

# The Epidemiology of the AIDS Pandemic: Historical, Cultural, Political, Societal Perspectives and Knowledge of HIV

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Human Immunodeficiency Virus (HIV) is a bloodborne pathogen that targets the body's immune system by attacking T cells. Having originated from Simian Immunodeficiency Virus, the first confirmed case was discovered in the Democratic Republic of Congo. In the 1980s, the AIDS (Acquired Immunodeficiency Syndrome) pandemic began, and by the end of that decade, the World Health Organization reported the presence of HIV in 145 countries and nearly 400,000 cases worldwide. This rapid spread left the scientific community perplexed, and the general population scared. Our literature review explores which factors led to the rapid global spread of HIV. Through historical records and peer-reviewed articles, we sought to uncover and piece together practical applications to enhance understanding of the history and knowledge of potential dangers in the spread of future pandemics.

**Keywords:** AIDS, HIV, history, culture, politics, society, transmission, treatment, prevention

HIV and AIDS went from an unknown disease in 1980, to a global pandemic by 1985. HIV has already infected 70 million individuals and more than 39 million individuals have died from AIDS-related illnesses worldwide (Cichoki, 2019). What factors contributed to such a rapid spread? By researching the means of transmission, available epidemiological literature, and development of treatment and prevention methods, we traced how HIV reached a worldwide prevalence in such a short time.

## Potential Methods of Transmission

Just as many other diseases have various modes of transmission, HIV is no exception. Our research focused on a total of four potential modes of transmission for this disease: drug abuse, unprotected sex, hospital settings, and perinatal, or mother-to-child transmission. The common denominator among these four modes of transmission is bodily fluids. This virus is spread interpersonally by bodily fluids including blood, vaginal secretions, rectal secretions, semen/pre-seminal fluids and breast milk (Centers for Disease Control [CDC], 2017).

### *Drug Abusers*

The first mode of transmission is perhaps one of the most common, and that is through the use and abuse of drugs. One of the ways to contract HIV through the use of drugs is by injection. Many wrongly believe that if one avoids injecting directly into the vein (known as the intravenous [IV] method of injection), that they are not at risk of contracting HIV. In reality, this is not the case. If an individual is using a contaminated needle, HIV transmission may also occur through subcutaneous injections (injecting into the fat under the skin), or through intramuscular injections, which means injecting directly into the muscle (Avert, 2018a). According to the World Drug Report (2016), of the 12 million people who had injected drugs, 1.6 million were living with HIV.

Among those who inject drugs, HIV is most prevalent in Eastern Europe, Southeast Europe, and Africa (Avert, 2018b). These numbers are high due to the fact that there are many other risk factors associated with the injection of drugs. These factors included sharing the same water source used to flush blood out of a needle and/or syringe, reusing materials, and improper disposal of items used during the preparation of drugs

that may have come into contact with contaminated blood (Avert, 2018a). Because there are many factors associated with using drugs that may put an individual at risk for contracting HIV, it is important to remain informed and up-to-date with information regarding the different methods of disease transmission.

### *Unprotected Sex*

Of all the potential methods for transmitting HIV, unprotected sexual contact accounts for the majority of infected individuals. While other methods of transmission may involve only one bodily fluid, people engaging in unprotected sexual contact might experience exposure to multiple bodily fluids. The CDC (2017) found that 90 percent of the infected individuals had been infected after participating in unprotected sexual activity. It is important to note that the majority of individuals infected were also found to be homosexual males due to the limitations of forms of sexual intercourse. As a result, couples participated in actions such as anal sex. Anal sex, as stated by the CDC (2018a), is the highest-risk sexual behavior for interpersonal HIV transmission. Anal sex carries high risk due to both the fragility of the cells lining the anal cavity and the lack of lubrication present. These factors make infection in the person on the receiving end 13 times more likely as compared to the person inserting during anal sex (CDC, 2018a).

The same risks also apply to heterosexual couples engaging in anal sex. The same data presented by the CDC (2017) depicted that women in heterosexual couples were infected more than men in heterosexual couples as women are the receptive partner during sex. However, insertive partners also have a chance to contract HIV, albeit with lower prevalence. Men who engaged in heterosexual sexual contact were also infected, but in lower quantities. While anal sex has the highest risk for HIV transmission, vaginal sex can also be a means of transmission for the virus. However, due to the natural lubrication and overall strength of cells lining the vaginal cavity, HIV is less likely to spread while engaging in vaginal sex (CDC, 2018a).

### *Hospitals*

The acquisition of a disease from a hospital or other healthcare settings is known as a Hospital-Acquired-Infection

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(HAI) or nosocomial infection. Kleinman (2017) reported that approximately 0.00003 percent of blood donations are infected with HIV. The CDC (2015) estimated that the chances of contracting HIV from an infected blood transfusion are 92.5 percent, the chances from a shared, infected needle used to inject drugs are 0.63 percent, and the chances from an accidental infected needle stick are 0.23 percent. Furthermore, the number of healthcare employees infected with HIV from a HAI between 1999 and 2013, was 58 individuals. However, the CDC itself states that the number may not be entirely accurate as reporting cases is voluntary (CDC, 2016).

#### ***Mother-to-Child***

Perinatal transmission of HIV is the spread of the virus from a woman living with HIV to her child. Transmission can occur during pregnancy, childbirth or breastfeeding. While there are various factors that can increase the risk of HIV transmission during pregnancy, the mother's viral load during pregnancy is paramount. A research study, comparing cases of women who transmitted HIV to their children during pregnancy, found that transmission mostly occurred when the pregnant women had viral loads above 500 copies/mL, and during the third trimester (Tubiana et al., 2010).

Mothers who have recently acquired HIV have higher chances of transmitting the virus because their viral loads are likely to be exceptionally high. In a study that investigated in-utero transmission of HIV, mothers with recent infection were more than twice as likely to transmit the virus (Taha et al., 2011). In addition, any illness to an HIV positive mother during pregnancy increased the risk of transmission. Lastly, there is a linkage between the use of illegal drugs during pregnancy and a higher risk of transmission. In a multiyear study in New York State, substance abuse during pregnancy more than doubled the risk of HIV transmission (Birkhead et al., 2010).

Transmission can take place during delivery when the baby is exposed to infected blood and bodily fluids. When passing through the birth canal, there is exposure to blood and genital secretions. The viral load in genital and cervical secretions is independent from that in the blood, thus, an increase of viral load in the cervical and genital secretions can cause transmission, regardless of the viral levels of the blood (John et al., 2001). Additionally, there is a higher risk of transmission if the rupture of membranes is prolonged. (International Perinatal, 2001; Aagaard-Tillery, Lin, Lupo, Buchbinder & Ramsey, 2006).

HIV can be transmitted mother-to-child by breastfeeding. HIV is detected in breastmilk, so, if a child is breastfed by an HIV positive woman, transmission of the virus may occur (John et al., 2001). Breastfeeding can also lead to infection through blood if the nipples are cracked or bleeding.

#### ***Transmission Misconceptions***

In exploring the epidemiology of HIV, it is important to observe all facets of transmission, including which factors can, versus cannot, transmit HIV. Given the ability of HIV to spread by bodily fluids, it is open to many misconceptions. The first misconception of HIV is that vectors can transmit it. When referring to vectors, the focus lies on arthropods such as mosquitos, ticks, and other arthropods that feed on blood. There are two primary reasons that HIV transmission by vectors is plausible. One reason is because HIV began in Africa (Worobey et al., 2016). In Africa, many of the diseases that have reached epidemic proportions are vector-borne, such as Yellow fever, Zika virus, & Malaria (WHO, 2017). The second

reason that HIV could be believed to be transmitted by vectors is because HIV exists in the blood of those infected. If a vector bites an individual infected with HIV, then it travels to bite another potential host, it is believed that the infected blood could be transmitted to the new host.

In 1996, Bockarie and Paru reported that the level of HIV in human blood is too low to be transmitted by vectors. In order to be infected with HIV via mosquitoes, for example, an individual would need to be bitten by 10 million HIV-carrying mosquitoes (Bockarie & Paru, 1996). Furthermore, HIV is not able to survive outside the body long enough for transmission (Bockarie & Paru, 1996). It has been reported in the laboratory that HIV can survive outside the human body in blood for 5-6 days (Tjotta, 1991). The counter argument could be that a vector carrying infected blood could bite another potential host within that period. Bockarie and Paru (1996) resolved these claims as well, reporting that HIV is not able to replicate within vectors. Vectors do not contain the T-cells necessary for HIV to be replicated, and are ultimately digested along with the rest of the blood meal.

The second misconception about the transmission of HIV is that HIV can be spread through saliva. Given that other bodily fluids can spread HIV, it seems plausible that saliva may be a reservoir of transmission, but, Baron, Poast and Cloyd (1999) found that HIV cannot be transmitted by saliva. The hypotonic nature of saliva disrupted infected HIV leukocytes, lysing the infected cells and preventing transmission to other cells (Baron et al., 1999). However, it is important to note that other bodily fluids may be involved in oral transmission of HIV. For instance, oral sores or blisters may cause bleeding in the mouth. In which case, blood would be the means of transmission.

### **The Epidemiology of HIV/AIDS**

#### ***The Origin***

Over the years, many have developed theories on the origin of HIV. However, scientists believe that the strongest theory is that of the Hunter Theory (Sharp & Hahn, 2011). This theory states that hunters in Africa killed simians (Order Primate), which carried strains of the Simian Immunodeficiency Virus (SIV). SIV is believed to have entered the human body via consumption of tainted meat or through contact with contaminated blood via open wounds. Once SIV entered the human body, it adapted and became HIV to suit its new host (Sharp & Hahn, 2011). Because every person is different, the SIV strains adapted in various ways, which gave rise to different strains, HIV-1 and HIV-2. Each form of HIV has its own group including HIV-1 group M, which is the most well-known form of the disease for it is the one responsible for the AIDS pandemic (Avert, 2019a).

#### ***The Origin: 1920's-1960's***

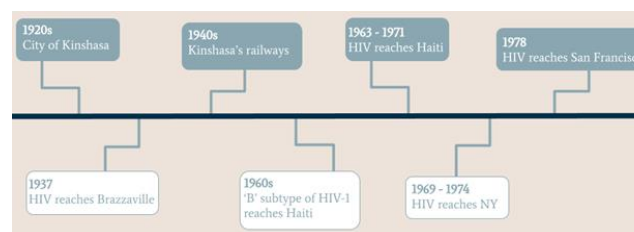
While there are theories which state that HIV was present around 1908, scientists have traced the origin of the AIDS pandemic back to the 1920s via archived genetic samples (Gallagher, 2014). These samples revealed that HIV likely began in the capital city of Kinshasa located in the then Belgian Congo, a country in Africa that is now Democratic Republic of the Congo (Gallagher, 2014). Research shows that the HIV-1 group M pandemic first spread via railroad and water transportation networks through the country and into a neighboring country, the Republic of the Congo (Keim, 2016). During this time, railroads were the most popular way for

getting around and becoming connected to the world. Railroads then contributed to the rapid spread of HIV. Other factors that allowed HIV to spread included population growth and the flourishing sex trade (Avert, 2018c). By 1937, the virus had reached Brazzaville (capital city of the Republic of the Congo), which is located about 120 km west of Kinshasa (Avert, 2018c). By the end of the 1940s, approximately one million people were using Kinshasa's railways (Gallagher, 2014). Approximately 20 years later, by the 1960s, it is believed that the 'B' subtype of HIV-1 was brought to Haiti by workers returning home from Africa (Gilbert et al., 2007; Keim, 2016).

#### **The Origin: 1960's-1980's**

In 1960, the former Belgian Congo gained its independence from Belgium. With its newfound freedom, the Democratic Republic of the Congo, and its largest growing cities, had many openings in corporate positions, which were often filled by Haitian businessmen (Faria et al., 2014). With the population expanding, the sex trade grew proportionally, and it was not long before the Haitians in Kinshasa contracted HIV through involvement in the sex trade (Faria et al., 2014).

Worobey et al. (2016) published research on HIV's genome, creating a roadmap of where and when HIV traveled (see Figure 1). They found that from Kinshasa, HIV then traveled to Haiti between the years 1963 and 1971. From Haiti, HIV then made its way to New York City between the years 1969 and 1974. New York City was and continues to be the economic and cultural center of the United States (U.S.), and as such, HIV was free to travel across the country. As a result, HIV travelled to San Francisco in 1978 (Worobey et al., 2016).



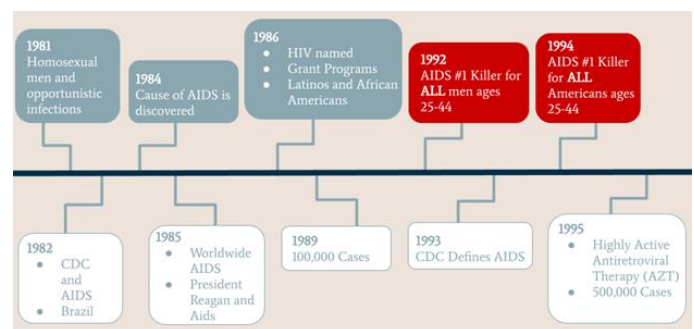
**Figure 1.** Timeline of the origin of HIV/AIDS in the 1920s through 1970s, constructed from the reviewed literature.

There are three important distinctions to be drawn from our review of the literature. The first would be that HIV traveled from Africa to Haiti. Originally, a common belief in the U.S. was that HIV began in Haiti, due to the observation that Haitians had contracted HIV before Americans. Worobey et al. (2016) dismissed that notion after finding that HIV began in Africa and moved to Haiti. The next distinction is that the HIV spread in the U.S. began in San Francisco. This was a common belief as the first reported cases of Kaposi sarcoma and the subsequent first diagnoses of HIV/AIDS were in San Francisco. Worobey et al. (2016) also dismissed these notions, after finding that the genome of HIV in San Francisco came from those in New York City. The final distinction was that HIV was not spread in the U.S. by a male airline attendant deemed "Patient 0," who was believed to be responsible for much of the North American spread. Through analysis of the genome of the virus that infected him, it was determined that his partners had in fact contracted HIV not from him, but from prior encounters (Worobey et al., 2016).

#### **The Americas**

After arriving in the U. S. from Haiti, HIV spread maliciously while it confused medical professionals. Figure 2 traces its spread in a composite timeline. The spread of HIV began in 1981, when homosexual men were presenting opportunistic infections more often. Opportunistic infections are viruses that take advantage of weakened immunological states in order to thrive; otherwise, the immune system of a healthy individual would be able to prevent opportunistic infections. In the U. S. during the 1980s, the most commonly seen opportunistic infections were Kaposi sarcoma and *Pneumocystis carinii* pneumonia (HIV.gov, 2019). A year later in 1982, South America experienced its first exposure to HIV and the CDC used the term AIDS for the first time to describe the disease (Saffier, Kawa & Harling, 2017). After continuous research, the U.S. managed to identify the cause of AIDS as a retrovirus in 1984 (HIV.gov, 2019).

Later in 1985, the United Nations reported that all regions of the world had experienced at least one case of AIDS. This year was also the first time that, despite the social stigma that revolved around AIDS and the homosexual community, President Ronald Reagan openly spoke about AIDS and considered it a threat to the general populous (HIV.gov, 2019). In 1986, the retrovirus causing AIDS was officially named Human Immunodeficiency Virus. During the same year, the U.S. government funded educational grant programs to teach the public about the disease, its means of transmission, and prevention techniques. The funding went to the most affected cities of New York, Los Angeles, Miami and San Francisco. The CDC also reported that African American and Latino populations were the most affected by this disease. Within 3 years of discovering the cause of AIDS, the U.S. had 100,000 cases recorded. After another 3-year interval, the CDC announced that AIDS was the number one killer of all American men aged 25-44. In 1993, the CDC defined AIDS based on the number of T-cells present in the body. In 1994, AIDS became the number one killer of all Americans aged 25-44. Finally in 1995, after reaching 500,000 diagnosed cases of AIDS in the U.S., the first highly active antiretroviral therapy was produced and approved by the US Food and Drug Administration (HIV.gov, 2019).



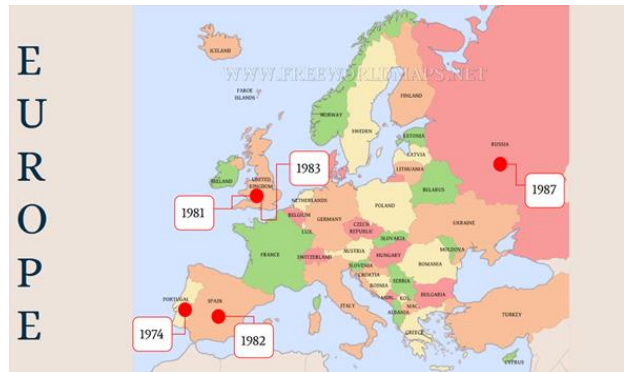
**Figure 2.** Timeline of the spread of HIV/AIDS in the 1980s and 1990s, constructed from the reviewed literature.

#### **Europe**

##### **HIV/AIDS in Europe**

While reviewing the literature of HIV/AIDS outside of the U.S., we found that the information regarding the

epidemiology of the virus in other regions of the world was either not well documented or not publicly available. Given the scarcity of documented information on the history of HIV in Europe that we could find, it is difficult to construct a linear timeline of events. However, to track down the spread more accurately, *Figure 3* was constructed of the when-and-where of significant HIV/AIDS events in Europe.



**Figure 3.** Map of HIV/AIDS spread in Europe constructed from the reviewed literature.

#### *Portugal, 1974*

The earliest mention of HIV, specifically HIV-2, in Europe was in 1974, in Portugal (Valadas, França, Sousa & Antunes, 2009). The spread of HIV-2 in Portugal occurred in the aftermath of the Portuguese Colonial War, which took place in Guinea between 1961 and 1974. Portuguese soldiers fighting in Africa were likely infected from the treatment of war-related injuries, as well as through sexual contact while in Guinea. Then in 1974, when Portuguese soldiers and Guinean refugees returned home to Portugal, the disease was able to spread. It is interesting to note that Portugal remains one of the countries with the highest population of HIV-2 infected people in the world today (Valadas et al., 2009).

#### *Spain and the United Kingdom, 1981-1983*

The next appearances of HIV in Europe were found between the years 1981 and 1983. The first reported cases of HIV began to appear in the news media in the United Kingdom (U.K.) during 1981 (Hallor, 2017). Meanwhile, the first cases of HIV were being reported in Spain between 1981 and 1982. Some sources disagree on the exact year that HIV arrived in Spain. One states that the first infection was in 1981 (Allbritton, 2016), while another states that the first infection was in 1982 (Soriano, Ramos, Barreiro, Fernandez-Montero, 2018). Due to the disagreement of the dates for the first infection in Spain, and our inability to track down a primary source stating the first HIV infection in Spain, it is difficult to conclude if the U.K. or Spain had the disease first. Regardless, it is unlikely that HIV had travelled along a linear path from one country to another in Europe, especially considering that the virus arrived in the U.K. and Spain at nearly the same time.

#### *Blood Transfusions in the United Kingdom, 1983*

Another significant date regarding HIV in Europe happened in 1983, in the U.K. A 2001 newspaper article by Garfield in *The Guardian* stated that the two hemophiliacs living in the U.K. had been diagnosed with AIDS, likely from blood transfusions (Garfield, 2001). This was one of the first indicators to the public that HIV was not merely a “gay

disease,” but rather, a virus that could be transferred through certain bodily fluids, including blood. Although, at the time, it could not be said for certain that HIV was transferred by fluids, the story of the two hemophiliacs showed the prospect of potential infection regardless of sexual orientation.

#### *Russia, 1987*

A story of a homosexual man from Russia in 1987, showed the possible first contact that the Russians had with HIV (Avert, 2019b). The man was working as a translator in Tanzania during 1982. In late 1985, he began to show symptoms of Kaposi sarcoma, a cancer that commonly presents after an HIV infection. Later, in early 1987, the man was finally diagnosed with HIV, one year after the modern term for the virus had been officially established (Pokrovskii et al., 1992). This event was significant not only as the first contact that Russia had with HIV, but also linked the cause of the virus directly to the source, which was Africa; reports in the U.K. and Spain had mentioned the disease, but without tracing it back to where the virus had been before arriving in each country.

#### *Thoughts Regarding Europe*

It is important to note that there was a rampant IV drug use problem that plagued much of Europe before, and coinciding with, the time of the AIDS pandemic. Although unprotected sex was one of the most common forms of transmission in Europe, the IV drug use problem is credited as a major contributor to the rapid spread of HIV throughout the continent (EMCDDA, 2010).

Our literature search led us to construct *Figure 3*, where we can observe that all of the countries reporting first contact cases were all coastal or surrounded by water. The exception is Russia, but in that case, the specific instance of virus was traced directly back to Africa. This observation leads us to conclude that it was likely sea travel that helped HIV jump from country to country across continents, a conclusion which is further supported by our observations in Asia. However, it is possible that HIV had been present in Europe before the 1980s, but had not been in the public eye, or had reports written about it, until the disease gained recognition from the reports coming out of the U.S. In other words, it is possible that Europe was not entirely HIV-free before the time of the first reports, which would invalidate the conclusion about sea travel. However, we were unable to determine the presence of the disease before the time of the AIDS pandemic based on our review of the literature.

#### *Asia*

In a similar fashion to Europe, the epidemiology of HIV in Asia was not well documented at the time of the pandemic. As a result, we constructed *Figure 4* based on our review of the literature, noting important dates and locations of HIV on the continent of Asia. HIV was introduced onto the Asian continent during the early 1980s. The portal of entry and exact period of entry of the virus is uncertain due to the lack of documented sources that we could find. However, the virus was rapidly spread through the continent as several Asian countries started to report their first cases of HIV around the same time. Sources show that there were six Asian countries that first reported the first HIV cases on the continent.



**Figure 4.** Map of HIV/AIDS spread in Asia constructed from the reviewed literature.

#### Thailand

The first case reported in Asia was in Thailand in 1984 (Siraprasiri, Ongwangdee, Benjattanaporn, Peerapatanapokin & Sharma, 2016). The virus in Thailand was mostly detected in homosexual men who participated in unprotected sex. The virus spread so rapidly across the country that by the beginning of 1987, Thailand had 8 confirmed AIDS cases, and 112 HIV positive cases (Siraprasiri et al., 2016).

#### China

Following Thailand, the first HIV case in China was reported in early 1985 (Jia et al., 2011). The infected patient was diagnosed in Beijing, China. In 1988, transmission of HIV occurred through contaminated blood transfusions of imported Factor VIII, an essential blood-clotting protein (Leavitt, 2007). It was discovered that the sample was infected overseas and then imported to China leading to the infection of a large number of individuals. The virus was also concentrated among injecting drug users in the Yunnan province from 1989 to 1994 (Jia et al., 2011).

#### Singapore

Singapore reported its first cases of HIV in a hospital in May 1985 (Thulaja, 2004). That same year, the government convened the Advisory Committee on AIDS, which developed the National AIDS Control Programme to implement control measures to prevent HIV incidences in Singapore (Thulaja, 2004). AIDS in Singapore saw a predominance of male cases, with a ratio of 7:1 of male cases compared to female cases. The most popular mode of transmission in this country was through unprotected heterosexual sex (Cutter et al., 2004).

#### Japan

The first reported cases of HIV in Japan were in 1985 (DiStefano, 2016). Beginning in the 1980s, hemophiliacs, having been infected through blood products, were a majority of Japan's HIV cases through the middle 1990s (Hanabusa, 2008). DiStefano (2106) concludes that homosexual male intercourse outpaced other means of HIV transmission from 2000 onward.

#### India

The first cases of HIV in India were in 1986, in Chennai, on the Bay of Bengal in eastern India. In the beginning of the epidemic, four of India's southern states (Andhra Pradesh, Karnataka, Maharashtra, and Tamil Nadu) and the northeastern states of Manipur and Nagaland were classified as high-prevalence states (Paranjape & Challacombe, 2016). While the

epidemic centered on high-risk populations of female sex workers, men having unprotected homosexual sex, and IV drug users, the majority of transmissions were attributed to the heterosexual route (Jain, John & Keuscg, 1994).

#### Malaysia

The first HIV cases in Malaysia were reported in 1986 (Huang & Hussein, 2004) and the epidemic was concentrated among injecting drug users, sex workers, transgender individuals who participated in unprotected sex, and homosexual men who participate in unprotected sex. The number of infected individuals increased steadily each year. By late 2002, there were 57,835 people living with HIV/AIDS, and 5,676 AIDS-related deaths (Huang & Hussein, 2004).

#### Cultural & Political Aspects

The HIV pandemic cannot be fully explained without discussing the social and political aspects. From a social perspective, the biggest asset to HIV reaching pandemic portions was the "sexual revolution" that occurred in the U.S. from the 1960s to the 1980s. Escoffier (2004) reported that between the 1960s and 1980s, there was a shift in the cultural attitude towards sexual freedom among both heterosexual and homosexual. Helen Gurley Brown wrote the book *Sex and the Single Girl* in 1992, essentially arguing that women have as much of a right to non-marital sex as men (Escoffier, 2004). The sexual liberation of both men and women caused people to settle down later in life. In other words, society as a whole tended to postpone marriage until an older age than it had previously, thus increasing the time both men and women could have different partners. This led to an increase in the overall number of sexual partners for both men and women.

While the sexual revolution was in full swing, sex education and contraceptives were not able to keep up. In 1961, there were roughly 140 instances of gonorrhea per 100,000 individuals. By 1973, gonorrhea rates had reached nearly 500 instances per 100,000 individuals (CDC, 2008). This increase reflects the mass spreading of sexually transmitted diseases (STDs), without much knowledge of contraception, safe sex practices, or sex education.

At the same time as the sexual revolution, a new movement began, the Homosexual Civil Rights Movement. While this time period saw great progress in furthering societies views of the LGBT community, it resulted only in tolerance as opposed to acceptance. Hence, some in the homosexual community hid behind closed doors, giving rise to an increasing number of bathhouses. A bathhouse was often described as a place where men could meet other men, and interact with them, often in sexual ways. Therefore, bathhouses became a safe-haven for homosexual men to express their sexuality, and many times these practices were unprotected. Between 1968 and 1982, the number of registered bathhouses in the United States jumped from less than 50, to near 200 (Woods, Tracy & Binson, 2008). However, with the rapid spread of HIV and other STDs, a push to close down bathhouses began. From 1982 to 1990, the national number of registered bathhouses dropped from near 200 to less than 75 (Woods et al., 2008). While bathhouses did play a role in the spread of HIV, the greater social influence can be credited to the change of culture that placed an emphasis on freedom of personal expression.

The political aspects that helped spread the transmission of HIV throughout the country can be primarily associated with

the war on drugs. There are three primary reasons for this relationship (Global Commission, 2012). The first reason is that the restriction of sterile syringes forced drug users to have to share and use old and dirty syringes, including ones that may have been previously used by an HIV-infected individual. By confiscating any clean needles arrested drug users may have possessed, the number of clean needles in circulation began to diminish (Global Commission, 2012). The second reason for the relationship was due to fear. Individuals who began to display signs or symptoms of HIV due to IV drug use feared being apprehended if medical attention was sought. Instead of seeking proper medical attention, those infected would not only continue to use drugs as their own conditions worsened, but would greatly increase their chances of infecting others as well. The final reason for the relationship between the war on drugs and the spread of HIV was incarceration. As of 1993, approximately 1 million individuals were incarcerated in jails or prisons (National Research Council, 1993). With many of those incarcerated being drug users, HIV prevalence in prisons was greater than 10 percent (Dolan, Kite, Black, Aceijas & Stimson, 2007). The increase in HIV prevalence was due to unprotected sex, unsafe drug use, and insufficient HIV treatment available in prisons at the time (Global Commission, 2012).

### **Treatment & Prevention**

Understanding how a disease is spread allows for solutions to be developed to prevent its transmission. Scientists have been able to understand how the different modes of transmission work, and as a result, they have been able to devise solutions to prevent the further spread of HIV.

#### ***Drug Users***

Beginning with transmission via drug injections, there are many actions that can be taken to prevent the contraction and further spread of this disease. A few of the most basic actions include using sterile water, using new or disinfected materials, disinfecting the area being injected, and lastly, proper disposal of all drug-related materials used, especially needles and syringes (Avert, 2018a). Another action is to seek help for both curing the addiction and finding safer means of drug use. In some countries, there are Needle and Syringe Programs in which a used needle can be exchanged for a clean needle or syringe (Avert, 2018b). While there are many modes of action that an individual can take in order to prevent the contraction of HIV, there are also actions that can be taken as a country.

In addition to providing programs and resources, another major way to help reduce the spread of HIV is by decriminalizing the use of drugs. This is not to say that the use of drugs should be legal, but rather, that the negative consequences of being caught with drugs can be adjusted. In other words, instead of sending people caught using drugs to prison, help can be offered. For example, in 2010, Portugal proudly announced the effects of a program they put into action in the year 2000. In 2010, officials claimed that the number of HIV cases went down by 75 percent (Associated Press, 2010). Portugal's plan was to present those caught using drugs to a health panel composed of a social worker and a psychologist who urged drug users to join treatment programs. If they refused, social workers remain in touch to provide food and medicine, all while still trying to urge them to seek help. Later, drug users may be offered a place at a residential treatment center (Associated Press, 2010).

#### ***Unprotected Sex***

While participating in abstinence from sexual activities is the only 100 percent effective way to prevent transmission (CDC, 2018b), there are many different ways to limit or prevent the spread of the disease. By practicing monogamy, an individual reduces their chances of encountering someone who might potentially have the virus. Other ways to prevent the spread of HIV include the diligent use of contraception, and the proper application, storage and use of condoms along with lubrication (CDC, 2018b).

Furthermore, increasing the amount of sexual education taught in schools can decrease the chances of spreading the virus in the future. Graf and Patrick (2015) conducted a study in Trinidad where they surveyed adults aged 17 to 81, on the basis of sexual health literacy. They found that individuals who were younger and had gone to school in more recent years had a greater understanding of contraception and also how to openly communicate with their sexual partner about the risks of unprotected sex. Afterwards, the study was brought to the U.S., where they taught sexual education in a school. The students were then presented with a survey that was eventually compared to the results from a participating college. The cohort that was taught sexual education was less likely to engage in risky behaviors, such as unprotected sex, and had more open communication with their partners as compared to the college cohort.

If an individual chooses to engage in high risk sexual activities, medications such as pre-exposure (PrEP) and post-exposure prophylaxis (PEP) can counter the risk. PrEP is a medication that reduces the chances an individual has of obtaining HIV from someone who might be infected with the virus. In contrast, PEP is a medication for an individual who is already infected with HIV. The purpose of PEP is to create an undetectable viral load of the HIV, thus making the transmission of HIV highly unlikely. If both medications are taken effectively, along with proper contraception use, spreading the virus can become increasingly difficult and can lower the risk of transmission (CDC, 2018c; CDC, 2018d).

#### ***Hospitals***

There are many different methods used today in order to prevent not just nosocomial HIV infections, but nosocomial infections in general. There are different regulations and standard methods of practice that help to maintain cleanliness and prevent contamination in healthcare settings. These methods of prevention include the following: the use of barriers such as gloves and goggles; having dedicated sharps bins; single-use instruments; decontamination of tools and facilities; hand-washing; standard cleaning procedures; and the testing of donations before use (Better Health Channel, 2018).

#### ***Mother-to-Child***

Perhaps the greatest challenge to stopping perinatal transmission of HIV is diagnosis, as mothers may not know they are infected. Thus testing for HIV during pregnancy is essential for reducing perinatal transmission. Antiretroviral therapy (ART) may be given to HIV positive women during pregnancy to both lessen the likelihood of mother-to-child transmission and treat the mother's HIV (Panel on Treatment, 2018). A combined approach is suggested to reduce the mother's antepartum viral load, as well as provide the infant with antiretroviral prophylaxis (Choudhary, 2019).

## Conclusion

Ultimately, through our review of the literature, it was found that HIV has four main modes of transmission: drug abusers, unprotected sex, nosocomial infections, and mother-to-child. Each method of transmission was found to have one common factor, which is bodily fluids. Despite their shared characteristic, it was concluded that the most prevalent mode of transmission was through unprotected sex due to a lack in sexual education and an increase in sexual expression beginning in the 1980s.

Using the information gathered from the published literature, we were able to construct a timeline following the path of HIV from its origin in Africa, to Haiti, and to the U.S., debunking common misconceptions in the process. These misconceptions include the idea that spread first came to the U.S. initially in San Francisco then to New York, and the idea that vectors can be modes of transmission for HIV. However, we found little documentation of the epidemiology of HIV outside of the U.S. For this reason, we were unable to construct a linear timeline for regions outside the U.S. but, rather, created Figures 3 and 4 to visualize the spread of HIV in Europe and Asia, respectively. Lastly, actions that can be taken to limit the further spread of HIV were found and explained on a political, social, and individual level. The impact of HIV on the world is vast and through learning about its history, society will be better equipped to combat this disease, as well as any future pandemics.

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## Acknowledgements

All student authors contributed equally to this work under the research direction of Kean University faculty Drs. Kristie Reilly and Laura Lorentzen. A. Sergios was supported by the NSF Garden State LSAMP (Louis Stokes Alliance for Minority Participation).

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