# Determinants of HIV/AIDS Spread in West Africa: Does Public Corruption Matter?

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ECOWAS countries, in addition to face increasing health problems related to HIV/AIDS epidemic, experience a high rate of public corruption. Health sector is particularly marked by corruption so that the prevalence seems to coexist with corruption. In this respect, our study aims to assess the influence of public corruption on the evolution of HIV/AIDS. Our econometric analysis of panel data shows that public corruption promotes expansion of HIV prevalence in ECOWAS countries. Besides, we find that literacy of the girl significantly contributes to reduce the prevalence in short run. In long run, the results indicate that the higher is the level of education the higher infection possibilities are while a higher number of health professionals and an increase in health expenditure retard the spread of the epidemic. From these results, we conclude that strategies for reducing prevalence of HIV/AIDS should be focused on the fight against corruption, improving education of young girl and a more efficient allocation of resources in health system.

Key Words: ECOWAS, HIV/AIDS, corruption, education, health expenditure, panel data

## Introduction

In the ECOWAS[1] region, as in other areas of sub-Saharan Africa, HIV/AIDS significantly undermines economic and social development. In those countries severely affected by HIV/AIDS, premature death of people in the most productive age affects not only families, but also farms, education and health systems as well as government action. In this regard, Barnett and Halswimmer (1995) establish the existence of growing relations between food shortages, depletion of households in some regions, and family and social problems caused by high mortality and high morbidity in workforce. Likewise Aventine & Huard (2000), examining the adverse effects of HIV/AIDS on Ivorian manufacturing sector, concluded that viability of firms is threatened by loss of workers, absenteeism, and increased drug costs for HIV/AIDS treatment.

Apart from having to face increasing health problems related to HIV/AIDS, many low-income countries (which include ECOWAS countries) have seen their economic situation worsens and therefore had to reduce their health budgets. This was followed by a serious shortfall of medical personnel (WHO, 2006), a lack of drugs and medical equipment, a reduction or suspension of health professionals salaries, a deterioration in the quality of medical care and a total lack of equity in health services. Blighted by public corruption[2], both cause and consequence of their sore, these developing countries have seen public health deteriorate and health system collapse (World Bank, 2004).

Thus, corruption has modified the structure of public investment and has led to distortions budget more or less harmful to efficiency of the health system (Tayler & Dickinson, 2006). Especially in the case of fight against HIV/AIDS, diversion of resources limits the strategic actions to fight against this pandemic. Indeed, in those economies, dominated by hunting for bribes, decisions to invest in programs to fight against HIV/AIDS are not motivated by the opportunity of investment, but by the importance of bribes that can be touched.

Although HIV/AIDS epidemic knows a relative decline in recent years (UNAIDS, 2010), persistence of prevalence coexists with a high rate of public corruption in ECOWAS countries. All goes as if the bad governance contributed to maintain cycle of transmission of the HIV/AIDS virus in these countries. It is with this observation that our study aims to examine the influence of public corruption on HIV prevalence in ECOWAS countries (excluding Cape Verde[3]).

The remainder of the paper is organized around five sections. In the second section, we present literature review. In the third section, we expose the methodological framework by specifying variables and prior approaches to the estimation of an econometric model of panel data. The fourth section presents econometric results and the last section is devoted to discussions before drawing a conclusion.

## Literature review

Most traditional strategies to prevent the spread of

HIV/AIDS have focused on behavioral changes such as abstinence, faithfulness and promotion of condom use. While this approach has certainly prevented large numbers of people from being infected, many of people are not in a position to abstain from sex, rely on fertility or negotiate condom use. In this way, authors address the role of other factors susceptible to increase the evolution of HIV/AIDS. Unfortunately, studies examining the influence of corruption on HIV prevalence are almost nonexistent.

However, studies that have addressed this issue concluded that corruption negatively impacts reduction of HIV prevalence through various channels. Among other relevant findings, Lewis (2005) states that the initiatives of fight against HIV/AIDS, funded by the Global Fund and PEPFAR in several developing countries have failed because of corruption. Cockburn et al. (2005) explain that the spread of counterfeit drugs of HIV/AIDS (and other diseases) can be serious for patients and insofar as these drugs contain little or no active ingredients, the patient under counterfeit antiretroviral remains a vehicle of infection for healthy individuals. So Cockburn et al (op.cit) suggest the requirement for the pharmaceutical industry to expose counterfeit medical products which may be known.

The empirical analysis has also tried to analyze the effects of social, economic and demographic conditions on seroprevalence. Thus, O'Farrell (2001) and more recently, Fox (2010) relativized positions become "quasi dogmatic" according which poorest people are the most affected by HIV/AIDS. This authors show that in sub-Saharan Africa, the worst affected countries are not necessarily the poorest in the continent. In the same logic, (Gillespie et al. 2007) show that in geographic level; the richest areas (which are usually cities) have a higher concentration of the epidemic than poor rural areas. At individual level, Baker et al. (2008) and Hargreaves and Glym (2002) estimate that compared to the poor, the richest people have the higher rates of HIV/AIDS infection in sub-Saharan Africa.

When attempting to understand the relationship between HIV/AIDS and the education of infected people, one of the conclusions of studies is the existence of a positive relationship between the number of infections and the education level of individuals. Thus, Forston (2008) shows that adults with six years of schooling are three times more likely to be infected by HIV/AIDS than adults who have never been to school. In Tanzania, the workers in the modern sector are two to three times more likely to be infected than agricultural workers (Fox, 2010). Furthermore, the level of wealth and education, multiple extramarital sexual partners

(Kelly et al., 2003) and the probability of having sex before marriage (Forston, 2008) increases the risk of infection. In addition, one note the role of complex social norms highlighted by Leclerc-Madlala (2008) and Gilbert (1996), which explain that the disproportionate vulnerability of women to HIV/AIDS is the result of their economic dependence on men. As a consequence, women are subject to coercion and are in a situation requiring an exchange of sex against money or housing.

## Methods

Data are from Statistics of "World Development Indicators". The study covers period from 1999 to 2009. The dependent variable is the rate of HIV/AIDS among persons aged 15 to 49 years. The choice of this age group is related to its importance in the population. This segment of population is considered to be the most active group. It captures more adequately the impact of the disease on the population and on global productivity (Temah, 2009).

The independent variables are a composite set that includes a state variable that is corruption perception index *(cpi)* and control variables. These variables describe the social, economic and demographic characteristics of countries. These are: women participation index *(wpi)*, Gini coefficient *(gini)*, political stability index (psi), educational level of the population *(educ)*, educational level of women *(w.educ)*, rate of adolescent fertility *(a.fert)*, health expenditures (h.exp), ratio of physicians per capita *(doc)* and growth rate of the population aged 15 to 49 *(pop)*.

Specifically, women participation index *(wpi)* measures inequality between men and women; it expresses the extent of women's poverty and degree of emancipation of women from traditional and cultural sluggishness. Examination of political instability *(psi)* on the prevalence results from fact that development of non-rule state and proliferation of gangs expose girls to rape, prostitution and favor dry sex. Global level of education *(educ)* and the woman education level *(w.educ)* should help to reduce the prevalence as they improve. Adolescent fertility *(a.fert)* aims to capture the precocity and intensity of sexual relations among young girl. Health expenditure *(h.exp)* reflect the priority given to health by government authorities and the ratio of doctors per capita *(doc)* captures influence may exercise proximity of health professionals (doctors, nurses, etc..) on households for use preventive methods against HIV/AIDS infection. Finally, the workforce growth rate *(pop)* aims to assess influence of the population aged 15 to 49 years in the cycle of transmission of HIV/AIDS.

Table 1. Variables specification.

| Variables | Definition | Expected impact |
|-----------|------------|-----------------|
| *hiv* | HIV/AIDS prevalence rate | |
| *cpi* | Corruption perception index | + |
| *wpi* | Women participation index | - |
| *gini* | Gini coefficient | - |
| *psi* | Political stability index | + |
| *educ* | Global level of education | - |
| *w.educ* | Women literacy rate | - |
| *a.fert* | Adolescent fertility rate | + |
| *h.exp* | Health expenditure | - |
| *doc* | Doctor for 100000 habitants | - |
| *pop* | growth of workforce | + |

When considering a sample of panel data, the first task that should be done is a test of poolability (test of specification or test of homogeneity) in order to check the homogeneous or heterogeneous specification of the generator data process. This specification is intended to test the equality of coefficients of the model studied in a single dimension (in econometric point) and show that theoretical model studied is exactly the same for all countries or whether there are specificities of each country.

Table 2. Poolability test.

| Null hypothesis | F-stat | Decision |
|-----------------|--------|----------|
| 1. All individuals are sufficiently homogeneous | $F_1(117,28)= 9.8743066$ | Rejection |
| 2. all individual coefficients are equal | $F_2(104,28)= 1.5101733$ | Acceptation |
| 3. All individual constants are equal | $F_3(13.132)= 54.771651$ | Rejection |

Methodology from the formalization of panels is a linear model whose expressive form is as follows:

$$y_{i,t} = \beta \cdot x_{i,t} + \alpha_i + \varepsilon_{it}$$
$$i = 1,2 \cdots I \quad et \quad t = 1,2, \cdots T \tag{1}$$

The basic framework is a linear model that describes relationship between evolution of HIV/AIDS prevalence and all independent variables that explain this evolution. This model is an explicit form of equation (1) and is written as follows:

$$hiv_{it} = \beta_0 + \beta_1 cpi_{it} + \beta_2 wpi_{it} + \beta_3 gini_{it} + \beta_4 psi_{it} + \beta_5 educ_{it} + \beta_6 w.educ_{it}$$
$$+ \beta_7 a.fert_{it} + \beta_8 h.\exp t_{it} + \beta_9 doc_{it} + \beta_{10} pop_{it} + \alpha_i + \varepsilon_{it} \tag{2}$$

The choice of type of effects considered (fixed or random) is subject to certain methodological problems. In this respect, Verbeek and Nijman (1992) note that where fixed effects lead to the identification problem, random effects can lead to inconsistent estimates. Therefore, the Hausman's specification test (1978) is used to distinguish fixed and random effects.

Table 3. Hausman's specification test.

| Null hypothesis | Chi2(9) | Prob>Chi2 |
|-----------------|---------|-----------|
| Presence of random effects | Chi2(9)= 80,91 | Prob>Chi2=0,0000 |

The fixed effects model appears suitable to estimate determinants of HIV/AIDS since the Hausman's specification test shows that we are in presence of individual fixed effects.

In order to avoid a false estimate, we use two stationarity tests: the test of Im, Pesaran and Shin (IPS) and the test of Levin and Lin (LL). The simultaneous use of these two tests is not a superfluous exercise as well as based on ADF test;

the IPS test assumes a heterogeneous specification of the autoregressive root while the LL test assumes homogeneous specification of the root. When calculated statistics are lower than the critical values, variables are stationary in the panel. From this test, we obtain that variables gini, psi, a.fert and pop are stationary in level, while others are stationary in first difference.

Table 4. Test of stationnarity.

| Variables | In level | | In first difference | |
|---|---|---|---|---|
| | IPS | LL | IPS | LL |
| *hiv* | -1.628 | -3.003* | -1.919* | -2.868* |
| | (0.193) | (0.001) | (0.061) | (0.002) |
| *cpi* | -1.137 | 0.121 | -2.307* | -3.299* |
| | (0.913) | (0.548) | (0.003) | (0.000) |
| *wpi* | -1.664 | -3.485* | -2.021* | -1.929* |
| | (0.159) | (0.000) | (0.037) | (0.027) |
| *gini* | -1.764 | -4.751* | - | - |
| | (0.087) | (0.000) | | |
| *psi* | -2.241* | -8.51* | - | - |
| | (0.003) | (0.000) | | |
| *educ* | -1.327 | -0.029 | -2.651* | -2.995* |
| | (0.744) | (0.489) | (0.000) | (0.001) |
| *w.educ* | -1.815 | -4.055* | -2.488* | -6.6* |
| | (0.123) | (0.000) | (0.000) | (0.000) |
| *a.fert* | -2.57* | -8.657* | - | - |
| | (0.000) | (0.000) | | |
| *h.exp* | -1.524 | -1.904* | -2.452* | -6.03* |
| | (0.469) | (0.028) | (0.001) | (0.000) |
| *doc* | -1.785 | -3.094* | -2.562* | -7.435* |
| | (0.147) | (0.001) | (0.000) | (0.000) |
| *pop* | -7.360* | -10.246* | - | - |
| | (0.000) | (0.000) | | |

Note: (*) indicates rejection of the null hypothesis at the 5%

Moreover, presence of at least two non-stationary series led us to investigate the presence of long run equilibrium between the variables of the model. To do this, given the small temporal dimension of our panel (T <30), we use the test of Kao which seems more robust than that of Pedroni, although both are a development of Engle and Granger method's (1987).

Table 5. Kao co-intégration test.

| H0 : absence of co-integration | | |
|---|---|---|
| t-statistic | Prob. | Decision |
| -2.52151 | 0.0049 | Rejection of $H_0$ |

Our series are cointegrated, we use estimation procedure in two steps of Engle and Granger (1987). This procedure is as follows: in the first step, we estimate the long run relationship and residues of this estimate is recovered, and, in the second step, we estimate the short run relationship (estimation of error correction model) by integrating residues of the long run relationship with a delayed period. The latter relationship is validated for a negative recall force, and significantly less than one (1) in absolute value.

**Results**

Table (6) shows that public corruption facilitates progression of HIV prevalence in ECOWAS countries. Besides this, we note that in short run, literacy of girl significantly helps to reduce the prevalence while in the long run, the infection possibilities are higher in countries where level of education is high. In contrast, a higher number of healthcare professionals and an increase in health expenditure limit spread of the pandemic.

Table 6. Coefficients.

| Variables | Long run | | Short run | |
|---|---|---|---|---|
| | coefficients | t-student | Coefficients | t-student |
| $cpi^1$ | 0.3240** | 2.23 | 0.0609** | 2.45 |
| $wpi^1$ | - 0.0360 | - 0.31 | 0.0394 | 0.99 |
| $gini$ | 0.0021 | 0.34 | - 0.001 | - 0.385 |
| $psi$ | 0.0018 | 0.47 | - 0.0009 | - 1.23 |
| $educ^1$ | 0.0215** | 2.53 | - 0.0001 | - 0.11 |
| $w.educ^1$ | - 0.0064 | - 0.09 | - 0.0454*** | - 4.81 |
| $a.fert$ | - 0.0091 | - 0.45 | 0.0036 | 0.50 |
| $h.exp^1$ | - 0.1143*** | - 2.95 | 0.0013 | 0.21 |
| $doc^1$ | - 0.0571*** | - 3.27 | - 0.0017 | - 0.37 |
| $Pop$ | - 0.3375*** | - 6.58 | - 0.0094 | - 1.02 |
| $Const$ | 20.0111 | 0.31 | 1.1178** | 2.00 |
| $lag\_resid$ | --------- | -------- | - 0.0617*** | - 3.25 |
| $R^2$ | 0.9379 | | 0.8533 | |

(1) delayed values of this variables are used to estimate the model at short run,
*** Significance at 1%,    ** Significance at 5%,

## Discussions

### *Effects of corruption*

Corruption appears to be a significant brake in the fight against HIV/AIDS. Due to its negative effects, corruption helps maintain transmission of the virus. Theft and misappropriation of funds committed by ministries and national structures in charge of fight against HIV/AIDS, one hand, and the action of hospital employees who extorts tips for giving medication, on the other hand, are channels by which public corruption maintains the cycle of transmission. Clearly, the exercise of discretionary power and asymmetric information that promote corruption in health sector favor contamination conditions in West Africa.

Another explanation of the positive impact of corruption on HIV/AIDS prevalence is social and cultural, although regimented by a need of income maximization. Indeed, for public service employees, corruption is a way to increase income. However, some risk factors for HIV/AIDS as multiple sexual partners and probability to have extramarital sex (Forston, 2008), increase with the level of wealth. Thus, by increasing economic and financial power of people, corruption facilitates polygamy and exacerbates extramarital sexual relations.

This result is an empirical validation of findings of Tayler & Dickinson (op.cit) according to which corruption undermines the government action and the misappropriation of resources limits the strategic actions to reduce the spread of HIV/AIDS. Also, this result updates those of Azfar (2005) according to which reduction of corruption can contribute to improving public health through better use of public spending. Finally, following Zaman & Abdul (2006) and Lindelow & Sernells (2006), our results show the negative influence of the corrupt practices of personnel of health services on their use.

### *Influences of education and young girl literacy*

The most widespread conclusion and highlighted by authors such as Macheke and Campbell (1998) is that education, by its contribution to the improvement of cognitive ability and openness to raising awareness about the perverse effects of HIV/AIDS reduces risk of infection. Another major contribution of our study is that it challenges this paradigm and reinforces previous findings (Fox, 2010; Forston, 2008, Leclerc-Madlala, 2008, Baker et al 2008; Smith, 2007; Guiella & Madise, 2007).

In dynamic of these authors, we note that education system in sub-Saharan Africa opposed many obstacles to behavior change towards HIV/AIDS and is often a very important place for its spread. Behavioral deviations find favorable field to their expression in the school. Sexual abuse, cross-generational sex and transactional sex are all behaviors that promote the spread of HIV/AIDS (Leclerc-Madlala, 2008, Smith 2007; Guiella & Madise, 2007: Gilbert, 1996). In addition, the school does not take sufficiently into account the new risk groups (young girls) and exposes them to early sex or multiple sexual partners, thereby increasing risk of infection. In this regard, Forston (2008) shows that adults with six years of schooling are three times more likely to be infected by HIV/AIDS than adults who have never been to school. In the same vein, Fox (2010) estimates that in Tanzania, workers in modern sector are two to three times more likely to be infected than agricultural workers.

The negative influence of young girl literacy in short run appears as a signal in terms of strategic actions to reduce HIV prevalence. Given importance of culture and tradition, girls are not in school (or taken out of school) and are given in marriage early to older people, often polygamous or having several extramarital sexual relations. Finally, the positive effects of girl literacy are

wiped out by the weakness of the educational system. In those countries where illiteracy is more pronounced among women and where ignorance protective means against sexually transmitted infections exposes them to high risk of contamination, a special emphasis on girl education would contribute to reduce the prevalence of HIV/AIDS.

### *Impacts of health expenditures and weight of doctors*

Interest to examine influence of health expenditure on the prevalence of HIV/AIDS is that health systems face considerable demand as spread of HIV/AIDS is high. As well, the epidemic seems to have paralyzed the efficiency of health systems in Africa. Our study shows that health expenditures negatively affect the prevalence of HIV/AIDS. In other words, when the part of the budget devoted to health increases, the prevalence drops significantly. This result reveals the role of government in the fight against HIV/AIDS. In countries where the budget allocated to health is rising, there is a significant decline in HIV prevalence. For example, a tripling of the budget allocated to health between 2000 and 2009 in Senegal has significantly reduced HIV prevalence, so that this country is now one which has the low prevalence rate of HIV/AIDS in ECOWAS area.

The negative sign of ratio of doctors per capita reveals the important role of health professionals in fight against viral infections and particularly that of HIV/AIDS. Indeed, actions of health professionals in therapeutic education (awareness, information, learning, and psychological and social support) of infected persons or their environment promotes adoption of more responsible behavior with regard to the epidemic. In addition, professionals are a guarantee of efficiency of health policies insofar as holders of medical knowledge, they are, for governors, a good channel to perceived needs of population and an ideal vehicle for transmitting strategies struggle against HIV/AIDS.

### *Influence of workforce growth*

Works of Kambou et al. (1992), those Hancock et al. (1996) and those of Aventine & Huard 2000) agree on the negative impact of HIV/AIDS on productivity and economic growth. They show that this epidemic has a negative impact on labor productivity (absenteeism, morbidity...), implying a decrease in output per capita. The problem with these studies is that they do not provide a meaningful analysis on the long run and hypothesize of a positive and ongoing relationship between prevalence and rate of population growth. But it is clear that this effect cannot persist in long run. Indeed, development of means of protection and enhancement of fight to reduce number of new

infections should lead to a change in people sexual behavior. In this way eventually, HIV prevalence will to evolve in the opposite direction of growth of the labor force as shown by our results.

### Conclusion

In West Africa, HIV/AIDS reduces the productive capacity of populations and weakens economies. In parallel to that devastating effect, public corruption plagues countries health system and limits actions against HIV/AIDS. All goes as if bad governance contributed to maintain cycle of transmission of the HIV/AIDS virus in these countries. For this reason, our study has as objective to identify factors that explain prevalence of the epidemic in the case of ECOWAS countries, and particularly tries to capture the influence of public corruption.

The results show that public corruption facilitates the progression of HIV prevalence in ECOWAS countries. In addition, in short run, literacy of the girl significantly helps to reduce the prevalence while in long run, possibility of infection, will be more important in countries where the overall level of education of the population is high. On the contrary, we reveal that a greater number of health care professionals and an increase in health expenditure limit the spread of the pandemic.

From these results, we conclude that strategies for reducing prevalence of HIV/AIDS should be focused on the fight against corruption, improving education of the young girl and a more efficient allocation of resources in health system.

### Notes

1. The Economic Community of West African States (ECOWAS) has, since the withdrawal of Mauritania in December 1999, fifteen countries which are: Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.
2. Public corruption is the use of a public function for private gain, and it therefore refers to the delegation of a public office and power attached to it (Rose-Ackermann, 2004).
3. The unavailability of statistics on the prevalence of HIV/AIDS in Cape Verde, has led us to exclude this country in our analysis.

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