

# An evaluation of the prevalence of HIV/AIDS on selected economies of sub-Saharan Africa

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## Abstract

Human immunodeficiency syndrome (HIV) whose full-blown period is called acquired immunity deficiency syndrome (AIDS) is today a terminal disease. While one weakens the body hormones, the other comes to claim the life with its accompanying opportunistic diseases. Several factors have been reviewed to be causing the infection and its prevalence as well as its socio-economic, scientific and cultural dimensions. The cost implication of this ailment is enormous when considered from individual, national or global perspective, especially when the cost of treatment and the cost of the disability adjusted life years (DALYs) lost to incapacitation from HIV/AIDS is considered. This study has investigated the financial implications of treatment and the DALYs lost to HIV/AIDS from the perspective of sub-Saharan Africa covering thirty-five countries. Infected population of age 15-49 years were considered, being the active life year age group. Applying Morrow's DALYs measurement, and Ainsworth's *per capita* general rule method of costing HIV/AIDS, it was found that the cost of treatment of HIV/AIDS in any country depends on her economic strength on the one hand and the size of the infected population on the other, to the extent that no country spends or loses less than 3 percent of her national income on treatment and to DALYs. To any country, the financial cost of the DALYs lost to HIV/AIDS is much more than the cost of treatment per episode, mostly huge enough to develop a sector of the country's economy. However, a single recommendation could be difficult as individual countries experience different effect, but different countries must pursue long-run anti-prevalence policies individually and as economic region or bloc.

## Introduction

The onset of HIV/AIDS epidemics in West Africa began in 1985 with reported cases in Cote d'Ivoire, Benin, and Mali, Niger Burkina Faso, Ghana, Cameroon Senegal and Liberia,

followed in 1986 by Sierra Leone, Togo and Nigeria in 1987; Mauritania in 1988, while the Gambia, Guinea Bissau and Guinea in 1989 and finally, Cape Verde in 1990. Recent data on the spread of HIV/AIDS in the world indicate that the number of people suffering from the disease has been on the increase since the mid 1990s with the global figure of the pandemic in 2005 put at 40.2 million infected people, out of which 2.4 million deaths had been recorded. Sub-Saharan Africa with less than 11 percent of the world's population has more than 60 percent of all HIV infected people. At the country level, Botswana, South Africa, Swaziland and Lesotho recorded 37 percent, 29.5 percent, 56 percent and 27 percent respectively of the pregnant women infected in 2005.<sup>1</sup> In 2007, Nigeria recorded 3.6 million HIV victims, 310,000 deaths from HIV/AIDS and 2.5 percent adult prevalence. In the same vein, Cameroon had 100,000 cases of HIV/AIDS, 82,000 deaths and 15.9 percent adult prevalence.<sup>2</sup> A number of factors are said to have led to this increase, ranging from economic, socio-cultural to epidemiological factors. The main economic variables are poverty, gender and 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-economical, cultural, and biological reasons. Unequal regional development among countries, as well as, within countries can induce labour migration to urban areas or other countries. The resultant 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 the societies and violent conflicts, *e.g.* war. 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 cofactor is ulcerative sexually transmitted diseases, such as syphilis and chlamydia infection. The ulcer provides a portal of entry for HIV. Other sources include 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.<sup>3-12</sup>

With this prevalence and the assumption that each HIV/AIDS case directly influences the lives of at least four other individuals, the disease is affecting a total of more than 150 mil-

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lion people. Sub-Saharan Africa is the region most affected. More important is the fact that most, if not all, of the 25 million people in sub-Saharan Africa who are living with HIV/AIDS will have died by the year 2020, in addition to the 13.7 million Africans already claimed by the epidemic. By implication there will be increase in 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. On the other hand, the gradual rise in mortality rates caused by AIDS will have two important demographic aspects with macro-economic 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.<sup>13-21</sup>

Drawn from the above, it would be realized that HIV/AIDS epidemic has created enough consequences on economic, social, public health as well as human resources sector to warrant a cost evaluation especially as may affect each country within the sub-Saharan Africa. Life expectancy could be drastically reduced (quality life years lost), high infant mortality could reduce survival gains. By implication, the cost to individual region may not be informed by the prevalent rate, but rather by the economic strength of such a region. Most of the affected sub-Saharan Africa countries face dual challenges of lowering HIV prevalence (which can happen only over many years) and coping with the impact of existing high prevalence on the health system and society. Their domestic budgetary resources to accomplish this are quite limited.

In view of the above, the objective of this study is to investigate into the economic consequences of the prevalence of HIV/AIDS on the economy of each of the countries of the

sub-Saharan Africa. The rest of the paper is divided into three parts: *Materials and Methods* section presents the data and methods of analysis, *Results and Discussion* section presents and discusses the results, while *Conclusions* section recommends intervention mechanisms.

## Materials and Methods

### Data

The data used for this study are based on the number of adults between the ages 15 and 49 years that are living with HIV/AIDS, the total population in each country selected for the study and the countries' *per capita* income in US\$. In the course of evaluating the prevalence of HIV/AIDS in sub-Saharan Africa, a set of cross-country data drawn from 35 countries in the sub-region (for the period 2005) was used. The data were sourced from the several publications.<sup>22-24</sup>

### Methods

In order to attain the objective of this study, simple descriptive method of analysis was employed. Several descriptive methods had been employed in several other studies.<sup>25,26</sup> However, since HIV/AIDS deaths entail substantial disability before death, disability adjusted life years (DALYs) was also adopted for this study.<sup>25</sup> This DALYs measures the impact of diseases than when considered as a share of total deaths.

Thus, DALYs is postulated as:

$$DALY_i = Dd_i \times (Ad_i - Ao_i) \times 365 \text{ days} \quad (1)$$

where:

$DALY_i$  = disability adjusted life years in each country;

$Dd_i$  = those who may die but the extent of disability before death in each country;

$Ao_i$  = the average age of onset in each country;

$Ad_i$  = the average age of death in each country.

However the number of days or time between the incubation or asymptomatic period and the full blown period when incapacitation is expected cannot be fixed, but available literature suggests that it might be as short as 5 years among the poorest people in the poorest countries and as long as 19 years in the rich countries, thus on the average, incapacitation can be placed at 12 years.<sup>27,28</sup> Furthermore, it has been shown that the average age of onset for HIV/AIDS ranges between ages 15 and 49 years, which can also be placed at 32 years. Furthermore, assume that, the average age of death is asymptomatic period plus the full blown period, for example, if HIV is contracted at age 21 years, and the average

asymptomatic period is 11 years, it means that the average age of death can be placed at 44 years of age, *i.e.*  $Ad_i = 21 + 11 + 12 = 44$  years.

In this sense, DALYs per affected person per annum can be established as:

$$DALY_i = 12/100 (44-32) \times 365 \text{ days} \quad (2)$$

$$DALY_i = 525.6 \text{ days per head per country} \quad (3)$$

It means that an individual person that is HIV/AIDS infected is expected to lose the above number of days to incapacitation. A general formula for the quantity of DALYs lost to incapacitation by a whole country become:

$$DALY_i = 0.12 (12) \times 365 \times N_i \quad (4)$$

where:  $N_i$  is the total number of infected people in a country.

Estimating the cost of HIV/AIDS treatment to a country involves, using the general rule as established by some researchers.<sup>26</sup> Accordingly, each case costs 2.7 times the *per capita* gross national income (GNI) of each country. To get the total financial cost (TFC<sub>i</sub>) to a country therefore:

$$TFC_i = 2.7 (GNI_i/Pc_i) \times N_i \quad (5)$$

where:

TFC<sub>i</sub> = total financial cost per country;

GNI<sub>i</sub> = Gross National Income per country;

Pc<sub>i</sub> = total population of the country;

$N_i$  = total number of affected individual per country.

Note that the financial cost of death from HIV/AIDS to any country was not calculated because data on this could not be found.

## Results and Discussion

The result of the evaluation of the prevalence of HIV/AIDS in sub-Saharan Africa is presented in Table 1 below. As indicated in the table, Botswana, Zimbabwe and Swaziland in the Southern Africa present the highest scenario of HIV epidemics, with 37.3, 33.7 and 33.4 percent of their ages 15-49 populations respectively. This is closely followed by Lesotho and Namibia with 28.9 and 22.5 percent of their ages 15-49 population respectively. The effects of these proportions become alarming when transformed into DALYs and the sum of money lost to HIV. For example, Botswana presents 746,000 HIV infected persons in 2003, amounting to 2722.9 DALYs per year per 100,000 persons and \$555,822.8 million. This translates to a loss of \$1.68 billion on treatment for the whole patients. This forms 12.04 percent of her \$14 billion GNI for the year, and can pay the country's debt service at 0.7 per-

cent of the GNI in 7.2 times.

Comparing the above analysis with a country with low GNI and high prevalence of HIV, many development variables would have eluded such a country, for instance Malawi with \$1.8 billion, Mauritania with \$1.1 billion and Swaziland with \$1.2 billion annual GNI respectively. It implies that Malawi with \$14 *per capita* health expenditure can afford higher per capita health expenditure towards better health outcome without the HIV/AIDS infected persons.

The above does not describe a nation as having an edge, but rather, the effect of HIV differs from one country to the other in terms of financial strength. For example only 1.6 percent of the total age 15-49 years of Gambia's population was reported to have been infected by HIV, yet it costs the country 1262.4 DALYs/100,000 or 5.7 percent of her annual GNI per 100,000. However, the cost of treatment of these lots amount to 54.11 percent of the country's GNI. This by comparison takes care of the health expenditure at 7.3 percent in about 8 times assuming constancy and consistency.

Furthermore, the cost of HIV infection to any nation can be so devastating. Except very few countries like Senegal, Angola, Ethiopia and Congo Democratic Republic, most countries loose not less than 3 percent of their National Income to HIV/AIDS treatment, while some even loose as high as 30 to 40 percent of their GNI. For example, Namibia, Mozambique and Cameroon loose 36, 35 and 31.99 percent of their GNI to HIV/AIDS treatment for the year in question respectively. A further look at the DALYs lost revealed that Namibia loses \$2,740,986 to incapacitation. Where these are viable, development can be attained.

However, an outlier is found in Lesotho with 28.9 percent of her ages 15-49 years of her population infected with HIV/AIDS. With only \$6.0 billion GNI, and 578,000 people infected, this amounts to a loss of 3040.3 DALYs/100,000 or \$9.4 million and a whopping sum of \$4.8 billion for treatment or 80.63 percent of her annual GNI. Generally, some of the implications of this finding are that; funds that are supposed to go for other social development programmes are threatened by diversion towards HIV/AIDS remedy and many actively young ages are eliminated due to the effect of HIV/AIDS. Close to the above is the loss of productive time by the person affected and those relatives whose contribution spread beyond sympathy; money, labour time, stigma and psychosomatic depression.

## Conclusions

It has been found that the cost of treatment of HIV in any sub-Saharan country is colossal

that can well be enough to bring up about 35,476 persons from age 0 to 18 years by United Nations standard. However, the loss to DALYs, to acute illness could be costlier. For example, Senegal with the least HIV prevalence of 0.5 percent of age 15-49 years population incurs \$7,290,000 or \$7.3 million on treatment, but the lost to DALYs amounts to \$1.63 billion/100,000 per year. It has also been found that the lower the income of a nation, the more devastating the effect of HIV on the economy, and as such the more the danger of further susceptibility to economic instability and vulnerability.

Based on the above, treatment of the ailment may be a temporary solution at prolonging the death sentence on the infected, but it

is not as economical as eliminating its existence (infection and prevalence). It is however difficult to recommend a blanket solution to the menace of HIV/AIDS to all countries under study because the effect differ from country to country. In view of these differences, countries are expected to tackle the ailment with different strategies relating to the prevalent factor that causes it. In whatever forms the intervention will be made, different countries both as individual nations and as region must pursue long-run anti-prevalence policies. By this conclusion, all factors suspected or found to be causing the infection are therefore recommended to be eliminated through campaign and orientation, decrees and promulgations, legislation, and expansion of socio-infrastruc-

tural facilities to reduce urban drift and poverty. In specific terms:

Research and extension programmes should contain an HIV/AIDS education component, and should encourage rural people to consider how they would respond to the menace of the infection. Policies and programmes should go beyond care but prevention. In these wise, behavioural issues such as early marriage (since sexual activity is often highest among unmarried young adults), women economic empowerment, creation and expansion of small-scale institutions and investing more in women's education status are recommended. All the above however depend on the individual country's preference based on socio-economic and cultural exigencies.

**Table 1. Cost of HIV/AIDS in terms of disability adjusted life years lost and treatment in each country.**

Countries	Population living with HIV	Life expectancy at birth (years)	GNI per head US\$	DALYs lost (days per * 100,000)	DALYs in \$ (dollar per 100,000)*	Cost of treatment in US\$ million*	Cost of treatment % of GNI*
Angola	77,000	47	740	405.0	299,714.8	2099.5	1.53
Benin	241,200	53	440	1268.7	55,822.8	286.5	9.6
Botswana	746,000	38	8370	2722.9	22,790,673	1685.9	12.06
Burkina Faso	786,500	43	300	4136.9	1,241,070	637.1	17.7
Burundi	597,600	42	90	3143.4	282,906	145.2	24.2
Cameroon	1,899,800	48	630	9992.9	6,295,527	78.1	31.99
Chad	324,000	48	240	1704.24	409,080	227.4	9.99
Co'te d'Ivoire	1,629,600	45	600	8571.7	5,143,020	102.64	23.80
Congo	273,600	52	650	1439.1	935,441	263.99	20.01
Congo, Dem. Rep.	289,100	45	100	1520.7	152,067	480.2	1.45
Ethiopia	422,400	42	90	2221.8	199,890	424.11	1.60
Gabon	462,000	53	340	2430.12	8,262,408	300.0	9.42
Gambia	240,000	53	2010	1262.41	2,537,424	216.4	54.11
Ghana	1,209,000	57	320	6359.3	2,034,988.8	6979.5	16.07
Guinea	258,400	46	430	1359.2	584,447.4	15.9	8.82
Guinea Bissau	42,000	46	140	220.92	30,928.8	64.8	7.94
Kenya	4,530,000	45	400	2382.8	9,531,200	1242.0	38.2
Lesotho	578,000	38	3100	3040.3	9,424,930	1600.5	80.63°
Liberia	84,000	47	110	441.8	48,598	7.29	6.24
Malawi	150,000	38	160	789	126,240	89.20	3.6
Mauritania	15,000	51	400	79	31,600	1400.49	11.29
Mozambique	2,470,000	41	210	12,992.2	2,728,320	1406.97	35.91
Namibia	2,700,000	40	1930	1420.2	2,740,986	153.2	36.08
Niger	165,200	46	200	869	173,800	2000.6	3.72
Nigeria	2,117,000	49	350	11,142.4	3,897,397	139.1	4.21
Rwanda	64,000	66	220	336.6	74,052	4837.9	21.91
Senegal	5000	49	540	26.3	14,202	394.41	1.32
Sierra Leone	371,000	37	150	1951.5	292,725	256.7	17.4
South Africa	9,400,000	46	2750	49,444	135,971,000	24.9	22
Swaziland	4,008,000	47	4430	2108.21	9,339,370.3	479.3	33.3
Tanzania	2,808,000	43	300	14,770.1	4,431,030	319.7	22.74
Togo	294,000	50	310	1546.4	479,396.4	1044.5	17.11
Uganda	1,250,000	43	250	6575	1,643,750	843.7	13.61
Zambia	1,560,000	36	380	8205.6	3,118,128	4892.4	40.01
Zimbabwe	4,381,000	39	270	23,044.1	6,221,907	319.3	A°

GNI, gross national income; DALYs, disability adjusted life years lost. \*, authors' computation; A°, not certain because the GNI and the total population of the country cannot be ascertained.



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