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Factors that Affect the Prevalence of Acquired Immune Deficiency Syndrome  
and the Human Immunodeficiency Virus

by

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# Factors that Affect the Prevalence of Acquired Immune Deficiency Syndrome and the Human Immunodeficiency Virus

## Introduction

The disease of AIDS and its causative agent, HIV, are spreading around the planet at epidemic proportions. The World Health Organization estimates that at the end of 2000, 21.8 million people had died from AIDS since the late 1970's. They calculate that an additional 36.1 million people are currently living with the virus (*AIDS Epidemic Update 3*). This problem is affecting the entire globe; therefore, solutions for controlling the spread of the disease must take into account both local and international factors.

A common strategy in controlling the increase of any disease is to identify how and why it spreads the way it does. One way of doing this with the AIDS virus is to compare various places that the virus is affecting and to find traits that may or may not make a location more vulnerable to the spread of the disease. The purpose of this study is to find differences and similarities in the areas of economy, education, availability of medical resources, and geography in selected countries. This information can then be applied to limiting the further spread of AIDS and control levels of infection in currently affected areas.

The countries being analyzed are Botswana, Thailand, Brazil, France, and the United States. Botswana has the highest rate of prevalence worldwide, and is representative of Sub-Saharan Africa, where over 70% of the world's AIDS cases are. Thailand is typical of Southeast Asia, which has the second highest concentration of AIDS cases worldwide (*AIDS Epidemic Update 5*). Brazil is a developing nation that has

a problem with AIDS, although according to the statistics it is not as severe. France is one of the world's overall "healthiest" countries and has the best health system performance worldwide (WHO). The United States is the world's richest country, and has been a pioneer in fighting the AIDS epidemic. This sampling includes a country with a disproportionately high prevalence rate, one with a moderately high prevalence rate, and several with statistically lower rates. This enables the different factors to be compared under varying conditions.

To assess the level of HIV and AIDS infection in a country, prevalence was used as a marker. Prevalence indicates the number of people per capita living with HIV/AIDS. This statistic reflects a number of interplaying factors. For instance, prevalence describes the number of people living with the virus, not the incidence, or number of newly infected people. This means that even though a country might be experiencing a decline in incidence, prevalence rates could be high due to patients who are living longer. This is the case in many industrialized countries that have implemented the use of highly active anti-retroviral therapy (Epidemiological Fact Sheets 6). In this situation, higher prevalence could actually be positive, being a sign of longer survival.

There are four patterns of HIV transmission as described by the World Health Organization. The first pattern is seen in areas such as North America and Western Europe. It involves homosexual males and injection drug users (IDUs), although there has recently been an increase in heterosexual and perinatal transmission in these areas. The second transmission pattern is common in areas such as sub-Saharan Africa, where the virus is spread through non-IDU, heterosexual contact or perinatal transmission. The third pattern involves a combination of the first two: homosexual and bisexual

transmission that is evolving into heterosexual transmission. The last group is characterized by few HIV infections that are isolated to high-risk groups such as prostitutes and IDU's, although areas with this type of transmission are few and fast diminishing (Stine 266). These patterns are important in identifying why certain factors will effect one country in one way and have an apparently different affect elsewhere. In countries where the virus is limited to high-risk populations, factors that take into account the nation as a whole will be less significant.

The AIDS epidemic varies from country to country, and there are reasons behind this phenomenon. By analyzing the different factors in individual countries and then comparing this information, similarities and differences can be found that point to those reasons. Once the factors are identified, more effective strategies can be developed to control the epidemic. The results of this study will in themselves be too limited to be directly applied, but they will lay the groundwork for future research which will be able to make difference in the control of the AIDS epidemic.

#### Description of the HIV/AIDS Epidemic and Factors in Selected Countries

**Botswana.** The AIDS epidemic in Sub-Saharan Africa started somewhere in the late 1970's to early 1980's (*AIDS Epidemic Update* 5). Botswana is located in the center of this region and has been one of the hardest hit countries. In 1988, when the epidemic was still relatively young, there were only 16 reported cases of AIDS in Botswana. This number is small when compared with other nations in Africa for that same year: neighboring South Africa reported 120 cases, while Uganda topped the list with 4,006

cases (Stine 268). Since Botswana had the highest economic growth rate in Africa, it appeared to have an advantage. Unfortunately, the numbers in Botswana soon echoed the trends in the rest of Sub-Saharan Africa. In this region, where the virus is spread through predominantly heterosexual and perinatal transmission, the numbers rose rapidly, with a nearly equal number of men and women being infected (Stine 267).

Currently, Botswana has the highest prevalence rate in the world at 35.8%; the average prevalence rate for Sub-Saharan Africa is 8.57% (UCSF). At the end of 1999, an estimated 290,000 people, 52% of them women and 3% of them under the age of 15, were living with the virus. This number does not include the 24,000 that died during 1999 (*Epidemiological Fact Sheets*).

In spite of recent setbacks, Botswana still has one of the highest economic growth rates among developing countries. Between 1970 and 1995, the country's GNP increased at an average of 7.3% each year. This has slowed in the last year or two after a drop from 8% growth in 1998 to 4.5% growth in 1999 (UCSF). The economy certainly faces many challenges, as is evidenced by the unemployment rate, which is estimated at 40%. The 47% of the population estimated to be living below the poverty line is another indicator that this economy is far from being strong. The growth of the last few years has managed to edge the GNP per capita up to \$3,900 (USD), but this is still comparatively low. To add to this, the country has \$651 million in external debt and is receiving \$73 million in economic aid (World Factbook). Overall, although it is growing, Botswana has a very poor economy.

The governmental system of education in Botswana involves twelve years of basic education split into seven years of primary level schooling and five years of

secondary education. The program, which is overseen by the Ministry of Education and the Ministry of Local Government Lands and Housing, has 977 schools and approximately 470,000 students (Gov. of Botswana). Beyond the secondary level, there is one main university and six other college level institutions. Enrollment at the college and university level in 1998 was slightly less than 11,000 (CSO). There is currently a literacy rate of 69.8% for the total population, which breaks down into 80.5% of the male population being literate and 59.9% of females (World Factbook). While the majority of the population can read, these numbers are still very low indicating a weak educational system.

Botswana's medical resources are rather limited. Health services in Botswana provide 23.7 hospital beds per 10,000 people. In 1997, there were 424 doctors and 4,129 nurses in the country. This equated to 3,616 and 371 people per doctor and nurse, respectively. For the same year, the public health expenditure per capita was \$52 (UCSF). Using the World Health Organization's indicators and rankings for 2000, Botswana's overall health system attainment received a ranking of 168th worldwide. The overall health system performance received a similar ranking at 169th (World Health Report). In addition, the immunization levels for the country are quite low as are the percent of births attended by trained medical personnel (*Epidemiological Fact Sheets 2000*).

Geographically, Botswana is a mostly flat country with some gently rolling tableland and the Kalahari Desert in the southwest. It has a semiarid climate with warm winters and hot summers. Brush fires and seasonal dust storms are among the natural hazards that the area must deal with, although droughts and flooding take the largest toll

(CSO). Droughts have been given partial credit for the recent economic decline, due to the blow they have dealt to the agricultural sector. Nearly 80% of the population works in agriculture and are badly hit by the droughts and erratic rainfall (World Factbook). Desertification and limited fresh water sources present challenges in this country where there are only 20 square kilometers of irrigated land. Being geographically located in Sub-Saharan Africa, Botswana is not far from the accepted origin of the AIDS epidemic.

**Brazil.** South America was hit by the AIDS epidemic in the late 1970's and early 1980's. The first case in Brazil was reported in 1980, and within five years there were over 500 reported cases. The virus in this region is spread through a combination of homosexual and heterosexual transmission, as well as injecting drug use. This means that no part of the population has been isolated from the disease. The prevalence in Brazil is not as severe as in Botswana, and as of 1999, was only 0.57%. While this percentage is small, it represents 540,000 adults and children. To add to this figure, in 1999 there were 18,000 deaths that resulted from AIDS (*Epidemiological Fact Sheets*). This number is significant enough to be factored into infant mortality, population growth rates, and distribution estimates (World Factbook). Compared to the one to one ratio of male to female infection in Botswana, 74% of the HIV and AIDS cases in Brazil are males. This fits with the high level of transmission through male-to-male sex.

The economy in Brazil is well developed and surpasses all other South American countries. It has had problems in the past with high inflation rates and a fluctuating currency, but has been stable since 1994, when the real was fixed to the US dollar. It has now been dissociated from the dollar, but continues to maintain a comparable value. The



GNP has had a steady growth trend in the past that was expected to be around 3% in 2000, although it was only 0.8% for 1999. The GNP per capita is estimated to be at \$6,150, but there is a large disparity among the population and unequal income distribution is a problem. 17.4% of the population is living below the poverty line and the unemployment rate is 7.5%. In spite of Brazil's relatively strong economy, it has been a recipient of economic aid and has an external debt of \$200 billion (World Factbook).

Brazil's general education system consists of eight years of primary education, starting around at the age of seven, and three years in secondary school. There are 196,479 primary level institutions in the country, which greatly dwarfs the number in the United States (UNESCO). The overall literacy rate is 83.3% and is roughly the same for both males and females.

According to the Ministry of Health, which oversees medical care, 100% of the population has access to health services; this includes both urban and rural areas. Immunizations levels for DPT, polio, and measles all run above 90%, which is another good indicator that people in the country are receiving needed health care (WHO). However, Brazil has a health system attainment ranking of 125th, which is not very high. Their overall health system performance ranking is at the exact same spot. The average health expenditure per capita (in international dollars) is \$428 annually, which the WHO gave a fairness ranking of 189th, putting Brazil towards the bottom of that list (World Health Report).

Since Brazil is such a big country, it has a very diverse terrain ranging from flat to rolling lowlands in the north to a coastline in the east and the Andes to the west. The

climate is mostly tropical, although droughts in the northeast are a problem. About 5% of the land is arable; another 58% is covered by tropical forests and woodlands (World Factbook). Its geographic location from the origin of the AIDS virus is distant, but that distance is comprised of the Atlantic Ocean, which is criss-crossed by trading routes.

**Thailand.** Southeast Asia had a slightly later start on the AIDS epidemic than most other regions. Although the first reported case in Thailand was in 1984, it was not until 1988 that transmission rates drastically increased and the epidemic got underway. This initial spike in incidence was credited to injected drug use. From there, the virus spread quickly, especially among high-risk groups such as sex workers. Early in the epidemic, HIV prevalence rates among female sex workers in northern Thailand were measured as high as 44% (Nelson). In 1990, there were 107 reported cases of AIDS. By 1995 that number had increased to 18,890, and continued to grow to a high point in 1998 of 25,847 cases (*Epidemiological Fact Sheets*). In just ten years, the number of AIDS victims had increased nearly 300 times.

The current outlook for the HIV/AIDS problem in Thailand is rather optimistic. HIV incidence has finally begun to decline, although prevalence numbers remain high. At the end of 1999 there were an estimated 755,000 people living with HIV/AIDS, which accounts for 2.15% of the population (ibid.). Males make up the majority of this number at 58%; this is probably because males are the major targets of the commercial sex industry, which has been a major means of spreading the disease (*AIDS Epidemic Update* 7). The decline in incidence that has been seen recently is credited to the extensive preventative programs that have been implemented.

With a GNP of \$388.7 billion, Thailand is not exceedingly poor, although the GNP per capita of \$6400 annually is small compared to the western world's standards. Between 1985 and 1995, Thailand had the world's highest growth rate, averaging around 9%. The country experienced an economical crisis in the late 1990's, but is now recovering. In 1999, the growth rate was at 4%, and it is predicted to continue climbing. Even though the unemployment rate is only 4.5%, 12.5% of the population lives below the poverty line (World Factbook).

The educational system in Thailand consists of six years of primary schooling followed by six years of secondary school. Thailand's literacy rate is reasonably high: 93.8% for the total population. There is somewhat of a discrepancy between genders, though, with 96% of males and only 91.6% of females being literate (World Factbook).

Medical resource availability in Thailand is best described through indicators such as immunization and births attended by medical personnel. Immunizations for DPT, polio, and measles range from 91-94%, indicating that the majority of people have access to some form of health services. In addition, over 70% of births were attended by trained health personnel (*Epidemiological Fact Sheets*). The World Health Organization gave the overall health system attainment a ranking of 57<sup>th</sup> and health system performance a ranking of 47<sup>th</sup>.

Geographically, Thailand is a tropical, somewhat mountainous country with a plateau in the east and a central plain. The weather follows a pattern of monsoons: a rainy, warm, and cloudy monsoon from mid-May to September in the southwest and a dry, cool monsoon from November to mid-March in the northeast. The southern isthmus is consistently hot and humid. Droughts are a problem and depletion of the water table

has resulted in land subsidence in Bangkok (World Factbook). Thailand is quite distant from Western Africa, and this might have been part of the reason why the epidemic did not start as soon in this region as it did in many other parts of the world.

**France.** The HIV/ AIDS epidemic took off at the same time in Western Europe as it did in many other parts of the world, including Africa and the Americas. The first AIDS cases were reported in France in 1978. By the late 1980's, France had more reported cases than any other European country (Stine 268). The mode of transmission in Europe has been primarily through homosexual males and injection drug users. In 1990, over 90% of the AIDS cases in Europe were in one of those two groups (Stine 277).

Currently, however, the story is changing as the virus is crossing lines from such stereotyped high-risk groups into the heterosexual population. In 1998, heterosexuals made up 35% of reported cases, while homosexuals accounted for 31% and injection drug users an additional 18% (*Epidemiological Fact Sheets*). At the end of 1999, there were an estimated 130,000 people infected with HIV. This gives France a prevalence rate of 0.43%. Over 73% of infected adults are males, and less than 1% are children, which shows that even though the patterns of transmission are changing, the prevalence rate still reflects the former trend of homosexual transmittance. In addition, there were only 2000 deaths from HIV in 1999, which would make up about 1.5% of the living infected population (*Epidemiological Fact Sheets*). This points to the fact that France has been able to implement highly active anti-retroviral therapy, thereby prolonging life-spans among AIDS patients and producing a higher level of prevalence.

France has a modern capitalistic economy in which the government is heavily involved in many sectors, including the railway, electric, and telecommunication firms. Its GNP real growth rate for 1999 was 2.7%, which is typical for France. As the leading agricultural producer in Western Europe, France enjoys a GNP of \$1.373 trillion. The GNP per capita is \$23,300, which is incredibly high compared to most developing nations. France does battle a high unemployment rate of 11% though, and has an external debt of \$117.6 billion. Economic aid is given rather than received by this country: \$6.3 billion annually according to a 1997 estimate (World Factbook).

The indicators for education in France show a well-developed system. The literacy rate is 99% for both males and females. Pre-primary education is available starting at age two, and continues through four years of pre-primary, five years of primary, and seven years of secondary school. There are approximately 41,000 schools for the nation's children at the primary level and 18,844 institutions for pre-primary schooling.

The government, making health care accessible to nearly everyone, heavily subsidizes the health system in France. Immunization rates for DPT, polio, and measles are 96%, 97%, and 97% respectively. The overall health system performance ranking, as determined by the WHO for 2000, was the highest in the world. France has one of the world's highest life expectancies at birth, 78.76 years (World Factbook) and is third in overall level of health rankings (WHO).

As the central and largest country in Western Europe, most of France enjoys a temperate climate with warmer areas along the Mediterranean. There are few natural hazards other than occasional flooding in lowlands and avalanches in the Alps. The

terrain of the country is mostly flat plains and rolling hills, although the Alps in the southeast, the Pyrenees to the west, and several other small ranges add mountainous regions. France is less distant in from Africa than either Brazil or the United States. Europe and Africa are closely connected politically due to former colonization, and this could have been a factor in how quickly the virus spread

**The United States.** The AIDS epidemic in the United States found its foothold in high-risk groups, such as homosexual males and injection drug users. In 1981, while the disease was still new to North America, 100% of the cases reported to the CDC were in homosexual males. By 1991, the virus had diversified: 55% of cases were in homosexual males, 33% in injection drug users, and the remaining 12% in heterosexuals (Stine 237-8). Rates of reported AIDS cases climbed steadily through the early 1990's, but in more recent years, a decline due to the effects of preventative and educational measures is beginning to show. At the end of 1999, there were an estimated 320,282 persons living with AIDS in the United States. This puts the rate of prevalence at 0.116%. Following a declining trend, 16,273 deaths were reported for the year and the estimated incidence was 42,697 (CDC).

The economy of the US is without contest the largest in the world. It is driven by private individuals and businesses in a market-oriented environment. The government is largely uninvolved, which gives companies much more freedom to grow and develop new methods and products. Capitalism has served most Americans well: the average per capita GNP is \$33,900 and unemployment is only 4.2%. In addition, the GNP growth rate is 4.1% for the nation. On the other side of this rosy picture, 12.7% of the population

lives below the poverty line and the government carries \$862 billion in external debt (World Factbook).

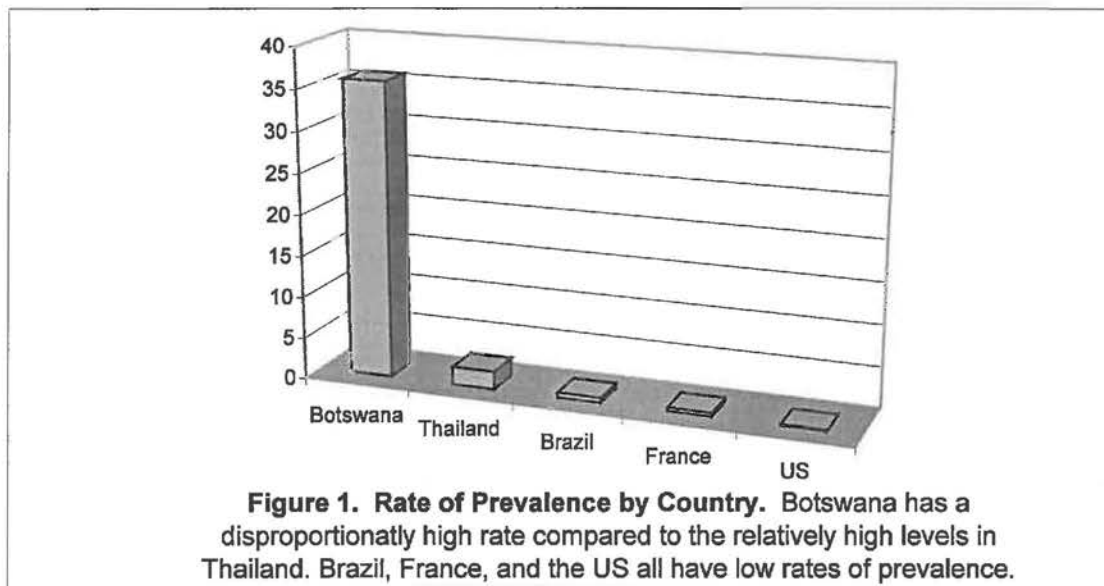
The educational system in the US is fairly advanced, with a literacy rate of 97% (World Factbook). Most children start grade school around the age of six and complete a total of eight years of primary education and four years of secondary education. In the 1998-99 school year, there were 46.5 million public school students and 2.8 million teachers (CCD), which gives a ratio of about 17 students for every teacher.

Health care, although not topping the charts internationally, is both advanced and widely accessible. The World Health Organization gave the overall health system attainment a ranking of 15, although health system performance was lower at 37. The amount that the government spends per capita in international dollars is \$3724, which is more than any other nation.

The terrain of America is incredibly diverse, as it covers such a large area (9,629,091 square kilometers). It ranges from the deserts of the southwest to the northern forests, across the Rockies and the great central plain to the hills of the east. The majority of the nation has a temperate climate, though it is tropical in Florida and Hawaii and arctic in Alaska. Along with this assortment of climate zones and terrain comes just about every natural hazard imaginable. There are tsunamis, volcanoes, and earthquakes around the Pacific Basin, hurricanes along the Atlantic and Gulf of Mexico, tornadoes in the midwest and southeast, mud slides in California, forest fires in the west, and occasional flooding just about anywhere else. Geographically, the US is separated from Western Africa by many miles of Atlantic Ocean.

### Analysis of Factors

**The AIDS Epidemic.** The primary marker of how hard a country has been hit by the AIDS epidemic is the rate of prevalence (see Fig. 1). Among the five countries selected, Botswana has a disproportionately high level: more than ten times more than the second highest country. This is not random, the countries in Sub-Saharan Africa are home to 70% of the worlds HIV infected population, and Botswana has the highest rate within that region (McGeary 39). Thailand has the next highest percentage of prevalence, although a higher actual number of infected people. The prevalence rates in Brazil and France are nearly the same, with France being lower by .14%. The US has the lowest rate out of the selected countries at slightly more than one-tenth of one percent. In sheer numbers of cases per country, the story is a little different. Thailand has the top ranking, followed by Brazil, the US, Botswana, and France as the lowest. This order however, has little meaning when the overall population is considered.

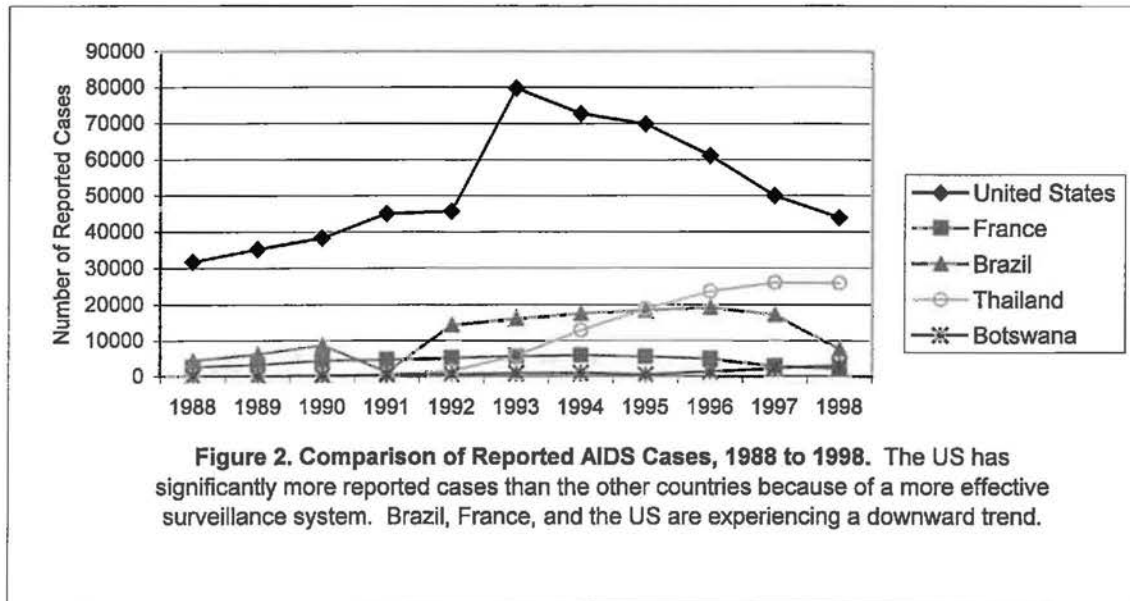




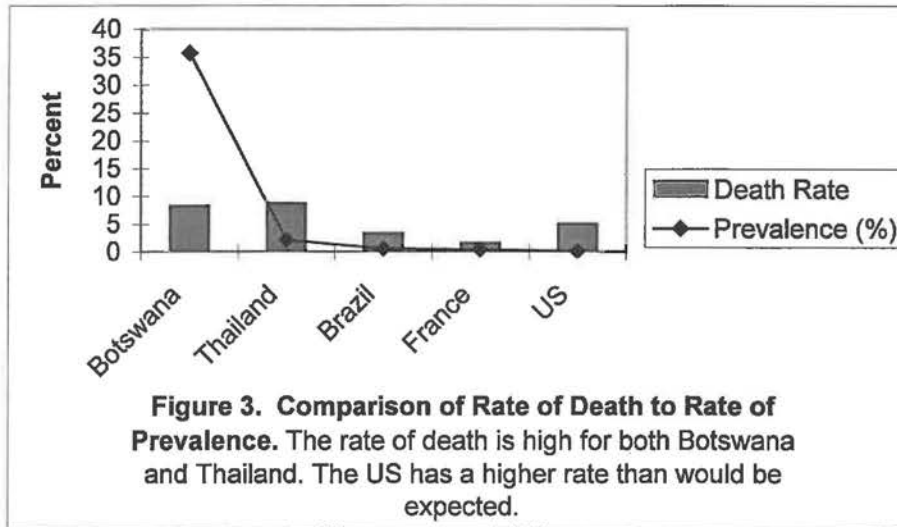
In tracing the development of the AIDS epidemic in each country, the number of reported cases per year is the only hard data available. It should be recognized though, that this number is just an indicator of the actual number of AIDS cases. Also, since it can take up to ten years after infection with HIV for the disease to develop, such figures do not necessarily reflect current trends in infection rates. For instance, in 1998, there were 2992 cases reported in Botswana; however, the estimated number of infected people for the next year was 290,000. There are also discrepancies from country to country in the methods that are used to report cases and then estimate actual infection rates. For these reasons, it is impractical to make direct comparisons between countries, but general trends can still be useful.

A significant trend should be pointed out in the development of the epidemic. With the exception of Botswana, all of the countries have experienced a decline in the number of reported AIDS cases in recent years. This downward trend started first in the US in 1994, followed by France in '95, and Brazil and Thailand in '97. Botswana, on the other hand, has more than doubled in reported cases since '96 (see Fig. 2). When looking at this chart, the US shows up as having significantly more cases than the other countries. These higher numbers have several probable explanations. For one, people in the US are more likely to report infection, since many of the cultural taboos about AIDS that exist in other places do not exist in this society. In addition, there is more incentive to report, since medical aid is available and in most cases prolongs life. There are also more advanced surveillance techniques in place, which mean that a larger percentage of those infected will end up being reported. For similar reasons, some of the other countries have disproportionately low numbers. The methods of reporting are different in every country,

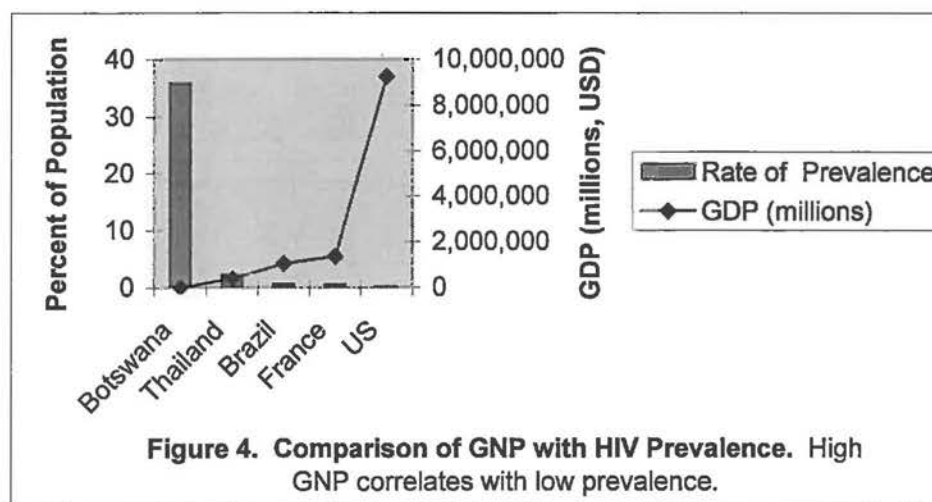
as are the number and effectiveness of surveillance sights. This probably accounts for why Botswana has the lowest line on this chart: there simply is not the same degree of reporting and surveillance taking place.



Another indicator of how AIDS is affecting a country is the death rate. When looking at the number of deaths in 1999 as a percentage of prevalence, the results indicate a different trend (see Fig. 3). Thailand and Botswana have the highest percentages at 8.74% and 8.28%, respectively. What is surprising is that the US follows them with 5.09%. Brazil weighs in at 3.33% and France takes up the end at 1.54%. Rates of death are dependant on several things, so these numbers are difficult to interpret. For one thing, while new drug therapies initially lowered the death rate, these medications have reached their limit. In addition, new drug-resistant strains are taking their toll. These are among the explanations for the high death rate in the US (CDC).

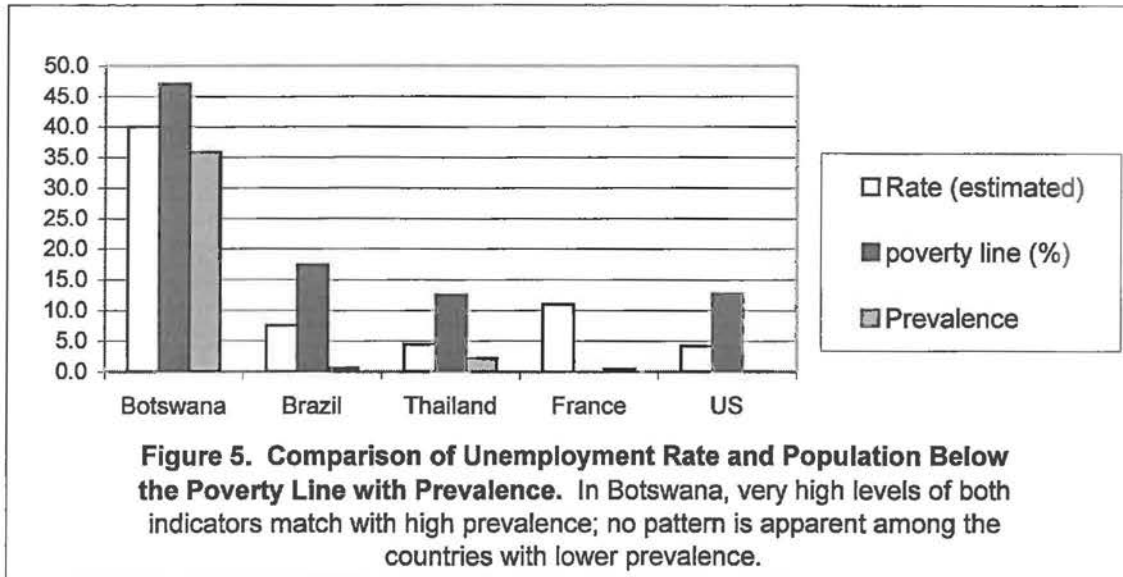


**Economy.** One way of judging a country's economy is by looking at its gross national product. At \$9.255 trillion GNP, the US leads as one of the world's richest countries. France and Brazil have comparable GNP's at just over one trillion dollars. There is a huge drop to Thailand, whose GNP of \$388.7 billion still looks large next to Botswana's \$5.7 billion. This is where one of the strongest correlations can be seen. As GNP decreases, the rate of prevalence increases proportionally (see Fig. 4).



The GNP growth rate is another indicator of how a country's economy is doing. However, it does not seem to be a factor in determining how vulnerable a country is to the AIDS epidemic. Botswana has one of the world's highest GNP growth rates, as did Thailand up until the mid-1990's. Both of these countries have much higher rates of prevalence than the other countries. They are also both experiencing a decline in GNP growth, which has coincided with the explosion of the AIDS epidemic. Similarly, trends in the GNP per capita inversely reflect prevalence rates, with the exception that Thailand has a slightly larger GNP per capita than Brazil.

While GNP matches closely with prevalence, unemployment rate and the percent of population below the poverty line are not relevant indicators (see Fig. 5). Unemployment rates vary greatly across the countries, ranging from 4.2% in the US to an estimated 40% in Botswana (the official rate is 21%). While the very high unemployment rate in Botswana corresponds with a high prevalence rate, France also has higher than normal unemployment but with a low rate of prevalence. Therefore, unemployment does not appear to correlate with prevalence. In the same way, the percent of a country's population that live below the poverty line does not indicate the degree to which the AIDS epidemic has spread within the country. Thailand has a slightly lower percent than the US does, but a much higher rate of prevalence. However, a very high percent, as seen in Botswana, does correspond with a high prevalence rate. It should be noted on the graph that there is no entry for the percent of the population below poverty line in France; this is because that data is not available.

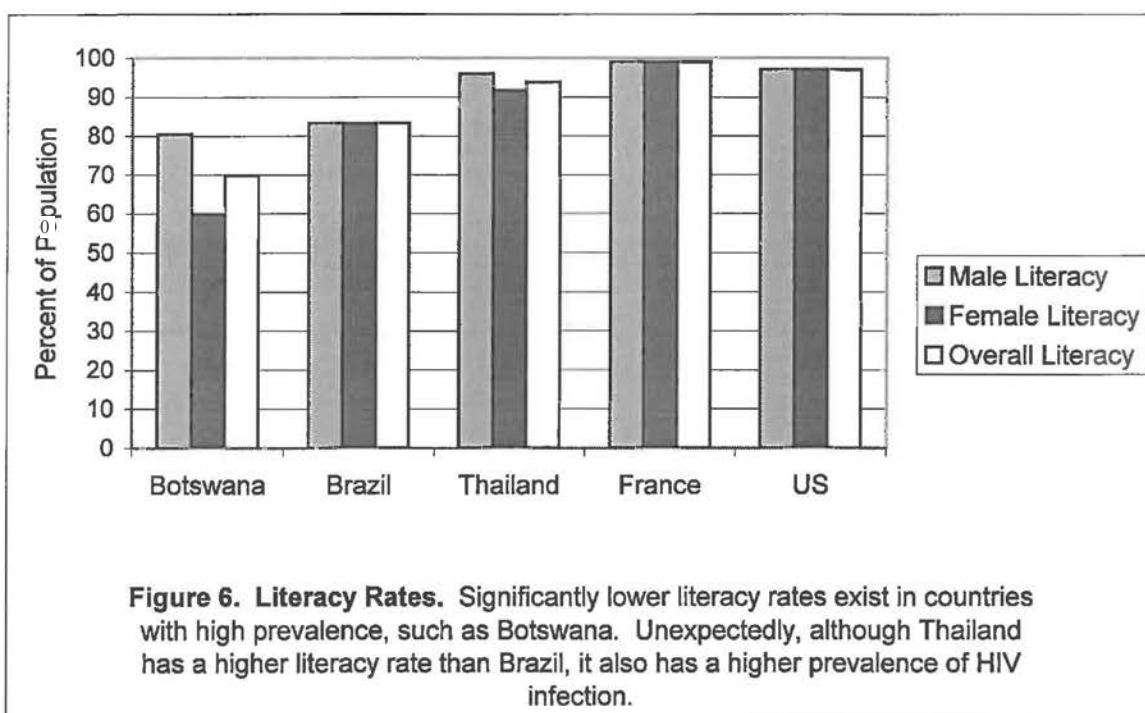


External debt and the amount of aid received or given were also examined as indicators of national wealth. When straight dollar amounts are compared, the US has by far the largest amount of debt and Botswana has the smallest. Relating the external debt as a percent of GNP yields different results. Thailand and Brazil both have large percents of debt, 20.6% and 18.9%, respectively. Botswana has a lower percent at 11.4%, and the US and France bottom out the chart at 9.3% and 8.6%. This does not conform to the prevalence rates, and neither does the amount of aid received or give. Both the US and France are economic aid donators, which fits nicely, but the other three receive quantities of economic aid in a similar order to their debt, which does not match prevalence rates.

**Education.** To examine the state of education in the various countries literacy rates and the number of primary institutions relative to the population were considered. Botswana had significantly lower rates than the other four countries, which supports a correlation between low literacy and high HIV prevalence. However, Brazil has lower rates than Thailand, which is opposite of their prevalence ranking. One indicator that does match

more closely with prevalence is the difference between the literacy rates of males and females. The countries with the highest prevalence also have the highest differences in literacy rates (see Fig. 6). This suggests that countries where education is equally available to both men and women are less susceptible to the epidemic.

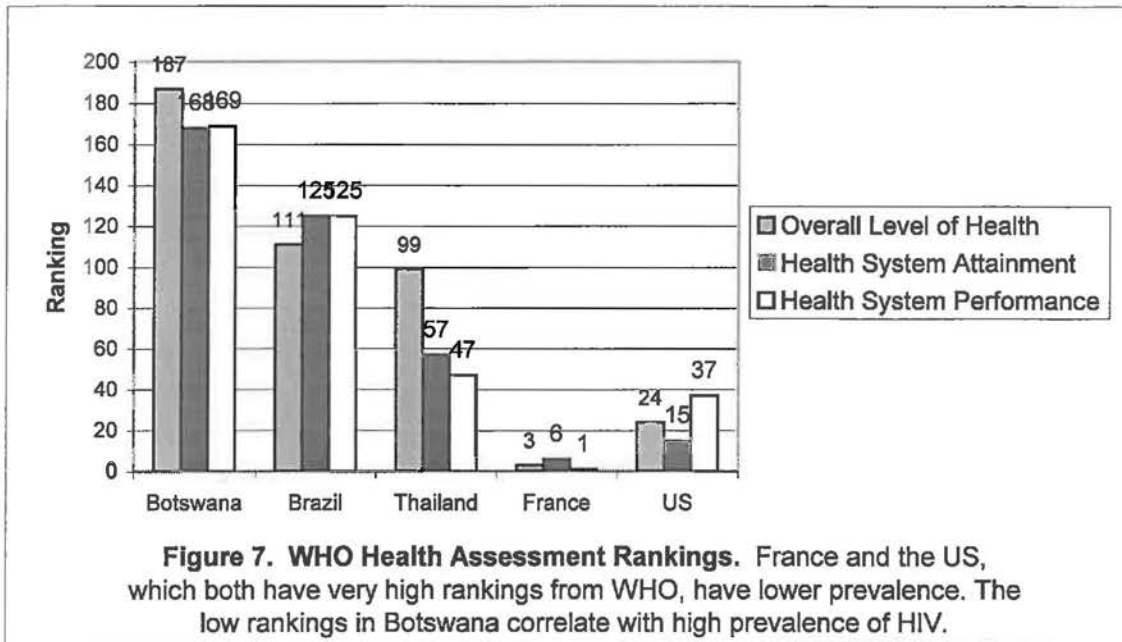
The ratio of primary educational institutions to the total population did not show any correspondence with prevalence rates. Brazil has the largest number of schools per population while France actually had the smallest. The similarity of their rates of prevalence reveals that this is not a highly relevant indicator.



**Medical Resources.** In measuring the quality and availability of medical resources in the individual countries, indicators set up by the World Health Organization were very useful. The health system of a given country is measured according to its overall performance, or, “the ratio between achieved levels of health and the levels of health that

could be achieved by the most efficient health system” (WHO 149). Its overall attainment is a “composite measure of achievement in the level of health, the distribution of health, the level of responsiveness, the distribution of responsiveness and fairness of financial contribution” (WHO 150). The WHO also ranks countries on their overall level of health, which is based on disability-adjusted life expectancy. These rankings match up with the trends in prevalence for the most part, but there are a few discrepancies (see Fig. 7). France has the highest rankings in all three areas, even though it has a higher prevalence than the US. In addition, Thailand has higher rankings across the board than Brazil, once again contradicting the order of prevalence.

The amount of money that the government spends per person on health care is a strong gauge of the medical resources that are available to the citizens in a country. It also correlates with prevalence rates. The US spends \$3724 (in international dollars) per capita each year compared to \$219 in expenditures that Botswana puts out. The numbers are not exactly proportional, as Brazil has nearly the same rate of prevalence as France, but spends \$1697 per year per capita less than France does. Generally speaking, however, the more money that is spent on health care, the less severe the epidemic of AIDS. Of course, the ability of a country to spend this money is closely tied to the nation’s economy.



The percent of the population immunized against diphtheria, polio, and measles is also an indicator of how accessible medical care is, as does the percent of births that are attended by trained medical personnel. While the percentages among Brazil, Thailand, France, and the US vary slightly and show no particular pattern, Botswana has a significantly lower portion of the population that has been immunized. The percent of births attended by trained medical personnel was lowest for Thailand at 71% and Botswana at 78%. Births in Brazil were attended by medical personnel 92% of the time, while in the US and France medical personnel were present at 99% of births. Once again, these numbers do not directly line up with prevalence, but it is safe to say that generally low attendance rates are present in the countries with higher prevalence rates.

**Geography and Climate.** The geography and climate of a region can affect many things about the region, including economics, which in turn affects everything else. Overall, the countries in temperate climates had lower levels of prevalence than those in tropical or



semiarid climates. However, considering the similarity of prevalence rates between France, a temperate country, and Brazil, a tropical country, it does not appear that climate has any direct link with the prevalence of AIDS.

As far as terrain is concerned, there is such diversity within each country that it is impossible to say whether or not a mountainous region or a plains area might be more susceptible to AIDS. Land use presents no better correlations: the amount of land designated for farming, development, woodlands, and other uses show no patterns whatsoever.

Natural hazards could also be a possible factor in making a country more vulnerable to the epidemic. In considering the different types of natural disasters that occur in each country, droughts are the only common denominator in countries with higher rates of prevalence. In this case as well, though, France does not suffer from droughts while Brazil does, negating the supposition that there is a connection between the seasonal droughts of Botswana, Brazil, and Thailand and their rates of prevalence.

While the geographic features of a country seem to have little to do with the AIDS epidemic, the geographic location of a country in relation to where the epidemic began does. One difficulty in looking at this is that while there are theories as to the origin of the virus, nothing has been confirmed. The first cases were in Western Africa, and that region is accepted as the central starting point of the virus (Cohen 90). One way of judging the relationship between the origin of the virus and how it spread is to look at the time period that the epidemic began in a particular region. Botswana is directly below this area and the higher incidence there as well as on the continent of Africa as a whole strongly supports the assertion that the proximity of the origin affects prevalence.

The epidemic in Sub-Saharan Africa started in the late 1970's and early 1980's. The epidemics in North America, South America, and Western Europe all started during this same time. The exception is Thailand in South-East Asia, where epidemic proportions of HIV infection were not seen until the late 1980's. While Thailand is connected by landmasses to Western Africa, it is also the farthest away. The other three regions are also linked more closely to Africa through travel and trade. It is true that the epidemic started almost a decade later in Thailand than in the other areas, but the rate of prevalence in Thailand is also much higher than that of Brazil, France, or the US. This points to a connection between geographic location and the timing of the epidemic, but not necessarily prevalence.

### Conclusion

The factors that affect the AIDS epidemic are far more diverse and in-depth than this study can cover. Furthermore, the mode of transmission varies from region to region, causing HIV prevalence to be focused in certain sectors of the population. The indicators that were used take into account the nation as a whole, but in some places, the virus is concentrated in specific populations. The result is that the effects of the factors will be different. For instance, in the US, where infection has been largely in homosexual and IDU populations, it would be more useful to look at how the economy of just those groups. However, that information is not available. It is also important to keep in mind that much of the information used for this study is dependent on data gathering techniques in the individual countries, and that these vary widely. These elements put some limitations on the conclusions.

In spite of the limitations of this research, several conclusions can be made. For one, economy is generally a strong factor, with gross national product relating directly to rates of prevalence. Nevertheless, it is not enough for a country to have a growing economy; it must have an established, high level of national wealth. Another strong correlation is seen between the availability of medical resources and HIV prevalence. Looking at the indicators used in this study, the higher rates of immunizations and births attended by medical personnel occur in countries where HIV infection exists at a lower rate. Additionally, where education and literacy are strong, there is a lower occurrence of HIV infection. An appreciably lower rate of literacy aligned with a much higher rate of prevalence, although there is little marked correlation among the countries with moderate infection rates. One thing that emerged is that in countries where men and women are educated equally (based on literacy rates), there is a lower rate of prevalence. This could indicate a cultural factor regarding the roles and treatment of males and females, which is beyond the scope of this paper.

Based on the findings of this study geography plays a less significant role than economy, medical resources, and education do. There were a wide variety of indicators included under geography, and none of them revealed any distinct patterns in relation to prevalence. The distance that a country is from the origin of the virus shows a relationship with how soon the epidemic started, but not with current prevalence.

The results of this research show that certain factors do affect the prevalence of HIV and AIDS. They also show that some of the factors analyzed have nothing to do with whether or not a country is more vulnerable to the epidemic. What is important is that this separation can be made and the knowledge applied to containing the HIV and

AIDS epidemic. This is only the first step and supplies more questions than it does answers.

This study brings up a wealth of questions for future research. The next step is to go beyond the limitations of this paper and try to answer the questions that the conclusions lead to. In looking at the information that this study brings up, the following questions should be addressed:

- Why is it that the poor are more vulnerable? The virus is not biologically selective for poor people, so there must be other reasons why the poor are more vulnerable; what are these reasons?
- Do poor economies tie in with low education rates? Does the lack of education result in being poor or does being poor limit access to education?
- High literacy rates seem to correlate with less infection; is this because of education about AIDS? If so, how can the illiterate be informed about the virus?
- Why are certain health systems more effective at controlling the epidemic?
- What specific medical resources are most effective in battling the spread of AIDS?
- If geography alone is not a factor in HIV prevalence, why is the epidemic concentrated in certain geographic areas?

All of these are questions that need to be approached in more depth to try to explain why the virus is concentrated the way it is. The information that they would reveal could then be implemented to create methods that can control the epidemic and prevent its growth.

## Appendix

Table 1. Reported AIDS Cases by Year

Country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Botswana	-	-	-	-	-	-	-	-	-	21
Thailand	-	-	-	-	-	0	1	1	7	10
Brazil	0	1	0	11	36	132	553	1148	2708	4380
France	-	-	-	34	51	127	310	688	1815	2548
US	-	-	202	738	2375	4686	8631	13057	21076	31793

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Botswana	14	133	320	590	870	968	535	1364	2335	2992
Thailand	39	107	453	1466	5713	12807	18890	23664	26000	25847
Brazil	6099	8584	1137	14345	16096	17504	18383	19222	17187	7564
France	3221	4355	4565	5141	5583	5798	5486	4840	2836	2026
US	35200	38300	45066	45629	79752	72737	69892	61109	50000	43894

Source: *Epidemiological Fact Sheets 2000*, UNAIDS/WHO

Table 2. AIDS/HIV Statistics by Country for 1999

Country	Estimated Cases	Population	Rate of Prevalence	Deaths	Death Rate
Botswana	290,000	1597000	35.8	24,000	8.28
Brazil	540,000	167998000	0.57	18,000	3.33
Thailand	755,000	60856000	2.15	66,000	8.74
France	130,000	58886000	0.43	2,000	1.54
US	320,000	275563000	0.116	16,273	5.09

Source: *Epidemiological Fact Sheets 2000*, UNAIDS/WHO

Table 3. National Wealth and Economic Indicators

Country	GNP (millions)	GNP Growth Rate	GNP Per Capita	Population below Poverty line (%)	Unemployment Rate (estimated)
Botswana	5,700	6.5	3,900	47.0	40.0
Brazil	1,057,000	0.8	6,150	17.4	7.5
Thailand	388,700	4.0	6,400	12.5	4.5
France	1,373,000	2.7	23,300	NA	11.0
US	9,255,000	4.1	33,900	12.7	4.2

	External Debt (millions)	Aid Received (millions)
Botswana	651	73
Brazil	200,000	1,012
Thailand	80,000	1,732
France	117,600	-6,300
US	862,000	-6,900

\*Negative number indicates aid donated

Source: *World Factbook 2000*, CIA

Table 4. Medical Resource Availability Indicators

Country	Overall Level		Health System		Health System	
	of Health	Ranking	Attainment	Ranking	Performance	Ranking
Botswana	32.3	187	57.4	168	0.338	169
Brazil	59.1	111	68.9	125	0.573	125
Thailand	60.2	99	80.7	57	0.807	47
France	73.1	3	91.9	6	0.994	1
US	70	24	91.1	15	0.838	37

Country	Health Expenditure per capita	% of Population Immunized for:			% of Births Attended by Trained Personnel
		DPT	Polio	Measles	
Botswana	219	82	73	80	78
Brazil	428	94	96	96	92
Thailand	327	94	94	91	71
France	2125	96	97	97	99
US	3724	95	88	90	99

Source: *World Health Report 2000*, WHO; *Epidemiological Fact Sheets 2000*, UNAIDS

Table 5. Literacy Rates by Country

Country	Overall Literacy	Male Literacy	Female Literacy	Gender Difference in
				Literacy Rates
Botswana	69.8	80.5	59.9	20.6
Brazil	83.3	83.3	83.2	0.1
Thailand	93.8	96	91.6	4.4
France	99	99	99	0
US	97	97	97	0

Source: *World Factbook 2000*, CIA

Table 6. Summary of Climate, Terrain, and Natural Hazards

Country	Climate	Terrain	Natural Hazards
Botswana	Semiarid	Flat to rolling tableland; Kalahari Desert	droughts; seasonal winds
Brazil	Tropical, some temperate in south	Flat to rolling lowlands; some mountains	droughts; flooding
Thailand	Tropical—monsoon seasons	Central plain, some mountains	droughts
France	Temperate	Flat to rolling hills Several Mt. ranges	flooding; avalanches
US	Temperate Some Tropical and Arctic	Diverse	tornadoes, hurricanes, earthquakes, tidal waves

Source: *World Factbook 2000*, CIA

Table 7. Land Use by Country

Country	Arable Land	Permanent Crops	Permanent Pastures	Forests and Woodland	Other
Botswana	1%	0%	46%	47%	6%
Brazil	5%	1%	22%	58%	14%
Thailand	34%	6%	2%	26%	32%
France	33%	2%	20%	27%	18%
US	19%	0%	25%	30%	26%

Source: *World Factbook, 2000*, CIA

## Bibliography

- Center for Disease Control. Division of HIV/AIDS Prevention.  
[www.cdc.gov/hiv/stats/hasr1201/commentary.htm](http://www.cdc.gov/hiv/stats/hasr1201/commentary.htm) (March 12, 2000).
- Central Intelligence Agency. *The World Factbook 2000*. CIA, 2000.  
[www.odci.gov/cia/publications/factbook/index.html](http://www.odci.gov/cia/publications/factbook/index.html) (March 2, 2001).
- Central Statistics Office. Botswana Government, 2000. [www.cso.gov.bw/cso/index.html](http://www.cso.gov.bw/cso/index.html)  
(March 12, 2001).
- Cohen, Jon. "The Hunt for the Origin of AIDS." *Atlantic Monthly*. Oct. 2000: 88-102.
- Common Core of Data. *Information on Public Schools and School Districts in the United States*. <http://nces.ed.gov/ccd/quickfacts.html> (March 30, 2001)
- Joint United Nations Programme on HIV/AIDS and the World Health Organization.  
*AIDS Epidemic Update: December 2000*. UNAIDS/WHO, 2000.  
[www.unaids.org/epidemic\\_update/report/index.html](http://www.unaids.org/epidemic_update/report/index.html) (March 13, 2001).
- Epidemiological Fact Sheets: 2000 Update*. UNAIDS/WHO, 2000.  
[www.who.int/emc-hiv/fact\\_sheets/index.html](http://www.who.int/emc-hiv/fact_sheets/index.html) (March 13, 2001).
- McGeary, Johanna. "Death Stalks a Continent." *Time*. 12 Feb. 2001: 36-53.
- Ministry of Education. Government of Botswana, 2000.  
[www.gov.bw/government/ministry\\_of\\_education.html](http://www.gov.bw/government/ministry_of_education.html) (March 12, 2001).
- Nelson, K. E. "Overview of the HIV/AIDS Epidemic in Thailand." *Aidsline*. National Library of Medicine. [www.aegis.com/pubs/aidsline/1998/apr/M9840079.html](http://www.aegis.com/pubs/aidsline/1998/apr/M9840079.html)  
(March 13, 2001).
- Stine, Gerald J. *Acquired Immune Deficiency Syndrome: Biological, Medical, Social, and Legal Issues*. Englewood Cliffs, NJ: Prentice Hall, 1993.
- University of California, San Francisco. "Botswana." *HIV InSite: Gateway to AIDS Knowledge*. UCSF, 2000.  
[www.hivinsite.ucsf.edu/international/africa/2098.419f.html](http://www.hivinsite.ucsf.edu/international/africa/2098.419f.html) (March 18, 2001).
- United Nations Educational, Scientific, and Cultural Organization.  
[www.unescostat.unesco.org](http://www.unescostat.unesco.org) (March 12, 2001).
- World Health Organization. *World Health Report 2000*. WHO, 2000.  
[www-nt.who.int/whosis/statistics/menu.cfm](http://www-nt.who.int/whosis/statistics/menu.cfm) (March 13, 2001).



SOUTHERN SCHOLARS SENIOR PROJECT

Name: (2493) Melissa Wyong Date: 12/6/2000 Major: International Studies

SENIOR PROJECT

A significant scholarly project, involving research, writing, or special performance, appropriate to the major in question, is ordinarily completed the senior year. The project is expected to be of sufficiently high quality to warrant a grade of A and to justify public presentation.

Under the guidance of a faculty advisor, the Senior Project should be an original work, should use primary sources when applicable, should have a table of contents and works cited page, should give convincing evidence to support a strong thesis, and should use the methods and writing style appropriate to the discipline.

The completed project, to be turned in in duplicate, must be approved by the Honors Committee in consultation with the student's supervising professor three weeks prior to graduation. Please include the advisor's name on the title page. The 2-3 hours of credit for this project is done as directed study or in a research class.

Keeping in mind the above senior project description, please describe in as much detail as you can the project you will undertake. You may attach a separate sheet if you wish:

Signature of faculty advisor [Signature] Expected date of completion Apr 15/01  
D. Parra

Approval to be signed by faculty advisor when completed:

This project has been completed as planned: yes

This is an "A" project: A

This project is worth 2-3 hours of credit: 2

Advisor's Final Signature [Signature] April 20/01

Chair, Honors Committee \_\_\_\_\_ Date Approved: \_\_\_\_\_

Dear Advisor, please write your final evaluation on the project on the reverse side of this page. Comment on the characteristics that make this "A" quality work. See attached notes.

April 20, 2001

To the Honors Committee:

Greetings,

This senior project is mostly based on statistical information compiled via internet. From my discipline what I see as relevant to this investigation are cultural issues involved in the research. Melissa tried to approach this issues by means of statistics from international and local governmental findings and analysis of those results.

I have taken in consideration the simple fact that the scope of this research is limited by many issues such as unreliable sources, and variations in the general perception of the notion of medical care in the many countries investigated. Melissa has expressed those limitations and has gone further into posing new questions as a result of this research. Her new inquiries are pointing to analysis of social structure of national collective and levels of education of the population in relation to propagation and of disease in the different countries analyzed. Although, these inquiries are far from being conclusive, her suggestions about going further in the research in order to try to find answers to a health issue of global proportions is well taken. Therefore, I believe this research paper is an "A" paper for 2 credits as a senior honors project.

As the committee reviews this paper I am sure some questions will arise. Please let me know if I or Melissa need to know about their relevance to the final grade of this investigation.

Sincerely,



Carlos Parra, Chair  
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