The Role Of Gender, Socio-Economic And Epidemiological Factors In The Prevalence Of HIV/AIDS In Sub-Saharan Africa

Vida Wakhshouri

B.A., University of Northern British Columbia, 2005

Thesis Submitted In Partial Fulfillment Of

The Requirements For The Degree Of

Master Of Arts

in

International Studies

(International Development)

The University of Northern British Columbia

April 2008

Your file Votre référence
ISBN: 978-0-494-48802-7
Our file Notre référence
ISBN: 978-0-494-48802-7

ABSTRACT

Cross-sectional estimates of 34 countries for the year 2003 were used to examine the effect of various socioeconomic (including cultural) and epidemiological factors contribution to the prevalence of HIV/AIDS in Sub-Saharan Africa, and to see if these factors have a differential impact on women and men. The empirical model consisted of multiple regressions in which HIV/AIDS prevalence rates as dependent variables were regressed on a number of determinants as independent variables. Of the 11 independent variables used to measure the various determinants of HIV/AIDS prevalence rates, GDP per capita, Human Poverty Index, Access to information, Percentage of Muslim population, Prevalence of male circumcision and Literacy rates were significant predictors to the prevalence of HIV/AIDS in the 34 countries of Sub-Saharan Africa. These findings are important as they identify the links between HIV/AIDS and socioeconomic as well as epidemiological factors, and highlight the direction of health policy in Sub-Saharan Africa.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

GLOSSARY OF TERMS AND ACRONYMS

AIDS: Acquired immune deficiency syndrome; the last and most severe stage of the clinical spectrum of HIV-related diseases.

CIA: Central Intelligence Agency

GDP: Gross Domestic Product; the total market value of all the goods and services produced within the borders of a nation during a specified period.

GNP: Gross National Product; the total market value of all the goods and services produced by a nation during a specified period.

HIV: Human immunodeficiency virus; a retrovirus that damages the human immune system thus permitting opportunistic infections to cause eventually fatal diseases. The causal agent for AIDS.

HIV prevalence: Total number of persons living with HIV at any given moment in time.

NIAID: National Institute of Allergy and Infectious Diseases; a component of the National Institutes of Health.

STD: Sexually Transmitted Disease; also known as **sexually transmissible diseases**, **sexually transmitted infections (STIs)** or (infrequently) **venereal diseases (VD)** or **social disease**; diseases or infections that have a significant probability of transmission between humans by means of sexual contact, vaginal intercourse, oral sex, and/or anal sex.

SSA: Sub-Saharan Africa

TB: Tuberculosis

UN: United Nations

UNAIDS: Joint United Nations and World Health Organization Programme on HIV/AIDS

UNDP: United Nations Development Programme

UNICEF: United Nations Children's Fund

WHO: World Health Organization

WDI: World Development Indicators; a World Bank database.

ACKNOWLEDGMENT

It is a pleasure to thank the many people who made this thesis possible.

The utmost thanks are owed to Dr. Jalil Safaei. It is difficult to overstate my gratitude to my M.A. supervisor. With his kindness, his insight, and his great efforts to explain things clearly and simply, he helped to make economics, especially statistics, enjoyable for me. Throughout my thesis-writing period, he provided encouragement, motivation, sound advice, good teaching, and many great ideas. Dr. Safaei, it has been an honor to work with you.

I would like to express my appreciation to my advisory committee: Dr. Corinne Koehn and Dr. Kevin Keen. The comments and time given by my committee members has greatly improved and clarified this work.

I wish to thank my extended family for providing a loving environment for me. My Aunt and Uncle were particularly supportive, providing encouragement and motivation even during the hard times of this study. Special thanks to my Cousin, Pej, who made me laugh at times when it seemed impossible.

I express my profound appreciation to my Step Dad, Bob. You always know best, especially when I should know better. I am grateful for your constant teaching, support, patience and love.

My warmest thanks are owed to Mikel on whose constant encouragement and love I have relied on throughout this time. Without your support, the moments of rest away from my thesis would have been a lot harder; for that and much more, thank you.

Lastly, and most importantly, I wish to thank my parents. Even from afar, my Dad provided endless support, wisdom, and love...merci.

My Mom, Farah Marzbani, has been an inspiration throughout my life. She is the most important person to me, and the reason behind everything I do. She has always supported my dreams and aspirations, and I am grateful for the fine job she did raising me. I thank her for all she is, and all she has done for me. To her, with love, I dedicate this thesis.

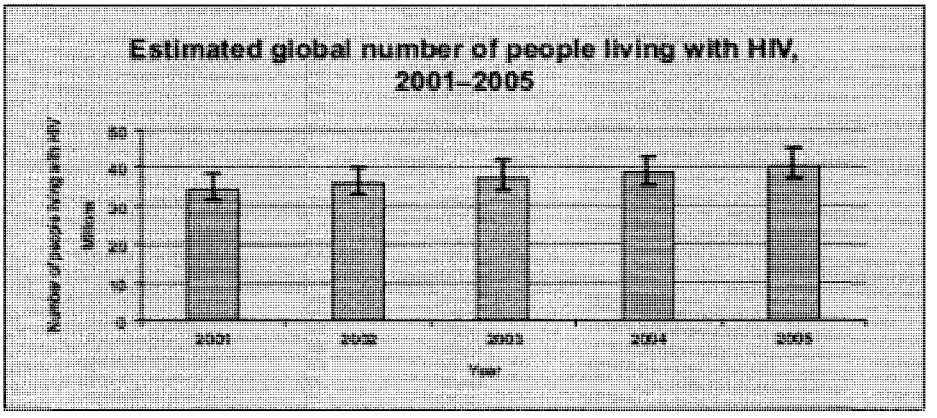
CHAPTER ONE

Introduction

The AIDS Pandemic

Acquired Immune Deficiency Syndrome (AIDS) has killed more than 25 million people since it was first recognized in 1981, making it one of the most destructive pandemics[1] in recorded history. The total number of people living with Human Immunodeficiency Virus (HIV) reached its highest level: an estimated 40 million people are now living with HIV.[2] Close to 5 million people were newly infected with the virus in 2005 (refer to Figure 1.1). Such disturbing statistics often single out the HIV/AIDS disease for special attention over other life-threatening diseases such as malaria and tuberculosis (TB).[3]

Figure 1.1: Estimated Global Number of People Living with HIV, 2001-2005



Source: Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "AIDS Epidemic Update, December 2005: Special Report on HIV prevention," *UNAIDS/WHO*, http://www.who.int/hiv/epi-update2005_en.pdf (accessed March 23, 2006), 2.

---

1 Pandemic refers to an epidemic occurring over a very wide area, crossing international boundaries and usually affecting a large number of people. A global epidemic.

2 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "AIDS Epidemic Update, December 2005: Special Report on HIV prevention," *UNAIDS/WHO*, http://www.who.int/hiv/epi-update2005_en.pdf (accessed March 23, 2006), 2.

3 According to the WHO's World Health Report 2004, HIV/AIDS accounted for 4.9 percent of total global deaths, while TB and malaria only answered for 2.7 and 2.2 percent, respectively.

AIDS affects mainly prime-age adults and has a long incubation period between stage 1 (no symptoms) and stage 4 (full blown AIDS).[4] Unless people get tested, they can be passing on the virus through sexual intercourse and by other means (i.e. blood transfusions, breastfeeding, etc.) without knowing it. This makes the disease very hard to contain. Furthermore, by harnessing the basic human desire of sexual intimacy (and the breastfeeding of babies) as the prime means of transmission, the virus can gain a fast and extensive grip on an entire population, leaving heartbreak and socio-economic devastation in its wake. And, as economic hardship increases, so too does the risk of HIV transmission.[5] These biological and socio-economic aspects of AIDS make the disease a worthy target for special policy attention.

HIV/AIDS constitutes a public health crisis and a threat to economic livelihood similar to no other illness. As De Cock et al. notes, "HIV/AIDS is the greatest threat to life, liberty and the pursuit of happiness and prosperity in many African countries. Interventions, therefore, must be quantitatively and qualitatively commensurate with the magnitude of the threat posed by the disease."[6] DeWaal makes a similar point, arguing that the impact of AIDS on economic development amounts to a "development process run in reverse."[7]

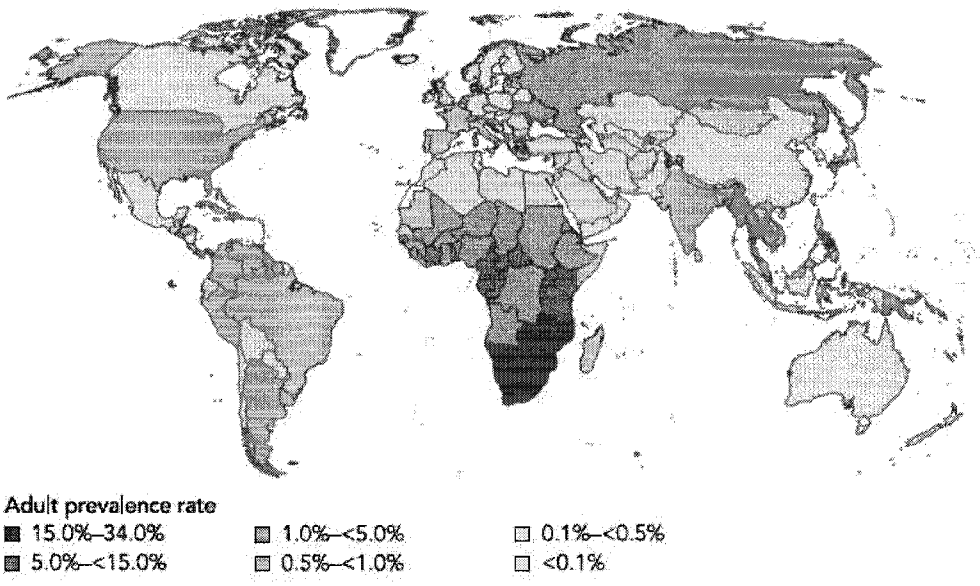
This pandemic is the biggest obstacle to the achievement of the development goals agreed to at the UN Millennium Summit in 2000. It works against the objectives of equity, gender equality and poverty eradication. Since its discovery in early 1980s, HIV

---

4 Nicoli Nattrass, *The Moral Economy of AIDS in South Africa* (Cambridge, UK; New York, NY: Cambridge University Press, 2004), 23.
5 Ibid.
6 Kevin De Cock, Dorothy Mbori-Ngacha, and Elizabeth Marum, "Shadow on the continent: public health and HIV/AIDS in Africa in the 21st century," *The Lancet* 360 (2002): 68.
7 Alex DeWaal, "How will HIV/AIDS transform African governance?" *African Affairs* 102 (2003): 11.

has claimed a heavy toll in the world, especially in Sub-Saharan Africa (SSA). AIDS is probably the greatest constraint to human and economic development in Africa, a continent that desperately needs to provide its people with the promise of a better life – higher living standards, access to basic services and greater opportunities to live a self-fulfilling life. Twenty five to 28 million of the 34 to 46 million people globally infected live in Africa.[8] But the epidemic is not limited to Africa. (Refer to Figure 1.2). Ten million infected people currently live in China and there is evidence that the epidemic is accelerating in Asia and Eastern Europe.[9]

Figure 1.2: A Global view of HIV infection - 38.6 million people living with HIV, 2005



Source: Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "2006 Report on the Global AIDS Epidemic – Chapter 2: Overview of the Global AIDS epidemic," *UNAIDS/WHO*, http://data.unaids.org/pub/GlobalReport/2006/2006_GR_CH02_en.pdf (accessed October 22, 2006), 14.

---

8 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "2004 Report on the Global AIDS Pandemic," *UNAIDS/WHO*, http://www.unaids.org/bangkok2004/GAR2004_pdf/UNAIDSGlobalReport2004_en.pdf (accessed October 22, 2006), 14.

9 The most recent UNAIDS report warns of serious epidemics in Brazil, Russia, India and China and rising prevalence rates in these countries.

The goal of most early research on HIV/AIDS was to understand the dynamics of transmission and resulting prevalence rates. This was of particular urgency in Africa, where prevalence rates were significantly higher than elsewhere in the world. Africa is the continent hit first and hardest by HIV, and it is no surprise that research conducted on the epidemic in Africa offers the most insight into the nature of HIV epidemics in other developing countries.

To date, more than 95% of infected people live in the developing world, with 70% of them living in SSA alone. Moreover, 95% of the twenty-three million deaths due to HIV/AIDS since the onset of the pandemic were from the developing world, 83% of whom were from SSA.[10] These figures are especially alarming since SSA is home for only one tenth of the World population. The average HIV/AIDS prevalence rate among the adult population in SSA is 7.2% compared to 1.1% in the whole world.[11] Twenty-one countries in the region have the highest prevalence rates in the world and the disease has surpassed malaria as the principal cause of death on the continent. Worldwide, HIV/AIDS is the fourth biggest killer.[12]

The virus affects all countries on the continent, but some experience a bigger impact than others. Most new infections occur in the east and the south of the SSA region, as are the countries that are the most severely affected by the pandemic. But the threat from the disease is not confined to these sub-regions. Less than half of the countries in Sub-Saharan Africa (17 out of 43 for which data are available) are

---

10 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "2001 Global Report on the HIV/AIDS Epidemic," Geneva, Switzerland: *UNAIDS/WHO* (2001).
11 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "AIDS Epidemic Update, December 2005: Special Report on HIV prevention," *UNAIDS/WHO*, http://www.who.int/hiv/epi-update2005_en.pdf (accessed March 23, 2006), 3.
12 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "AIDS Epidemic Update: December 2001," *UNAIDS/WHO*, http://www.who.int/hiv/facts/en/isbn9291731323.pdf (accessed March 23, 2006), 2.

experiencing a generalised epidemic, with the adult HIV infection rates (i.e., the rates for those aged 15–49) exceeding 5 percent at the end of 2005 (see Table 1.1).[13] Furthermore, Botswana and Swaziland have the highest prevalence with 24.1% and 33.4% of the adult population infected with the virus respectively. It bears reminding that there is no single, 'African' epidemic, and that HIV prevalence varies significantly between and within sub-regions and countries. Such general trends in HIV prevalence therefore should not obscure the highly varied nature of the AIDS epidemics underway throughout this region.

Table 1.1: African Adult HIV Infection Rates (%), End of 2005

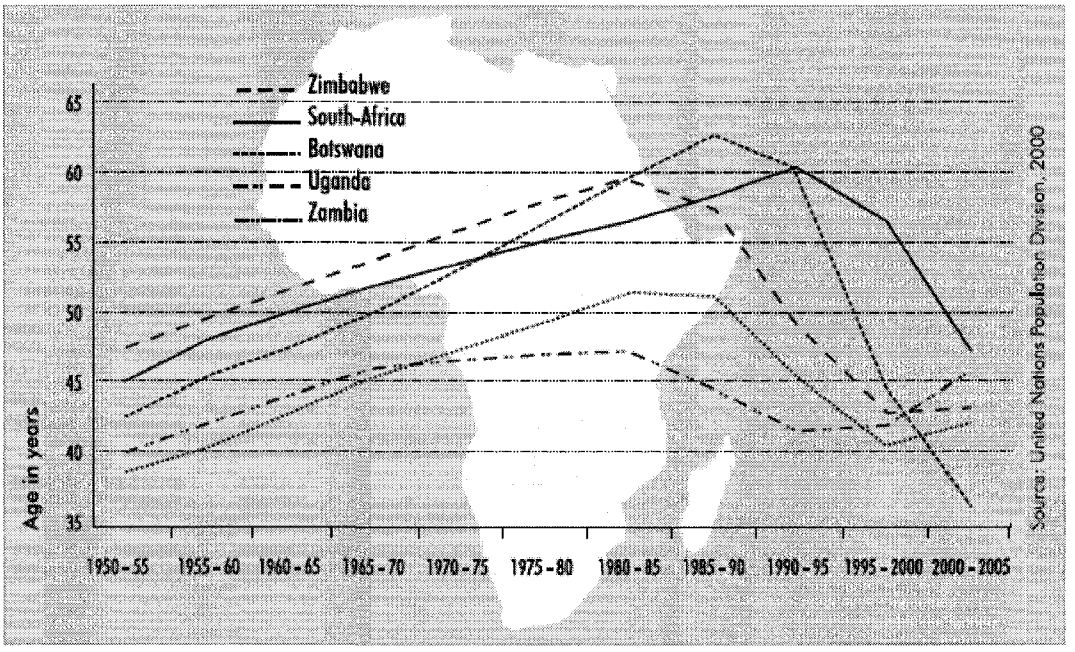
More Than 10%		5% - 10%		<0.1% - 5%			
Swaziland	33.4	Gabon	7.9	Nigeria	3.9	Burkina Faso	2
Botswana	24.1	Côte d'Ivoire	7.1	Guinea-Bissau	3.8	Benin	1.8
Lesotho	23.2	Uganda	6.7	Angola	3.7	Mali	1.7
Zimbabwe	20.1	Tanzania	6.5	Chad	3.5	Sierra Leone	1.6
Namibia	19.6	Kenya	6.1	Burundi	3.3	Sudan	1.6
South Africa	18.8	Cameroon	5.4	Congo, Dem. Rep.	3.2	Guinea	1.5
Zambia	17	Congo	5.3	Equat. Guinea	3.2	Niger	1.1
Mozambique	16.1			Togo	3.2	Senegal	0.9
Malawi	14.1			Djibouti	3.1	Somalia	0.9
Cent. African Rep.	10.7			Rwanda	3.1	Mauritania	0.7
				Eritrea	2.4	Mauritius	0.6
				Gambia	2.4	Madagascar	0.5
				Ghana	2.3	Comoros	<0.1

Source: Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "2006 Report on the Global AIDS Epidemic - Annex 2: HIV and AIDS estimates and data, 2005 and 2003," *UNAIDS/WHO*, http://data.unaids.org/pub/GlobalReport/2006/2006_GR_CH02_en.pdf (accessed October 22, 2006), 506.

13 No prevalence rates were reported for Cape Verde or Sao Tome. Preliminary data for Ethiopia of between 0.9% and 3.5% were reported. Data for Liberia of between 2% and 5% were reported; estimates from other sources range as high as 12%. UNAIDS is a key source of national AIDS data in Africa. Its data are widely seen as accurately reflecting trends, though some researchers assert that improved data collection and statistical models are showing that it may have overestimated infection rates in some countries. See Craig Timberg, "How AIDS in Africa was Overstated," Washington Post, Apr. 6, 2006.

HIV/AIDS is having a devastating impact on development in Africa. According to the World Bank, if the AIDS pandemic had not happened in Southern Africa, life expectancy would have reached 64 years by 2010-15. Instead, it has regressed to 47 years, reversing the gains of the past 30 years.[14] Figure 1.3 shows how the life expectancy rose in the five southern African countries during the 1970s and early 1980s, but then fell sharply in 1990s as the AIDS pandemic and economic crisis took their toll. The AIDS pandemic is clearly implicated in this decrease in life expectancy.

Figure 1.3: AIDS in Africa – Changes in life expectancy in selected African countries with high HIV prevalence, 1950-2005



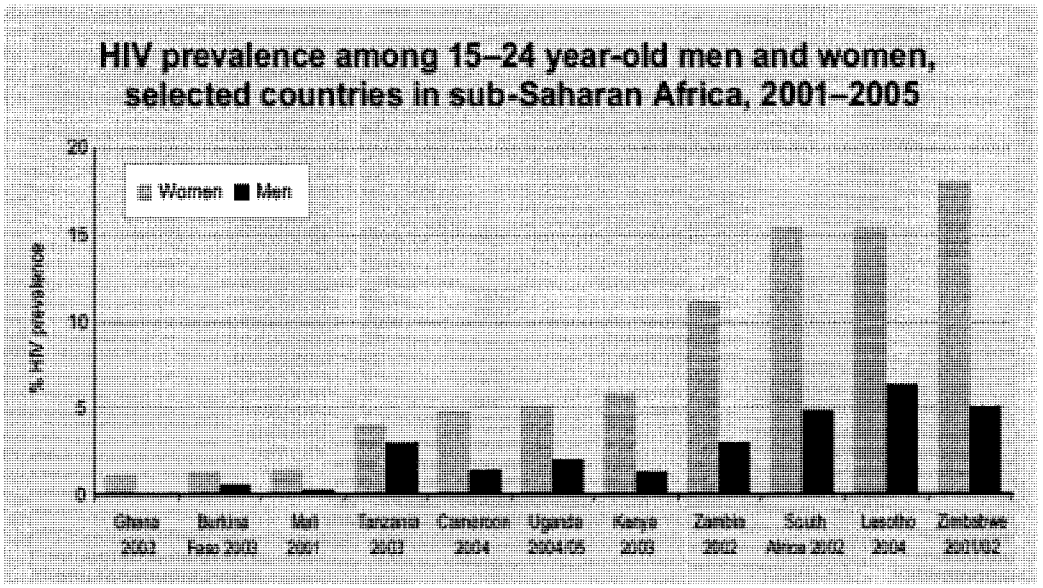
Source: Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "AIDS Epidemic Update: December 2001," *UNAIDS/WHO*, http://www.who.int/hiv/facts/en/isbn9291731323.pdf (accessed March 29, 2007), 9.

14 World Bank, "World Development Report 2000/2001: Attacking Poverty," *The World Bank Group*, http://worldbank.org/poverty/wdrpoverty/index.htm (accessed March 23, 2006), 139.

At this point, the HIV/AIDS pandemic is very much an African phenomenon and females bear the greatest burden. HIV/AIDS prevalence is higher among women than men throughout the region: among HIV-infected people, the percent of adults (15-49 years of age) living with HIV who are women is 57%.[15] Two thirds of all people living with HIV are in Sub-Saharan Africa, as are 77% of all women with HIV.[16] In several southern African countries, more than three quarters of all young people living with HIV are women, while in Sub-Saharan Africa overall, young women between 15 and 24 years old are at least three times more likely to be HIV-positive than young men. This is reflected in Figure 1.4. Drawn from selected countries in Sub-Saharan Africa from 2001-2005, this figure highlights the higher HIV prevalence among 15-24 year-old women than men in these parts of the region.[17]

15 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "AIDS Epidemic Update, December 2005: Special Report on HIV prevention," *UNAIDS/WHO*, http://www.who.int/hiv/epi-update2005_en.pdf (accessed March 23, 2006), 17.
16 Ibid., 2.
17 Ibid., 9.

Figure 1.4: HIV Prevalence among 15-24 year-old Men and Women in SSA



Source: Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "AIDS Epidemic Update: Special Report on HIV prevention," *UNAIDS/WHO*, http://www.who.int/hiv/epi-update2005_en.pdf (accessed March 23, 2006), 2.

A major challenge to controlling the HIV/AIDS disease in Sub-Saharan Africa rests in endemic gender inequality, where women have little control over the factors that make them more susceptible to the disease. The rights and status of women and young girls deserve special attention because around the world—from Sub-Saharan Africa and Asia to Europe, Latin America and the Pacific—an increasing number of women are being infected with HIV.[18] It is often women with little or no income who are most at risk. Widespread inequalities involving political, social, cultural and human security factors exacerbate the situation for women and girls. Therefore, there is a need to understand how gender and socio-economic factors create vulnerability in women, as

18 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "AIDS Epidemic Update, December 2005: Special Report on HIV prevention," *UNAIDS/WHO*, http://www.who.int/hiv/epi-update2005_en.pdf (accessed March 23, 2006), 17.

opposed to men. The burden of the HIV/AIDS epidemic in Sub-Saharan Africa on people's lives and the prospects for economic development in that region is a major international concern.

In fact, the HIV/AIDS illness affects people in their most sexually active years, which are also their most productive years. That means it affects labour force, the key production factor in Sub-Saharan Africa. Through labour force participation, HIV/AIDS undermines the major development pillars of human and physical capital, and therefore, ultimately economic growth. Even though growth rates are currently positive in SSA, it is assessed that when the HIV/AIDS prevalence rate reaches 8%, the cost at the macroeconomic level could be as high as 0.5 of a percentage point in terms of growth.[19] This is too much for a continent of which half of its population lives under the poverty line and which must realize some positive economic growth just to maintain status quo. Moreover, the social consequences are enormous and visible through the increasing number of orphans and street children. Finally, the pandemic contributes to deepening the gap between developed and developing countries. It is thus a full-blown crisis.

The UNAIDS 2004 *Report on the Global AIDS Pandemic* notes: "AIDS is an extraordinary kind of crisis; it is both an emergency *and* a long-term development issue".[20] This takes us directly beyond the epidemiological aspects of the disease to the social and economic dimensions. It is a development issue, and so it involves economic wellbeing and human development.

---

19 World Bank, *African development Indicators 2001* (Washington DC: World Bank Publications, 2001), 32.

20 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "2004 Report on the Global AIDS Pandemic," *UNAIDS/WHO*, http://www.unaids.org/bangkok2004/GAR2004_pdf/UNAIDSGlobalReport2004_en.pdf (accessed October 22, 2006), 14.

HIV/AIDS pandemic is driven by many cultural, socio-economic and epidemiological determinants. These determinants are numerous, complex, with significant interactions among them. Also these determinants may have reverse causality with the pandemic. In fact, the pandemic spreads out because economic, socio-cultural and epidemiological conditions favour it; in turn, it worsens these conditions, namely through its impact on the labour force, institutions and diseases thus creating a vicious circle of the pandemic in low-income countries.

Part of the complexity of dealing with the relationship between HIV/AIDS and socioeconomic variables is that the latter can be both determinants and consequences of the pandemic. This dual relationship gives rise to complex causal patterns and feedback loops, which make single cause-effect relationships more difficult to isolate. For example, increased poverty and income inequality fuel the spread of the pandemic.[21] The pandemic, in turn, worsens the economic situation of the household, often leading to increased poverty and income inequality.

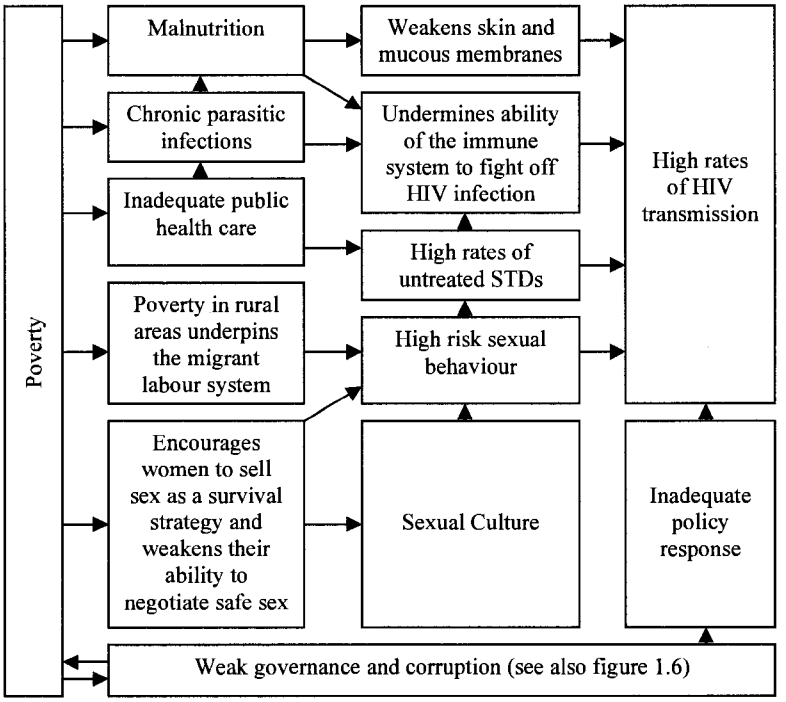
The link between poverty and AIDS in Africa poses a development dilemma which can be summarized as follows: poverty has been speculated to contribute to the spread of AIDS (Figure 1.5); therefore, poverty alleviation may act as a precondition for combating AIDS. However: AIDS undermines productivity and economic growth (Figure 1.6); therefore, addressing AIDS is a precondition for addressing poverty. Hence, the

---

21 Nicoli Nattrass, *The Moral Economy of AIDS in South Africa* (Cambridge, UK; New York, NY: Cambridge University Press, 2004), 30.

determinants' dual causality with the pandemic generates this development dilemma that makes AIDS an extraordinary kind of crisis.[22]

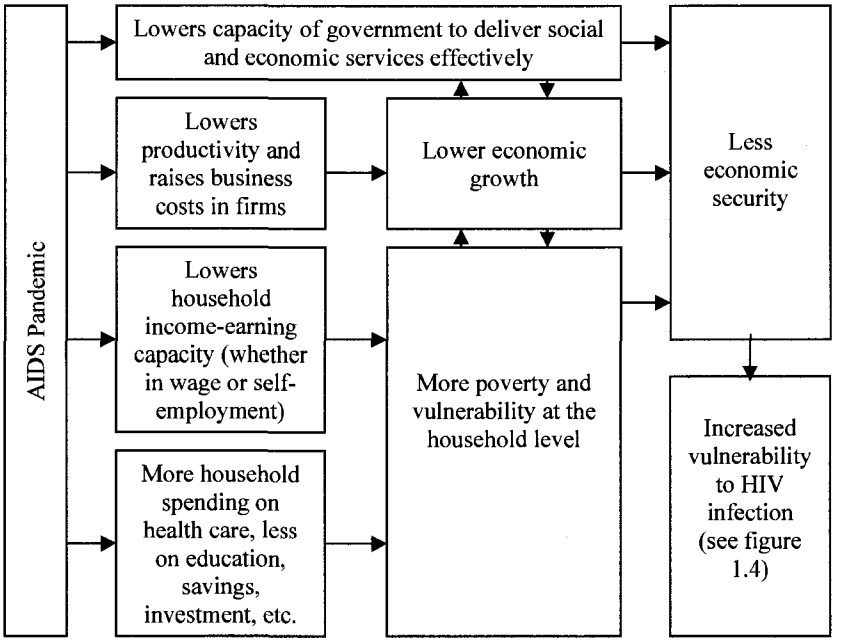
Figure 1.5: The links between socio-economic, biomedical and behavioural determinants of the spread of AIDS in Africa



Source: Nicoli Nattrass, *The Moral Economy of AIDS in South Africa* (Cambridge, UK; New York, NY: Cambridge University Press, 2004), 30.

22 For a detailed review of the positive relationship between poverty and AIDS and the negative relationship between AIDS and economic growth see Nicoli Nattrass, *The Moral Economy of AIDS in South Africa* (Cambridge, UK; New York, NY: Cambridge University Press, 2004).

Figure 1.6: AIDS and economic security



Source: Nicoli Nattrass, *The Moral Economy of AIDS in South Africa* (Cambridge, UK; New York, NY: Cambridge University Press, 2004), 34.

Although AIDS has been named as the "disease of poverty,"[23] the relationship between socio-economic indicators and HIV prevalence is complex. Whilst it is true that, globally, Africa as the poorest continent is the most affected, at country level, the association between poverty and HIV infection breaks down, as it is the wealthier countries of Sub-Saharan Africa that are most affected. The same applies to education. Although, globally, countries with high literacy have lower levels of HIV-infection, in Sub-Saharan Africa the most affected countries are those with relatively high levels of education. This may be because the social changes that accompany increased schooling are associated with other behavioural changes which increase risk and "[t]his may be

23 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "1998 Report on the Global HIV/AIDS Epidemic: Global HIV/AIDS surveillance," *UNAIDS/WHO*, Internet version available at http://www.unaids.org (accessed October 22, 2006), 20.

especially the case for women, who without education may have very much less social mobility and be exposed to a much narrower spectrum of social and sexual relationships."[24] Evidence from Zambia shows that while older women with more years of schooling are more likely to be infected than their less educated peers, the pattern is much less pronounced among younger women.[25] This suggests behavioural changes are occurring despite an increasing awareness of HIV/AIDS.

Research on the impact of HIV and AIDS has increased significantly over the past five years. Studies concerned with socio-economic impacts have been carried out at many different levels (individual, household, firm, institutional, government and macroeconomic), employing various methodologies. According to the literature, the greatest impact of the pandemic is felt at a household level, where socio-economic factors combine with socio-cultural and epidemiological variables to influence prevalence.[26] It is the household unit that carries the greatest burden. Since socioeconomic indicators, such as poverty and inequality, are both consequences and determinants of HIV/AIDS, they can interact with the pandemic at a household level to perpetuate a vicious downward cycle towards greater indigence.

Significant research has concentrated on the consequences of the pandemic on socio-economic conditions. The pandemic's influence on household living conditions derives in great part from the virus's specific demographic effects. HIV/AIDS changes the structure of the population; it is distinct from other diseases because it primarily

---

24 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "1998 Report on the Global HIV/AIDS Epidemic: Global HIV/AIDS surveillance," *UNAIDS/WHO*, Internet version available at http://www.unaids.org (accessed October 22, 2006), 21.
25 Ibid.
26 Social Science Research Council Working Group on HIV/AIDS, "The Social Science of HIV/AIDS: A Critical Review and Priorities for Action," *Social Science Research Council* (New York, NY: USA, 2004).

strikes prime-aged adult, the most productive segment of the economy.[27] Thus the breadwinners are falling ill and dying, destroying much-needed labour skills and depriving children of their parents. Barnett and Clement (2005) point out that the key to the social and economic impact of HIV/AIDS is that it is a slow moving virus: as a result it can affect three human generations.[28]

The principal economic impacts experienced by affected households are: loss of available income, as working adults falling ill or dying or having to stop work to look after the ill; additional expenditure on health care and funerals. Other effects include depletion of household assets (due to increased health expenditure, consumption needs and labour losses), lower productivity of subsistence labour and reduced availability of food. School enrolment may also decrease, as children are forced to dedicate time to labour and care-giving.[29]

HIV/AIDS impacts various interconnected levels of the economy. Whereas the greatest impact, in terms of human and social costs, is felt at the household level, there is increasing evidence and recognition of macro level effects. After all, phenomena at micro and macro levels are closely related, since macroeconomic aggregates represent the outcome of economic decisions and behaviour of actors at a micro level.[30]

---

27 Tony Barnett and Alan Whiteside, *AIDS in the Twenty-First Century: Disease and Globalization* (Basingstoke, UK: Palgrave Macmillan, 2002).
28 Tony Barnett and Colette Clement, "HIV/AIDS Impact: so where have we got to and where next?" London School of Economics: Development Studies Institute, Progress Report, (London, UK: 2005).
29 Marisa Casale and Alan Whiteside, "The Impact of HIV/AIDS on Poverty, Inequality and Economic Growth: IDRC Working Papers on Globalization, Growth and Poverty," *Health Economics and HIV/AIDS Research Division* (HEARD) University of KwaZulu Natal, South Africa (2006).
30 Nina Veenstra and Alan Whiteside, "Economic Impact of HIV," *Best Practice & Research Obstetrics and Gynaecology* 19 (2005).

The Roots of the Pandemic

In the early years of the HIV/AIDS pandemic, the disease was popularity viewed through the prism of its Northern epidemiology – that is, as a disease mainly of gay men and intravenous drug users. Seen in this light, Africa seemed exceptional to the public and mass media. Thus, early epidemiological profiling of the epidemic in Africa was complemented by research that tried to explain the social context of HIV transmission. This line of research initially sought to identify endogenous social factors that could explain high HIV prevalence in Africa. Early analytical approaches to the global AIDS pandemic focussed on the pathogen (the HI virus) and on the individual behavioural determinants of HIV transmission.[31] This focussed attention on high-risk groups (i.e. migrant workers, truck drivers, soldiers, commercial sex workers and homosexual men) as 'vectors' of the spread of HIV.

Surveys of knowledge, attitudes, behaviours, and practices (KABP or KAP) comprised the first wave of studies, and investigations in epidemiologically important "high risk" settings continue to be carried out (Ali 2001; Fritz 2002; Mataure 2002). Although these studies often yielded useful data and insights, they were limited by methodological shortcomings. Specifically, Schopper (1993) asserts that although data were deemed to be accurate at the aggregate level, accuracy of reporting at the individual level was found to be low. The gender difference in reporting of casual partners may be due to female underreporting, to not having incorporated prostitutes or to a different perception of the meaning of casual partnership. Schopper asserts that all KAP surveys should include a validity analysis, so as to provide a sense of the accuracy of the surveys and allow for comparison of the quality of different KAP surveys. Furthermore, he

31 Max Essex, *AIDS in Africa* (New York: Kluwer Academic/Plenum Publishers, 2002), 12.

suggests that there is an urgent need for a standardized approach to validating the findings from AIDS-related KAP surveys.[32]

Subsequent analysis shifted attention more towards sexual culture and high risk-behaviours (as oppose to high-risk groups). In East Africa, risky sexual culture practices include widow inheritance, widow 'cleansing,' wife sharing, wife exchanging with land and cattle, polygamy and female circumcision.[33] In Southern Africa, socio-cultural norms of gender inequality, sexual violence, a preference for dry sex, fatalistic attitudes and pressure to prove fertility contribute to a high-risk environment.[34] Other early work also sought to identify "cultural determinants" of risk (McGrath 1992), but relatively less attention was paid to the hypothesis that poverty might be a driving force, perhaps because a few initial studies reported higher rates among those better off (Dalkbetta et al.1993).

Although higher risk was subsequently linked with poverty and migration (MacDonald 1996; Brockerhoff 1999), initial interest in exotic African "sexual rites," such as the use of local preparations for vaginal douching and the application of leaves and powders prior to sexual intercourse for the purpose of enhancing the male sexual experience, has persisted (Runganga 1995; Gresenguet 1997; Kun 1998; Van De Wijgert 2001). Some observers have pointed to non-sexual practices, such as "blood brotherhoods," contact with non-human primates, or female circumcision, as portrayed as cultural culprits in the expanding epidemic (Hrdy 1987; Grisaru 1997). Others have

---

32 Doris Schopper, Serge Doussantousse and John Orav, "Sexual behaviors relevant to HIV transmission in a rural African population. How much can a KAP survey tell us?" *Soc Sci Med.* 37 (1993): 401-12.
33 United Nations, "East Africa: Feature – Traditional Culture Spreading AIDS," *United Nations* 2003, Available on www.irinnews.org (accessed March 23, 2006).
34 Janet Maia Wojcicki, "She Drank His Money: Survival Sex and the Problem of Violence in Taverns in Gauteng Province, South Africa," *Medical Anthropology Quarterly* 16 (2002): 270.

claimed that the "African sexual system" is characterized by promiscuity and therefore could explain the extent of the epidemic there (Caldwell 1989).

Sexual culture is an important dimension of the AIDS pandemic. Understanding it contributes to the knowledge of HIV transmission (especially the vulnerability of young women) and of the challenges faced by interventions designed to change behaviour. Recently, the National AIDS Councils/Commissions of Kenya, Uganda and Tanzania issued a statement recognizing the 'centrality of culture' to the AIDS pandemic and urging the need to 'transform' it.[35] However, this can be a difficult task, particularly when it comes to transforming sexual relationships in a context where men are expected to have multiple sexual partnerships, and where young women form sexual liaisons with older men for financial advantage.[36]

However, sexual culture cannot alone (or even significantly) explain the destructive spread of AIDS in Africa. According to a study of the determinates of HIV infection in four Sub-Saharan Africa cities, high rates of partner change, contacts with commercial sex workers, and concurrent sexual partnerships were not reported more systematically in the high prevalence sites than in the low-prevalence sites. Cofactors such as male circumcision (which appears to provide a degree of protection from HIV infection), the presence of untreated sexually transmitted diseases (STDs) as well as the age of marriage for young women were highlighted in the study.[37] Sexual behaviour is obviously an important driver of the disease – especially in Africa, where transmission is

---

35 United Nations, "East Africa: Feature – Traditional Culture Spreading AIDS," *United Nations* 2003, Available on www.irinnews.org (accessed March 23, 2006).

36 Also, at this point, it is worth mentioning that male homosexuality is often hidden as a result of the cultural stigma that is associated with homosexuality throughout most of SSA.

37 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO) "Differences in HIV Spread in Four Sub-Saharan African Cities," *UNAIDS/WHO* 1999, www.unaids.org/publications/documents/epidemiology/determinants/lusaka99.html (accessed on March 23, 2006).

overwhelmingly heterosexual.[38] But it is perhaps the combination of biomedical and socio-economic factors with unsafe sexual practices that produces the ripe environment for the spread of HIV.

The slow demise of culturalism as an explanatory paradigm accelerated in the wake of more recent research that has identified poverty as the pandemic's primary social determinant (Herrell 1991). This work is typical of a broader domain of inquiry that identifies the mechanisms by which poverty leads to vulnerability.[39] Poverty leads to riskier behaviour, either by favouring transactional sex, or by driving migration—an observation that has helped inform new definitions of vulnerability (Kalipeni 2000) and resilience (Loevinsohn and Gillspie 2003). Concepts such as vulnerability and resilience help researchers identify individuals—who often have minimal control over their circumstances—to social structures. Initially, however, little research sought to link everyday poverty to the broader political, social, and economic climate.

The habit of treating poverty as inevitable, rather than as a product of social processes, broke with the publication of a critical article indicting structural adjustment programs for creating conditions favourable to the pandemic by deepening poverty and cutting back health services at a time when the continent was already vulnerable to other infectious diseases (Lurie et al.1995). This controversial article stimulated critical thinking, and widened attention to the "political economy of disease" thesis that was already well established in research on health in Africa. In this view, political ideologies are refracted through state and macro-economic policy to shape the disease environment,

---

38 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "AIDS Epidemic Update: December 2001," *UNAIDS/WHO*, http://www.who.int/hiv/facts/en/isbn9291731323.pdf (accessed March 23, 2006), 3.

39 For a review see Alan Whiteside, "Poverty and HIV/AIDS in Africa." *Third World Quarterly: Special Issue on Global Health and Governance* 23 (2002): 313-332.

either directly through health care spending or indirectly in the way they allocate resources that can mitigate underlying health status (Turshen 1992; Bond 2003). Structural adjustment and austerity policies, often dictated to cash-starved African governments, have not only decreased access to curative health services but compromised public health by privatizing basic necessities such as electricity and water (Fiil-Flynn 2001; McDonald 2002). Lack of access to clean water and electricity can be hypothesized to increase vulnerability to HIV by favouring the spread of diseases associated with poor hygiene, thus weakening the immune systems of the poor.

More recent research has focused on the immune system's response to HIV as a key determinant of HIV transmission. Several International Food Policy Research Institute (IFPRI) publications investigate the causal relationship between proper nutrition and HIV prevalence. For example, Gillespie and Kadiyala (2005) affirm that food insecurity and malnutrition may accelerate the spread of HIV, both by increasing people's exposure to the virus and by increasing the risk of infection following exposure.[40] They draw on a number of previous studies to support this theory, including work carried out by Stillwaggon (2002), which found that falling calorie and protein consumption and increasing inequality to be strongly correlated with HIV prevalence in 44 Sub-Saharan African countries. Moreover, the authors cite a number of medical studies suggesting that improved maternal micronutrient status may reduce vertical transmission of HIV; concluding that one of the main factors determining the risk of mother-to-child transmission of HIV is the health and nutritional status of the mother.

---

40 Stuart Gillespie and Suneetha Kadiyala, "Impacts of Food and Nutrition Insecurity on the Spread of HIV. In HIV/AIDS and Food and Nutrition Security: From Evidence to Action," *International Food Policy Research Institute*, Food Policy Review 7 (Washington, DC, USA, 2005).

There is now a strong body of biomedical evidence showing that "malnutrition and parasite infection increase HIV susceptibility, not only to opportunistic infection after HIV infection, but also to enhance HIV transmission, just as they increase susceptibility to other infectious diseases."[41] Given that malnutrition is a function of poverty, there is thus good reason for assuming that poverty helped hasten the spread of HIV in Sub-Saharan Africa. One researcher observed that "from 1988 to 1998, when nascent or concentrated AIDS epidemics developed into generalised pandemics in Sub-Saharan Africa, 30% of the region was malnourished."[42] Micronutrient deficiencies (particularly of Vitamins A, C, and B) undermine the body's natural defences against HIV infection (i.e. skin integrity and mucous membranes) thus contributing further to the vulnerability of HIV infection.[43] Furthermore, parasite infections are endemic in Africa, but the situation is made worse by inadequate health care – itself a function of poverty and low levels of development – which leaves more parasite infections untreated.

Poverty increases susceptibility to contracting HIV/AIDS through several channels including: increased migration to urban areas; limited access to health care, nutrition and other basic services; limited access to education and information; sexual exploitation and gender inequality. Little recent empirical research explores the influence of socio-economic variables on the risk of contracting HIV. Mead Over's (1998) cross-sectional analysis of 72 countries is an exception.

A report by the World Bank in 1999 summarized the literature on the global impact of HIV/AIDS and how government policies can be structured to mitigate its

---

41 Eileen Stillwaggon, "HIV/AIDS in Africa: Fertile Terrain," *The Journal of Development Studies* 38 (2002): 4.
42 Ibid., 5.
43 Micheal W. Adler, "ABC of AIDS: Development of the Pandemic," *British Medical Journal* 322 (2001): 1227.

impact. A number of background studies were commissioned for the report. An important study by Over attempted to explain why it is that some countries have higher rates of urban HIV/AIDS infection than others. In a sample of 72 countries (32 from Sub-Saharan Africa), Over found that there were eight significant variables. Positively related to infection rates were: the age of the epidemic; the percentage of the population that are foreign born; the extent of relative income inequality (as measured by the Gini coefficient); the size of military personal as a percentage of the population; the magnitude of the male-female gender gap in urban areas; and the male-female literacy gap. Negatively related to infection rates were GNP per capita and the percentage of the population that were Muslim.

The value of doing exploratory research like the Over study is that it can subsequently lead to causal research that tests specific hypotheses. As a result, a number of social and economic conditions have been identified that affect a population's vulnerability to HIV. These include poverty, social inequality, state capacity, migration, and the nature of sexuality and gender relations. However, none of these has individually emerged as a robust determinant of HIV prevalence. There exists a research gap in examining the various hypothesized determinants of HIV/AIDS together. When studied together, it would be possible to reveal the most influential factors in the prevalence of HIV/AIDS.

Further, evidence is mounting that a number of biological co-factors increase the transmission of HIV. The strongest evidence exists for untreated STIs, lack of male circumcision, tainted blood supplies and younger age of first intercourse for women. While each of these factors increases individual susceptibility to HIV infection, together

they also describe pandemic patterns within populations, since these biological co-factors are at least in part a result of locally dominant cultural, social, and political relations. Therefore, increased understanding of vectors of transmission and biological vulnerability to disease, combined with increasing recognition that social and economic conditions shape both sexual networks and biological vulnerability, suggests a broader hypothesis that considers biological with socio-cultural and economic co-factors in order to explain how the HIV/AIDS pandemic has spread in SSA. Little is known about the particular mechanisms by which broader contextual features may increase population-level vulnerability to HIV across the countries in SSA. Understanding these bio-social interactions requires that political, economic, social, and cultural data be considered alongside biomedical and epidemiological evidence.

The Purpose of this Study

This study considers the socioeconomic and epidemiological determinants of the HIV/AIDS pandemic in Sub-Saharan Africa using aggregate data. A great deal of research has been devoted to HIV/AIDS economics, but most of it consists of impact studies and evaluations of the consequences of the pandemic on diverse aspects of economic life rather than the causes of HIV/AIDS prevalence. We need to assess the impact of each group of determinant, and the relative importance of individual indicators in each group, to be able to formulate an effective policy response, aimed at the prevention of HIV/AIDS spread.

Therefore, this study will empirically test the relationship between social, economic, and epidemiological factors and the prevalence of HIV/AIDS using the latest

available data to explain what factors, and determine to what extent such factors, account for variations in the rates of HIV/AIDS infected men and women across countries in Sub-Saharan Africa. Such investigation will shed some light on the understanding of the variations in the HIV/AIDS prevalence among the SSA countries.

The remainder of this study is organized as follows: chapter two will begin by explaining the preliminary considerations concerning the research methodology, specifically pertaining to the chosen variables and sample of countries. Once the relevant variables are identified and operationalized, chapter two will then proceed to outline the intended research design/empirical model. Multiple regression models that relate the HIV/AIDS prevalence to the social and economic determinants along with epidemiological factors will be estimated using ecological data from the countries across Sub-Saharan Africa, which is estimated for women and men separately. Chapter three presents and discusses the empirical results, followed by a brief discussion of the study limitations and some suggestions for furthering this area of research. The fourth, and final, chapter closes with a summary and discussion of the main results and their implications for development in SSA.

CHAPTER TWO

Methodology and Data

The Conceptual Model

HIV/AIDS has reached the proportions of a pandemic. While factors determining the transmission of the virus from one person to another are purely individual, what makes this disease a pandemic are factors much more complex and global. According to the literature, there are two main groups of determinants of the pandemic: socioeconomic (including cultural practices) and epidemiological. Although, there are other groups of determinants that have received attention in terms of influencing HIV/AIDS in SSA (e.g. political), I will focus my investigation on the role of socioeconomic issues that affect prevalence rates, using epidemiological variables as control variables.

Socio-economic determinants can act both directly and indirectly on HIV/AIDS prevalence rate by creating an environment that favours risky situations and influences people's behaviour. They include poverty, income inequalities, income, gender discriminations, education, access to information, mobile population, and some cultural and religious practices.

Epidemiological variables are conventionally considered to be variables that determine one individual's infectivity and virus transmission during sexual intercourses directly. These are the presence of ulcerative sexually transmitted infections (STI), condom use, malnutrition and circumcision practice.

Socio-economic determinants

HIV transmission is profoundly influenced by the surrounding social and economic environment. The most important socioeconomic determinants identified in the literature are poverty, income inequalities, and gender discriminations, specifically pertaining to housing and living conditions, access to safe water and food, as well as access to education and health care services.

Poverty: in both high-income and developing countries, AIDS has also struck society's wealthiest and most influential, underscoring the universal nature of the threat posed by the pandemic.[44] In general, however, the impacts of AIDS have disproportionately affected those who have the fewest economic and social resources. Although HIV affects rich and poor, young and old, and all regions of the world, HIV has disproportionately affected groups that already face social and economic disadvantages. The pandemic reinforces these conditions by undermining food and economic security in the hardest-hit countries. AIDS deepens poverty and increases the number of poor at risk of infection, because those with the fewest resources have the least access to health-care services or health-related information.[45]

Income inequalities: in addition to their low-income African countries are characterized by unequal income distributions. For the same income level, a country with more income inequality may have a higher prevalence rate because a greater part of their limited resources are consumed by the rich and those in positions of power, whereas the

---

44 John Donnelly, "HIV hits Africa's rich hardest, study says," *The Boston Globe*, June 14, 2006. Available at http://www.boston.com/news/world/africa/articles/2006/06/14/hiv_hits_africa_rich_hardest (accessed February 28, 2007).

45 United Nations, "Population, Development and HIV/AIDS with Particular Emphasis on Poverty: The Concise Report," *United Nations Department of Economic and Social Affairs: Population Division* ST/ESA/SER.A/247 (2005): 12-13.

rest of the population does not have access to such basic needs as education and health. HIV/AIDS prevention activities are based in sanitarian structures and infected people need to know about their infectivity status (through testing) in order to prevent further infection in their partners. In poor countries where tritherapy[46] is already available, poor people cannot afford its cost and will thus remain infective.

Income level: A country's level of income is important when addressing the determinants of HIV/AIDS, since a country's capabilities of addressing the pandemic are based on its income level. The first HIV/AIDS cases have been discovered in developed countries, but the pandemic spread the fastest in poor countries. Developed countries could implement prevention measures and care for sick people, thus decreasing their infectivity and by then the number of new infections. Poor countries also have the highest rates of vertical transmission. Therefore, a country's income level is considered to be a predictor of HIV/AIDS prevalence, as poor countries do not have the capacity to address the pandemic.

Gender discriminations: As mentioned before, UNAIDS estimates that in seven countries in sub-Saharan Africa, women aged 15-24 are nearly three times more likely to

---

46 Tri signifies "three" and therapy signifies "treatment". Tritherapy is therefore not a medication. It is a method of battling pathogenic micro-organisms that implies taking three medications conjointly. The term tritherapy is principally associated with AIDS. To maximise the effectiveness of the treatment, doctors employ several medications together to attack HIV (the virus that causes AIDS) on several fronts. For now, there are two types of anti-AIDS medications. The first is a reverse transcriptase inhibitor, which prevents HIV from transforming its RNA into DNA, an important step in the infection cycle of HIV. Well-known examples of reverse transcriptase inhibitors are AZT and 3TC (3TC was discovered by a team of researchers who worked at McGill University and the Institut Armand Frappier!). The second type is constituted of protease inhibitors, which attack proteases, the viral enzymes that are essential to the virus' reproduction. Examples of protease inhibitors are Ritonavir and Indinavir. Usually, tritherapy implies the taking of two transcriptase inhibitors and one protease inhibitor. Still, it is important to be careful, tritherapy does not cure AIDS, it just slows the disease's progression. Furthermore, these medications are very strong and cause numerous very unpleasant side effects.

be infected than their male counterparts.[47] On a strict biological basis, the risk of contamination from an infected man to a healthy woman is three times greater than the risk of infection from an infected woman to a healthy man.[48] Moreover, many women in the hardest-hit countries face heavy economic, legal, cultural and social disadvantages which increase their vulnerability to HIV infection and to the pandemic's impact. There are many ways in which gender discrimination influences the evolution of the pandemic. First, girls have limited educational opportunities. In some countries, women have few, if any, rights with respect to property ownership or secure tenure or to inheriting wealth, and many women either experience, or are at high risk of experiencing, sexual assault or other forms of violence. In many countries, laws do not allow women to inherit land or to open bank accounts without a husband's permission. They do not have legal or financial means to compel financial independence and are subject to men's economic power; their unfavourable position is a basis for prostitution. Divorce or the death of a husband can lead to destitution, sometimes forcing women to turn to sex for survival. Trafficking for the sex trade is also a growing threat to women and girls. For many of them, it is the only source of income. Bringing a form of economic independence to women would reduce prostitution by increasing its opportunity cost.[49]

Given the enormous legal, social and economic impediments facing women, many find it difficult, if not impossible, to negotiate condom use with their male partners,

---

47 United Nations, "Population, Development and HIV/AIDS with Particular Emphasis on Poverty: The Concise Report," *United Nations Department of Economic and Social Affairs: Population Division* ST/ESA/SER.A/247 (2005): 13.

48 Women are between two and four times more likely than men to contract HIV from sexual encounter. Reasons include higher concentrations of HIV in semen than in vaginal fluid, the larger surface of exposed female genital area, the longer period of exposure of semen in the vaginal tract, and the greater permeability of the mucous membranes in the vagina compared to the penis (see summary of evidence in Baylies and Bujra 2001: 5).

49 "Opportunity cost" refers to the cost of an economic activity foregone by the choice of another activity.

and may be forced into transactional sex as a result of their economic dependency on their partners, and their lack of power in the relationship. Women cannot always negotiate conditions in which sexual intercourses will take place, such as condom use even if there is certainty about the partner seropositivity.[50] Throughout the world, women faithful to one partner become infected with HIV as a result of their partner's sexual activities outside the relationship.

Education: one of the key-determinants of the pandemic is education level. At the onset of the pandemic in SSA, the virus affected educated and non-educated people in an indifferent manner; however, as the pandemic spread out educated people were less affected than the rest of population. This can be due to many reasons; first, educated people are better informed about prevention measures. As is access to health care, access to education is a means of being informed on prevention methods, especially if educative programs include sexual education. Next, since infected educated people are no more productive at the onset of sickness and will not be able to receive an income, education increases the opportunity cost of being infected. Last, education impacts on HIV/AIDS prevalence by delaying age at the onset of sexual activity, especially in regions where girls are sent into marriage as soon as they abandon schooling.[51]

Nevertheless, people's education can also be a factor that exposes them more to virus infection. Indeed, those people from high socio-professional categories (especially men) travel more than others for work and are more likely to support a "second office,"

---

50 "Seropositivity" means the presence of antibody to HIV as detected by appropriate laboratory tests.
51 Isobel Coleman, "The Payoff from Women's Rights," *Foreign Affairs: Council on Foreign Relations*, (2004), http://www.foreignaffairs.org/20040501faessay83308-p10/isobel-coleman/the-payoff-from-women-s-rights.html (accessed on February 15, 2006).

given their socio-economic status. That is what Over (1992) called the socio-economic gradient of the HIV/AIDS epidemic.[52]

Access to information: most infections occur because people are not even aware of the process of viral transmission. Although some people are aware of it, they do not always know about transmission modes. A joint-report from UNAIDS, UNICEF and WHO shows that the majority of young people in the world do not know either how HIV transmits from an individual to another, or how to prevent this transmission; and it is the age group most exposed to the infection. From this view, information is of great importance to stop or slow down the pandemic. Information and education have a synergic action; information campaigns consist of display posters, advertising messages on the radio and television, which are generally in the official language that can sometimes be different from local ones. Since awareness is widely done on the radio and through posters, the ability of an individual in reading and speaking the official language(s) makes it possible to follow the informational messages.

Mobile population: migrant workers form an important part of labour force in poor countries. Industrial and mining projects are mostly located in remote areas where workers cannot see their regular partners for long periods of time. Commercial sex develops in these areas for economical reasons cited above. Generally, neither sex workers, nor their clients are aware of their serologic status. Then both the incoming population (workers will infect their regular partners once back at home) and the welcoming population (sex workers will infect their occasional and regular partners when

---

52 According to Over (1992), the socioeconomic gradient of HIV/AIDS is the bias in the distribution of the epidemic among individuals according to their socioeconomic status. Thus, the pandemic is said to be upward if the epidemic affect more people in higher social strata and downward biased inversely. It is equally distributed if the population is affected uniformly.

migrant workers will leave the area) are affected by the pandemic. Mobility significantly increases HIV-related risk.[53] Often, migrant workers move from low-prevalence rural regions to urban centres, where HIV prevalence is much higher and risk behaviours are more frequent. Studies have identified high infection rates among long-haul truck drivers, mine workers and other migrant labourers.[54]

Religious and cultural practices: in recent years, increasing attention has been paid to the manner in which socio-cultural variables influence risk behaviours related to HIV infection transmission. These are the least subject to change.

Social contexts of sexual behaviour – practices of widow inheritance, widow 'cleansing,' wife sharing, wife exchanging with land and cattle, polygamy and female circumcision, for example – are strong influences on risk. Further, there is an undeniable interconnection between religion and the expression of human sexuality, which highlights the extent to which religion influences beliefs and shapes human sexual behaviour. Though the association of contentious ethical and moral issues with HIV risk behaviours exists in all societies, it is much more pronounced in the Muslim world. Therefore, Muslim religion can act negatively on many practices that influence high risk-behaviours.

---

53 It has been found that the risk of HIV was greater among women whose male partners traveled frequently (a partner who was away > 4 times/month). For more information see Sia E. Msuya, Elizabeth Mbizvo, Alhtar Hussain, Jacquiline Uriyo, Noel E. Sam, and Babill Stray-Pedersen, "HIV among pregnant women in Moshi Tanzania: the role of sexual behaviour, male partner characteristics and sexually transmitted infections," *AIDS Research and Therapy* 3 (2006): 5. Internet version available at BioMed Central http://www.aidsrestherapy.com/content/3/1/27 (accessed on February 28, 2007).
54 United Nations, "Population, Development and HIV/AIDS with Particular Emphasis on Poverty: The Concise Report," *United Nations Department of Economic and Social Affairs: Population Division* ST/ESA/SER.A/247 (2005): 13-14.

Epidemiological determinants

These are variables that condition virus transmission during contacts between individuals.

Presence of STIs: STI presence is surely the most important cofactor of the pandemic.[55] Most STIs cause ulcers that in turn become real culture mediums for HIV. In a study determining the role of social, behavioural and biological risk factors of HIV infection among pregnant women in Moshi urban, Tanzania, Msuya et al (2006) found that independent predictors of HIV were the presence of bacterial vaginosis, genital ulcer, active syphilis and herpes simplex virus type 2.[56] Another experiment conducted in Mwanza (Tanzania) shows that the probability of virus transmission was higher when people were already infected with an ulcerative STI. In that study, the new infections rate decreased from 40% in the treatment-group and remained the same in the control group.[57] On the contrary, a study conducted in Rakai, another Tanzanian city, suggests that STI's treatment does not affect the evolution of the pandemic. The explication of this paradox lies in the fact that the two cities had different HIV infection rate before the intervention; it was 16% in Rakai compared to 4% in Mwanza.[58] Thus, if the pandemic is just beginning, STIs presence can be an important factor of propagation of the infection while it depends more on behavioural factors when the pandemic is well established.

Nutritional status: the interactions between HIV/AIDS and nutritional status can be observed at the biological level as well as at the socio-economic level. The weakness

---

[55] Sia E. Msuya, Elizabeth Mbizvo, Alhtar Hussain, Jacquiline Uriyo, Noel E. Sam, and Babill Stray-Pedersen, "HIV among pregnant women in Moshi Tanzania: the role of sexual behaviour, male partner characteristics and sexually transmitted infections," *AIDS Research and Therapy* 3 (2006): 5. Internet version available at BioMed Central http://www.aidsrestherapy.com/content/3/1/27 (accessed on February 28, 2007).

56 Ibid.

57 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "Consultation on STDs interventions for Preventing HIV: What's the Evidence." *UNAIDS/WHO* (2000), Internet version available at http://www.unaids.org (accessed on October 22, 2006), 20.

58 Ibid.

of the immune system is one of the direct consequences of malnutrition. In her comparison of pandemic's determinants in SSA and in Latin America, Stillwagon (2002) suggests that population's nutritional status could be the most important factor of the pandemic in Latin America. She considers that HIV/AIDS is an infectious disease before all and that its pandemic dimension should not make people forget that determinant variables for infectious diseases transmission are still relevant for HIV/AIDS transmission.

Malnutrition and parasitical diseases are endemic in poor countries and it is well known that they weaken the body's immune function. For instance, vitamin A is important for epithelial integrity, which plays a determinant role in STIs protection, especially those that are ulcerative, which make virus transmission easier. Thus, they would then be considered a determinant in the pandemic's evolution. Nutritional status also acts as a transmission canal between poverty and the infection. Food insecurity additionally leads to risky behaviours such as seasonal migrations or sex work, strategies people use to diversify their income and increase their food security.

Condom use: For young people who are sexually active, consistent condom use is a critical HIV prevention measure. The WHO recommends condom use as the only contraceptive that also protects from HIV/AIDS. HIV/AIDS is transmitted through sperm, vaginal secretions and blood.[59] Thus, even in the absence of any ulcerative STI, a non-protected sexual intercourse can lead to virus transmission between individuals.[60]

---

59 Contrary to this endorsement, the US government prohibits the use of condoms in sexual education programs it funds abroad, which often makes this form of contraceptive prevention difficult to implement.
60 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "Consultation on STDs Interventions for Preventing HIV: What's the Evidence?" *UNAIDS* (2000), Internet version available at http://www.unaids.org (accessed on October 22, 2006).

Circumcision: Studies have found that uncircumcised men are more likely to be infected than circumcised men; the unknown role of male circumcision in prevention is currently the subject of several clinical trials.[61] Circumcision is a compulsory practice in Muslim religion and common in many African societies. It consists of the prepuce removal for men. There are at least two potential reasons justifying the negative relationship between circumcision and HIV/AIDS infection. The prepuce's presence exposes men to HIV/AIDS infection due to potential tearing during sexual intercourses; in addition it exposes them to STIs that are cofactors of the pandemic.

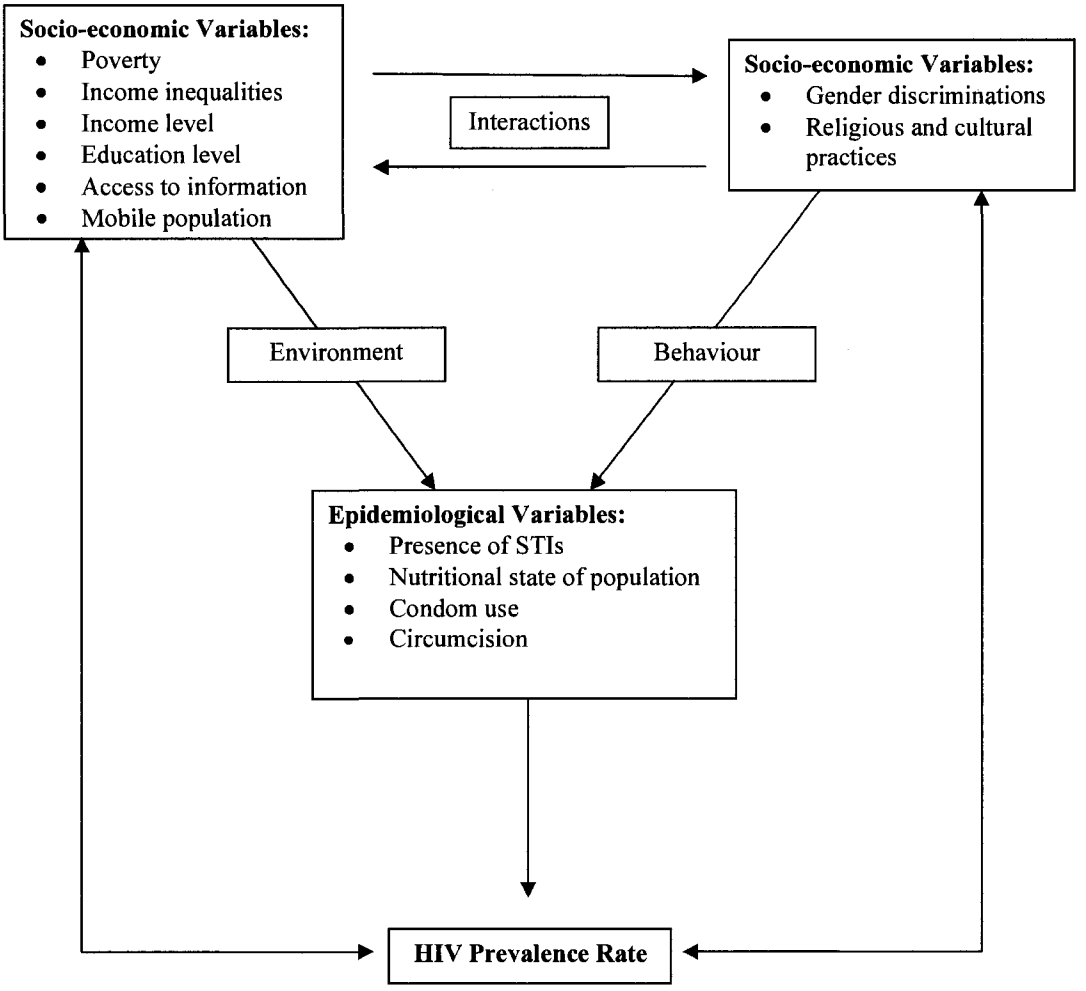
A Schematic Model of HIV/AIDS Prevalence

There are various links existing between the different determinants and the HIV/AIDS prevalence. For instance, low education leads to an unskilled labour force, which in turn increases income inequalities; in the same way, the proportion of Muslim population in total population tends to result in a lower education rate. The socioeconomic variables influence HIV/AIDS prevalence rate; poor countries cannot allocate funds to vaccine research nor offer a tritherapy to sick people. Lastly, socioeconomic factors influence epidemiological variables; for example, income influences nutritional status and circumcision is associated with cultural and religious practices. In other words, various factors interact with (feed on) each other to have some bearing on HIV/AIDS prevalence as depicted in Figure 2.1.

---

[61] Circumcision Halves H.I.V. Risk, U.S. Agency Finds," *The New York Times*, December 14, 2006. Available at http://www.nytimes.com/2006/12/14/health/14hiv.html?ex=1323752400&en=af128f63110c1c4d&ei=5088&partner=rssnyt&emc=rss (accessed on January 14, 2007).

Figure 2.1: A Schematic Conceptual Model of the Determinants of HIV/AIDS Prevalence



Empirical model

Based on the above conceptual model, I will use an empirical model that captures the various determinants of HIV/AIDS as discussed above. The model uses multiple regression in which HIV/AIDS prevalence rates are regressed on independent variables for men and women in separate models. The models are estimated using ecological (cross sectional) data of 34 SSA countries for which data are available. Before presenting the indicators, it is worthwhile to note the difficulties implied by the data.

Dependent Variable: HIV/AIDS Prevalence Rate

HIV/AIDS prevalence is not easy to measure. Researchers gather pertinent data, refine various assumptions about the routes and pace of HIV transmission, and calibrate mathematical models that can approximate how many people are infecting HIV and dying as a result of AIDS. In mainly heterosexual AIDS epidemics, such as those in sub-Saharan Africa, the most commonly-used data for such calculations are gathered at a sample of antenatal clinics, where blood samples of pregnant women are anonymously tested for HIV.[62] The data do not provide *direct* evidence of prevalence among men, among women younger and older than child-bearing ages, or among women who are not having unprotected sex.[63] These factors can lead to an overestimation of HIV infections. On the other hand, because HIV reduces fertility, data gathered by testing pregnant women might not reflect large numbers of women who are infected with the virus and are

62 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "AIDS Epidemic Update, December 2005: Special Report on HIV prevention," *UNAIDS/WHO*, http://www.who.int/hiv/epi-update2005_en.pdf (accessed on 23 March 2006), 18-20.
63 By definition, though, the data only reflect HIV prevalence among women who have had unprotected sex. Because of this, they are prone to overestimating HIV prevalence among young women (15–24 years old), significant proportions of whom are not yet sexually active. Often the sampled clinics are predominantly urban or quasi-urban.

not able to become pregnant. Once adjusted accordingly with other relevant information and evidence-based assumptions, the data offer a basis for reasonably accurate estimations, which are presented within 'plausibility bounds' or 'ranges of uncertainty'.[64]

Household surveys that include testing for HIV provide countrywide data on HIV prevalence for both sexes and for various age groups, and include samples from remote rural areas. These, too, are prone to uncertainty. If a significant share of respondents refuse to be tested, or answer only certain questions, or are absent at the time of the survey, a non-response bias is introduced into the survey data.[65] The surveys usually do not reveal the possible association between a person's absence or refusal to participate, and that person's HIV status. It might be that a person's refusal to participate or his/her absence from the household is correlated with a stronger likelihood of HIV infection. Therefore, there is a likelihood that high non-response rates in household-based surveys could lead to underestimation of HIV prevalence.[66]

Each of these methods has its strengths and weaknesses.[67] Considered together, the various data can yield more accurate estimates of HIV infection levels and rates (and of other estimates, such as AIDS-related deaths). However, HIV and AIDS estimates (whether derived from household surveys or sentinel surveillance data) need to be

---

64 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "AIDS Epidemic Update, December 2005: Special Report on HIV prevention," *UNAIDS/WHO*, http://www.who.int/hiv/epi-update2005_en.pdf (accessed on 23 March 2006), 18-20.

65 This has been a recurrent issue in most of the household surveys carried out in African countries in recent years, where non-response rates of 8–42% have been reported. The estimates can be adjusted if the salient characteristics of non-responders are known.

66 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "AIDS Epidemic Update, December 2005: Special Report on HIV prevention," *UNAIDS/WHO*, http://www.who.int/hiv/epi-update2005_en.pdf (accessed on 23 March 2006), 18-20.

67 Generally, estimates based on antenatal clinic data are a useful gauge of HIV infections trends among 15–49 year-olds. National household surveys, on the other hand, can reveal important information about the national prevalence level and about the spread of HIV, particularly among young people, men and residents in rural areas.

assessed carefully, and the data as well as the assumptions reviewed continually.[68] The HIV/AIDS prevalence rates used in this study have incorporated both sources of information.

Independent (Explanatory) Variables

These variables consist of socio-economic variables, namely: poverty, income inequalities, income level, gender discriminations, education, access to information, mobile population, as well as cultural and religious practices; with epidemiological variables: presence of ulcerative sexually transmitted infections (STI), condom use, malnutrition and circumcision practice, which are used as control variables.

Poverty is multi-dimensional and means more than income poverty. It is a matter of the quality of people's lives and is defined by many variables. Nevertheless, poverty is a "key factor" leading to behaviours that expose people to the risk of HIV infection;[69] therefore, it is beneficial to investigate poverty indicators in order to derive its influence on a country's HIV/AIDS prevalence. Poverty is defined as an absolute condition - the inability to purchase or consume a fixed minimum package of goods and services - used with an official poverty line set at 1 US dollar a day or less, representing the income required to purchase the range of goods and services.[70] I use United Nations Development Programme's (UNDP) *Human Poverty Index (HPI-1) Value* as the indicator for a country's level of human and income poverty. The HPI-1 value is a

---

68 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "AIDS Epidemic Update, December 2005: Special Report on HIV prevention," *UNAIDS/WHO*, http://www.who.int/hiv/epi-update2005_en.pdf (accessed on 23 March 2006), 18-20.

69 United Nations, "Population, Development and HIV/AIDS with Particular Emphasis on Poverty: The Concise Report," *United Nations Department of Economic and Social Affairs: Population Division* ST/ESA/SER.A/247 (2005): 12-13.

70 Michael P. Todaro and Stephen C. Smith, "Poverty, Inequality, and Development," in *Economic Development* ninth edition (Boston: Addision-Wesley, 2006), 199.

composite index measuring deprivations in the three basic dimensions captured in the human development index—a long and healthy life, knowledge and a decent standard of living. Poverty is expected to be positively related to the HIV/AIDS prevalence rate in the regression.

Inequality, like poverty, is usually measured in monetary terms (income). The Gini coefficient is used as a measure of the inequality of income distribution, where a lower Gini coefficient tends to indicate a higher level of social and economic equality. The Gini index is the Gini coefficient expressed as a percentage, and is equal to the Gini coefficient multiplied by 100. The *Gini index* was intended to be used in this study as the measure of income inequality; but, the data for *Gini index* was not available for ten of the countries in the sample. In the interest of a larger sample size, the *Gini index* was ignored.

For measuring of a country's income, the *GDP per capita* (in purchasing power parity terms in US dollars) is used as the indicator.

Gender disparities, in terms of how variables impact prevalence of HIV/AIDS, is considered by testing the various determinants against male and female prevalence rates separately. This investigation will reveal what factors, if any, account for variations in the rates of HIV/AIDS infected men and women across the sampled SSA countries.

As for education, *Literacy rates* and the *Combined gross enrolment rates for primary, secondary and tertiary* are used with a negative sign expected. Each education variable is used in separate regression models to alternatively investigate the influence of education on HIV/AIDS prevalence rates. In addition, both education indicators are measured in gender specific expressions. In other words, against male HIV/AIDS

prevalence rates, *Male literacy rates* and *Male combined gross enrolment rates* are used and against female HIV/AIDS prevalence rates, *Female literacy rates* and *Female combined gross enrolment rates* are used in the regression equations.

Mobile population is a concept difficult to approximate; when displacements are not very long, they are not usually declared in immigration offices. As such, figures concerning the proportion of alien labour force in total labour force are not available and that is why *Urban population (% of total)* is used as a distant proxy for mobile population. Even if this indicator does not serve as the best proxy for the concept of mobile population, *Urban population* is still a valid socioeconomic variable that can be considered on its own.

Access to information is captured through the number of *Televisions sets (per 1000 people)* and its impact should be negative on the pandemic.

A religious and cultural practices indicator is the most complex attribute to quantify. In the absence of published data on the cultural norms that shape a society's sexual practices I use the *Percentage of Muslim population in total population.*

The *Prevalence of Male Circumcision (%)* is used as the indicator for the epidemiological variable of circumcision.

Since STI detailed epidemiological data was mostly unavailable, it required an alternative approach to measuring this variable. Although an indicator of expenditure on STI would have been a good proxy, such data is not available for the sample countries. Nevertheless, I use health expenditure per capita as a remote proxy. Similar to some of the other proxies used, this indicator may not serve as the best indicator for the presence

of STIs; but *Health expenditure per capita* is still a relevant factor in the prevalence of HIV/AIDS in Sub-Saharan Africa.

To explain HIV/AIDS pandemic's evolution, nutrition in total population is relevant. Therefore, I use the latest available data on *Prevalence of undernourishment (% of population)*.

The act of condom use, for both male and female populations, is captured through the *Prevalence of Condom Use (%)* variable.

Data

HIV/AIDS prevalence measures the number of individuals infected in the population aged 15 and above. These statistics are estimates at the end of 2003 published by UNAIDS in their *Report on the Global HIV/AIDS Epidemic, May 2006*. The estimates include all people with HIV infection, whether or not they have developed symptoms of AIDS, alive at the end of 2003. The number of individuals infected were converted into prevalence rates by dividing by the total number of adults, male and female aged 15-64 in a country as given in the World Bank's 2003 *World Development Indicators database.*[71] If a country is not included in the table it is because there were no reliable statistics for the country at the time the report was published.

Most country studies rely on national averages covering men and women. Given the intended emphasis on how socioeconomic variables impact the prevalence of HIV/AIDS in women and men separately, prevalence rates for female and male populations for the year 2003 will be used.

---

71 World Bank, World Development Indicators database 2003, http://devdata.worldbank.org/hnpstats/query/default.html (accessed on April 7, 2006).

When considering the socio-economic and epidemiological factors of HIV/AIDS, clearly providing definitions of the variables in terms of the specific activities to measure it with empirical evidence is useful. To capture these determinants, specific independent variables were selected. In all, 11 different independent variables are tested against 2 different dependent variables. The UNDP (*Human Development Report),* the Central Intelligence Agency (*World Fact Book*), and the World Bank (*World Development Indicators*) provided most of the data used. All the variables, their sources and descriptions are included in Appendix I.

There are 48 Sub-Saharan African countries on the World Bank list. Therefore the original research sample consisted of the 48 nations in the Sub-Saharan African region. Forty-two of these nations are on the African mainland. In addition, four island nations in the southwest Indian Ocean (Madagascar, Comoros, Mauritius, and Seychelles) and two island nations in the Atlantic Ocean (Cape Verde and São Tomé and Príncipe) are considered part of Sub-Saharan Africa. UNAIDS provided fact sheets for all of them as of the end of 1999. However, only for 43 of the countries did UNAIDS give information on female and male infection numbers. Even though there were 43 Sub-Saharan African countries for which UNAIDS had data on male and female infection rates, only 34 countries' experience could be used in the cross-sectional analysis due to socioeconomic and epidemiological data availability. See Table 2.1 for a complete list of the 34 Sub-Saharan African countries included in the sample.

Table 2.1: 34 Sub-Saharan African countries in the research sample

CENTRAL AFRICA	EAST AFRICA	NORTH EAST AFRICA	SOUTHERN AFRICA	WEST AFRICA
• **Angola** *(also sometimes considered part of Southern Africa)* • **Burundi** *(also sometimes considered part of East Africa)* • **Cameroon** *(also sometimes considered part of West Africa)* • **Central African Republic** • **Chad** *(also sometimes considered part of West Africa)* • **Democratic Republic of the Congo** • **Gabon** *(also sometimes considered part of West Africa))* • **Zambia** *(also sometimes considered part of Southern Africa)*	• **Burundi** *(also sometimes considered part of Central Africa)* • **Kenya** • **Mozambique** *(also sometimes considered part of Southern Africa)* • **Rwanda** *(also sometimes considered part of Central Africa)* • **Tanzania** • **Uganda**	• **Eritrea** • **Ethiopia**	• **Angola** *(also sometimes considered part of Central Africa)* • **Botswana** • **Lesotho** • **Malawi** • **Mozambique** *(also sometimes considered part of East Africa)* • **Namibia** • **Swaziland** • **Zambia** *(also sometimes considered part of Central Africa)* • **Zimbabwe**	• **Benin** • **Burkina Faso** • **Cameroon** *(also sometimes considered part of Central Africa)* • **Chad** *(also sometimes considered part of Central Africa)* • **Côte d'Ivoire** • **Gabon** *(also sometimes considered part of Central Africa)* • **The Gambia** • **Ghana** • **Guinea** • **Guinea-Bissau** • **Mali** • **Mauritania** • **Niger** • **Nigeria** • **Senegal** • **Sierra Leone** • **Togo**

Notes:

- Equatorial Guinea, Republic of Congo, Djibouti, Somalia (including Somaliland), Sudan, South Africa, Liberia, Cape Verde, Comoros, Madagascar, Mauritius, São Tomé and Príncipe, Seychelles, Mayotte, Réunion were not included in the sample due to a lack of available data.

CHAPTER THREE

Results and Discussion

Results

As outlined in chapter two, the variables used to relate the prevalence of HIV/AIDS, with various explanatory variables. Two slightly different regression models are considered.

In Model 1, the socioeconomic variables that are used for male and female HIV/AIDS prevalence rates include: *GDP per capita*, *Human Poverty Index Value*, *Urban population*, *Televisions sets (per 1000 people)*, *Percentage of Muslim population in the total population*, and *Female and Male literacy rates*. In addition, the epidemiological variables that were used in this model consist of: *Prevalence of Male Circumcision*, *Health expenditure per capita*, *Prevalence of undernourishment*, and *Prevalence of Condom Use*.

Model 2 replaces literacy rates with combined gross enrolment rates as an alternative education variable. The relationship between education and HIV/AIDS prevalence is ambiguous in the literature. As such, experimenting with alternative measures of education is a worthwhile. In Model 2 all the socioeconomic and epidemiological (control) variables are the same except for the education variable, which is changed to one that incorporates the influence *Female and Male combined gross enrolment rates for primary, secondary and tertiary,* instead of *Female and Male literacy rates* that were used in Model 1.

Model 1

In Model 1, when a multiple regression analysis is done for ten of the original independent variables against the dependent variable of female HIV/AIDS prevalence, six of the variables are found to be associated at a statistically significant level of .05. Running the same multiple regression model against male HIV/AIDS prevalence rates reveals five statistically significant predictor variables. More specifically, the results of Model 1 indicate statistically significant influences of *GDP per capita* (GDP), *Human Poverty Index* (HPI), *Female literacy rate* (FLR), *Percentage of Muslim population* (MUSLIM), *Prevalence of Male Circumcision* (MC), and *Health expenditure per capita* (HE) on female HIV/AIDS prevalence rates; and, *Human Poverty Index, Access to information* (TELE), *Male literacy rate* (MLR), *Prevalence of Male Circumcision* (MC), and *Health expenditure per capita* on male HIV/AIDS prevalence rates. The results of Model 1 for the first set of multiple regressions for both female and male HIV/AIDS prevalence rates are shown in Table 3.1.

Table 3.1: Model 1
Regression results of the socioeconomic and epidemiological determinants of HIV/AIDS prevalence rates

Determinants	Female			Male		
	B	t	p-value (α)	B	t	p-value (α)
(Constant)	-0.11953	-1.32579	0.19790	-0.14523	-1.56887	0.13030
GDP	-0.00004	-4.31701	0.00030*	-0.00002	-1.88176	0.07260
HPI	0.38920	3.21074	0.00390*	0.38351	3.20709	0.00390*
URB	0.11821	1.97310	0.06060	0.04799	0.90779	0.37340
TELE	-0.00024	-1.82746	0.08060	-0.00017	-2.04384	0.05260*
FLR	0.13422	2.21930	0.03660*			
MLR				0.14409	2.59709	0.01610*
MUSLIM	-0.06363	-2.33774	0.02850*	-0.03567	-1.52480	0.14090
MC	-0.07913	-2.77439	0.01080*	-0.08082	-2.97089	0.00680*
HE	0.00136	5.50967	0.00000*	0.00074	2.88989	0.00830*
PUN	-0.03519	-0.78851	0.43850	-0.05739	-0.95139	0.35130
CU	0.10843	0.32638	0.74710	0.30144	0.97607	0.33920
R-squared	0.90437			0.85757		
Adjusted R-squared	0.862792			0.795644		
F-value	21.7511			13.8483		
Degrees of freedom	25			25		

Notes:

- B is the estimated coefficient of the regression.
- t is the "t-ratio" of the estimated coefficient.
- α is the p-value of the estimated coefficient.
- Adjusted R-sqaured indicates the "goodness of fit," that is, the proportion of total variation in HIV rates that is explained by the determinants
- F value is a measure of the overall significance of the regression results
- Standard errors of the estimated coefficients (parameter estimates) are adjusted for heterskedasticity.
- Degrees of freedom for t-test is 25 and for F-test is 1,25
- * indicates statistical significance at .05

According to Model 1, *GDP per capita*, used as the indicator for income level, was found to be significantly associated with female prevalence rates though not with male rates. The sign associating *GDP per capita* to prevalence rates was, as expected, negative. Therefore, as income levels increase, HIV/AIDS prevalence rates decrease, more so for female prevalence rates than for male rates, as the influence of *GDP per capita* is greater (in absolute terms) for females than males.

Human Poverty Index shows comparable results for male and female prevalence rates. It is positively associated with female and male HIV/AIDS prevalence rates. Although for both genders the associations are highly significant, poverty has a stronger association with female HIV/AIDS prevalence rates. Nevertheless, as the level of poverty increases, so do HIV/AIDS prevalence rates for both the male and female populations.

The *Urban population* rate has the appropriate positive sign in the regression. That is, countries with higher urbanization rates tend to have higher HIV/AIDS prevalence rates. Such positive associations, however, are found to be statistically insignificant for males and statistically significant at 10% only for females.

Access to information, proxied by *Televisions sets (per 1000 people),* is found to have the predicted negative sign in the regression. That is, as the access to information increases, the prevalence of HIV/AIDS decreases, which especially holds true for male prevalence rates. This effect is statistically significant at 5% for males and only 10% for females.

Literacy rates, as the socioeconomic indicator for education, shows statistically significant associations with both male and female HIV/AIDS prevalence rates. However, despite the significant association, the expected sign is contrary to my original prediction; but consistent with other research results cited in this thesis. Instead of the expected negative association with prevalence rates, it is found that *Literacy rates* are positively related to HIV/AIDS prevalence rates. As such, this suggests that as the level of education increases, so do the prevalence rates for both the male and female populations. A study conducted by Robert Brent (2006), focusing on the effect of the level of female education, and the gap between male and female level, on prevalence rates, found that

female education is positively related to country infection rates. Such findings led him to put forward the notion that education is tied up with religion in SSA, pointing to the reality that countries with smaller Muslim populations and greater education participation have higher infection rates: and countries with a larger Muslim population and lower education participation have lower infection rates.[72] Therefore, in large part, the positive relationship between education and HIV/AIDS prevalence rates could be the results of education being indirectly tied up with other factors such as religious and cultural practices and poverty; both of which were found to be significantly associated to HIV/AIDS prevalence rates in my research.

Nevertheless, since this result is counterintuitive, I used an alternative variable for education to see if the association between education and HIV/AIDS prevalence rates is indeed positive. Model 2, presented later, provides the results once the education variable is altered to reflect the influence of enrolment rates, instead of literacy rates that are used in Model 1.

Percentage of Muslim population appears to be negatively associated with the HIV/AIDS prevalence rates for both males and females, as expected. Therefore, as the frequency of risky sexual practices decreases due to adherence to Islamic codes of conduct, the prevalence of HIV/AIDS decreases, which holds true only for female prevalence. The association is stronger for female prevalence rates than for male rates. In fact, the association between the *Percentage of Muslim population* and female prevalence rates is significant at 5%, whereas it is insignificant for males. Such impact appears to be

72 Robert J. Brent, "Does female education prevent the spread of HIV-AIDS in Sub-Saharan Africa?" Applied Economics 38 (2006): 499-500.

in addition to the effect of male circumcision, which is also a practice mostly prescribed by Islamic teachings.

The control variable, *Prevalence of Male Circumcision*, used as the indicator for the epidemiological determinant of HIV/AIDS transmission, is significantly associated with both male and female HIV/AIDS prevalence rates and has the appropriate negative sign. In other words, as the prevalence of male circumcision increases, the prevalence of HIV/AIDS decreases. Therefore, male circumcision appears to be associated with reductions in the transmission and thus the prevalence of the disease.

Health expenditure per capita, used as a proxy for the prevalence of other STDs, is significantly associated with both male and female HIV/AIDS prevalence rates and has the expected positive sign. The positive association between *Health expenditure per capita* and HIV/AIDS prevalence rates may be also be due to more health expenditure in response to higher HIV/AIDS prevalence. This would mean the presence of a potential endogeneity problem which will be addressed below.

The *Prevalence of undernourishment*, has a negative sign that is contrary to my original hypothesis, but the estimate is statistically insignificant for both the male and female populations.

Lastly, the occurrence of condom use, as represented by the *Condom use* variable, is not statistically association to HIV/AIDS prevalence rates.

According to the results of Model 1, gender does play a role in HIV/AIDS prevalence rates as there are differences in the magnitudes and the levels of significance of the coefficients associating the variables to male and female prevalence rates. Similarly, for both male and female prevalence rates significant predictor variables are

Human Poverty Index, Literacy rates, Prevalence of male circumcision, and *Health expenditure per capita*. However, the negative association between *Prevalence of male circumcision* and HIV/AIDS prevalence rates is stronger for males than females in this model. The opposite pattern holds true for the other predictor variables, as *Human Poverty Index, Literacy rates* and *Health expenditure per capita* have stronger positive associations with female HIV/AIDS prevalence rates than with male prevalence rates. In addition, the *Percentage of Muslim population* and *GDP per capita* have much stronger associations with female prevalence rates than with male rates, as both are significantly associated with only female prevalence rates, and not to male rates. In contrast, *Access to information* has stronger associations with male prevalence rates, as it is significantly associated with only male prevalence rates. Clearly, gender does play a role in the extent of associations between the chosen variables in Model 1.

Model 2

Model 2 was constructed to examine the role of an alternative education variable. Since the results for the socioeconomic variable of education was contrary to my original expectation, I used an alternate variable for education to find out if the association between education and HIV/AIDS prevalence rates is indeed positively related. The education variable is changed to that of enrolment rates, as opposed to literacy rates that are presented in Model 1. When a multiple regression analysis is estimated for ten of the original independent variables, in addition to the one alternate education variable, against the dependent variables of female and male HIV/AIDS prevalence rates, the results only differ slightly from those found in the Model 1.

The results of Model 2 indicate statistically significant influences of *GDP, Access to information, Percentage of Muslim population, Prevalence of male circumcision,* and *Health expenditure per capita* on both female and male HIV/AIDS prevalence rates. The results of Model 2 for the second set of multiple regressions for both female and male HIV/AIDS prevalence rates are shown in Table 3.2. What follows is a comparison of the results from Model 1 and Model 2.

Table 3.2: Model 2
Regression results of the socioeconomic and epidemiological determinants of HIV/AIDS prevalence rates

Determinants	Female			Male		
	B	T	p-value (α)	B	t	p-value (α)
(Constant)	0.01529	0.14363	0.88700	0.05170	0.62381	0.53890
GDP	-0.00005	-4.10928	0.00040*	-0.00003	-2.32703	0.02910*
HPI	0.23033	1.61611	0.11970	0.18074	1.62931	0.11690
URB	0.12156	1.76280	0.09120	0.08757	1.50903	0.14490
TELE	-0.00032	-2.30956	0.03020*	-0.00025	-2.34822	0.02780*
FER	0.02721	0.33063	0.74390			
MER				-0.01237	-0.23744	0.81440
MUSLIM	-0.07906	-2.53618	0.01850*	-0.06008	-2.39555	0.02510*
MC	-0.10990	-3.64740	0.00130*	-0.10973	-3.46036	0.00210*
HE	0.00158	5.02961	0.00000*	0.00093	3.30998	0.00310*
PUN	-0.01561	-0.27045	0.78920	-0.03671	-0.58032	0.56730
CU	0.26515	0.62793	0.53620	0.28368	0.82717	0.41660
R-squared	0.877728			0.83129		
Adjusted R-squared	0.824567			0.757938		
F-value	16.51057			11.33287		
Degrees of Freedom	25			25		

Notes:

- B is the estimated coefficient of the regression.
- t is the "t-ratio" of the estimated coefficient.
- α is the p-value of the estimated coefficient.
- Adjusted R-squared indicates the "goodness of fit," that is, the proportion of total variation in HIV rates that is explained by the determinants
- F value is a measure of the overall significance of the regression results
- Standard errors of the estimated coefficients (parameter estimates) are adjusted for heterskedasticity.
- Degrees of freedom for t-test is 25 and for F-test is 1,25
- * indicates statistical significance at .05

In general, the results of Model 2 provided comparable results to Model 1. There are some variations in the extent of significance associating certain variables to prevalence rates.

Certain variables that were not as statistically significant in Model 1 became significant in Model 2. This is the case, in particular, for *Percentage of Muslim population*, *GDP per capita* and *Access to information*, where the estimates are now significant for both males and females. In Model 2, *Percentage of Muslim population* is significantly associated with both male and female prevalence rates, not only with female rates as it appeared in Model 1. Furthermore, similar to Model 1, the association between the *Percentage of Muslim population* and female prevalence rates is stronger than its association with male rates in Model 2, as evident from increased p-value and t-values.

Also, in Model 2, the *Access to information* variable continues to have a negative sign but is significantly associated with both male and female prevalence. This variable's influence is stronger for both males and females than it was in Model 1. Still, as the access to information increases, the prevalence of HIV/AIDS decreases more so for males than for females.

GDP per capita also has stronger associations in Model 2 with both male and female prevalence rates. Although the association between *GDP per capita* and female prevalence rates are comparable with the results in Model 1, *GDP per capita* and male prevalence rates are more significant in Model 2. In fact, *GDP per capita* and male prevalence rates are statistically significant at 5% in Model 2.

On the other hand, certain variables actually became less significant once the education variable was altered for Model 2. Specifically, the poverty variable (*Human*

Poverty Index) has less significant associations than in Model 1. Likewise, education variable (*Combined gross enrolment rate*), is also not significant for male and female prevalence rates.

More interesting, in contrast to Model 1, the education variable used in Model 2 is no longer positively related to HIV/AIDS prevalence rates, as these associations are not statistically significant. Such result is an interesting contrast to the general finding in the literature as replicated in Model 1, and that may be closer to intuition

The influences of *Prevalence of male circumcision, Urban population, Health expenditure per capita* and *Condom use* are found to be similar to those in Model 1.

Taken together the results of Model 1 and Model 2 indicate statistically significant results in general. The R-squares (both adjusted and unadjusted) are high and the F values are all significant. The residuals for both models appear to be well-behaved (See Appendix II). Also, most parameter estimates are statistically significant. Those that are found to be significant in both models are *GDP per capita, Health expenditure per capita,* and *Prevalence of male circumcision.*

Discussion

The comprehension of variables that influence the course of HIV/AIDS pandemic constitutes an important stake both at the economic and human levels for SSA because it is the first step in eradicating the disease. This study, though not exactly an innovative response to a real demand in the field, does complement previous ones since it considers the impact of different socioeconomic and epidemiological determinants on HIV/AIDS prevalence. It attempts to identify the determinants that are most important in influencing

the pandemic of HIV/AIDS prevalence rates, and investigates the differential impact, if any, of such determinants on females and males separately for the 34 SSA countries, and to what extent such factors account for variations in prevalence rates among the male and female populations in SSA. The attempt proved to be delicate for many reasons and as such the results should be interpreted with caution.

Socioeconomic factors

Among the socioeconomic determinants, *Human Poverty Index, GDP per capita, Literacy rates, Percentage of Muslim population,* and *Access to information* were found to be significantly related to HIV/AIDS prevalence rates.

It has long been known that poverty is associated with health compromising behaviours. Malnutrition, lack of access to health care, poor sanitation, limited resources for meeting basic need, conflict, and violence are among the conditions of poverty that impede health and well-being. In this context, poverty is often perceived as a factor likely to contribute to the progression of HIV, and to affect efforts for prevention[73] (Shisana and Simbayi, 2002; Bloom and Goodwin, 1997; Collins and Rau, 2000; Booysen, 2004; Stillwaggon, 2002; Bloom et al, 2002; Lachaud, 2007; Kalichman et al, 2006).

Although HIV affects rich and poor, young and old, and all regions of the world, HIV has disproportionately affected groups that already face social and economic disadvantages because those with the fewest resources have the least access to health-care

73 The speeches of the President of South Africa, Thabo Mbeki, at the 13th International Conference on AIDS in Durban in 1999, fall into this context: "The world's biggest killer and the greatest causes of ill health and suffering across the globe, including South Africa, is extreme poverty."

services or health-related information.[74] This view is supported by the findings of this study. Poverty (measured by the indicator *Human Poverty Index (HPI-1) Value*) is found to be positively associated with increased HIV/AIDS prevalence in this study. Furthermore, the positive association between the *HPI-1 Value* and HIV/AIDS prevalence rates was stronger for females than for males in the models. Therefore, as the extent of poverty increases, the prevalence of HIV/AIDS increases as well, which holds true more for female populations than male populations across SSA.

Poverty has strong ties to gender inequality because poverty affects women differently from men. Women are disproportionately poor and often disempowered. Burdened by productive work, childbirth, and care of family members without having adequate access to land and better employment opportunities, hinders female empowerment and worsen poverty.[75]

GDP per capita, as an average measure of a country's income and also its standard of living, is important when addressing the determinants of HIV/AIDS. A country's capabilities of addressing the pandemic are based on its income, and this is realized since the pandemic has spread the fastest in poor countries. Developed countries can implement prevention measures and care for sick people, thus decreasing their infectivity and by then the number of new infections. As such, a country's income is a significant determinant of HIV/AIDS prevalence rates, as poor countries cannot and do not have the capacity to address the pandemic.

---

74 United Nations, "Population, Development and HIV/AIDS with Particular Emphasis on Poverty: The Concise Report," United Nations Department of Economic and Social Affairs: Population Division ST/ESA/SER.A/247 (2005): 12-13.

75 United Nations Development Programme, Human Development Report 1997 (New York: Oxford Press, 1997), 3.

Of all the socioeconomic variables, the results for education (captured by both *Literacy rates* and *Combined gross enrolment rates*) are the most surprising. Counter intuitively, the *Literacy rates* are found to be positively associated with HIV/AIDS prevalence rates.

Education is a well known factor of HIV/AIDS in Sub-Saharan Africa, but no consensus exists regarding the nature of the relationship. The World Bank (2002) report, in which the authors focused explicitly on the education gap variable to argue that a solid, basic education was the most cost-effective way for governments to intervene in the HIV/AIDS pandemic. They listed a number of excellent reasons why expanding female education would be helpful in this regard:

> Better educated women are more likely, in comparison with their peers, to delay marriage and childbearing, have fewer children and healthier babies, enjoy better earning potential, have stronger decisions making and negotiation skills as well as higher self-esteem, and avoid commercial sex.[76]

Logically, in the African context, where the HIV infection is primarily caused by unprotected, heterosexual intercourse that has intergenerational mixing and is not always consensual, raising female education levels would seem likely to lead to greater economic and social empowerment. The specific mechanism by which the literacy gap was thought by the World Bank to have its impact on infection rates was via the gap leading to fewer conventional job opportunities or lower wages for women, thus leading to a greater supply of female sex workers. All the same, the unforeseen results that were revealed suggest that as education increases, so does the HIV/AIDS prevalence rates across Sub-Saharan Africa.

---

76 World Bank, "Education and AIDS," *The World Bank Group* (2002), http://www.polity.org.za/pdf/EducationAndAids.pdf (accessed on March 23, 2006).

But, is the result of a positive relation between education and HIV/AIDS prevalence really new? In the early days of the pandemic, when the transmission mechanism was not well understood, there was evidence that education and HIV/AIDS were positively related. However, this was thought not to be the case once people became more knowledgeable about the disease. World Bank (2002) stated that:

> Data for the late 1980s and early 1990s, when the HIV/AIDS pandemic was just emerging, mostly showed a positive correlation between level of education and rates of infection. This was perhaps because the higher socioeconomic status and greater mobility of better educated people enabled encounters with a greater number and range of sexual partners, but also because at that time education seldom included HIV/AIDS prevention or behavioural change programs, and the level of knowledge about the disease was generally low. However, once the ways to avoid infection became better known, better educated people were more likely to adopt safer behaviour (World Bank 1999), and later studies show a reversal in the trend.[77]

So it appears that the old positive relation has returned to SSA and public policies must be adjusted accordingly. But when *Literacy rates* are substituted with *Enrolment rates,* the positive association vanishes. The effects of *Enrolment rates* for both females and males are not statistically significant. Perhaps being enrolled in schools gives a better indication of the level of education than the literacy rates. Those at schools are more likely to be given HIV/AIDS-specific education which is more effective in raising awareness about the risks of the pandemic. Thus, the inclusion of HIV/AIDS prevention programs (i.e. increasing knowledge about the biology of HIV transmission) or behavioural change programs (i.e. transforming the risky cultural basis of sexual relationships) incorporated into schools' curriculum may begin to reverse this trend once again to highlight that raising education levels leads to greater economic and social

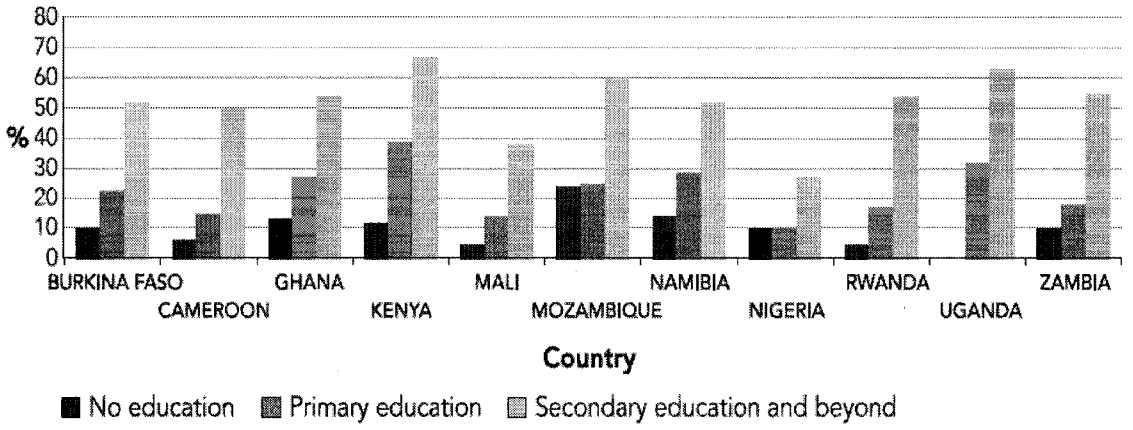
---

77 World Bank, "Education and AIDS," *The World Bank Group* (2002), http://www.polity.org.za/pdf/EducationAndAids.pdf (accessed on March 23, 2006).

empowerment in helping to avoid the risky sexual relations that produce a ripe environment for the deadly spread of HIV/AIDS, particularly among African women.

The variation in comprehensive HIV knowledge between countries is noteworthy at this point. Among young women in the 14 sub-Saharan African countries surveyed, comprehensive knowledge levels ranged from below 10% in Benin, Chad and Mali to more than 40% in Botswana and Tanzania. Data suggest that school-based HIV education is critical to increasing HIV-related knowledge levels for young people.[78] Generally, HIV-related knowledge levels almost doubled for young people who had received at least a primary education, and rates almost quadrupled among young people with secondary education or higher (refer to Figure 3.1 for young men, Figure 3.2 for young women).

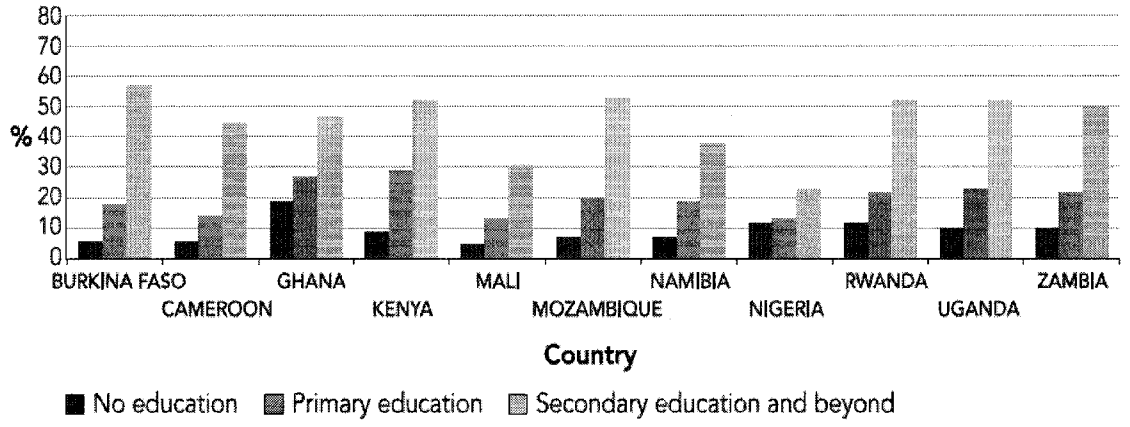
Figure 3.1: Comprehensive knowledge about HIV and AIDS among young males aged 15-24, by level of education in 11 sub-Saharan African countries, 2000-2004



Source: UNAIDS, 2006. "2006 Report on the Global AIDS Epidemic – Chapter 3: Progress in Countries." *Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO).* May 2006. p.64.

78 MEASURE DHS 2006, *Measure, Demographic and Health Surveys/AIDS Indicator Surveys.* Available at http://www.measuredhs.com/ (24 January 2007).

Figure 3.2: Comprehensive knowledge about HIV and AIDS among young females aged 15-24, by level of education in 11 sub-Saharan African countries, 2000-2004



Source: UNAIDS, 2006. "2006 Report on the Global AIDS Epidemic – Chapter 3: Progress in Countries." *Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO).* May 2006. p.64-65.

Most infections occur because people are not even aware of virus existence. Although some people may be aware of it, they do not always know about transmission modes. Access to information, as measured by the *Televisions sets (per 1000 people)* variable, was found to be negatively related at significant levels to the prevalence of HIV/AIDS across SSA. Therefore, as access to information increases, prevalence rates tend to decrease. From this analysis, information is of great importance to stop or slow down the pandemic. Since information is widely spread on the radio, television and through posters, the fact that a large part of the population can read and speak the official language(s) makes it easier to disseminate the informational messages. In light of the synergy between information and education, increasing HIV/AIDS information into school curriculum should check the disease. Investing in education with the inclusion of school-based HIV education is important not only to gain access to information, but to

decode prevention messages. Investing in education should not be abandoned, despite the uncovered positive relationship, because education influences a number of other variables, namely: employment opportunities, access to health care, and gender discriminations, which can all indirectly influence HIV/AIDS prevalence. However, more research investigating the influences of these variables on HIV/AIDS prevalence is necessary.

Religious and cultural norms contribute to a high-risk environment and place individuals, especially women, in a subordinate and vulnerable position.[79] Cultural and religious norms have implications for sexual conduct and, therefore, the risks of HIV/AIDS infection.

Though the association of contentious ethical and moral issues with HIV risk behaviours exists in all societies, it is much more pronounced in the Muslim world. Islam is a religion that prohibits sexual deviance – it does not allow taking liberties with your sex life. Therefore, Muslim religion prohibits many practices that influence high risk-behaviours and therefore HIV/AIDS prevalence rates. This study finds a negative relationship between the *Percentage of the Muslim population* and the prevalence of HIV/AIDS, more so for females than males. The findings suggest that policies need to reduce risky sexual behaviours that create vulnerability to HIV/AIDS. This is logical if one examines some of the religious and cultural norms practiced across SSA and

---

79 Some other cultural and religious practices likely to facilitate HIV transmission are: (a) ritual cleansing (where the surviving spouse is 'cleansed' and freed of the dead person's spirit through sexual intercourse with a family member of the deceased); (b) widow inheritance (a practice, which traditionally was a social safety net for women, that allows a brother or close male relative to inherit the widow); and (c) heirship for chieftaincy (where a woman from each family in the community has sexual intercourse with the chief, thus giving all families the opportunity to produce his heir). For more information see International Fund for Agriculture Development (IFAD), "Strategy Paper on HIV/AIDS for East and Southern Africa." *IFAD* (2001), http://www.ifad.org/operations/regional/pf/aids.pdf (March 23, 2006): 11 and Janet Maia Wojcicki, "She Drank His Money: Survival Sex and the Problem of Violence in Taverns in Gauteng Province, South Africa," *Medical Anthropology Quarterly* 16 (2002): 270.

considers the fact that Muslims do not advocate many of these risky behaviours and practices that create exposure to HIV/AIDS infection, particularly among women.

Many of the risky cultural and religious norms practiced across SSA subordinate women through cultural and religious discrimination of women, generating a greater female vulnerability to HIV/AIDS. Social and cultural systems in many African societies dictate that women have no control over their sex lives, or the sex lives of their husbands outside marriage.[80] The culturally prescribed lack of control on their sexual relationships has made women, particularly married women, highly vulnerable to HIV infection.[81] Wives are not allowed to refuse sex from their husband, or to use a condom, even if the husband is infected with HIV. What is more, many of the traditional risky cultural and religious norms practiced across SSA that subordinate women, may begin to address some of the links between the cultural and religious discrimination of women and education, as the subordinate position of women also has implications for safe-sex education.[82] Therefore, by further examining some of the risky cultural and religious practices and behaviours, which subordinate women across SSA, one may begin to address some of the links between the cultural and religious discrimination of women and its associations with education, as these determinants seem to feed on each other in generating greater vulnerability to HIV/AIDS, especially for women.

---

80 John C. Caldwell, Pat Caldwell, and Pat Quiggin, "The social context of AIDS in sub-Saharan Africa," *Popul Dev Rev* 15 (1989): 185–234.

81 Extramarital affairs by both sexes are tolerated in many parts of Sub-Saharan Africa, but most traditional cultures have rules requiring women to have very little sexual experience before marriage and to be monogamous thereafter, whereas for men premarital and extramarital sex are tolerated or even expected. Young men and boys are often encouraged by peers to demonstrate their masculinity through early sexual initiation and many sexual conquests. Bride payments—financial compensation to a bride's family by her new husband—perpetuates the idea that a woman is her husband's property. For more information see Anne Buvé, Kizito Bishikwabo-Nsarhaza, and Gladys Mutangadura, "AIDS in Africa: The spread and effect of HIV-1 infection in sub-Saharan Africa," *The Lancet* 359 (2002): 2014.

82 Men are supposed to know everything and cannot admit ignorance, whereas women are not supposed to be aware of issues related to sex.

Epidemiological factors

Researchers have long noted that parts of Africa where circumcision is common – particularly the Muslim countries of West Africa – have much lower AIDS rates, while those in southern Africa, where circumcision is rare, have the highest.[83] Moreover, recent findings of the National Institute of Allergy and Infectious Diseases (NIAID) assert that circumcision appears to reduce a man's risk of contracting AIDS from heterosexual sex by half.[84] The fact that the *Prevalence of male circumcision* indicator is found to be significantly negatively associated to HIV/AIDS prevalence rates in my study further reinforces the recent findings. Such findings are especially important since two of the largest agencies dedicated to fighting AIDS have announced that they would be willing to pay for circumcisions, which they have not previously due to lack of evidence that it worked.[85]

Of the other epidemiological variables that were tested, the result for condom use and nutritional status – captured by the indicators, *Prevalence of Condom Use* and *Prevalence of undernourishment* – were unexpected. Contrary to my original hypothesis,

---

83 But drawing conclusions was always confounded by other regional factors, like strict Shariah law in some Muslim areas, rape and genocide in East Africa, polygamy, rites that require widows to have sex with a relative, patronage of prostitutes by miners, and men's insistence on dangerous "dry sex" – with the woman's vaginal walls robbed of secretions with desiccating herbs, increasing the risk of ripping and tearing creating open vectors into a woman's body. For more information see Donald G. McNeil Jr., "Circumcision Halves H.I.V. Risk, U.S. Agency Finds," *The New York Times*, December 14, 2006. Available at http://www.nytimes.com/2006/12/14/health/14hiv.html?ex=1323752400&en=af128f63110c1c4d&ei=5088&partner=rssnyt&emc=rss (accessed on January 14, 2007).

84 Ibid.

85 Dr. Richard G. A. Feachem, executive director of the Global Fund to Fight AIDS, Tuberculosis and Malaria, which has almost $5 billion in pledges, said in a television interview that if a country submitted plans to conduct sterile circumcisions, "I think it's very likely that our technical panel would approve it." Also, Dr. Mark Dybul, executive director of President Bush's $15 billion Emergency Plan for AIDS Relief, said in a statement that his agency "will support implementation of safe medical male circumcision for H.I.V./AIDS prevention" if world health agencies recommend it. For more information see Donald G. McNeil Jr., "Circumcision Halves H.I.V. Risk, U.S. Agency Finds," *The New York Times*, December 14, 2006. Available at http://www.nytimes.com/2006/12/14/health/14hiv.html?ex=1323752400&en=af128f63110c1c4d&ei=5088&partner=rssnyt&emc=rss (accessed on January 14, 2007).

the *Condom Use* variable was found to be statistically insignificant. It is possible that the effect of this variable is picked up by other variables like *Male circumcision* and/or the *Percentage of Muslim population*, leaving little impact to be contributed by *Condom Use*. Also, perhaps rates of condom use are constrained by the unavailability of condoms for purchase. The unexpected results for the *Prevalence of undernourishment* variable may also be explained in a similar fashion to that of the Condom use. It is possible that the *Prevalence of undernourishment* is correlated with *Poverty index* and/or *GDP per capita*, and therefore its potential effect is overshadowed by these variables. At any rate, these are tentative results that need to be further investigated.

Limitations and adjustments

First, some of the important variables are not easy to observe, especially in Sub-Saharan African countries as there is a lack of available data. Also, to maintain higher degrees of freedom, I was forced to let go of some of the variables and experiment with different models and alternative measure of certain determinants. Despite these difficulties, I find some interesting and plausible results, which can guide the formulation of effective policy responses to the pandemic.

Secondly, some of the factors of the HIV/AIDS pandemic may also be its consequences. From a methodological point of view, this may introduce an endogeneity bias. For example, when considering the effect of health expenditure (HE) per capita on the prevalence rates of HIV/AIDS, it is plausible to think that these prevalence rates may have their own effect on the HE. If so, HE per capita cannot be considered a truly independent (or exogenous) variable. In other words, there is a feedback loop from HE

per capita to HIV/AIDS rates and from the latter back to the HE per capita. Such 'two-way causality' or endogeneity problem somewhat undermines the validity of ordinary least squares (OLS) regression method of estimation used for Models 1 and 2 above. In order to account for this problem, I thought of using the two-stage least squares (2SLS) regression method, but that would take me beyond the scope of this research. As such, I am willing to consider such deeper examination seriously for future research.

Thirdly, the models are potentially subject to heteroskedasticity (non-constant variance of the errors) due to variations in size and other aspects in the units of analysis (countries). This potential problem undermines the validity of the Ordinary Least Squares (OLS) results. However, I have adjusted my models to rectify this potential problem by using the so called "White Heteroskedasticity Consistent Standard Errors," which were used for the results presented above.

Fourthly, a typical problem with multiple regressions is multiple collinearity (multi-collinearity), which refers to the correlation among the independent variables. Multicollinearity occurs when variables are so highly correlated with each other that it is difficult to come up with reliable estimates of their individual regression coefficients. One way to asses the possibility of multicollinearity among independent variables is to examine the correlations among the independent variables. Usually a correlation coefficient of 0.75 or higher among variables indicates multicollinearity. Some statisticians suggest that correlations of .90 or greater may indicate multicollinearity. The following four tables report correlation coefficients among the independent variables (socioeconomic and epidemiological determinants). Tables 3.3 and 3.4 report the

correlations for Model 1, for females and males, respectively. Whereas Tables 3.5 and 3.6 report correlations for Model 2, for females and males, respectively.

Table 3.3: Correlation coefficients of independent variables for Model 1 – Females

	CU	PUN	MC	HPI	TELE	MUSLIM	URB	HE	FLR	GDP
CU	1.000	-.2423	-.1969	-.3676	-.0799	-.4208	.5139	.2461	.5068	.2634
PUN	-.2423	1.000	-.1397	.0997	.0672	-.1243	-.3880	.0631	.0320	.1041
MC	-.1969	-.1397	1.000	.0652	.2364	.5070	-.3273	.0685	-.6209	.0545
HPI	-3676	.0997	.0652	1.000	.0173	.4619	-.3822	.0974	-.5512	.1034
TELE	-.0799	.0672	.2364	.0173	1.000	.0342	.1460	.7628	-.1858	.7382
MUSLIM	-.4208	-.1243	.5070	.4619	.0342	1.000	-.1412	-.0686	-.6889	-.0819
URB	.5139	.3880	.03272	-.3822	.1460	-.1412	1.000	.2273	.0890	-.0819
HE	.2461	.0631	.0685	.0974	.0763	-.0686	.2273	1.000	-.0412	.9785
FLR	.5068	.0320	-.6209	-.5512	-.1858	-.6889	-.0890	-.0411	1.000	-.0306
GDP	.2634	.1041	.0545	.1034	.7382	-.0819	.3766	.9785	-.0306	1.000

Table 3.4: Correlation coefficients of independent variables for Model 1 – Males

	CU	PUN	MC	HPI	TELE	MUSLIM	URB	HE	MLR	GDP
CU	1.000	-.2423	-.1969	-.3676	-.0799	-.4208	.5139	.2461	.1563	.2634
PUN	-.2423	1.000	-.1397	.0997	.0672	-.1243	-.3880	.0631	.2976	.1041
MC	-.1969	-.1397	1.000	.0652	.2364	.5070	-.3273	.0685	.1449	.0545
HPI	-3676	.0997	.0652	1.000	.0173	.4619	-.3822	.0974	-.1600	.1034
TELE	-.0799	.0672	.2364	.0173	1.000	.0342	.1460	.7628	.3668	.7382
MUSLIM	-.4208	-.1243	.5070	.4619	.0342	1.000	-.1412	-.0686	-.1353	-.0819
URB	.5139	.3880	.03272	-.3822	.1460	-.1412	1.000	.2273	.3300	-.0819
HE	.2461	.0631	.0685	.0974	.0763	-.0686	.2273	1.000	.3579	.9785
MLR	.1563	.2976	.1149	-.1600	.3668	-.1353	.3300	.3579	1.000	.3790
GDP	.2634	.1041	.0545	.1034	.7382	-.0819	.3766	.9785	.3790	1.000

Table 3.5: Correlation coefficients of independent variables for Model 2 – Females

	CU	PUN	MC	HPI	TELE	MUSLIM	URB	HE	FER	GDP
CU	1.000	-.2423	-.1969	-.3676	-.0799	-.4208	.5139	.2461	.1423	.2634
PUN	-.2423	1.000	-.1397	.0997	.0672	-.1243	-.3880	.0631	.0810	.1041
MC	-.1969	-.1397	1.000	.0652	.2364	.5070	-.3273	.0685	.1227	.0545
HPI	-3676	.0997	.0652	1.000	.0173	.4619	-.3822	.0974	.1315	.1034
TELE	-.0799	.0672	.2364	.0173	1.000	.0342	.1460	.7628	.5701	.7382
MUSLIM	-.4208	-.1243	.5070	.4619	.0342	1.000	-.1412	-.0686	.1081	-.0819
URB	.5139	.3880	.03272	-.3822	.1460	-.1412	1.000	.2273	.0551	-.0819
HE	.2461	.0631	.0685	.0974	.0763	-.0686	.2273	1.000	.6964	.9785
FER	.1423	.0810	.1227	.1315	.5701	.1081	.0551	.06964	1.000	.6669
GDP	.2634	.1041	.0545	.1034	.7382	-.0819	.3766	.9785	.6669	1.000

Table 3.6: Correlation coefficients of independent variables for Model 2 – Males

	CU	PUN	MC	HPI	TELE	MUSLIM	URB	HE	MER	GDP
CU	1.000	-.2423	-.1969	-.3676	-.0799	-.4208	.5139	.2461	.0656	.2634
PUN	-.2423	1.000	-.1397	.0997	.0672	-.1243	-.3880	.0631	.0961	.1041
MC	-.1969	-.1397	1.000	.0652	.2364	.5070	-.3273	.0685	.2034	.0545
HPI	-3676	.0997	.0652	1.000	.0173	.4619	-.3822	.0974	.2145	.1034
TELE	-.0799	.0672	.2364	.0173	1.000	.0342	.1460	.7628	.4758	.7382
MUSLIM	-.4208	-.1243	.5070	.4619	.0342	1.000	-.1412	-.0686	.1896	-.0819
URB	.5139	.3880	.03272	-.3822	.1460	-.1412	1.000	.2273	-.0147	-.0819
HE	.2461	.0631	.0685	.0974	.0763	-.0686	.2273	1.000	.5778	.9785
MER	.0656	.0961	.2034	.2145	.4758	.1896	-.0147	.5779	1.000	.5551
GDP	.2634	.1041	.0545	.1034	.7382	-.0819	.3766	.9785	.5551	1.000

It is evident from the tables above that most of the correlation coefficients are fairly small, indicating little or no correlation. The exceptions, however, are the correlation between GDP and HE, which is very high (0.9785), as well as the correlations between TELE and HE (0.7628) and TELE and GDP (0.7382). A possible solution here would be to omit one or two of the correlated variables (GDP, HE, and TELE) from the model, but that would come at the expense of losing determinants that are intuitively relevant. Another potential solution for multicollinearity is to increase the sample size, as

more data can produce more precise parameter estimates (with lower standard errors). However, this remedy is faced with the reality of lacking available aggregate-level data needed to increase the sample size.

Lastly, when doing multiple tests (like testing the significance of a parameter or model) based on the same sample (data set), a concern is that the chosen nominal level of significance (e.g. alpha = 5%) is not valid, and a much lower alpha has to be considered for such tests (e.g. the Bonferroni correction). This is a concern more for the analyses that do many comparisons (tests) among the categories (variables). However, I am using four slightly different data sets for the two Models (1 and 2) and for each gender. Although a number of tests consider the statistical significance of each of the individual parameters, these parameter estimates result from the same estimation process. It would be ideal for the results to live up to the Bonferroni restrictive criterion; however, very few empirical studies are capable of doing so.

Conclusion

The policies needed to fight against HIV/AIDS will only be effective if focussed on the most important factors for the disease. The findings of this study shed light on some of the important socioeconomic and epidemiological determinants of HIV/AIDS prevalence. More specifically, poverty, average income, education and access to information, cultural beliefs and religious practices related to sexual conduct, and male circumcision are found to be significant determinants of this pandemic. Therefore, policies aimed at reducing poverty and improving incomes, as well as incorporating HIV/AIDS prevention programs or behavioural change programs into schools'

curriculum should be promoted. Also, campaigns to promote male circumcision could prove to be effective in containing the pandemic.

In most Southern African cultures, particularly in poor communities, women are especially vulnerable because they have little power to refuse sex, and if they insist on using condoms, they may face physical or economic retaliation.[86] Furthermore, poverty may lure young women and girls into prostitution, placing them at higher risk of HIV infection. Many young women exchange sex for money to buy basics such as food, soap, clothes and sometimes to pay for their education. Poverty makes a wide age discrepancy in sexual relationships acceptable, often resulting in exploitation of young girls, and teen pregnancy with many young girls dropping out of school.[87] According to an analysis of the data, poorer women know less about how HIV is transmitted, and are less able to access and use condoms, than their better-off counterparts; this appears to be contributable to the level of education in poorer women.[88] Given the interactions between poverty, education and access to information, and vulnerability to risky sexual behaviour, the need for policies to eradicate poverty in SSA, particularly among the women of this region cannot be overemphasized.

---

86 United Nations Development Programme, *Human Development Report 1997* (New York: Oxford Press, 1997), 67.

87 G Lesetedi, (1999). HIV/AIDS and the status of women in Bostwana. In K.R. Hope Sr. (Ed.), AIDS and development in Africa – A social science perspective. New York: The Haworth Press p.51 quoted in Seiko Watanabe, "HIV/AIDS in Rural Botswana: Poverty, Gender Inequality, Marginalization and Stigma" (M.A thesis: University of Northern British Columbia, 2005), 20.

88 Nicoli Nattrass, *The Moral Economy of AIDS in South Africa* (Cambridge, UK; New York, NY: Cambridge University Press, 2004), 32.

CHAPTER FOUR

Implications for Development

It is a tragic irony that almost three decades after the Alma-Ata Declaration[89] elevated health to the status of a basic and fundamental human right and explicitly recognized its relationship with economic development that we are witnessing what may amount to the biggest health and development challenge the world has ever confronted; a disease, which is unique in its devastating impact on the social, economic and demographic foundations of development.[90] The extraordinary impact of HIV/AIDS on development can be attributed to its ability to undermine the three significant determinants of economic growth: physical, human and social capital.[91] Furthermore, it impacts all economic sectors throughout SSA; whilst, the most immediate impacts of HIV/AIDS being felt at the individual and household level. An assessment of these impacts of HIV/AIDS on the development prospects of SSA provides a useful summary view of the economic impact of the pandemic, and will highlight the need for corresponding action as a means of controlling the devastating implications of the disease.

---

89 Under WHO director Mahler of Denmark (1973-88) the goal of "Health for All" was proposed and was formally put forth in the 1978 WHO-UNICEF Alma-Ata Declaration. The attendees of the conference realized that improving health called for a comprehensive approach whereby primary health care was seen as "the key to achieving an acceptable level of health throughout the world in the foreseeable future as a part of social development and in the spirit of social justice." WHO, Declaration of Alma Ata, as reported in Report on the international conference on primary health care. The Alma-Ata Declaration affirmed health as a fundamental human and right and called for a transformation of conventional health care systems and for broad inter-sectoral collaboration and community organizing.

90 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "2004 Report on the Global AIDS Pandemic," *UNAIDS/WHO*, http://www.unaids.org/bangkok2004/GAR2004_pdf/UNAIDSGlobalReport2004_en.pdf (accessed October 22, 2006), 14.

91 Rene Bonnel, *What Makes an Economy HIV-Resistant? ACT Africa,* (Washington, DC: World Bank, 2000).

Recent estimates suggest that HIV/AIDS has reduced the rate of growth of Africa's per capita income by 0.7 percentage points a year, and that for those African countries also affected by malaria, growth was further lowered by an additional 0.3 percentage points per year.[92] HIV/AIDS is clearly having a detrimental effect on the growth of African economies and even reversing the modest gains made in recent times.

HIV/AIDS impacts *physical capital*[93] as households will tend to invest less towards retirement as the expectation of a lower life span takes hold. HIV/AIDS will also impact *physical capital* by lowering the volume and uses of domestic savings of governments.[94] Budgets are affected by increases in costs associated with treating and caring for AIDS related diseases. Other expenditures, such as pension payments, increase as civil servants are forced to take early retirement. The training of newly hired teachers and health professionals – to replace those lost to the disease – also affects national budgets. Thus, fiscal deficits would tend to generally worsen; as few countries will be able to offset the fiscal cost of the HIV/AIDS pandemic by cutting other expenditures or raising taxes'. In sum, reductions in household and government savings lead to "less investment, less productive employment, lower incomes and a slower rate of GNP growth, and possibly a lower level of GNP" leading to reduced long-term economic growth.[95]

HIV/AIDS also impacts *human capital* accumulation. HIV/AIDS affects the most economically active age-groups, thereby reducing both the quantity and quality of

---

92 Rene Bonnel, *What Makes and Economy HIV-Resistant? ACT Africa,* (Washington, DC: World Bank., 2000), 1.
93 The accumulation of physical capital is a function of the savings rate of the economy.
94 Desmond Cohen, "The Economic Impact of the HIV Epidemic," Issues Paper No. 2 *UNDP* (1992), http://www.undp.org/hiv/publications/issues/english/issue02e.htm (accessed May 1, 2007), 4.
95 Over, M. *The Macroeconomic impact of AIDS in Sub-Saharan Africa* (Washington, DC: World Bank 1992) and Desmond Cohen, "The Economic Impact of the HIV Epidemic," Issues Paper No. 2 *UNDP* (1992), http://www.undp.org/hiv/publications/issues/english/issue02e.htm (accessed May 1, 2007), 4.

available labour.[96] Entire generations of teachers, health workers, civil servants and other skilled and professional people are being lost. Shorter life expectancies are raising the costs of schooling and training, thereby reducing the short-term returns.[97] Since a significant amount of human capital accumulation takes place within the household, the death or sickness of a parent, particularly a mother, can have a disruptive impact on the inter-generational transmission of knowledge. Moreover, children may be forced to leave school to help replace lost income or production caused by the loss of a parent, as family finances come under increasing strain. Thus the *human capital* of African nations is being lost and incentives to invest in the education training of replacement labour are being reduced.[98]

HIV/AIDS affects not only a country's physical and human capital, but its *social capital* as well. The pandemic is eroding social networks and traditional support mechanisms as well as challenging the efficacy of legal and regulatory institutions to respond. [99] The quality of countless lives is being eroded and a generation of children are growing up without the emotional and financial support of their parents or communities.

Although there is no conceivable way of measuring *all* the costs associated with HIV/AIDS, it is possible to explore the ways in which the disease affects different economic sectors. In all sectors HIV increases the rates of absenteeism, reduces productivity, and imposes additional costs in training and hiring new recruits and

---

96 Desmond Cohen, "The Economic Impact of the HIV Epidemic," Issues Paper No. 2 *UNDP* (1992), http://www.undp.org/hiv/publications/issues/english/issue02e.htm (accessed May 1, 2007), 16.
97 Rene Bonnel, *What Makes and Economy HIV-Resistant? ACT Africa,* (Washington, DC: World Bank, 2000).
98 Ibid.
99 Ibid., 5.

increases spending on health care, retirement and death benefits.[100] Governments are faced with the mounting and mammoth task of responding to the pandemic, as their employees in the health, education, agriculture, business and civil servant sectors are being affected, the very same people needed to advance national economic development.

Health care systems – on the front-line in coping with the AIDS crisis – are overburdened by the pandemic and the services that African countries can provide are woefully inadequate.[101] Africa is not only the worst HIV/AIDS affected region, it is also the world's poorest region with the lowest access to and quality of health care. Health care systems have to deal with increasing numbers of patients with AIDS-related illnesses (i.e., tuberculosis) and spending on HIV/AIDS is diverting scarce resources from other major health concerns.[102] Governments have to make some harsh choices and are facing trade-offs between: treating AIDS versus preventing new infection; treating AIDS versus treating other illnesses; and spending for health versus spending on other sectors.[103]

The education sector has been devastated, especially in the countries hardest hit by the pandemic. HIV-related illness takes its toll in a number of ways and teachers, administrators and pupils alike are affected. Skilled teachers are a precious commodity in all countries, but in many African countries they are leaving schools and dying at an unprecedented and shocking rate. The Central African Republic has a third fewer primary school teachers than it needs, yet between 1996 and 1998 almost as many teachers died as

---

100 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "2000 Report on the Global HIV/AIDS Epidemic," *UNAIDS/WHO*, http://www.unaids.org/epidemic_update/report/Epi_report.htm (accessed May 1, 2007).
101 Ibid.
102 Mead Over, "Coping with the Impacts of AIDS," *Finance & Development*, no. 35, (1998), http://www.worldbank.org/fandd/english/pdfs/0398/050398.pdf (accessed May 1, 2007).
103 Bollinger, L., J. Stover, (1999) The Economic Impact of AIDS, The Futures Group International, Glastonbury, CT, 6 quoted in African Development Forum (ADF), "HIV/AIDS and Economic Development in Sub-Saharan Africa," *Economic Commission for Africa* (ECA) 2000, http://www.uneca.org/ADF2000/theme1.htm#28 (accessed May 1, 2007).

retired; 85% of them were HIV positive and died on average ten years before the minimum retirement age of 52.[104] In Zambia, during the first ten months of 1998, 1,300 teachers were lost to AIDS, which is equivalent to two-thirds of all new teachers trained annually.[105] The quality of education is undoubtedly affected. The direct and indirect costs of AIDS on the education sector are immense; both the quantity and quality of services, skills and personnel are being eroded at a time when they are vital.

Agriculture is the largest sector in most African economies, accounting for a large portion of production and employing the majority of workers, and earnings from agricultural exports pay for essential raw materials and imports necessary for development (World Bank 1999: 16). In most of Sub-Saharan Africa, where agriculture accounts for a significant portion of employment and output, HIV/AIDS is having an especially detrimental impact on rural households engaged in peasant agriculture:

> The pandemic has caused the decimation of skilled and unskilled agricultural labour; a steep reduction in smallholder agricultural production; a decline in commercial agriculture; the loss of indigenous farming methods, intergenerational knowledge and specialised skills and practices; and capacity erosion and distribution in the service delivery of formal and informal rural institutions resulting from the scale of staff morbidity and mortality.[106]

The pandemic affects farm households by depleting the human capital base needed, by reducing the availability of labour skills and time and, "the capital available through remittances or savings, which may disappear or be diverted to cover costs related to

---

104 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "2000 Report on the Global HIV/AIDS Epidemic," *UNAIDS/WHO*, http://www.unaids.org/epidemic_update/report/Epi_report.htm (accessed May 1, 2007), 27.
105 Ibid.
106 International Fund for Agriculture Development (IFAD), "Strategy Paper on HIV/AIDS for East and Southern Africa, October 2001," *IFAD*, http://www.ifad.org/operations/regional/pf/aids.pdf (accessed March 23, 2006), 11.

sickness and death."[107] The resulting impacts invariably negatively affect both agricultural production and food security.

By contrast, South Africa's experience of de-agrarianization and the destruction of peasant agriculture under apartheid resulted in a situation where most food was produced by large, capital-intensive commercial farms. According to the Labour Force Survey (2002), only 7% of employment in South Africa was in subsistence and small-scale agriculture.[108] Given that only a small proportion of household income was generate by subsistence agriculture, the bulk of this 'employment' was in fact large-scale underemployment.[109] The impact of AIDS on the economic security of poor households in South Africa was thus felt primarily through declining income rather than food production.

Therefore, the impact of AIDS at firm-level is of particular importance in South Africa, and many of the other countries in the region. HIV/AIDS impacts the business sector by increasing expenditures and reducing revenues (World Bank 1999:16). Many industries are being subject to increased levels of absenteeism and have to recruit replacement labour as their staff fall sick and die; in turn incurring costs in recruitment, training, health-care, medical insurance, sickness and burial payments.[110] In a recent survey of businesses in thirty African countries, 'time lost to AIDS related sickness' followed by 'healthcare costs' were ranked as the two main impacts of the pandemic on

---

107 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "2000 Report on the Global HIV/AIDS Epidemic," *UNAIDS/WHO*, http://www.unaids.org/epidemic_update/report/Epi_report.htm (accessed May 1, 2007).
108 Nicoli Nattrass, *The Moral Economy of AIDS in South Africa* (Cambridge, UK; New York, NY: Cambridge University Press, 2004), 33.
109 Ibid.
110 Desmond Cohen, "The Economic Impact of the HIV Epidemic," Issues Paper No. 2 *UNDP* (1992), http://www.undp.org/hiv/publications/issues/english/issue02e.htm (accessed May 1, 2007), 5.

their workforce and business operations.[111] Ultimately, the resources available to firms (i.e., savings) for financing capital expenditure and for expanding will be reduced; the capabilities of many firms on the continent are in question. Not only are labour supplies changing, but demands for certain products are likely to be affected as consumers re-prioritize and allocate more of their income to health expenditure.[112]

Some sectors are clearly more vulnerable than others to the wrath of the pandemic. Labour intensive industries (for example transportation) and those requiring migrant labour (such as mining) are the worst affected as well as other sectors employing highly skilled labour since their employees are harder to train and recruit and are fewer in number. In these circumstances, the design, construction and maintenance of dams, roads, schools, public health centers, irrigation systems, power stations etc. has all been affected given the losses in skilled human resources. Indeed, it has been suggested that HIV/AIDS may have adverse indirect effects the rate of technological advancement. This is because technological advancement depends very much on the level of education and the skills of the labour force. Indigenous innovation and the adaptation of foreign technologies will also depend on the availability of a core of highly skilled scientists and engineers. In an environment that is heavily impacted by disease and where the level of human capital will, as I have noted, tend to be lower, such skills will typically be absent. Moreover, to the extent that technological advancement comes from the direct investment of high

---

111 David E. Bloom, Lakshmi Reddy Bloom, and River Path Associates, "Business, AIDS and Africa" in *The Africa Competitiveness Report 2000*, World Economic Forum, Ed. (New York: Oxford University Press, 2000), http://www.riverpath.com/library/documents/business_aids_africa.htm (accessed May 1, 2007).

112 Desmond Cohen, "The Economic Impact of the HIV Epidemic," Issues Paper No. 2 *UNDP* (1992), http://www.undp.org/hiv/publications/issues/english/issue02e.htm (accessed May 1, 2007), 11.

technology foreign firms, the very process of technological dissemination may be adversely affected if such investments are discouraged by the prevalence of disease.[113]

Given the evidence thus far, one could logically assume that promoting economic development should become the main strategy to combating HIV/AIDS. Unfortunately the issue is more complex than that. The crux of the development dilemma – i.e. the fact that AIDS undermines growth and development – makes the policy challenge much more complex than simply against AIDS as it requires a combination of anti-AIDS interventions and pro-poor development strategies.[114]

HIV/AIDS is a disease that cripples a person's ability to work, either through the real likelihood of secondary infections, or simply because keeping their family alive is already a full time job. When productive energy is spent on simply surviving, the potential for growth (let alone industrialisation) is severely stunted. To highlight this dynamic, take the hypothetical situation of a fictitious young married woman named Zahara...through poor hygiene, malnutrition and unsafe sexual practices, she became infected with HIV/AIDS; her husband was also infected, as are his mistresses. Furthermore, because of traditional, cultural and familial pressures, she gave birth to several children, of which most are also afflicted. Although she suffers markedly from the secondary affects of the disease, she is still responsible for the care of her family. Even had she the energy to find employment out of the house, her job options are still few and far between.

---

113 Sachs, 2000 quoted in African Development Forum (ADF), "HIV/AIDS and Economic Development in Sub-Saharan Africa," *Economic Commission for Africa* (ECA) 2000, http://www.uneca.org/ADF2000/theme1.htm#28 (accessed May 1, 2007).
114 Nicoli Nattrass, *The Moral Economy of AIDS in South Africa* (Cambridge, UK; New York, NY: Cambridge University Press, 2004), 32.

The profiles and case studies of individual women, clearly highlight the cumulative impacts of the disease and the vicious cycle of poverty, as HIV/AIDS has a disproportionate impact on the lives of women survivors in relation to men survivors. For example, upon the death of their spouse, women often lose their house, land, livestock, plough and other resources. Further, the burden of caring for people living with HIV/AIDS and for orphans falls largely on women.[115] The impact of AIDS on women's work time, entitlements, income and savings, and especially on how this affects women within households and woman-headed households in terms of their economic security and social status are all negatively influenced. The illness and/or death of a woman has a particularly dramatic impact on the family in that it threatens household food security, especially when households depend primarily on women's labour for food production, animal tending, crop planting and harvesting. In addition, when women fall ill while their husbands are working in urban areas, the overall socialization and education of their children and the management of the household may be seriously affected.[116] This ultimately hinders effective development in the region because it stunts human capital as more and more women fall ill and their children are orphaned. Sick and dying care-givers take their dependants out of school for economic and social reasons.[117] Girls are more likely to be removed than boys, resulting in: lower female education; more-out-of school youth (who are harder to reach with effective AIDS-prevention programs) putting the health and lives of these same children at risk. In a study of commercial farms in

---

115 International Fund for Agriculture Development (IFAD), "Strategy Paper on HIV/AIDS for East and Southern Africa, October 2001," *IFAD*, http://www.ifad.org/operations/regional/pf/aids.pdf (accessed March 23, 2006), 10.
116 Ibid., 11.
117 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "2000 Report on the Global HIV/AIDS Epidemic," *UNAIDS/WHO*, http://www.unaids.org/epidemic_update/report/Epi_report.htm (accessed May 1, 2007), 28.

Zimbabwe, where deaths of most farm-workers were attributable to AIDS, "48% of the orphans of primary-age who were interviewed had dropped out of school, usually at the time of their parent's illness or death, and not one orphan of secondary-school age was still in school."[118]

The impact of the disease on individual children depends on a variety of factors, such as their sex and age, the socio-economic status of their families, the number and age of their siblings, etc.[119] The care of these children often falls on the extended family, over-stretching their limited and declining resources. In many other scenarios, children have no caregivers in their households and manage their own household activities without the supervision of an adult. Many children are therefore heading households and are: more likely to be out-of-school, malnourished, less likely to receive heath care, and are usually extremely poor. Many end up on the streets where they may be abused and sexually exploited, vulnerable to contracting HIV/AIDS.[120]

Perhaps the most direct cost to households of HIV/AIDS is the cost of treatment and the cost of work time that is lost. There is a wealth of literature on the subject which predictably cites costs including increased expenditures, lost income and reallocation of responsibilities within the household. On the direct costs themselves, some studies estimate for instance that the cost of treatment and foregone productivity in Tanzania

---

118 Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), "2000 Report on the Global HIV/AIDS Epidemic," *UNAIDS/WHO*, http://www.unaids.org/epidemic_update/report/Epi_report.htm (accessed May 1, 2007), 28.
119 Topouzis et al. 1994, Section 2:12 quoted in African Development Forum (ADF), "HIV/AIDS and Economic Development in Sub-Saharan Africa," *Economic Commission for Africa* (ECA) 2000, http://www.uneca.org/ADF2000/theme1.htm#28 (accessed May 1, 2007).
120 Monica Awuor Ayieko, "From Single Parents to Child-headed Household: The Case of Children Orphaned by AIDS in Kisumu and Siaya Districts," *UNDP* Study Paper no. 7 (1997), http://www.undp.org/hiv/publications/study/english/sp7e.htm (accessed May 1, 2007).

from a single HIV infection is about $2462-$5316 in 1985 dollars.[121] High as these costs obviously are, the reality is that there are substantial additional secondary costs and it becomes clear that the most devastating impact of HIV/AIDS on an afflicted household is its dive into poverty. The affliction itself becomes the cause of household poverty or the further exacerbation of poverty as households are driven into crippling levels of indebtedness and assets are depleted to pay for health care and other basic needs.

The investigation into the economic impact of HIV/AIDS burdens generally and of the impact of the disease in particular, insinuates there is sufficient evidence that the overall economic impact of the pandemic is devastating. In spite of the cancerous infiltration of the pandemic in SSA, which pushes the bounds of hope, it is not too late for decisive action targeting the important determinants of the disease as delineated here. My research suggests programmes designed to combat poverty, as it ameliorates nutrition and access to healthcare, and would be critical for turning the tides on the wave of desolation brought by HIV/AIDS. Education is integral to the understanding of the ramifications of an individual's actions, and while an advanced degree is not required, basic reading and writing is crucial. The importance goes beyond decoding prevention messages, but education influences other variables such as economic activity, comprehension of health-care information, and the alleviation of gender discrimination. Long-term structural policy reforms, aimed at combating gender inequality and the economic and social vulnerability of women will be of paramount importance in this endeavour. Since the social and economic impacts of adult deaths from AIDS-related illnesses fall most heavily on poorer households, many of which are headed by women,

---

121 Sachs, 2000 quoted in African Development Forum (ADF), "HIV/AIDS and Economic Development in Sub-Saharan Africa," *Economic Commission for Africa* (ECA) 2000, http://www.uneca.org/ADF2000/theme1.htm#28 (accessed May 1, 2007).

development programming should include a strong pro-poor and gender-sensitive component. While my research suggested a lesser importance for the roles of certain socioeconomic variables, these findings do not preclude the possibility of improvement; rather they suggest the need for cost-efficiency analysis to determine the most effective allocation of resources.

Responses to the pandemic require an in-depth understanding of the dynamics of HIV/AIDS prevalence and impact. At the national level the response should be inclusive, such that the pandemic is taken into account when planning or implementing programs in *all* sectors that are affected by and impact on the HIV/AIDS pandemic. Therefore, national policies ought to be multi-pronged and all ministries should be involved, from health and education to planning and infrastructural development.

The growing focus on AIDS by development agencies and national governments represents an opportunity to reinforce and build health, educational and social services systems in places where they are neglected or lack resources. Improvements in these areas – for example, better coverage by basic reproductive health services, water and sanitation projects or poverty reduction measures – will in turn help to reduce the impact of AIDS. In countries which faces multiple development challenges beyond that of HIV/AIDS, such indirect approaches become a necessary complement to the direct provision of HIV-focused prevention, care and treatment programmes (Sengwana and Quinlan, 2004). An important component of mitigation in countries with generalized epidemics is the protection and strengthening of human capacity, as illness removes skilled personnel from the workforce, and deprives both the state and private sector of their knowledge and experience.

Like prevention and care initiatives, AIDS mitigation programming should be 'mainstreamed' into development processes at a variety of levels. This includes international and national development instruments, such as the United Nations Development Assistance Framework and Poverty Reduction Strategy Papers, but also the civil society work of nongovernmental organizations and community or faith-based groups at field level. It is important to stress that AIDS mitigation cannot be seen as an alternative to HIV prevention: it is a vital part of a comprehensive global response to AIDS. The old saying 'Prevention is better than cure' has a ring of self-evident truth which underpins the very logic of traditional cost-benefit analysis. In cost-benefit terms, any success in preventing infection today represents huge savings in money and effort in the future.

Thus, the fundamental causes of HIV/AIDS need to be addressed if the pandemic is to be effectively challenged. Findings such as these highlight poverty, equality (income and gender), education (prevention and behavioural change programs) and economic development as important components of an integrated approach to combating AIDS. Therefore, a path towards control of the AIDS pandemic is economic and social development, implemented so as to reduce poverty and increase gender equality. But policies to speed such growth are already desirable for general development reasons. The analyses presented here points to the need for additional education to reduce risky sexual behaviour, the sexually exploited, and others who are most likely to contract and spread HIV. Furthermore, an integration of programs and aid focussed on the promotion and accessibility of safe circumcision information and procedures will also do much in the way of reducing new infections and therefore future prevalence rates across SSA. Also,

providing more people with skills and access to better-paying jobs will probably pay off in terms of fewer HIV infections – although my findings suggest increases in education increases the likelihood of contracting HIV/AIDS and the announcement by the Anglo American Corporation that HIV infection had reached the ranks of its senior managers indicates the limits of this kind of strategy.[122] Education and skills development cannot be a substitute for other serious policies to combat AIDS. The findings in this study implies the combination of biomedical and socio-economic factors with unsafe sexual practices produces the ripe environment for the spread of HIV and therefore an integrated approach to combat these interconnected determinants of HIV/AIDS prevalence is essential.

While the findings here support such economic, social (including cultural) and epidemiological development initiatives, the regression analyses fail to fully explain the variation in prevalence rates across the 34 SSA countries. Some variation may be attributed to the selection of variables, though more of it is undoubtedly due to characteristics of the cultures of these countries and of their efforts to combat the AIDS pandemic. They are limited by the difficult to impossible task of measuring the spread of the disease at the aggregate or national level. The type of education programmes and poverty reduction initiatives will ultimately have an enormous impact on the success of national HIV control efforts. However, there is not much information currently available on the relative cost and likely impact of various interventions in different socio-economic settings. Attempts at estimating the cost of prevention programs are fraught with at least two problems: the first is to obtain available data on the cost of current programs, and the

122 Nicoli Nattrass, *The Moral Economy of AIDS in South Africa* (Cambridge, UK; New York, NY: Cambridge University Press, 2004), 31.

second, to scale up the costs of these programs.[123] So, until an HIV vaccine or like solution becomes available, effective control policy will require a combination of fair, pro-growth policies with multi-pronged, tightly focused interventions that ensure reductions in risky behaviours and environments of those most likely to contract and spread HIV infection, while protecting them from discrimination.

123 African Development Forum (ADF), "HIV/AIDS and Economic Development in Sub-Saharan Africa," *Economic Commission for Africa* (ECA) 2000, http://www.uneca.org/ADF2000/theme1.htm#28 (accessed May 1, 2007).

REFERENCES

Adler, Micheal W. "ABC of AIDS: Development of the Epidemic." *British Medical Journal* 322 (2001): 1226-1229.

African Development Forum (ADF). "HIV/AIDS and Economic Development in Sub-Saharan Africa." Economic Commission for Africa (ECA) 2000. http://www.uneca.org/ADF2000/theme1.htm#28 (accessed May 1, 2007).

Aggleton, Peter., Peter Davies, and Graham Hart. *AIDS: Rights, Risk, and Reason.* London; Washington, DC: Falmer Press, 1992.

Alexander, Peter, and Tina Uys. "AIDS and Sociology: Current South African Research." *Society in Transition* 33(2002): 295-312.

Ali, Mohamed M., John G. Cleland, and Michel Carael. "Sexual risk behavior in urban populations of Northeastern Africa." *AIDS & Behavior* 5 (2001): 343-52.

Ayieko, Monica Awuor. "From Single Parents to Child-headed Household: The Case of Children Orphaned by AIDS in Kisumu and Siaya Districts." *UNDP* Study Paper no. 7 (1997), http://www.undp.org/hiv/publications/study/english/sp7e.htm (accessed May 1, 2007).

Barnett, Tony, and Colette Clement. "HIV/AIDS Impact: so where have we got to and where next?" *Development Studies Institute: Progress Report.* London, UK: London School of Economics, 2005.

Barnett, Tony, and Alan Whiteside. *AIDS in the Twenty-First Century: Disease and Globalization.* Basingstoke, UK: Palgrave Macmillan, 2002.

Barnett, Tony, and Alan Whiteside. "HIV/AIDS and Development: Case Studies and a Conceptual Framework." *European Journal of Development Research* 11(1999): 200-235.

Baylies, Carolyn, and Janet Bujra. *AIDS, Sexuality and Gender in Africa: Collective Strategies and Struggles in Tanzania and Zambia.* London: Routledge, 2001.

Berer, Marge, and Sunanda Ray. *Women and HIV/AIDS: An International Resource Book: Information, Action, and Resources on Women and HIV/AIDS, Reproductive Health, and Sexual Relationships.* London: Pandora, 1993.

Bloom, David E., and Peter Godwin. *The economics of HIV and AIDS: the case of South and South East Asia.* Delhi: Oxford University Press, 1997.

Bloom, David E., River Path Associates, and Jaypee Sevilla. "Health, Wealth, AIDS and Poverty." Manila: Asian Development Bank, 2002. http://www.adb.org/documents/reports/healthwealth/hwap.pdf (accessed March 25, 2007).

Bloom, David E., Lakshmi Reddy Bloom, and River Path Associates. "Business, AIDS and Africa." In *The Africa Competitiveness Report 2000.* World Economic Forum, Ed. New York: Oxford University Press, 2000. http://www.riverpath.com/library/documents/business_aids_africa.htm (accessed May 1, 2007).

Bond, Patrick, and George Dor (2003). Uneven health outcomes and neoliberalism in Africa. Johannesburg, Regional Network for Equity in Health in Southern Africa (EQUINET): 31.

Bonnel, Rene. *What Makes and Economy HIV-Resistant?* ACT Africa. Washington, DC: World Bank, 2000.

Booysen, Fredrick. Le R. "HIV/AIDS, poverty and risky sexual behaviour in South Africa." *African Journal of AIDS Research*, 3 (2004): 57-67.

Brockerhoff, Martin, and Ann E. Biddlecom. "Migration, Sexual Behavior and the Risk of HIV in Kenya." *International Migration Review* 33 (1999): 833-856.

Brent, Robert J. "Does female education prevent the spread of HIV-AIDS in Sub-Saharan Africa?" *Applied Economics* 38 (2006): 491-503.

Buve, Anne., Kizito Bishikwabo-Nsarhaza, and Gladys Mutangadura. "AIDS in Africa: The spread and effect of HIV-1 infection in sub-Saharan Africa." *The Lancet* 359 (2002): 2011-2017.

Caldwell, John C., Pat Caldwell, and Pat Quiggin. "The Social Context of AIDS in Sub-Saharan Africa." *Population & Development Review* 15 (1989): 185-234.

Casale, Marisa, and Alan Whiteside. "The Impact of HIV/AIDS on Poverty, Inequality and Economic Growth: IDRC Working Papers on Globalization, Growth and Poverty." *Health Economics and HIV/AIDS Research Division (HEARD).* Natal, South Africa: University of KwaZulu, 2006.

Cohen, Desmond. "The Economic Impact of the HIV Epidemic." *UNDP* Issues Paper no. 2 (1992). http://www.undp.org/hiv/publications/issues/english/issue02e.htm (accessed May 1, 2007).

Coleman, Isobel. "Gender Disparities, Economic Growth and Islamization in Pakistan." *Woodrow Wilson International Center for Scholars* (2004), http://www.ctr.org/publication/7217/gender_disparities_economic_growth_and_islamization_in_pakistan.html (accessed February 15, 2006).

Coleman, Isobel. "The Payoff from Women's Rights." *Foreign Affairs*: Council on Foreign Relations (2004), http://www.foreignaffairs.org/20040501faessay83308-p10/isobel-coleman/the-payoff-from-women-s-rights.html (accessed February 15, 2006).

Collins, Joseph, and Bill Rau. (2000). *AIDS in the context of development.* Geneva: United Nations Research Institute for Social Development (UNRISD) and UNAIDS. Paper No. 4. UNRISD Programme of Social Policy and Development.

Cook, Nicolas. "AIDS in Africa: CRS Issue Brief for Congress." *Congressional Research Service: The Library of Congress.* Received Through the CRS Web: Order Code IB10050 (2006), (accessed February 15, 2006).

Country Indicators for Foreign Policy (CIFP) Project. "Conflict Risk Assessment: Sub-Saharan Africa." *The Norman Paterson School of International Affairs*: Carlton University (2002), http://www.carleton.ca/cifp/docs/CIFP_Conflict_Risk_Assessment_SubSaharan_Africa3.pdf (accessed November 11, 2006).

Dalkbetta G. A., Miotta, P. G., Chiphangwi, J. D., Saah, A. J. *et al.* High socio-economic status is a risk factor for Human Immunodeficiency Virus Type 1 (HTV-1) Infection but not for sexually transmitted diseases in women in Malawi: Implications for HJV-1 control. *Journal of Infectious Diseases* 167 (1993): 36-4.

De Cock, Kevin., Dorothy Mbori-Ngacha, and Elizabeth Marum, "Shadow on the continent: public health and HIV/AIDS in Africa in the 21st century," *The Lancet* 360 (2002): 67-72.

DeWaal, Alex. "How will HIV/AIDS transform African governance?" *African Affairs* 102 (2003): 1-23.

Dladla, Nozizwe A., Catherine A. Hiner, Ethel Qwana, and Mark Lurie. "Speaking to rural women: The sexual partnerships of rural South African women whose partners are migrants." *Society in Transition* 32 (2001): 79-82.

Donnelly, John. "HIV hits Africa's rich hardest, study says." *The Boston Globe*. June 14, 2006. http://www.boston.com/news/world/africa/articles/2006/06/14/hiv_hits_africa_rich_hardest (accessed February 28, 2007).

Essex, Max. AIDS *in Africa*. New York: Kluwer Academic/Plenum Publishers, 2002.

Fiil-Flynn, M., Soweto Electricity Crisis Committee (2001). "The Electricity Crisis in Soweto." Occasional Papers Series number 4. P. B. McDonald DA. Johannesburg, Municipal Services Project: 36.

Filmer, Deon P., and Elizabeth M. King. "Gender Disparity in South Asia: Comparisons Between and Within Countries Dataset." *World Bank,* (1998), http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,, contentMDK:20701013~pagePK:64214825~piPK:64214943~theSitePK:469382, 00.html (accessed February 15, 2006).

Fritz, Katherine E., Godfrey B. Woelk, Mary T. Bassett, William C. McFarland, Janell A. Routh, Ocean Tobaiwa and Ron D. Stall. "The Association Between Alcohol Use, Sexual Risk behavior, and HIV infection among men attending beerhalls in Harare, Zimbabwe." *AIDS & Behavior* 6 (2002): 221-8.

Gillespie, Stuart, and Suneetha Kadiyala. "Impacts of Food and Nutrition Insecurity on the Spread of HIV. In HIV/AIDS and Food and Nutrition Security: From Evidence to Action." *International Food Policy Research Institute: Food Policy Review 7.* Washington, DC, USA, 2005.

Gresenguet, Gerard., Joan K. Kreiss, Michael K. Chapko, Sharon L. Hillier and Noel S. Weiss. "HIV Infection and Vaginal Douching in Central Africa." *AIDS* 11 (1997): 101-106.

Grisaru, Nimrod., Simch Lezer, and R.H. Belmaker. "Ritual Female Genital Surgery Among Ethiopian Jews." *Archives of Sexual Behavior* 26 (1997): 211-215.

Herrell, Richard K. "HIV/AIDS Research and the Social Sciences." *Current Anthropology* 32 (1991): 199-203.

Hrdy, Daniel B. "Cultural practices contributing to the transmission of human immunodeficiency virus in Africa." *Reviews of Infectious Diseases* 9(1987): 1109-1109.

International Fund for Agriculture Development (IFAD). "Strategy Paper on HIV/AIDS for East and Southern Africa." *IFAD* (October 2001), http://www.ifad.org/operations/regional/pf/aids.pdf (23 March 2006).

Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "Report on the Global HIV/AIDS Epidemic: Global HIV/AIDS Surveillance." *UNAIDS/WHO*: Geneva, Switzerland, (July 1998), Internet version available at http://www.unaids.org (accessed October 22, 2006).

Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "Differences in HIV Spread in Four Sub-Saharan African Cities." *UNAIDS/WHO*: Geneva, Switzerland, (September 1999), www.unaids.org/publications/documents/epidemiology/determinants/lusaka99.html (accessed March 23, 2006).

Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "Report on the Global HIV/AIDS Epidemic." *UNAIDS/WHO*: Geneva, Switzerland, (June 2000), http://www.unaids.org/epidemic_update/report/Epi_report.htm (accessed May 1, 2007).

Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "Consultation on STDs interventions for Preventing HIV: What's the Evidence." *UNAIDS/WHO*: Geneva, Switzerland, (May 2000), Internet version available at http://www.unaids.org (accessed October 22, 2006).

Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "Global Report on the HIV/AIDS Epidemic." *UNAIDS/WHO*: Geneva, Switzerland, (December 2001), Internet version available at http://www.unaids.org (accessed October 22, 2006).

Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "2004 Report on the Global AIDS Pandemic." *UNAIDS/WHO*: Geneva, Switzerland, (May 2004), Internet version available at http://www.unaids.org (accessed October 22, 2006).

Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "AIDS Epidemic Update: Special Report on HIV prevention." *UNAIDS/WHO*: Geneva, Switzerland (December 2005), http://www.who.int/hiv/epi-update2005_en.pdf (accessed March 23, 2006).

Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO). "2006 Report on the Global AIDS Epidemic." *UNAIDS/WHO*: Geneva, Switzerland, (May 2006), Internet version available at http://www.unaids.org (accessed October 22, 2006).

Kalichman, Seth C., Leickness C. Simbayi, Ashraf Kagee, Yoesrie Toefy, Sean Jooste, Demetria Cain, and Chauncey Cherry. "Associations of poverty, substance use, and HIV transmission risk behaviours in three South African communities" *Social Science & Medicine* 62 (2006): 1641-1649.

Kalipeni, Ezekiel. "Health and disease in southern Africa: A comparative and vulnerability perspective." *Social Science and Medicine* 50 (2000): 965-983.

Kalipeni, Ezekiel, and Joseph Oppong. "The refugee crisis in Africa and implications for health and disease: a political ecology approach." *Social Science and Medicine* 46 (1998): 1637-53.

Kun, Karen E. "Vaginal Drying Agents and HIV Transmission." *International Family Planning Perspectives* 24 (1998): 91-92.

Lewis, Steven. *Race Against Time: 2005 Massey Lectures.* CBC Radio One program: *IDEAS*, 2005.

Lachaud, Jean-Pierre. "HIV prevalence and poverty in Africa: Micro- and macro-econometric evidences applied to Burkina Faso." *Journal of Health Economics* 26 (2007): 483-504.

Loevinsohn, Michael, and Stuart Gillespie. (2003). "HIV/AIDS, Food Security and Rural Livelihoods: Understanding and Responding." Renewal Working Paper No. 2 (12 May).

Lurie, Peter., Percy Hintzen and Robert A. Lowe. "Socioeconomic Obstacles to HIV Prevention and Treatment in Developing Countries – The Roles of the International Monetary Fund and the World Bank." *AIDS* 9 (1995): 539-546.

MacDonald, Davis S. "Notes on the Socio-Economic and Cultural Factors Influencing the Transmission of HIV in Botswana." *Social Science and Medicine* 42 (1996): 1325-1333.

Mataure, Priscilla., Willi McFarland, Katherine Fritz, Andrea Kim, Godfrey Woelk, Sunanda Ray and George Rutherford. "Alcohol use and high-risk sexual behaviour among adolescents and young adults in Harare, Zimbabwe." *AIDS and Behavior* 6 (2002): 211-219.

McDonald, David A. and Laila Smith. (2002). "Privatizing Cape Town: Service delivery and policy reforms since 1996." Occasional Papers number 7. Johannesburg, Municipal Services Project: 62.

McGrath, Janet W., Debra A. Schumann, Jonnie Pearson-Marks, Charles B. Rwabukwali, Rebecca Mukasa, Barbara Namande, Sylvia Nakayiwa, and Lucy Nakyobe. "Cultural determinants of sexual risk behavior for AIDS among Baganda women." *Medical Anthropology Quarterly* 6 (1992): 153-61.

McNeil, Donald G. Jr. "Circumcision Halves HIV Risk, US Agency Finds." *The New York Times.* December 14, 2006. <http://www.nytimes.com/2006/12/14/health/14hiv.html?ex=1323752400&en=af128f63110c1c4d&ei=5088&partner=rssnyt&emc=rss> (14 January 2007).

MEASURE DHS 2006. *Measure, Demographic and Health Surveys/AIDS Indicator Surveys.* Available at <http://www.measuredhs.com/> (24 January 2007).

Msuya, Sia E., Elizabeth Mbizvo, Alhtar Hussain, Jacquiline Uriyo, Noel E Sam, and Babill Stray-Pedersen. "HIV among pregnant women in Moshi Tanzania: the role of sexual behaviour, male partner characteristics and sexually transmitted infections." *AIDS Research and Therapy* 3 (2006). Internet version available at *BioMed Central* <http://www.aidsrestherapy.com/content/3/1/27> (28 February 2007).

Nattrass, Nicoli. *The Moral Economy of AIDS in South Africa*. Cambridge, UK; New York: Cambridge University Press, 2004.

Neuman, Lawrence W. *Basics of Social Research: Qualitative and Qualitative Approaches*. New York: Pearson Education Inc. Allyn and Bacon, 2004.

Over, Mead. *The Macroeconomic impact of AIDS in Sub-Saharan Africa*. Washington, DC: World Bank, 1992.

Over, Mead. "The Effects of Societal Variables on Urban Rates of HIV Infection in Developing Countries." in *Confronting AIDS: Evidence from the Developing World.* edited by M. Ainsworth, L. Fransen and M. Over. UK: European Communities, 1998. <http://iaen.org/limelette/pdfs/confront_aids_chapter_02.pdf> (23 March 2006).

Over, Mead. "Coping with the Impacts of AIDS." *Finance & Development*, no. 35 (1998), http://www.worldbank.org/fandd/english/pdfs/0398/050398.pdf (accessed May 1, 2007).

Ramsay, Sarah. "Shocking AIDS Data Released in South Africa." *The Lancet* 358 (2001): 1345-1347.

Runganga, Agnes., and Jonathan Kasule. "The vaginal use of herbs/substances: an HIV transmission facilatory factor?" *AIDS Care* 7 (1995): 639-646.

Schopper, Doris., Serge Doussantousse, and John Orav. "Sexual behaviours relevant to HIV transmission in a rural African population. How much can a KAP survey tell us?" *Soc Sci Med* 37 (1993): 401-12.

Sengwana, Manyeke, and Tim Quinlan. (2004). *Review of studies of socio-economic impact of HIV/AIDS in sub-Saharan Africa.* Durban, Health Economics and HIV/AIDS Research Division (HEARD) of the University of KwaZulu Natal, Durban.

Shisana, Olive, and Leickness Simbayi. (2002). *Nelson Mandela/HSRC Study of HIV/AIDS: South African National HIV Prevalence, Behavioral Risks and Mass Media, Household Survey 2002.* Cape Town, South Africa: Human Sciences Research Council.

Simbayi, Leickness C., Julian Chauveau, and Olive Shisana. "Behavioural responses of South African youth to the HIV/AIDS epidemic: a nationwide survey." *AIDS Care* 16 (2004): 605-618.

Social Science Research Council Working Group on HIV/AIDS. "The Social Science of HIV/AIDS: A Critical Review and Priorities for Action." *Social Science Research Council.* New York, NY, USA, 2004.

Stillwaggon, Eileen. "HIV/AIDS in Africa: Fertile Terrain." *The Journal of Development Studies* 38 (2002):1-22.

Temah, Chrystelle Tsafack. "Gender and Income Inequalities and HIV/AIDS Pandemic." *University of Auvergne.* 2004. <http://www.iaen.org/files.cgi/14610_GenderIncomeInequalities.pdf?PHPSESSID=fbb0d8968ffa01ef2cf9580febf4f34a> (31 October 2006).

Todaro, Michael P., and Stephen C. Smith. "Poverty, Inequality, and Development," in *Economic Development.* 9th edition. Addision-Wesley, 2006.

Turshen, Meredeth. "U.S. Aid to AIDS in Africa." *Review of African Political Economy* 55 (1992): 95-101.

United Nations. "East Africa: Feature – Traditional Culture Spreading AIDS." United Nations 2003. Internet version available at www.irinnews.org (accessed March 23, 2006).

United Nations. "Investing in Development." *United Nations,* (2003), http://www.unmillenniumproject.org/reports (accessed February 10, 2006).

United Nations. "Population, Development and HIV/AIDS with Particular Emphasis on Poverty: The Concise Report." *United Nations Department of Economic and Social Affairs: Population Division ST/ESA/SER.A/247* (2005).

United Nations Development Programme. 1997. *Human Development Report (HDR) 1997.* New York: Oxford Press. http://hdr.undp.org/reports/global/1997/en/ (accessed March 23, 2006).

United Nations Development Programme. 2003. *Human Development Report (HDR) 2003.* New York: Oxford Press. http://hdr.undp.org/statistics/data/ (accessed April 7, 2006).

Van De Wijgert, Janneke., Michael Mbizvo, Sabada Dube, Magdalene Mwale, Prisca Nyamapfeni, and Nancy Padian. "Intravaginal practices in Zimbabwe: which women engage in them and why?" *Culture, Health and Sexuality* 3 (2001): 133-148.

Veenstra, Nina, and Alan Whiteside. "Economic Impact of HIV." *Best Practice & Research Obstetrics and Gynaecology* 19 (2005).

Watanabe, Seiko. "HIV/AIDS in Rural Botswana: Poverty, Gender Inequality, Marginalization and Stigma." M.A. thesis, University of Northern British Columbia, 2005.

Whiteside, Alan. "Poverty and HIV/AIDS in Africa." *Third World Quarterly (Special Issue: Global Health and Governance)* 23 (2002): 313-332.

Williams, Brian G., James O. Lloyd-Smith, Eleanor Gouws, Catherine Hankins, Wayne M. Getz, John Hargrove, Isabelle de Zoysa, Christopher Dye, and Bertran Auvert. "The potential impact of male circumcision on HIV in sub-Saharan Africa." *PLos Med* 3 (2006): 1032-1040.

Wojcicki, Janet Maia. "She Drank His Money: Survival Sex and the Problem of Violence in Taverns in Gauteng Province, South Africa." *Medical Anthropology Quarterly* 16 (2002): 267-293.

World Bank. "Confronting AIDS: Public Priorities in a Global Epidemic." *World Bank Report (Revised edition)*: Washington, DC; New York: Oxford University Press (published for the World Bank), 1997.

World Bank. "Intensifying Action Against HIV/AIDS in Africa: Responding to a Development Crisis." *Africa Region.* Washington, DC. 1999. Available at http://www.worldbank.org/html/extdr/offrep/afr/aidstrat.pdf (accessed March 23, 2006).

World Bank. "World Development Report 2000/2001: Attacking Poverty." *The World Bank Group*: Washington, DC. 2001. Available at http://worldbank.org/poverty/wdrpoverty/index.htm (accessed March 23, 2006).

World Bank. *African Development Indicators 2001.* The World Bank Group: Washington, DC. 2001. Internet version available at http://worldbank.org/ (accessed March 23, 2006).

World Bank. *World Development Indicators Database.* The World Bank Group: Washington, DC. 2002. Available at http://devdata.worldbank.org/hnpstats/query/default.html (accessed April 7, 2006).

World Bank. *GenderStats: Database of Gender Statistics.* The World Bank Group: Washington, DC. 2002. Available at http://devdata.worldbank.org/genderstats/ (accessed February 15, 2006).

World Bank. "Education and AIDS." *The World Bank Group*: Washington, DC. 2002. Available at http://www.polity.org.za/pdf/EducationAndAids.pdf (accessed March 23, 2006)

World Bank. 2004. *World Development Indicators Database.* The World Bank Group: Washington, DC. 2002. Available at http://devdata.worldbank.org/hnpstats/query/default.html (accessed April 7, 2006).

APPENDIX I

Variables, their description and sources

	Variables	Descriptions	Sources
Dependent Variables	Female HIV/AIDS Prevalence Rates 2003 *(Dependent variable)*	The total number of women aged 15+ living with HIV/AIDS at any given moment in time, divided by the total number of women aged 15-64 in a particular country.	UNAIDS (*Report on the Global HIV/AIDS Epidemic, May 2006)* *Source:* *http://www.unaids.org/en/HIV_data/2006GlobalReport/default.asp* Source: *WDI* database
	Male HIV/AIDS Prevalence Rates 2003 *(Dependent variable)*	The total number of men aged 15+ living with HIV/AIDS at any given moment in time, divided by the total number of men aged 15-64 in a particular country.	UNAIDS (*Report on the Global HIV/AIDS Epidemic, May 2006)* *Source:* *http://www.unaids.org/en/HIV_data/2006GlobalReport/default.asp* Source: *WDI* database
Poverty	Human Poverty Index (HPI-1) Value (%)	A composite index measuring deprivations in the three basic dimensions captured in the human development index—a long and healthy life, knowledge and a decent standard of living. The HPI-1 value is comprised of various indicators including: Probability at birth of not surviving to age 40, Adult illiteracy rate, Population without sustainable access to an improved water source, Children under weight for age, Population below income poverty line ($1 a day, $2 a day, national poverty line), and HPI-1 rank minus income poverty rank. For further details on how the index is calculated, see *Technical note 1* @ UNDP's official website.	UNDP (*Human Development Report)* *Source:* http://hdr.undp.org/hdr2006/statistics/indicators/18.html

Income Level	GDP per capita (PPP US$ billions), 2004	The value of all final goods and services produced in a country in one year, divided by the population (see also gross national product). GDP can be measured by adding up all of an economy's incomes- wages, interest, profits, and rents- or expenditures- consumption, investment, government purchases, and net exports (exports minus imports). Both results should be the same because one person's expenditure is always another person's income, so the sum of all incomes must equal the sum of all expenditures. Gross domestic product (in purchasing power parity terms in US dollars) divided by midyear population.	UNDP (*Human Development Report)* *Source:* http://hdr.undp.org/hdr2006/statistics/indicators/131.html **And...** *Source:CIA Factbook*
Education	Female literacy rate (% ages 15 and older) 2003	The percentage of the female population ages 15 and above who can, with understanding, both read and write a short, simple statement related to their everyday life.	UNDP (*Human Development Report)* **And...** *Source:CIA Factbook*
	Male literacy rate (% ages 15 and older) 2003	The percentage of the male population ages 15 and above who can, with understanding, both read and write a short, simple statement related to their everyday life.	UNDP (*Human Development Report)*
	Female combined gross enrolment ratio for primary, secondary and tertiary schools (%) 2003	The number of female students enrolled in primary, secondary and tertiary levels of education, regardless of age, as a percentage of the population of official school age for the three levels. See *education levels* and *enrolment ratio, gross.*	UNDP (*Human Development Report)* *Source:* http://hdr.undp.org/hdr2006/statistics/indicators/4.html
	Male combined gross enrolment ratio for primary, secondary and tertiary schools (%) 2003	The number of male students enrolled in primary, secondary and tertiary levels of education, regardless of age, as a percentage of the population of official school age for the three levels. See *education levels* and *enrolment ratio, gross.*	UNDP (*Human Development Report)* *Source:* http://hdr.undp.org/hdr2006/statistics/indicators/4.html
Access to Information	Television sets (per 1,000 people)	Television sets are the estimated number of television sets in use, per 1,000 people. For more information, see Tables: WDI 5.11.	Source: *WDI* database

Mobile population	Urban Population (% of total) 2003	Urban population is the midyear population of areas defined as urban in each country and reported to the United Nations. It is measured here as the percentage of the total population.	Source: *WDI* database **And...** UNDP (*Human Development Report)* *Source:* http://hdr.undp.org/hdr2006/statistics/indicators/41.html
Religious and cultural practices	Percentage of Muslim population in total population 2005	Population counts by religious affiliation, like most demographic characteristics of a population, are based upon statistical science and subject to observational error and are technically referred to as estimates. The percentage of Muslim population of each country was taken from the US State Department's *International Religious Freedom Report 2004* (http://www.state.gov/g/drl/rls/irf/). Other sources used were CIA fact book (https://www.cia.gov/cia/publications/factbook/) and adherents.com (http://www.adherents.com/Na/Na_321.html#2058). In a few cases of conflicting estimates, the average of lowest and highest estimates was calculated. The total population of each country was taken from census.gov (http://www.census.gov/cgi-bin/ipc/idbrank.pl).	US State Department's *International Religious Freedom Report 2004* • *CIA FactBook* • *adherents.com* • *Religious Freedom page* • *census.gov* *Source:* http://www.answers.com/topic/islam-by-country
Circumcision	Prevalence of Male Circumcision (%) 2003	The prevalence of circumcision (or circumcision rate) refers to the proportion of males that are circumcised in a given population. It may also refer to the proportion of newborn males that are circumcised. The World Health Organisation estimates as of 2003.	Williams, B G; *et al.* "The potential impact of male circumcision on HIV in sub-Saharan Africa." *PLos Med* 3 (7): e262. *Source:* www.plosmedicine.org
Presence of STI	Health expenditure per capita ($) 2003	The sum of public and private expenditure (in purchasing power parity terms in US dollars), divided by the population. Health expenditure includes the provision of health services (preventive and curative), family planning activities, nutrition activities and emergency aid designated for health, but excludes the provision of water and sanitation.	UNDP (*Human Development Report)* *Source:* http://hdr.undp.org/hdr2006/statistics/indicators/52.html

Nutritional State	Prevalence of under-nourishment (% of population) 2003	Measures the percentage of the population not having enough food to develop or function formally.	Source: *WDI* database
Condom use	Prevalence of Condom Use (%), 2005	The percentage of married women (including women in union) ages 15–49 who are using, or whose partners are using, condoms as a form of contraception.	United Nations Department of Economic and Social Affairs – Population Division *Source:* www.unpopulation.org

APPENDIX II

Residuals plots for the regression models

Figure A2.1a: Residuals plot for Model 1 – Females*

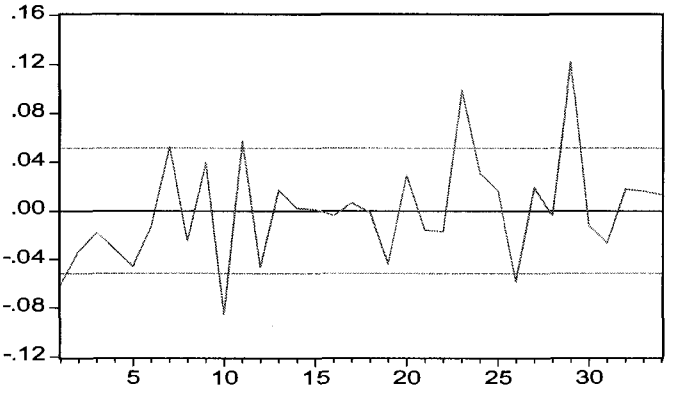
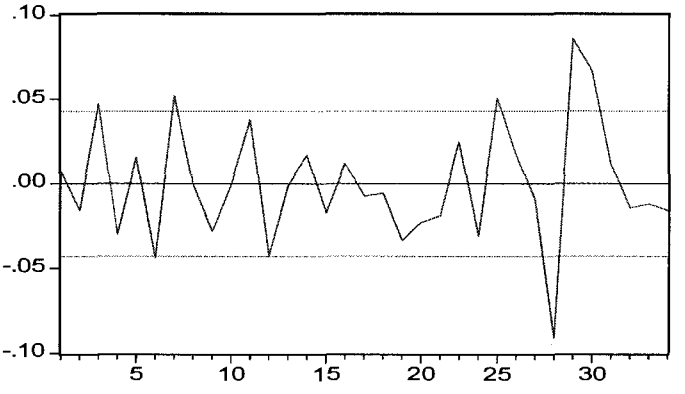


Figure A2.1b: Residuals plot for Model 1 – Males**



* The Jarque-Bera statistic for testing the normality of residuals is 4.154 (p-value 0.125).
** The Jarque-Bera statistic for testing the normality of residuals is 0.635 (p-value 0.728).

Figure A2.2a: Residuals plot for Model 2 – Females*

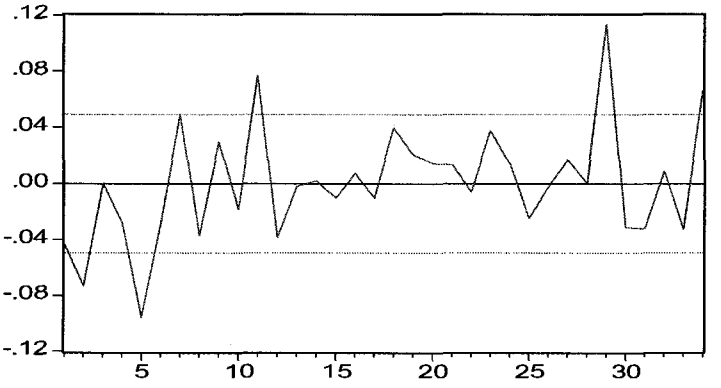
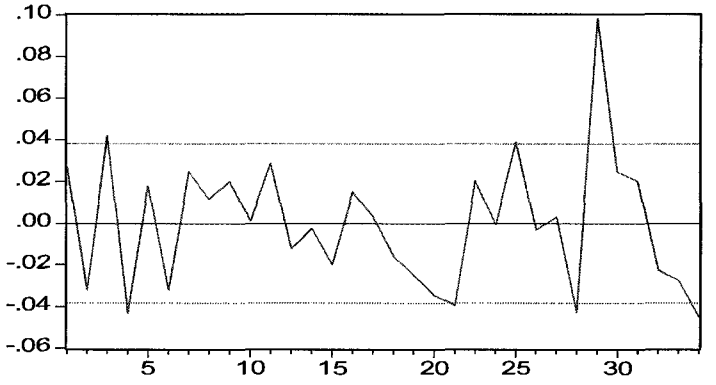


Figure A2.2b: Residuals plot for Model 2 – Males**



* The Jarque-Bera statistic for testing the normality of residuals is 1.966 (p-value 0.376).
** The Jarque-Bera statistic for testing the normality of residuals is 4.410 (p-value 0.110).