, the most significant of which is the U.S. government. In FY 2009 funding from the U.S. President’s Emergency Plan for AIDS relief (PEPFAR) amounted to $541.5 million. The Global Fund is the second largest contributor to HIV/AIDS funding in Kenya, having distributed $87,417,519 in total.

Corruption is a major deterrent to donors and a lack of transparency of the distribution of funds may result in donors withholding funding. In 2009 Kenya was ranked in the bottom third of countries worldwide for corruption (146 out of 180). These problems have directly affected the influx of funding, as in 2003, 2008 and 2009 the Global Fund delayed and refused applications for funding to Kenya. It has been suggested a lack of clarity and accounting problems were the cause of Kenya’s most recent grant refusal in 2010. Other sources have attributed the refusal to rivalries between the ministries of Medical Services and Public Health who are dually responsible for the management of donor funds. The effects of the Global Fund’s rejection of recent applications will inevitably be felt by future programmes.
The flat-lining of PEPFAR funds also raises financial concerns for the future as funds will be fixed whilst costs continue to increase with inflation. With funding shortfalls already calculated to be around $1.7 billion by 2013 for HIV prevention, treatment and care, the need for sustainable funding for HIV and AIDS in Kenya has become increasingly apparent.

The Kenyan government have pledged to address their HIV funding crisis by focusing on past and present shortfalls in financial management, tracking and transparency. In addition, Michel Sidibe, executive director of UNAIDS, has identified Kenya’s need to achieve financial sustainability for its AIDS programmes through domestic funding. The government of Kenya has pledged $34 million annually for five years to go towards HIV and AIDS programmes. However, external sources continue to account for 85 percent of all HIV funding.

**Nutrition for HIV/AIDS**

In the absence of a cure, it is important to control symptoms, support the immune system, and lower the levels of HIV circulating in the blood. To lower the level of HIV in the blood, patients take a prescribed combination of antiviral drugs. The role nutrition plays will vary along the disease continuum (disease progression over many years), with consideration given to the patient's age, gender, behaviors, current medication, drug history, socioeconomic status, and associated health concerns.

In all cases, adequate hydration (fluid intake) and increased calorie and protein intake are necessary to fight the infection. Proper nutrition must begin immediately to support nutritional deficiencies (including vitamin A and E, the B vitamins, magnesium, and zinc) that occur early in the disease process. These nutritional deficiencies contribute to decreased immunity and disease progression. Ellen Mazo and Keith Berndtson, in *The Immune Advantage*, suggest that once the patient has been diagnosed with HIV infection, more protein and complex carbohydrates, along with moderate amounts of fats, should be consumed.

The diet should include lean meat, fish, beans, seeds and nuts, whole-grain breads and cereals, and fruits and vegetables. Moderate amounts of fat for energy and calories can be acquired through foods such as nuts, avocado dip, peanut butter, and seeds.

The diet should include each of the five major food groups (dairy, vegetable, meat, fruit, and bread). The sixth group (fats and sugars) should be used sparingly. Patients with a poor appetite should eat six or more small meals throughout the day, rather than three large ones. In prolonged cases of appetite depression, a physician may prescribe an appetite stimulant (e.g., megestrol acetate). It is important to keep all foods refrigerated, to avoid eating rare meats, to practice proper hand washing, and to use soap and hot water to clean sinks and utensils. Food-borne illnesses pose serious threats for HIV/AIDS patients.

**HIV/AIDS Complications**

Some symptoms will require additional attention beyond general nutritional recommendations. For example, diarrhea will rapidly reduce the water content of the body, causing severe
alterations in the body's **metabolism** and **electrolyte** balance. Electrolytes may be replaced with products such as Pedialyte or Gatorade. Proteins and calories should be increased to prevent weight loss, and dairy products, alcohol, caffeine, and spicy and fatty foods should be avoided.

A second complication is that of weight loss and wasting. According to Derek Macallan, in *Wasting HIV Infection and AIDS*, wasting may be either **acute** (associated with a secondary disease) or **chronic** (associated with **gastrointestinal** disease), and is the result of a variety of processes, including drug use, medications, concurrent disease, and HIV itself. HIV infection causes abnormal protein and fat metabolism. During episodes of acute wasting the patient may require a prescription for **steroids**, to help support tissue maintenance and tissue development, in combination with optimal protein and calories in the diet.

Contributing to weight loss and wasting is malabsorption (the failure of nutritional substances to be absorbed in the **intestines**). Malabsorption occurs in advanced cases of HIV infection when gastrointestinal disease is present. Diseases that can cause malabsorption in HIV/AIDS patients include Kaposi’s sarcoma, non-Hodgkin's lymphoma, cytomegalovirus, *Mycobacterium avium* complex, and cryptosporidiosis. Malabsorption may require an alternative to oral nutrition.

**Conclusion**

Although Kenya has seen a dramatic reduction in HIV prevalence figures since 2000, the country is still facing a severe AIDS epidemic. In order to make progress in Kenya, the following areas need to be addressed:

- The Kenyan government needs to increase the number of people who know their HIV status by promoting and expanding access to HIV testing.
- Social, economic and legal gender inequalities in Kenya need to be addressed in order to reduce the disproportionately high HIV prevalence among women.
- Among high-risk groups, Kenya needs to expand its HIV prevention work and increase access to HIV testing and treatment.
- Stigma and discrimination towards those living with HIV must be eradicated.
- As Kenya’s antiretroviral treatment programme continues to expand, the country needs to find sustainable sources of money to finance the growing need for antiretroviral drugs.

**Reference**

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- http://healthcenterinternationalresearches.webs.com/