

ISSN 111-4898

INTERNATIONAL JOURNAL OF SOCIAL SCIENCES

Vol. 6, No. 1 JUNE (2007)

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Faculty of Social Sciences, University of Uyo, Nigeria.



HIV/AIDS and Well-Being in Sub-Saharan Africa: Evidence from a Cross-Country Analysis

Gafar T. Ijaiya

Department of Economics

University of Ilorin, Nigeria

Usman A. Raheem

Department of Geography

University of Ilorin, Nigeria

Abdulwaheed O. Olatinwo & Munir-Deen A. Ijaiya

Department of Obstetrics and Gaenocology

University of Ilorin, Nigeria

ABSTRACT - This paper examines the impact of HIV/AIDS on well-being in sub-Saharan Africa using a cross-country data and a regression analysis. The result obtained indicates that HIV/AIDS has a negative influence on well-being in the sub-region. This situation can be linked to the severe decline in socio-economic activities in the countries that are hard hit with the disease because of increase morbidity and mortality rates and the governments' shift from the provision of social services to efforts at combating the spread of the disease. The paper thus suggests measures that can be used to curtail the spread of the disease in the sub-region.

Key Words: Sub-Saharan Africa, HIV/AIDS and Well-Being

INTRODUCTION

Governments, organizations and individuals the world over are now experiencing more fears and concerns at the rate which HIV/AIDS is spreading. At the global level, available data show that in 2001 only about 40 million people were infected with the disease with 2.4 million deaths but by 2005 this figure had increased to about 40.3 million people with about 3.1million deaths recorded (O'

Malley 2002; Robalino, et.al 2002; PFI/PRB 2004; UNAIDS/WHO 2005). Sub-Saharan Africa remains hardest hit and home to 25.8 million people living with HIV, almost one million more than in 2003. An estimated 20.4 million people died of HIV related illness in this region in 2005, while a further 3.2 million became infected with HIV (UNAIDS/WHO 2005. PFI/PRB 2004;).

A number of factors are adjudged to have caused the spread and increase in HIV/AIDS. According to Bulatao and Bos 1992; World Bank 1997; Bonnel 2000; Lamptey, et.al 2002; O' Malley 2002; Robalino, et.al 2002; MacNeil, et. al 2004; Tomori et. al. 2004), several economic, socio-cultural and epidemiological variables account for the spread of the HIV/AIDS epidemic. The main economic variables are poverty, gender inequality, income inequality and the extent of labour migration. Poverty, gender and income inequality make societies more vulnerable to HIV. Women are more vulnerable to HIV infection than their male counterparts in developing countries due to some socio-economic, cultural, and biological reasons. For labour migration, unequal regional development among countries, as well as, within countries can induce labour migration to urban areas or other countries. The resulting concentration of single men in urban areas, border towns or project sites is generally accompanied by a parallel increase in commercial and casual sex, with a concomitant rise in the risk of HIV infection. The socio-cultural variables include the type of sexual relations, religious belief, the structure of societies and conflicts. For instance, the type of sexual relations is important because it affects the relative spread of HIV among men and women. In Africa, HIV is mainly spread through heterosexual relations. The epidemiological variables include cofactors that increase the risk of sexual contacts resulting in HIV infection. The most important cofactors are ulcerative sexually transmitted diseases, such as syphilis and chlamydia infection, which provide a portal of entry for HIV and the re-use of contaminated syringes by injecting drug users, infection via birth or nursing from mother to child, re-use of contaminated needles in medical settings, and transfusions of contaminated blood or blood products.

The consequences of the upsurge of the disease include among others a reverse in decades of progress made in public health, economic and social development, education, in food security and nutrition and in well-being. These are against the backdrop of the effects of rising morbidity and mortality rates. The rise in morbidity has three immediate effects: reduction in labour productivity, increase in health care spending and reduction in savings. The negative labour productivity effect arises because sick or worried workers are less productive than happy and healthy workers are. Even the productivity of those who do not have AIDS may fall as infection and illness rates among friends, families and co-workers rise. The health care expenditure effect refers to increase expenditures by households and the (public or private) on health care systems to assist AIDS

patient and their families in coping with deteriorating health. The effects on saving can be seen from the following: the direct effect of higher medical expenditures which tend to reduce saving and the growth of per capita, life expectancy, age structure, and the healthiness of the population. The fall in domestic saving implies a reduction in capital formation, and if it is substantial, it will have a potentially large adverse effect on per capita income over the long term. On the other hand, the gradual rise in mortality rates caused by AIDS will have two important demographic aspects with macroeconomic consequences. First, there will be a slower population growth rate, which will result in a smaller population at a future date. Second, a rising number of deaths from AIDS will shift the age structure of the population toward the younger age cohorts. The shifts in age structure can be expected to have important effects on both aggregate supply and aggregate demand. On the supply side, the size of the working-age population (and perhaps the participation rate of the labour force) will be reduced. The smaller working-age population will directly reduce potential output. The loss in output would be exacerbated by a fall in labour force productivity as the average age and experience of the labour force declines. On the demand side, the shift in the size and composition of the population will affect the level and composition of public expenditures, as well as, the economy's overall (private and public) saving rates. For example, the smaller absolute number of young people will place lower demands on the education system and the overall consumption rates will be higher because of the younger age structure (Cuddington 1993; World Bank 1993a; World Bank 1993b; Ainsworth and Over 1994; World Bank 1995; World Bank 1997; Ainsworth 1998; Over 1998; Squire 1998; Barnett and Whiteside 2000; Barrett and Rugaleman 2001; Wilson 2001; Ainsworth and Filmer 2002; Robalino, et.al 2002; Birdsalla and Hamoudi 2004; Haacker 2004).

Drawing instances from some countries in sub-Saharan Africa, because of the upsurge of HIV/AIDS, progress in child survival and life expectancy at birth that are key social and development indicators have dwindled. In Botswana alone about three-fourths of deaths of children under-age 5 are linked to AIDS, as are about one-half the child deaths in Zimbabwe. In 2002, South Africa's child mortality rate was 97 deaths per 1000 children. Well-being having the share of its consequences of HIV/AIDS also deteriorates. Take the case of Botswana, which was one of the richest countries in Africa and where life expectancy at birth used to be close to 60 years before the AIDS epidemic took hold, had its life expectancy down to 33.9 years in 2002 and still falling (Lamptey et.al 2002; Crafts and Haacker 2004; Espsten 2004; Masha 2004).

Given this pathetic situation, to what extent therefore has HIV/AIDS impacted on the well-being of the people living with the disease in sub-Sahara Africa? This question is what this paper examines using a cross-country data and a regression analysis.

METHODOLOGY

Materials

The variables considered for this study are HIV/AIDS, some opportunistic diseases like tuberculosis and well-being. Acquired Immune Deficiency Syndrome (AIDS) is a disease often referred to as the end stage of Human Immuno-deficiency Virus (HIV) infection which destroys the immune system. HIV infection is caused by two strains of the human immune deficiency virus, HIV-1 and HIV-2. HIV-1 is the most common form of HIV that is predominating in different parts of the world, while HIV-2 is found predominantly in West Africa with some pockets in Angola and Mozambique. When compared with HIV-1, HIV-2 is less infectious and its clinical course is slower. Dual infection with HIV 1 and HIV 2 is possible. Once introduced into the human body, HIV attacks mainly a subset of immune system cells, which bear a molecule called Cluster Designation 4 (CD4). Specifically, the virus binds to two types of CD 4- bearing cells: Cluster Designation 4 + Lymphocytes (CD4+T)-cells and macrophages. These cells perform various tasks critical to the normal functioning of the immune system. CD4+ T-cells organize the overall immune response by secreting chemicals to help other immune cells work properly, while macrophages engulf foreign invaders and prime the immune system to recognize these invaders in the future (see World Bank 1997; Lamptey, et.al 2002; WHO 2003).

Tuberculosis for short (TB) is a chronic or acute infectious disease caused by the bacillus mycobacterium tuberculosis which affect any tissue of the body but usually found in the lungs. The name tuberculosis is derived from the formation by the body of characteristic cellular structures called tubercles in which the bacilli are trapped and walled off (Newell 2005).

On the other hand, well-being that is synonymous with good quality of life, include material well-being often expressed as having enough bodily well-being which includes being strong, being in the right frame of mind and looking good; social well-being which includes caring for and settling children; having self-respect, peace, and good relations in the family and the community; having security, including civil peace, a safe and secure environment, personal and physical security, and confidence in the future; and having freedom of choice and action, including being able to help other people in the community (Narayan, et.al 2000a, 2000b).

DATA SOURCE AND MODEL

In the course of determining the impact of HIV/AIDS on well-being in sub-Saharan Africa, a cross-country data drawn from 44 countries for the period 2003 (see Appendix 1) and a linear regression analysis of the Ordinary Least Square (OLS) was used. The data were obtained from the Population Reference

Bureau World Population Data Sheet for the year 2004, Population Reference Bureau (PRB) Country Profiles for Population and Reproductive Health: Policy Developments and Indicators for the 2004, the World Bank African Development Indicators for the year 2005 and the World Bank World Development Indicators also for the year 2005.

The first step in the use of OLS method is the specification of the model as indicated below:

$$WB_i = f(HIV/AIDS_i, Tuber_i) \dots \dots \dots (1)$$

When transformed into a linear equation the model thus becomes:

$$\ln WB_i = \hat{a}_0 + \hat{a}_1 HIV/AIDS_i + \hat{a}_2 Tuber_i + U \dots \dots \dots (2)$$

Where:

- $\ln WB_i$ = log of well-being in each country proxied by life expectancy at birth (years) in each country.
- $HIV/AIDS_i$ = percentage of the total population between the age of 15 and 49 years living with HIV/AIDS in each country.
- $\ln Tuber_i$ = log of the incidence of tuberculosis per 100,000 people in each country
- \hat{a}_0 = the intercept
- \hat{a}_1 and \hat{a}_2 = the estimation parameters associated with influence of the independent variables ($HIV/AIDS_i$ and $Tuber_i$) on the dependent variable ($\ln WB_i$)
- U = the error term.

To estimate the model, a regression analysis is used in order to reflect the explanatory nature of the variables. To verify the validity of the model, two major evaluation criteria were used: the *a-priori* expectation criteria which is based on the signs and magnitudes of the coefficients of the variables under investigation; and (ii) statistical criteria which is based on statistical theory, which in other words is referred to as the First Order Least Square (OLS), consisting of R-square (R^2), F-statistic and t-test. The R-square (R^2) is concerned with the overall explanatory power of the regression analysis, the F-statistic is used to test the overall significance of the regression analysis and the t-test is used to test the significance of the contribution of the independent variables on the dependent (Oyeniya 1997).

Drawing from the model, our *a-priori* expectations or the expected pattern of behaviour of the independent variables ($HIV/AIDS_i$ and $Tuber_i$) on the dependent variable ($\ln WB_i$) are $HIV/AIDS_i < 0$ and $Tuber < 0$, an indication that

the more the prevalence of HIV/AIDS and the incidence of tuberculosis the less the well-being of the people in sub-Saharan Africa.

Note that the incidence of tuberculosis is an interaction variable that expects HIV/AIDS to exert a differential impact on well-being depending on the prevailing situation of tuberculosis. In other words, it is posited that the effect of tuberculosis is exerted through two channels: directly as reflected on the incidence of the disease and indirectly through differential effect of HIV/AIDS on well-being depending on the severity of tuberculosis.

RESULTS AND DISCUSSION

The results of the regression analysis of the model conducted at 5 percent level of significance are presented in Table 1. The regression results show that the R^2 is 61 percent, which is the variation by which the dependent variable (well-being) is explained by the explanatory variables (HIV/AIDS and tuberculosis), while the error term take care of the remaining 39 percent which are variables in the study that cannot be included in the model because of certain qualitative features. At 5 percent level of significance, the F-statistic show that the model is useful in determining if the explanatory variable has any significant influence on the dependent variable, as the computed F-statistic that is 11.8 is greater than the tabulated F-statistic of 3.23.

Table1: Regression Results of HIV/AIDS and Well-being in sub-Saharan Africa.

Variable	Co-efficient estimates and t-values
Intercept (t)	3.92 (15.6)
HIV/AIDS _i (t)	-000.8 (- 0.36)
Tuber _i (t)	-0.10 (-3. 60)*
R^2	0.61
R^2 Adjusted	0.59
F	11.8

t-value in parenthesis; * Statistically significant at 5 percent level

The co-efficient estimate and the associated t-value of the independent variables (HIV/AIDS and tuberculosis) have the expected sign, thus fulfilling our a-priori expectations. Statistically only tuberculosis is significant to well-being at 5 percent level, implying that it is when the immune system is weakened by the HIV/AIDS virus that opportunistic diseases like tuberculosis will be active. The result of the a-priori expectations indicates that an increase in the prevalence of HIV/AIDS and tuberculosis have inverse effect on the level of well-being in sub-Saharan

Africa. A situation that can be linked to the severe decline in socio-economic activities in the countries that are hard hit with the disease because of the high rates of morbidity and mortality resulting from HIV/AIDS and the governments shift of focus from the provision of social services e.g. education, health care, safe water, sanitation facilities and roads to the people to efforts at preventing the continuous spread of the disease by treating, caring and giving supports to those that are already infected.

This assertion is also in accordance to Lamptey and others (2002), who found that HIV/AIDS has exerted a devastating toll on population and health over the last 20 years. The pandemic has reversed hard-own gains in socio-economic activities e.g. infant survival, life expectancy and per capita income in sub-Saharan Africa. HIV has triggered an upsurge in previously rare infections and malignancies and is contributing to an explosive tuberculosis (TB) epidemic. In heavily affected countries, HIV/AIDS has overwhelmed public health systems, stretching health care providers, infrastructure and budgets beyond capacity.

CONCLUSION AND RECOMMENDATIONS

An empirical study on the impact of HIV/AIDS on well-being in sub-Saharan Africa was carried out using a cross-country data and a linear regression analysis. The result obtained indicates that HIV/AIDS has a negative impact on well-being in the sub-region. A situation that calls for intense efforts at combating the spread of the disease and efforts at assisting those already infected. The starting point therefore should be a massive and continuous enlightenment campaign with emphasis on how not to contract the disease since heterosexual transmission is the major route of transmission in sub-Saharan Africa, provision of information that would change the sexual behaviour of the people, making available and affordable (possibly free) on a sustainable basis diagnostic tests and antiretroviral drugs for those affected, a quick search for a curable drug than just the one that would prolong the life of an infected person.

The management of the disease should be a matter of good governance, through collaborative effort with WHO operational strategy on Multi Country AIDS Project (MAP) in Africa, with focus on enhanced political commitment, multisectoral coordination, dramatic increase in financial resources, creation of fiduciary infrastructures to accelerate disbursement and channeling large shares of project funds directly to communities.

In agreement with Bell, et. al (2003), if nothing is done to combat the AIDS epidemic the economy of sub-Saharan Africa will completely collapse within three (3) generations, as AIDS decimates the workforce, create large number of orphans, exacerbates poverty and inequality and put tremendous pressure on health and social services.

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Appendix 1: The Number of Countries Selected for the Study in sub-Saharan Africa

Angola	Chad	Gambia	Mali	Rwanda	Togo
Benin	Comoros	Ghana	Mauritania	Senegal	Uganda
Botswana	Congo	Guinea	Mauritius	Sierra Leone	Zambia
Burkina Faso	Congo D.R	Guinea Bissau	Mozambique	Djibouti	Zimbabwe
Burundi	Cote d' Ivoire	Kenya	Namibia	South Africa	
Cameroon	Eritrea	Lesotho	Niger	Sudan	
Equ. Guinea	Ethiopia	Madagascar	Nigeria	Swaziland	
Cen. Africa Rep	Gabon	Malawi	Liberia	Tanzania	