Determinants of Adult HIV/AIDS Prevalence in Africa: Do Cultural Variations Matter?

Gizachew Tiruneh
University of Central Arkansas

This paper examines the relationship between several social, economic, political, cultural, and regional factors and the adult HIV/AIDS prevalence in Africa. More specifically, I investigate the impact of education, economic development, regime type, culture, and region on the AIDS epidemic. I employ ordinary least square (OLS) estimators to test the foregoing relationship in 47 African countries for 2004 adult HIV/AIDS prevalence data. I find that the most important factors that affect the adult HIV/AIDS prevalence in Africa are cultural and regional variations. More specifically, using religion type as a proxy for cultural differences, I find that being a Christian and living in southern Africa and being a Muslim and living in northern Africa account for most of the variation in the adult HIV/AIDS prevalence in Africa.

Introduction[1]

According to the UNAIDS, over 37 million people had been infected by the Human Immuno-deficiency Virus (HIV) by the end of 2003. This virus causes a deadly disease known as Acquired Immune Deficiency Syndrome (AIDS). Almost all countries worldwide are affected by the HIV infection. What makes AIDS potent is that it can spread very quickly by attacking the very defense of human beings, their immune systems (Grmek, 1990; Hunt, 1989; Webb, 1997). Since the detection of the AIDS virus in the early 1980s, more than 20 million people have died worldwide (UNAIDS, 2004).

The HIV/AIDS epidemic has at least two major patterns of transmission, Pattern One and Pattern Two. Patten One refers to the spread of the virus through homosexual activities. This pattern exists mainly in the United States, Europe, and Australia. Drug injection is also believed to contribute to the spread of HIV in Pattern One regions. Pattern Two, on the other hand, refers to the transmission of the virus primarily through heterosexual activities. The regions highly affected by

[1] An earlier version of this paper was presented at the Southern Political Science Association Annual Meeting, January 5-7, 2006, Atlanta, Georgia. I would like to thank Clay Arnold, Michelle Dion, Mark Mullenbach, and the anonymous reviewers for their valuable comments. I would also like to acknowledge my student, Christina Guillen, in my African political systems class in the Spring of 2003 semester at the University of Georgia for her insightful remark on the topic I address in this paper. More specifically, she stated, during her class presentation, that Morocco's low HIV/AIDS rate might be due to the country's Muslim tradition. After Christina's insight, I and the class were, during subsequent (weekly) presentations, able to observe similar patterns in other countries; predominantly Muslim African countries had less HIV/AIDS cases than predominantly Christian ones.

Pattern Two are sub-Saharan Africa, Latin America, and some parts of Asia (Hunt, 1989; Hunt, 1996; Webb, 1997; UNAIDS, 2004).

The Human Immuno-deficiency Virus has also two major types, HIV-1 and HIV-2. Although HIV-2 is the older version of the virus (Grmek, 1990), it is rarer and causes much fewer infections (Buvé, Bishikwabo-Nsarhaza, & Mutangadura, 2002). It is the HIV-1 strain that has spread so quickly worldwide, including in sub-Saharan Africa. Because of HIV's immense genetic variation (evolves continuously), attempts by the scientific community to develop a successful vaccine for the virus have not succeeded (Nabel, 2002; UNAIDS, 2004). The antiretroviral medicines available today, at best, prolong – they do not cure – the lives of those infected with the HIV/AIDS, and the cost of such drugs has been a major problem particularly for poorer countries (UNAIDS, 2004).

The region highly affected by the HIV/AIDS epidemic is sub-Saharan Africa; about 25 million people, or 66 percent of the world's HIV/AIDS prevalence rate, live with the disease in this region (see also UNAIDS, 2004). Ten million young people between the ages of 15 and 24 and almost 3 million children under 15 live with HIV (Brummer, 2002). Over 50 percent of the people infected with HIV are located in Eastern and Southern Africa alone (Caldwell, 2000). Southern Africa in particular is considered the epicenter of the global HIV/AIDS epidemic: countries like South Africa, Botswana, Zimbabwe, and Swaziland have the highest HIV/AIDS rates in the world (Brummer, 2002). In South Africa alone five million people, about ten percent of the country's population, are infected with HIV (Lurie, Williams, Zuma, Mkaya-Mwamburi, Garnett, & Sweat, 2003).

This paper addresses the following question: what factors best explain the variation in the level of adult HIV/AIDS prevalence in Africa? Most of the research on this topic employs case studies of one or more African countries. The relatively few cross-national studies employ either single-variable models or address only a portion of Africa. This paper contributes to our understanding of the HIV/AIDS epidemic on the African continent by conducting a multivariate cross-national analysis.[2] Unlike the previous research, this study analyzes the adult HIV/AIDS prevalence rates in both northern and sub-Saharan Africa, because only by addressing both regions can one isolate the factors that explain the much lower rates of infection in northern Africa. My contention is that in the Islamic societies of northern Africa, legal and moral restrictions on sexual activities reduce the adult prevalence rates in that region. In contrast, I argue that cultural and social norms in the predominantly Christian societies of southern Africa tend to be less prohibitive and more tolerant of various kinds of sexual activity, leading to the rapid spread of

[2] Six of Africa's six smallest countries, Cape Verde, Comoros, Djibouti, Equatorial Guinea, Sao Tome, and Seychelles, which lack adequate data are, however, not included in this study.

AIDS in this region. In addition, following previous research, this study tests the effects of several social, political, and economic variables on Africa's adult HIV/AIDS prevalence (Hunt, 1996; Webb, 1997; Brummer, 2002). More specifically, I test the effects of education, economic development, and regime type on the level of adult HIV/AIDS prevalence in Africa. I also control for healthcare expenditures, political instability, region, and previous adult HIV/AIDS prevalence rates.

I find that the most important factors that affect the adult HIV/AIDS prevalence in Africa are cultural and regional variations. More specifically, using religion type as a proxy for cultural differences, I find that being a Christian and living in southern Africa and being a Muslim and living in northern Africa account for most of the variation in the prevalence rates in Africa.

Theories of HIV/AIDS Prevalence

It is now clear that the single cause of the worldwide AIDS epidemic is HIV (Webb, 1997; Hunt, 1996). This disease has spread more rapidly in sub-Saharan Africa than in any other region or continent. For instance, in South Africa, the HIV-1 prevalence rates in 1990 and 2001 were 0.76 percent and 24.8 percent, respectively (Lurie et al. 2003). The question is why? More often than not, many people in sub-Saharan Africa do not fully understand the connection between unsafe sexual practices and sexually transmitted diseases (Brummer, 2002). Thus, lack of education seems to contribute to the spread of the HIV infection, since less educated migrant workers in particular and less educated populous of a given society in general are likely to practice unsafe sex (Zellner, 2003; Buvé et al., 2002; Philipson & Posner, 1995; Macheke & Campbell, 1998). For instance, Brockerhoff & Biddlecom (1999) find that persons with higher education in Kenya are likely to avoid risky sexual behavior. In addition, Zellner (2003) finds that having a secondary or higher education in Cote d'Ivoire significantly increases the odds of condom use in that country.

H1: The higher the level of education in an African country, the lower the level of adult HIV/AIDS prevalence.

Yet, education or awareness of the HIV/AIDS epidemic may not necessarily be a sufficient reason for practicing safe sex. The practice of unsafe sex, and hence the spread of the HIV infection, is likely to be affected by the level of economic development of a given country. More generally, the richer a country is, the higher the chances that it will prevent and resist the spread of HIV/AIDS (see also Brummer, 2002; Buvé et al., 2002; Brockerhoff & Biddlecom, 1999; Philipson & Posner, 1995; UNAIDS, 2004).

H2: The higher the level of economic development in an African country, the lower the level of adult HIV/AIDS prevalence.

The fact that the adult HIV/AIDS prevalence is higher in relatively richer countries in southern Africa, like South Africa and Botswana, however, suggests that it is not wealth of a country per se that matters in controlling the epidemic but whether or not political leaders are willing to use their resources effectively to combat the disease (Price-Smith et al., 2004; Buvé et al, 2002; UNAIDS, 2004). Perhaps, the more democratic a country is, the more responsive the leadership will be in the prevention of the epidemic. Yet, even in Uganda, a one-party state, the leadership has been effective in raising the level of AIDS awareness and reducing the impact of the epidemic (see also UNAIDS, 2004; Buvé et al., 2002; Price-Smith et al., 2004). Uganda had one of the highest rates of HIV infections in the early years of the epidemic but has reduced its adult HIV/AIDS prevalence rate to 4.1 percent. In contrast, the democratic states of Botswana and South Africa have two of the highest adult HIV/AIDS prevalence rates in Africa (37.3 percent and 21.5 percent, respectively). Thus, it may not be regime type per se that matters but perhaps leadership that makes the fight against AIDS a priority. In general, however, a relatively effective and responsive leadership is expected to exist in democratic countries (see also UNAIDS, 2004). Thus, we need to account for the variation in regime type to test whether or not this variable influences the level of adult HIV/AIDS prevalence in Africa.

H3: The more democratic an African country is, the lower the level of adult HIV/AIDS prevalence.

Another factor that may affect the spread of HIV/AIDS is cultural variation. For instance, do cultural norms in predominantly Muslim and Christian countries contribute to the spread of the epidemic? If one considers the predominantly Muslim societies of northern Africa (Algeria, Egypt, Libya, Mauritania, Morocco, Sudan, and Tunisia), where the adult HIV/AIDS prevalence is less than one percent, one may assume that being a Muslim reduces the chances of getting the HIV infection. The reasons for the low prevalence of the epidemic in this region seem to be the presence of cultural and religious prohibitions against pre- and extramarital sex and the curtailment of prostitution (Zuhur, 2005). For instance, if a woman is caught in an adulterous activity in a predominantly Muslim society, she could be killed by one or more members of her family (Zuhur, 2005). In Islamic cultures, such “honor killings” restore the social norms of sexuality and dignity of the family. According to Zuhur (2005: 19), shariah prohibitions against adultery and fornication are enforced by the state, and punishments for adultery include whipping and stoning. Similarly, Gray (2004) finds that being a Muslim in sub-Saharan Africa contributes to the low prevalence rates of HIV/AIDS in that region. According to Gray’s (2004) review of the literature, the Islamic tradition, besides the prohibition of sex outside of

marriage, forbids the consumption of alcohol and fosters male circumcision. Whereas alcohol consumption may encourage unsafe sex, the foreskin of the uncircumcised males tends to trap the virus, thereby facilitating the transmission of the infection.

On the other hand, the Christian religion prevails in southern Africa. Although Christianity condemns prostitution and pre- and extramarital sex, there is far less enforcement of these views by either the state or society (see also Caldwell, 2000; Brockerhoff & Biddlecom, 1999). For instance, if a person is engaged in adulterous act (which is considered morally wrong), he or she is not necessarily considered as a pariah by family members, friends, or neighbors. Pre-marital sexual activity is also common and is not a punishable crime in predominantly Christian countries of Africa.

H4: The more Christians living in an African country, the higher the level of adult HIV/ AIDS prevalence.

H5. The more Muslims living in an African country, the lower the level of adult HIV/AIDS prevalence.

Research Design and Model Specification

I employ ordinary least squares (OLS) regression to estimate the models specified in this paper. More specifically, I rely on a panel, cross-sectional, research design to test the impact of several socioeconomic, political, cultural, and regional variables on the adult HIV/AIDS prevalence rates in 47 African countries for 2004.[3] This panel design relies on the 1997 adult HIV/AIDS prevalence rates to determine

[3] One other variable that may be responsible for the prevalence of the epidemic in southern Africa is migrant labor (Hunt, 1989; 1996; Webb, 1997; Lurie, 2000; Lurie et al., 2003; Lydié, Robinson, Ferry, Akam, Loenzien, & Abega, 2004; Grmek, 1990; Philipson & Posner, 1995; Brummer, 2002; Decosas, Kane, Anarfi, & Sodji, 1995). Southern African countries, such as Botswana, South Africa and Zambia, are well known for their rich mineral deposits, including gold, diamond, and copper. Workers from these and neighboring countries migrate to mining areas in search of jobs. There were, for instance, about 2.5 million legal migrants working in South Africa alone (Lurie et al., 2003). These workers are mostly males who, because of the harsh mining environment, leave their wives and children behind. Because these male workers are separated from their spouses, they satisfy their sexual desires by sleeping with prostitutes (Brockerhoff & Biddlecom, 1999; see also Lydié et al., 2004). Prostitutes who are infected with HIV transmit the virus to these migrant workers, and when the workers return to their villages or towns, they in turn transmit the virus to their wives or girl friends (Brummer, 2002; Lurie et al., 2003; Brockerhoff & Biddlecom, 1999; Decosas et al., 1995). However, although migrant labor may have been a catalyst for the transmission of the HIV infection (Brummer, 2002), it is not necessarily the underlying cause for the spread of the epidemic. It is, rather, the practice of unsafe sex that spreads the epidemic. Moreover, although migrant laborers may have played a major role in the spread of the epidemic in the early years of the disease, it may not be so in recent times because the infection has now spread to the general population (Brummer, 2002; Lurie, 2000). Nonetheless, because of lack of adequate data on migrant labor, the impact of this variable on adult HIV/AIDS prevalence is not tested in this paper.

the presence of change (increase or decrease) in the 2004 adult HIV/AIDS prevalence data.

The adult HIV/AIDS prevalence, the dependent variable, refers to the percent of infected populations between the ages of 15 and 49.

I measure education by the literacy rate. The literacy rate refers to the percent of the population, which can read and write and is 15 years or older. This variable will be called EDUCATION hereafter. Economic development or wealth is measured by the gross domestic product per capita (GDP/C). It is adjusted for purchasing power parity and inflation. It is also logged since doing so captures much more variation in the dependent variable. This variable will be called ECONOMIC DEVELOPMENT hereafter.

I use the Freedom House democracy data to measure regime type. Freedom House defines democracy as a concept with two major attributes, political rights and civil liberties. Political rights refer to fair and free electoral competition, the right to vote, and the presence of multiple political parties. Civil liberties include freedom of speech, free press, and due process (Gastil, 1991). This democracy index is based on two 7-point scales, one for the political rights dimension and another for civil liberties. Thus, two countries with scores of 2 and 14, after combining the scores of the two dimensions, would be rated 'high' and 'low' democracies, respectively. However, I will reverse the democracy score polarity in this study for ease of interpretation. Thus, countries with lower scores will be considered least democratic or highly authoritarian and countries with higher scores least authoritarian or relatively democratic.[4] This variable will be called REGIME TYPE hereafter.

I use religion type, Christianity and Islam (the two major religions in Africa), as a proxy of cultural variations on the African continent. I measure religion by the percentage of Christians and Muslims in each country.[5] These variables will be called CHRISTIANITY and ISLAM hereafter.

Control Variables

[4] The Freedom House and other democracy indices like Polity IV fail to provide differential scores between countries that have been democratic for several decades and for the ones that have just established democratic rule. Thus, Great Britain and Sweden (older democracies) are rated equally or almost equally with newer democracies like Mali and Namibia (see Tiruneh, 2004b, for an in-depth analysis on the dynamics of democracy). Given that there have been only two or three older democracies in Africa (such as Botswana and Mauritius), however, the Freedom House data will fairly approximate the relationship between regime type and adult HIV/AIDS prevalence in this study.

[5] The existence of more than two religions or belief systems (including paganism and Judaism) in the southern and northern regions of Africa makes it possible to specify two separate religion variables without multicollinearity problems. Moreover, paganism is not, in an analysis not shown here, related to the epidemic.

Although richer countries are expected to spend more on the control and prevention of the epidemic, I control for healthcare expenditures of African governments. However, data on expenditures on the epidemic are not available; thus, I assume that the higher the healthcare expenditures, the higher the money spent on HIV/AIDS. This variable will be called HEALTHCARE hereafter.

Moreover, although democratic regimes tend to be politically stable and REGIME TYPE may be used as a good proxy for political stability and instability (see also Tiruneh, 2006), I control for political instability in this study. Some scholars have argued that political instability, including civil wars and violence, impacts the HIV infection in Africa. Buvé et al. (2002), for instance, argue that during civil wars and conflicts, civilians (due to displacement and lack of sufficient income) are subjected to human rights abuses, including to sexual violence and prostitution. These conditions are, according to these authors, conducive to the spread of the HIV infection. However, others contend that civil wars might actually slow down the spread of the HIV infection. For instance, the early 1990s civil war in Sierra Leone prevented cross-border migration and trade, somewhat insulating the country from the growing epidemic in western Africa (UNAIDS, 2004). This variable will be called POLITICAL INSTABILITY hereafter.

If the cultural thesis is correct, one also needs to take into account whether or not contiguity or being in the same region of Africa affects the level of adult HIV/AIDS prevalence. For instance, southern Africa and northern Africa are predominantly Christian and Muslim, respectively. Thus, these regions are expected to influence the adult HIV/AIDS prevalence rates. In contrast, other regions, namely, eastern, western, and central Africa may have little or no impact on the epidemic. This is because in these regions, the proportion of Christians, Muslims, and indigenous belief systems is almost even, and such a scenario will likely lead to the insignificance of the religion variables. The region variables will be called SOUTHERN, NORTHERN, EASTERN, CENTRAL, and WESTERN hereafter.[6]

This study uses a panel research design. More specifically, I examine whether or not the 1997 adult HIV/AIDS prevalence rates affect the 2004 adult HIV/AIDS prevalence data. This variable will be called HIV/AIDS-1997 hereafter.

Interactive Variables

Assuming that some of the foregoing factors may have multiplicative effects on the HIV/AIDS epidemic, I have specified interactive variables. For instance,

[6] The African Development Bank divides Africa into five regions: western, northern, eastern, central, and southern Africa (see Berthélemy, Kauffmann, Valfort, & Wegner, 2004). I follow the foregoing specification in this paper (see Appendix A).

Southern Africa has a huge Christian population, suggesting that Christianity's influence on the epidemic may be strongly shaped by the southern region (SOUTHERN); thus, I interact CHRISTIANITY with SOUTHERN; this variable will be called CHRISTIANITY X SOUTHERN hereafter. Similarly, I interact the northern region (NORTHERN), which is predominantly Muslim, with Islam; this variable will be called ISLAM X NORTHERN hereafter. In other words, by interacting Christianity with the southern region (Christianity X 1, if a country is in the southern region) and Islam with the northern region (Islam X 1, if a country is in the northern region), I intend to control for the two regions' predominantly Christian and Muslim populations, respectively. Moreover, I create two additional interactive variables to see if in fact the region variables, SOUTHERN and NORTHERN, condition the impact of minority religions, ISLAM and CHRISTIANITY, on the epidemic in the predominantly Christian south and Muslim north of Africa, respectively. These variables will be called ISLAM X SOUTHERN and CHRISTIANITY X NORTHERN hereafter.

Model Estimation and Analysis

As noted earlier, I employ ordinary least squares (OLS) regression to test the relationship between my independent and dependent variables.[7] The HIV/AIDS data for the northern region are skewed since each of the seven northern African countries has a very small, less than one percent, adult HIV/AIDS prevalence rate. To account for these skewed data, I log the adult HIV/AIDS prevalence data. I also use WESTERN (the least likely region to influence adult HIV/AIDS prevalence) as the baseline variable in all of the models in Table 1. In Model 1, I examine the impact of the additive variables on Africa's adult HIV/AIDS prevalence rates. The NORTHERN and HIV/AIDS-1997 variables are statistically significant at the 0.10 and 0.05 levels, respectively. The rest of the variables are insignificant.

In Model 2, I include the two major interactive variables, CHRISTIANITY X SOUTHERN and ISLAM X NORTHERN. The CHRISTIANITY, ISLAM, HIV/AIDS-1997, and CHRISTIANITY X SOUTHERN variables are statistically

[7] The data for EDUCATION, CHRISTIANITY, and ISLAM are collected from the CIA World Factbook web site. The data for the 2004 adult HIV/AIDS prevalence are from the CIA World Factbook web site and UNAIDS. The ECONOMIC DEVELOPMENT and HEALTHCARE data are from the World Development Indicators / the World Bank, 2005. The REGIME TYPE data are from Freedom House, 2004. The HIV/AIDS-1997 data are from the World Development Indicators / the World Bank, 1999. The POLITICAL INSTABILIITY data are from Tiruneh (2006). Tiruneh has constructed these data by conducting a content analysis. He assumes that civil war and military coups / uprisings are two major attributes of political instability in Africa, and coded the POLITICAL INSTABILITY variable whenever he observed the occurrence of civil wars and military coups / uprisings circa the year 2000. More specifically, he specifies POLITICAL INSTABILITY as a dichotomous variable: that is, he assigns a country a 1 whenever a civil war or a military coup / uprising occurred and a 0 otherwise (see Appendix C).

significant at the 0.05 level. The SOUTHERN variable is also significant but at the 0.10 level. The rest of the variables are insignificant. Further analysis of the data in Model 2, however, indicates the presence of a multicollinearity problem. More specifically, the correlations between SOUTHERN and CHRISTIANITY X SOUTHERN and between NORTHERN and ISLAM X NORTHERN are 0.97 AND 0.99, respectively. According to Gujarati (1995:341), one way of handling a multicollinearity problem is to drop one or more of the variables from a model.

Model 3 shows the outcome of the analysis when the SOUTHERN and NORTHERN variables are excluded from Model 2.[8] The CHRISTIANITY and ISLAM variables are, however, included here and in the rest of the models because the correlations between CHRISTIANITY and CHRISTIANITY X SOUTHERN and between ISLAM and ISLAM X SOUTHERN are 0.57 and 0.64, respectively. In this model, the HIV/AIDS-1997 and the CHRISTIANITY X SOUTHERN variables remain significant. Interestingly, ISLAM X NORTHERN now becomes significant, and CHRISTIANITY and ISLAM become insignificant, implying that the reason the former variable was not significant and the latter two variables were significant in Model 2 was due to a multicollinearity problem. As Gujarati (1995:333) argues, a multicollinearity problem could lead slopes to change signs and could make one or more of the variables statistically insignificant or significant. The rest of variables, in Model 3, are insignificant.

In Model 4, I replace CHRISTIANITY X SOUTHERN and ISLAM X NORTHERN (the two main interactive variables) with ISLAM X SOUTHERN and CHRISTIANITY X NORTHERN. Note that the latter two interactive variables are intended to gauge the impact of minority religious traditions on the levels of adult HIV/AIDS prevalence in the predominantly Christian south and Muslim north regions, respectively. The SOUTHERN and NORTHERN variables are not excluded from this model since the correlations between these variables and their interactive counterparts are not very high (0.60 and 0.64, respectively). I find that the two interactive variables are statistically insignificant. The only two variables significant in this model are SOUTHERN and HIV/AIDS-1997.

Model 5 through Model 8 show the results for the best possible models. In other words, I select and analyze the variables that have shown significance in one or more of the previous models. These variables are CHRISTIANITY, ISLAM, HIV/AIDS-1997, SOUTHERN, NORTHERN, CHRISTIANITY X SOUTHERN, and ISLAM X NORTHERN. In Model 5, I show the impact of the additive variables on the adult HIV/AIDS prevalence rates in Africa. The SOUTHERN, NORTHERN, and

[8] Of course, dropping variables from a model could lead to specification bias (Gujarati, 1995: 341), making such a practice not always very optimal.

Table 1: OLS Estimates of 8 Models (M); Dependent Variable: Adult HIV/AIDS prevalence (2004)

	M1	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**
	B	B	B	B	B	B	B	B
Intercept	1.90**	2.63**	2.20**	1.93**	1.82**	2.06**	1.92**	2.19**
	(0.49)	(0.51)	(0.48)	(0.51)	(0.25)	(0.26)	(0.24)	(0.28)
EDUCATION	0.001	0.0004	0.0002	-0.001	•	•	•	•
	(0.01)	(0.004)	(0.004)	(0.01)				
ECONOMIC DEVELOPMENT	-0.004	-0.01	-0.01	-0.02	•	•	•	•
	(0.03)	(0.02)	(0.03)	(0.03)				
REGIME TYPE	-0.004	-0.03	-0.02	0.01	•	•	•	•
	(0.02)	(0.02)	(0.02)	(0.03)				
CHRISTIANITY	-0.001	-0.01**	-0.01	0.001	0.0002	-0.01	-0.002	-0.0001
	(0.004)	(0.01)	0.01)	(0.01)	(0.004)	(0.004)	(0.004)	(0.004)
ISLAM	-0.004	-0.01**	-0.01	-0.01	-0.003	-0.01	-0.004	-0.01
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)
HEALTHCARE	0.01	-0.01	0.0001	0.03	•	•	•	•
	(0.06)	(0.06)	(0.06)	(0.07)				
POLITICAL INSTABILITY	-0.05	-0.09	-0.08	-0.07	•	•	•	•
	(0.14)	(0.13)	(0.20)	(0.15)				
SOUTHERN	0.42	-1.13*	•	•	0.45**	-0.73	•	•
	(0.27)	(0.57)			(0.17)	(0.53)		
NORTHERN	-0.43*	-0.65	•	•	-0.41**	-0.25	•	•
	(0.24)	(1.19)			(0.18)	(1.11)		
EASTERN	-0.23	-0.08	-0.08	-0.41**	•	•	•	•
	(0.21)	(0.20)	(0.20)	(0.20)				
CENTRAL	0.11	0.24	0.26	-0.10	•	•	•	•
	(0.21)	(0.20)	(0.20)	(0.19)				
HIV/AIDS-1997	0.05**	0.05**	0.05**	0.06**	0.05**	0.05**	0.05**	•
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
CHRISTIANITY X SOUTHERN	•	0.03**	0.01**	•	•	0.02**	0.01**	0.01**
		(0.01)	(0.004)			(0.01)	(0.002)	(0.002)
ISLAM X NORTHERN	•	0.002	-0.01**	•	•	-0.002	-0.004**	-0.01**
		(0.01)	(0.002)			(0.01)	(0.002)	(0.002)
ISLAM X SOUTHERN	•	•	•	-0.01	•	•	•	•
				(0.02)				
CHRISTIANITY X NORTHERN	•	•	•	-0.04	•	•	•	•
				(0.05)				
N:	47	47	47	47	47	47	47	47
R-Squared	0.84	0.88	0.86	0.82	0.82	0.85	0.84	0.75

**: $p < 0.05$; two-tailed test; Bs are unstandardized betas; standard errors in parentheses

HIV/AIDS-1997 variables are statistically significant at the 0.05 level, but CHRISTIANITY and ISLAM are insignificant.

I include the interactive variables with the additive ones in Model 6. The only two variables that are significant at the 0.05 level are HIV/ADIS-1997 and CHRISTIANITY X SOUTHERN.

Recalling the multicollinearity issue I have dealt with between Models 1 and 4, I exclude the SOUTHERN and NORTHERN variables from Model 7. Both CHRISTIANITY X SOUTHERN and ISLAM X NORTHERN become statistically significant at the 0.05 level. In addition, the HIV/AIDS-1997 remains significant. The additive variables, CHRISTIANITY and ISLAM, are, however, insignificant.

Finally, in Model 8, I exclude the HIV/AIDS-1997 variable to show the impact of the cultural and regional variables on the adult HIV/AIDS prevalence. Whereas the CHRISTIANITY X SOUTHERN and ISLAM X NORTHERN variables are significant at the 0.05 level, CHRISTIANTIY and ISLAM are not.[9] The variables in Model 8 explain 75 percent of the variance in the adult HIV/AIDS prevalence in Africa.[10]

Discussion of Results

A major finding of this paper is that cultural and regional variables impact the level of HIV/AIDS prevalence in Africa. On the other hand, economic and sociopolitical variables (such as EDUCATION, ECONOMIC DEVELOPMENT, and REGIME TYPE) do not seem to have any effect on the prevalent rates of the HIV infection. We should be cautious when interpreting the foregoing statement, however. Higher levels of education and economic development are, indeed, very

[9] The magnitudes of the slopes for some of the variables are small throughout the models due mainly to the fact that the dependent variable is logged.

[10] As stated earlier, scholars have argued that male circumcision helps to impede the spread of the HIV infection. It is further argued that a significant number of countries in southern, western, central, and eastern Africa have value systems that do not promote male circumcision (Moses, Bradley, Nagelkerke, Ronald, Ndinya-Achola, & Plummer, 1990; Webb, 1997; Caldwell, 2000; Gray, 2004). Bongaarts, Reining, Way, & Conant (1989), for instance, find that circumcision affects the HIV/AIDS epidemic in the capital cities of 37 African countries. In analyses not shown here, I use Bongaarts et al.'s (1989) data to test whether male circumcision in the capital cities of African countries impacts HIV/AIDS in Africa. I find that although the circumcision data show a statistically significant correlation with adult HIV/AIDS prevalence, they fail to do so when included in multivariate models. I have elected not to include the male circumcision variable in my analyses for it will lead to a significant drop in the units of observation or the number of countries; the data also do not accurately represent the populations of the 37 countries. In analysis not shown here, I also test whether Gray's (2004) finding that Islam has a negative relationship with sub-Saharan Africa's adult HIV/AIDS prevalence holds; sub-Saharan Islam data were correlated with adult HIV/AIDS prevalence but were not statistically significant in multivariate analyses.

essential in controlling and preventing an epidemic like AIDS. A plausible explanation for the lack of significance for the foregoing variables is that in sub-Saharan Africa, particularly in the southern region, the epidemic seems to have caught both governments and their respective societies unprepared. Indeed, most of the countries in the southern Africa have relatively educated citizenry and wealthy economies on the continent. Countries like Botswana have had the resources needed to fight the epidemic. Zimbabwe has Africa's highest literacy rate, 90 percent of its population can read and write, but this country has one of the highest HIV/AIDS prevalence rates (24.6 percent) in Africa. There seems to have been no effective plan to control and prevent the spread of the HIV infection in southern Africa. The leadership in this region seems to have failed to teach its respective society how to control and prevent the epidemic (see also Caldwell, 2000; UNAIDS, 2004). A cross-national study that includes all or most countries of the world will most likely find that higher levels of education and economic development are related to lower levels of the HIV infection. For instance, Price-Smith, Tauber, & Bhat (2004) report that higher level of socioeconomic development (or state capacity) leads to lower adult HIV/AIDS prevalence rates in 50 randomly selected countries. In addition, the low HIV infection rates in highly developed countries imply that education and wealth are essential in controlling and preventing the epidemic.

Moreover, although REGIME TYPE shows a positive and significant correlation with the HIV/AIDS data ($r = 0.39$; $p < 0.05$), it seems, when included in multivariate models, to have no real effect on the spread of the HIV infection in Africa. Indeed, the case of Botswana suggests that a country that has been a relatively stable democracy and that has had a competent civil service (see Tiruneh, 2004a) in Africa has failed to control the spread of the epidemic. As the case of Uganda, a less democratic country, suggests, it is perhaps the real concern and effectiveness of leaders, not necessarily their predisposition to democracy, that matter. This does not mean, however, democrats are inherently ineffective in preventing the epidemic in Africa or elsewhere; it may only imply that African democratic leaders have failed in this instance or were unaware of the potency and the magnitude of the HIV infection, at least at the initial stages of the epidemic.

The CHRISTIANITY and ISLAM variables have (with the exception of when SOUTHERN and NORTHEN are included in models) shown insignificant results. A plausible reason why CHRISTIANITY and ISLAM are not significant (when not interacted with their respective region counterpart) is that African regions, unlike the dominancy of Christianity in the south and Islam in the north, possess plural religious and cultural values. More specifically, religious and cultural diversity in EASTERN, CENTRAL, and WESTERN seem to lead to the overall decreased impact of CHRISTIANITY and ISLAM on the continent's epidemic.

The HEALTHCARE variable is insignificant in all of the models. However, as in the cases of EDUCATION and ECONOMIC DEVELOPMENT, African governments' expenditures on the epidemic may have come too late to make a huge difference in the reduction of the adult HIV/AIDS prevalence rates.

Moreover, the POLITICAL INSTABILITY variable, although has consistently shown a negative sign, is not statistically significant in any of the models. Thus, although political instability does not necessarily foster the spread of AIDS, it does not seem to help in controlling the epidemic.

The SOUTHERN and NORTHERN variables show some statistically significant effects on the epidemic but the other regions do not. This is particularly surprisingly for the EASTERN variable since it has the second highest prevalence rate, 20 percent, in Africa (see Appendix B). Moreover, CENTRAL, EASTERN, and WESTERN, when interacted with religion, do not (in analyses not shown here) show any statistical significance. A plausible explanation for this may be due to the fact that several of the countries in these regions have a greater mix of Islam, Christianity, and indigenous religions and value systems than those in the southern and northern Africa.

In addition, the positive sign and the consistent significance of the HIV/AIDS-1997 data indicate that the epidemic has been spreading on the African continent since 1997; when effective action is not taken by governments and their respective societies (as has been the case in most of sub-Saharan Africa), past adult HIV/AIDS prevalence seem to foster current adult HIV/AIDS prevalence.

The CHRISTIANITY X SOUTHERN and ISLAM X NORTHERN variables have (especially when SOUTHERN and NORTHER are excluded) consistently shown significance in this study. Southern Africa is predominantly Christian and the southern region is highly infected with the epidemic; so it is not surprising that CHRISTIANITY X SOUTHERN has a significant effect on the HIV infection. However, it is not be being a Christian per se that seems to foster the spread of the epidemic. For instance, the predominantly Christian Western European and North American societies have one of the lowest HIV infections in the world. The clue to this puzzle is found when we compare southern Africa with northern Africa. The northern African societies are predominantly Muslim, and they have strict religious and legal prohibitions to pre- and extra marital sex. As a result, the average HIV infection rate in northern Africa is as low as the HIV infection rates in Western European and North American societies. It is interesting to note that of the seven northern African countries, the Sudan (a country that has a significant black population) has the highest HIV/AIDS infection. Of the 456,600 people who live with the HIV infection in northern Africa, 400,000 of them are Sudanese nationals. And the epidemic is most severe in the southern part of Sudan (UNAIDS, 2004),

where the majority of the population is non-Muslim black. In addition, in Nigeria, where the population of Muslims and Christians is almost equal, the HIV/AIDS prevalence seems to be higher in states that are predominantly Christian than those states which are predominantly Muslim. According to Mack (2006), "[a]ll of the states with an HIV prevalence rate above 6% are in the Christian area of the country [Nigeria]. The prevalence rates within Muslim states [of Nigeria], on the other hand, generally fall between 2-4%." The foregoing cases support my assumption that religion is a *good* proxy of cultural variations on the African continent.

In southern Africa, however, although Christianity prohibits pre- and extra marital sex, there is no legal enforcement to such practices. The institution of commercial sex, which facilitates the spread of AIDS, is also prevalent in southern Africa. Thus, pre- and extra marital sexual relations are not uncommon in this region (see also Zellner, 2003). Therefore, it is perhaps the less prohibitive nature of the social and cultural norms of southern Africans that facilitates the spread of the epidemic in this region (see also Caldwell, 2000; Brockerhoff & Biddlecom, 1999). In other words, the CHRISTIANITY variable serves only as a proxy for the cultural values and norms of southern Africa. Indeed, the CHRISTIANITY variable, although insignificant, has shown a consistent negative sign in all of the models except in one, providing some credence to the foregoing statement. The statistical insignificance of ISLAM X SOUTHERN and CHRISTIANITY X NORTHERN (the two interactive variables that stand for minority religious traditions in southern and northern Africa, respectively) further suggests that religion by itself may have little or nothing to do with the adult HIV/AIDS prevalence in Africa. In other words, in the absence of social and legal enforcements, Islam will not likely curtail the spread of AIDS, and Christianity by itself does not seem to foster the spread of AIDS. Put differently, the dominant value systems of northern and southern Africa seem to affect the minority value systems of these regions. For instance, the curtailment of prostitution in northern Africa may have benefited the Christians of that region from contracting AIDS, and the less prohibitive social and cultural environment of southern Africa may have denied an extra advantage to the Muslims of this region in preventing AIDS. In sum, religion in the African context seems to be *only* a proxy of the general cultural phenomena in the region.

Conclusions

This study examined the effects of several social, economic, political, cultural, and regional variables on adult HIV/AIDS prevalence in Africa. I found that the most important factors that impact the epidemic are the interactions of Christianity and the southern region and Islam and the northern region. Moreover, the southern and northern African regions showed some statistically significant effects on the epidemic. Indeed, the cultural and regional variables explain about 75 percent of the variance in the epidemic in Africa. On the other hand, the western, central, and

eastern African regions, as well as the social, economic, and political variables showed little or no significance.

And although the independent variables analyzed in this study accounted for up to 88 percent of the variance in the epidemic, there seem to be other predictors that should be included in such a study. For instance, one could control for the level of commercial sex in African countries. Countries that have a significant number of prostitutes are likely to have higher rates of the HIV infection (see also Gmrek, 1990; Philipson & Posner, 1995; UNAIDS, 2004). Clearly, commercial sex is a facilitator or spreader, not a cause, of AIDS; what causes AIDS is HIV, the virus.

Thus, health officials and office holders must teach the people of sub-Saharan Africa how to avoid and control the viral infection (see also Gmrek, 1990). Indeed, it can be argued that the underlying reason that has led southern African societies to have had a higher level of HIV infection than any other region in the world may have been their unawareness and/or misjudgment of the potency of the HIV infection. Both governments and their respective societies seemed, at least early on, to have been caught unprepared by the deadly virus. Without the full awareness of the potency of the HIV infection, the relatively lax sexual norms of southern societies seemed to have been the most favorable environment for the spread of the AIDS disease. Thus, as Caldwell (2000; see also Brockerhoff & Biddlecom, 1999; Brummer, 2002; Buvé et al., 2002; Macheke & Campbell, 1998; UNAIDS, 2004) argues, what matters the most in the fight against AIDS is to change the sexual behavior of societies, particularly the encouragement of safe sex. Preventive ideas seem to be fundamental in the fight against the viral attack. Special attention, including the availability of condoms and the practice of abstinence, needs to be paid to teenagers, who may be tempted to engage in risky sexual activities. Southern Africa in particular and sub-Saharan Africa in general need good leadership – as well as a great deal of foreign assistance – to design, implement, and enforce preventive measures, so that the HIV/AIDS epidemic is successfully resisted and eventually defeated.

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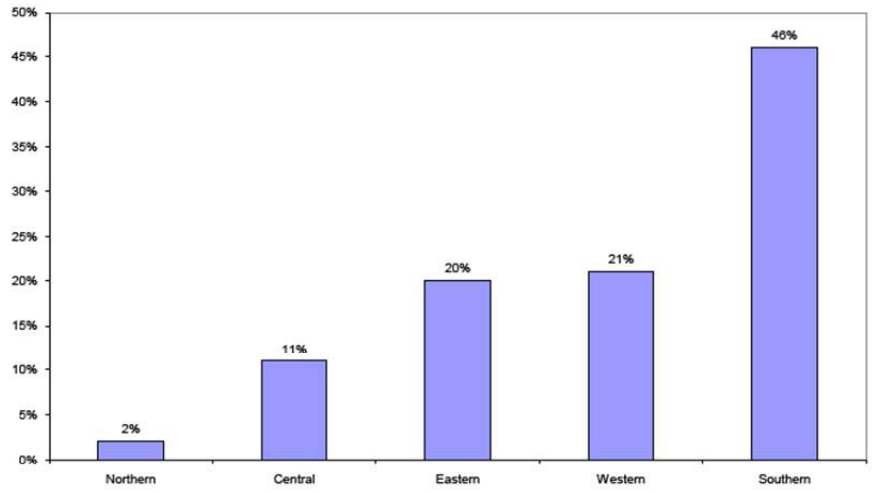
Appendix A: Adult HIV/AIDS prevalence: Data From CIA World Factbook & UNAIDS, 2004

Country	%	Region	Country	%	Region
Algeria	0.03	North	Libya	0.20	North
Angola	3.90	South	Madagascar	1.70	East
Benin	1.90	West	Malawi	14.20	South
Botswana	37.30	South	Mali	1.90	West
Burkina Faso	4.20	West	Mauritania	0.30	North
Burundi	6.00	Central	Mauritius	0.10	East
Cameroon	6.90	Central	Morocco	0.05	North
Cent. A. R	13.50	Central	Mozambique	12.20	South
Chad	4.80	Central	Namibia	21.30	South
Congo, D.	4.20	Central	Niger	1.20	West
Congo, R.	4.90	Central	Nigeria	5.40	West
Cote d'Ivoire	7.00	West	Senegal	0.80	West
Egypt	0.02	North	Sierra Leone	7.00	West
Eritrea	2.70	East	Somalia	1.00	East
Ethiopia	4.40	East	South Africa	21.50	South
Gabon	8.10	Central	Sudan	0.90	North
Gambia	1.20	West	Swaziland	38.80	South
Ghana	3.10	West	Tanzania	8.80	East
Guinea	3.20	West	Togo	4.10	West
Guinea-Bissau	10.00	West	Tunisia	0.01	North
Kenya	6.70	East	Uganda	4.10	East
Lesotho	28.90	South	Zambia	16.50	South
Liberia	5.90	West	Zimbabwe	24.60	South

Appendix B: Adult HIV/AIDS Prevalence in Africa by Region (%), 2003; Data Source:UNAIDS, 2004



Appendix C: Content Analysis: Political Instability in 44 African Countries (circa 2000)

Country	Circa 2000 Scores	Instability
Algeria	1	civil war
Angola	1	civil war
Benin	0	
Botswana	0	
Burkina Faso	0	
Burundi	1	civil war
Cameroon	0	
Cape Verde	0	
Central A. Rep.	0	
Chad	0	
Comoros	1	civil war
Congo, Dem	1	civil war
Congo, Rep	1	civil war
Cote d'Ivoire	1	military coup
Egypt	0	
Eritrea	1	civil war
Ethiopia	0	
Gabon	0	
The Gambia	0	
Ghana	0	
Guinea	0	
Guinea-Bissau	1	military uprising
Kenya	0	
Lesotho	0	
Libya	0	
Liberia	1	civil war
Madagascar	0	
Malawi	0	
Mali	0	
Mauritania	0	
Mauritius	0	
Morocco	0	
Mozambique	0	
Namibia	0	
Niger	1	military coup
Nigeria	0	
Rwanda	1	civil war
Sao Tome	0	
Senegal	0	
Sierra Leone	1	civil war

Somalia	1	civil war
S. Africa	0	
Swaziland	0	
The Sudan	1	civil war
Tanzania	0	
Togo	0	
Tunisia	0	
Uganda	0	
Zambia	0	
Zimbabwe	0	

**: Political Instability = civil war and / or military coup (uprising); Data Source: Tiruneh (2006).*