Determinants of HIV- AIDS Prevalence among Women: The Case of Côte d'Ivoire

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The aim of this study is to analyze the factors of HIV prevalence among women in Côte d'Ivoire. Health indicators including high infant mortality and maternal mortality rates and a high prevalence of HIV-AIDS among women represent a serious public health concern. Indeed, the people of all ages living with HIV are 450 000 and 220 000 women were concerned in Côte d'ivoire. Improved human development infers, in addition to economic growth, an increase in the satisfaction of basic needs, including nutrition, health, education, etc. Moreover, an improved health status among women positively affects productivity, overall income, and family welfare in the case of children. This study highlights the main risk factors for HIV infection in women based on AIDS indicators survey - Côte d'Ivoire 2005. Specifically, we use econometric and statistic approaches to identify the relevant socioeconomic and cultural factors which explain the high prevalence of HIV among women. Statistic analysis can be used to show HIV inequality between men and women and to explain the mechanism of transmission from mother to child. First, econometric estimates of probit models suggest a positive relationship between HIV prevalence and women between the age of 15-39. In addition, the study shows that violence against women is positively correlated with HIV prevalence. However, the econometric analysis highlights a negative relationship between the probability of HIV prevalence and two fundamental variables; the level of education and the standard of living. The probit model demonstrates that there is a high prevalence of HIV in all regions of Côte d'Ivoire except the northern region (in rural areas). Secondly, The results of the Demographic and Health Surveys with Multiple Indicators in Côte d'Ivoire (EDS -MICS 2011-2012) show that of a sample of 5671 women ages 15-49 years and 5677 men ages 15-59 years, 4.6% of women contracted the disease against 2.7 % for men. Firstly, 2005 EIS-Data analysis shows that of a sample of 3564 women screened, 2,326 were infected (65.3 %). Among those diagnosed with HIV, 2032 transmitted the virus to their babies during pregnancy, childbirth, or breastfeeding, resulting in 87.36 % of infected women giving the virus to their child. Finally, from the selected determinants, the study recommends: The introduction of sex education in schools to show the modes of transmission and how to behave to avoid it HIV. Children should not play with worn objects. Health educators should educate teenagers on abstinence and promote the use of male and female condoms when having sex. The integration of a section on the prevention and treatment of HIV/ AIDS in literacy programs for women, in order for them to obtain the information necessary to make appropriate choices on sexual and reproductive health. Mandatory testing of all pregnant women and treatment in case of infection early in pregnancy to prevent transmission of the virus from mother to child. Strengthening of the program (PMTCT) to allow greater access to HIV-positive women. The medical and social care of all women living with HIV. Reducing inequalities between men and women in terms of access to education, job opportunities, and decision-making. One must offer the same chances of success to both sexes. The implementation of priority actions in terms of employment of women in all sectors (formal, informal, agricultural). The actions of the government and donors should encourage women to take charge while providing them with funding.

Key Words: HIV-AIDS prevalence, gender inequality, mother-to-child transmission, Côte d'Ivoire

Introduction

The HIV and AIDS epidemic is widespread among women. 51% of people living with HIV worldwide are women, with 60% in sub-Saharan Africa (WHO, UNAIDS, UNICEF, 2008). Côte d'Ivoire remains the most affected country in the West African region, where 170,000 women live with HIV (EDS- MICS, 2011-2012). In Côte d'Ivoire, AIDS is a one leading cause of death among women after complications during pregnancy and childbirth (CI-UNICEF, 2006). Women constitute the most active population in all fields of economic activity. In addition, they play an important role in the procreation and education of children. In other words, women are generating life and constitute the foundation of the family unit.

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It is thus justified to take into account their specific health needs. To date, several measures have been taken to facilitate women's access to health care and increase their chances of survival. National control programs against HIV exist, including the program of Prevention of Mother to Child Transmission (PMTCT); increased medical care of people living with HIV with antiviral therapy; the offer of free testing in some health centers, etc. International agencies (UNAIDS, WHO, UNICEF etc.), NGOs and civil society are also involved in the eradication of this pandemic. These development organizations fund projects and programs to support and provide care for HIV patients. In Côte d'Ivoire, several sensitization programs were put in place in different regions through the media, including outreach campaigns, commercials, and programs.

Despite these intervention efforts to reduce the prevalence of HIV - AIDS in Côte d'Ivoire, particularly amongst women, the process contamination is persistent, and healthy people are still infected. In Côte d'Ivoire the prevalence of HIV-infected women ages 15-49 years went from 6.4 % in 2005 to 4.6% in 2012, which represents a decrease of 1.8%. Furthermore, there is a disparity between men and women in terms of HIV infection. From 2005 to 2012, the prevalence rate of HIV-infected men ages 15-59 years dropped from 2.9% to 2.7%. Women are more likely to be infected with HIV and other STIs than men due to anatomical and biological specificities. The virus can be transmitted through sexual intercourse, blood transfusion, contact with infected accessories contaminated with blood (blade, syringe, needle, knife, etc.), however, sexual intercourse accounts for 70% to 80% of cases of HIV transmission worldwide.

Studies have shown that the rate of transmission from man to woman is two to four times higher than that of woman to man. This results in a feminization of the HIV pandemic. Other studies were conducted throughout Africa to help understand the peculiarities of HIV infection and its treatment in women. However, there are few studies on the specificities of HIV amongst women in Côte d'Ivoire (UNICEF-CI, 2006);
Thus, the present study attempts to analyze the main socio-economic and cultural factors that may explain the vulnerability of women to HIV infection in Côte d'Ivoire.

To address this concern, specific hypotheses and objectives are defined and must be achieved. First, a descriptive statistics approach is used to identify the relevant socioeconomic and cultural factors which explain the high prevalence of HIV among women. This approach is also used to show the impact of gender inequality on the seroprevalence of women and highlight the strategy of prevention and transmission from mother to child.

Second, an econometric estimation is used to test for the negative relationship between socioeconomic factors and the probability of prevalence. The econometric approach will also enable us to verify the positive impact of demographic characteristics, such as behavior and geography, on the risk of HIV infection.

The next section of this study presents an analytical review of socio-economic and cultural determinants of the HIV epidemic. The analytical methodology follows in the second section and the third section is devoted to the statistical analysis. Section four presents the econometric analysis used to test the preliminary results of the descriptive approach and the recommendations are made in the conclusion.

Review of the Literature

According to the literature, several factors may explain the vulnerability of women to HIV infection. Several studies have addressed the specificity of women in HIV prevalence[1].

Some authors have shown that there is an inequality between men and women in terms of HIV infection (EDS-MICS 2012). Such as in Cameroon, 170 women ages 15-49 are infected with HIV compared with100 men of the same age group (MOSOKO and Affan, 2004). This inequality of HIV results from gender inequality in terms of access to education, employment, income, political life, and decision-making in society. Indeed, many women and girls lack knowledge about HIV and sexuality. This situation increases their risk of HIV infection (Carovano, 1991). Studies have also shown that fewer girls than boys ages 15-19 years have basic information about HIV and its modes of transmission (UNICEF, UNAIDS, 2002).

In sub-Saharan Africa, half of the adolescents interviewed in the course of an investigation indicated not knowing that a healthy person could be infected with HIV/AIDS (UNICEF 2005). A study revealed that in some countries, including Cameroon, Lesotho, Mali, Senegal and Vietnam, more than two thirds of young women ages 15-24 could not name three methods of HIV prevention (Calleja et al, 2006). Access to education and information on sexual health reduce the risk of infection through awareness in the media and major campaigns in local languages (Temah, 2009). The strong desire of women and girls to have a child and become a mother even though many of them lack knowledge about sexual health and have no fixed partner expose them to danger.

One of the risk factors for HIV infection is violence against women. A study in Rwanda revealed that 2,000 women raped during the genocide were tested for HIV test five years later

and 80 % of them were declared HIV positive (Donovan, 2002). Physical abuse also has an impact on the probability or risk of HIV infection. Women are often under dominant pressure from their partner due to their unfavorable economic situation. The lifestyle choices of the dominant partners, including a specific pace of life and sexual infidelity, are imposed upon women, who habitually remain silent and endure varied forms of aggression. Many younger women ages 15-19 years are at higher risk of contracting HIV because of rape and forced sex. Age is a factor of vulnerability. Socio- economic factors such as financial insecurity, unemployment, and poverty also create situations of vulnerability (Lachaud, 2005). Poverty and financial insecurity force girls and women to prostitution. Indeed People are looking for employment opportunities and move from one country to another. The massive movement of people can be a source of HIV infection. In Africa, risk factors and vulnerability factors are almost the same. Few studies have been conducted in Côte d'Ivoire specifically on HIV prevalence in women (Babalola, S. & Kouadio A. M., 2012). It is through this lens that the present study attempts to analyze the factors associated with high prevalence of HIV among women in Côte d'Ivoire.

Methods

In this section, the basic model, statistical sources and specification of variables are presented. To measure the health status of individuals in a given population, the following indicators are used: infant mortality rate, maternal mortality rate, HIV prevalence,HIV sensitivity, etc.

A basic health model [2] was constructed with the following hypothesis: Suppose a household consisting of a single individual is both a producer and a consumer. It maximizes the (consumer) utility function in question by

$$U = (H, S, L, Z, X) \qquad (1)$$

Where: H is health, S is schooling, L is labor supply, Z is inputs of health, such as food, drinking water, sanitation, and X is all other goods and services. The maximization of (1) is under various constraints which consists of the health production function, the earnings function, the production function of tradable goods, and the time budget time [3]. This maximization generates a set of reduced functions for the demand for health and education and other property expressed by equation (2)

$$H, S, X, Z$$
$$= f\big(P_s, P_z, P_q, d, A, T, U_h, U_w, U_q, V_h, V_w, V_q, Y\big) \quad (2)$$

This expression (2) is a useful analytical framework for this research. From this model, the probability of being infected with HIV is expressed in the following reduced equation:

$$HIV$$
$$= P\big(C_{fd}, C_{fe}, D_{fh}, G_m, V_{cf}, V_f, \in, f\big) \qquad (3)$$

The probability for a woman to be infected with HIV_f is explained by: (i) the socio-demographic characteristics of women C_{fd} ;(ii) the economic characteristics C_{fe} of women;(iii) the human capital endowments of women D_{fh}; (iv) the geographical location of the woman G_m; cultural factors V_{cf}, other factors related to her private life and V_f, error term $\in$.

Table 1: Specification of variables

Variables	Definition	Expected sign
HIV_f	probability of prevalence	
C_{fd}	sociodemographic characteristics	
age	[15-24] ; [25-29] ; [30-34] ; [35-39]	(+)
	[40-44] et [45-49]	(-)
Presence of spouse	woman lives with spouse	(+)
Head of household	female head of household	(-)
C_{fe}	socioeconomics characteristics	
Wealth index	standard living	(-)
D_{fh}	human capital endowment	
Instruction	educational attainment	(-)
G_m	geographical location	(+)
Region	Abidjan, others cities ,	(+)
	rural center, rural center east,	(+)
	rural north, rural north east, rural west	(+)
	et rural South	(+)
V_{cf}	cultural factors	(-)
Religion	Christians, Muslims, animists	(-)
V_f	others factors	(+)

Data sources

The current paper uses the 2005 EIS data (AIDS Indicator Survey) wherein a national sample of 4980 households was selected and investigated. All men and all women, ages 15-59 years and 15-49 years respectively, residing in the selected households, or present the night before the survey, were eligible to be surveyed and tested for HIV-AIDS[4]. In the 4368 households surveyed, 5,772 women ages 15-49 years were identified as eligible for the individual survey and, of these, 5,183 were interviewed successfully, resulting in a response rate of 90%.

The sample is based on an area from two –stage stratified. First degree was shot 249 clusters of which 109 urban and 140 rural. Second degree is counted 20 households per cluster. Two questionnaires were used during I'EISCI: the Household questionnaire and individual questionnaire. The Household questionnaire was used to list all the usual household members and visitors selected. One of the key objectives Household questionnaire was to identify women and men eligible for individual interviews and testing the HIV-AIDS. Basic information on the characteristics of each individual were collected, including the relationship to head of household, age, sex, parental survival, education, birth registration marital status. The Household questionnaire also allowed to collect information on

the characteristics of household, as the main source of drinking water, type of toilet, type of soil material and the roof housing, ownership of certain durable goods, possession and use of mosquito nets, etc. In addition to this information, the household questionnaire also identified orphans and vulnerable, study their position, they receive support, etc. Individual questionnaire was used to collect information on all women and Men ages 15-49 years. The questions cover a variety of topics such as: Socio-demographic characteristics of the respondents; Birth history, prenatal care during childbirth and postpartum; Marriage and sexual activity; Knowledge and vis-à-vis attitudes HIV-AIDS and other sexually Transmitted (STIs); other diseases; Maternal mortality.

All I'EISCI collection procedures, including procedures for HIV testing were pretested from February to March 2005. For I'EISCI pilot survey, 26 officers have been recruited and trained for three weeks on the questionnaires and procedures blood samples for HIV testing. Training on the blood samples was provided by a National Health Laboratory team Public and featured a theoretical and a practical phase in room and in training health. The land of the pilot survey was conducted in the District of Abidjan and covered a sample of 200 households (40 in rural areas and 160 in urban areas). The acceptance rate of blood samples was high enough in the pre-test proving that its implementation during the actual investigation was possible. The lessons learned from this pretest were

valued in the finalization of instruments and logistics of the survey.

In all selected households, men and women ages 15-49 years were eligible for HIV-AIDS test. The protocol for the HIV test was approved by the Ethics Committee (Internal Board Committee) ORC Macro in Calverton and the National Ethics Committee in Côte d'Ivoire. Blood samples were taken from eligible men and women who voluntarily agreed to take the test. The protocol for HIV is based on the anonymous-related protocol developed by DHS project (Demographic and Health Surveys) and approved by the Ethics Committee (Internal Board Committee) ORC Macro. According to this protocol, no name or other personal or geographical feature that identifies an individual cannot be related to the blood sample. The National Committee of Ethics in Côte d'Ivoire, after examination and amendment, approved the specific protocol for anonymous-related I'EISCI and the final Informed consent and testing the Volunteer. Since the HIV test is strictly anonymous, it was not possible to inform respondents about their test results. For eligible individuals, they have accepted (by signing the consent form) or not to be tested for HIV, a map was given to them to obtain, if they so wished, free advice and a test with a Voluntary Testing Centre (VTC). On the back of this card was given a list of all VTC operational throughout the national territory. To perform blood tests to eligible persons, each member of the team Field sampling was responsible for those eligible household that he had investigated. In addition to the investigators training for data collection, the officers had received special training all aspects of HIV testing protocols. First, for each eligible person, the officer sought to obtain informed consent after explaining the sampling procedures, confidentiality and anonymity of the test. At this time, the card was given to him to receive advice and a free test with a VTC. For women and men who agreed to be tested, agent, respecting all recommended health and safety precautions, levied drops of blood on a filter paper. In most cases, the drops of blood were obtained in the same prick finger. A label containing a bar code was adhered to the filter paper containing the blood. A second label with the same barcode was stuck on the Individual questionnaire on line corresponding to the consent of the eligible person and a third label, always with the same bar code, was bonded to the transmission record. Blood spots on filter paper were dried for at least 24 hours in a drying box with absorbent

desiccant moisture. The day, each dried sample was placed in a small plastic bag and waterproof closure hermetic. Conservation levies, desiccants and humidity indicators were placed in the small bag. Those in individual plastic bags were well kept dry until routing the laboratory RETROCI in Abidjan. After processing the data, the total number of women considered throughout our analysis is 3564 women ages 15-49 years.

This survey was conducted by the National Institute of Statistics (INS). It was aimed to:

- Collect national data to calculate the trends and levels of fertility and child mortality;
- Provide information that will help construct indicators required by UNAIDS and the WHO, as well as indicators of the United States President's Emergency Plan for AIDS Relief (PEPFAR);
- Collect data on women and men's knowledge and attitudes in regards to AIDS and evaluate recent changes in behavior regarding the use of condoms;
- Take blood samples in all survey households for anonymous testing for HIV and AIDS in women and men ages 15-49 years to estimate HIV prevalence in the general population;
- Determine the relationship between HIV prevalence and sexual behavior leading to the risk of HIV infection in the general population.
- Collect information on fertility and attitudes related to family planning.
- From these data, a statistical analysis will be done to show the correlation between the number of infected women and certain socioeconomic and cultural variables.

Results of Descriptive analysis

Biological and anatomical factors cannot significantly explain the prevalence of HIV among women. As stated by Mataka: "the most important factors that one must deal with if we want to eradicate the HIV/AIDS epidemic are economic, social and political."

Socio-economic and cultural factors

The gap in economic and social standing between men and women compromises women's safety in sexual relationships and their ability to bargain for the use of condom. **Figure 1** below shows the relationship between HIV prevalence in women and the standard of living (in terms of wealth index).
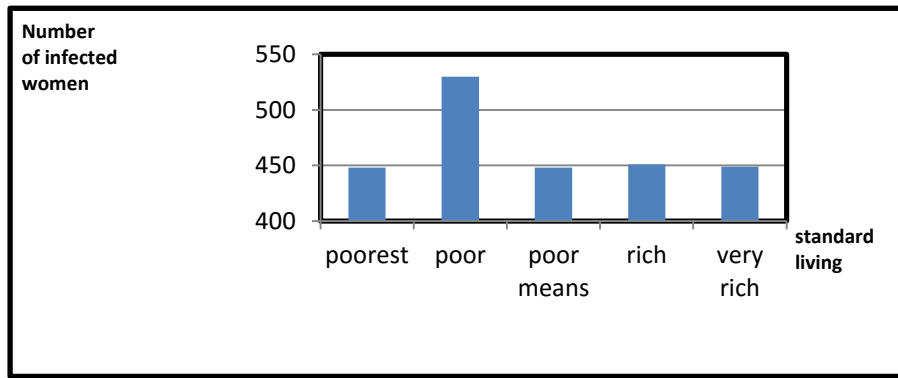
Figure 1: HIV prevalence by standard living, Source: from 2005 EIS-CI data

This graph shows that poor women are more infected with HIV than rich and poor means. Those with medium and high standards of living are less infected by the HIV virus. A study shows that inadequate nutrition during the previous 12 months is positively related to the irregular use of condoms, the exchange of sex for money, and other signs of risky sexual behavior among women (Weiser et al, 2007). In the United States, poor women belonging to racial minorities are much more likely to be HIV infected than other women (Dean et al. 2005). Economic dependence of women next to their spouses limits their bargaining power in terms of safe sex. In many African countries, women do not enjoy the right to property; they have no access to land and no control over the family patrimony. When their partner dies, many women are deprived of their homes, inheritance, property, livelihoods, and even their children. This situation forces many of them to adopt survival strategies that increase their risk of contracting HIV.

One factor that makes women more vulnerable than men is education. The effects of education on women's protection against HIV are even more pronounced. A high level of education permits women to access better paying jobs. This promotes economic independence allowing them to keep safe from HIV. Furthermore, formal education allows girls to acquire essential skills in decision-making regarding their sexuality.

Our results are consistent with those of Hargreaves and Boler. In their 2006 study, these authors demonstrated that girls who have completed their secondary school curriculum are at lower risk of HIV infection and are more likely to practice safer sex than girls who have not completed their primary education. There is a negative relationship between the risk of HIV infection and the level of education of women (Temah, 2009). **Figure 2** shows that the number of infected women decreases with education. Education is therefore a key factor that programs working against HIV have to take into account to be effective.
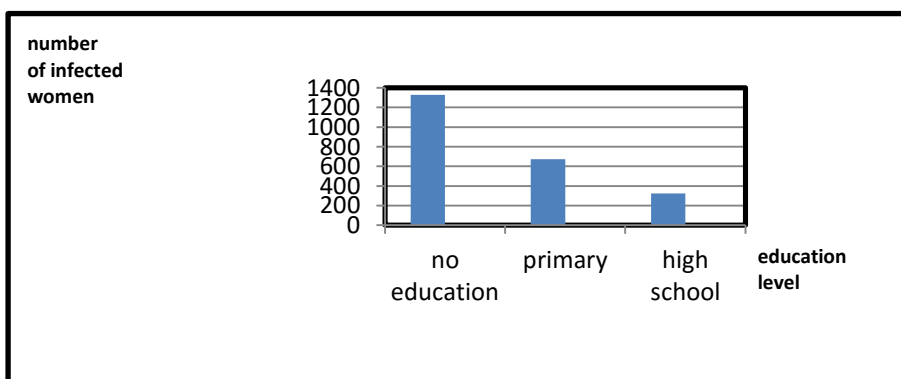

Figure 2: HIV prevalence by education level. Source: from 2005 EIS-CI, data

Since education is a powerful factor in reducing the risk of HIV infection, it is extremely important to disaggregate and analyze the data by age, to determine which subgroups of women and girls run a greater risk of infection. The analysis by age group allows us to design programs that meet the specific needs of these subgroups. Figure 2 shows the number of women infected with HIV by age group.

Young women are more affected than adults. HIV transmission occurs in 70-80 % of cases during unprotected sex. Women ages 15-34 are the most vulnerable and women ages 15-24 have a higher risk of HIV infection. Similar results were found in studies conducted in Haiti (Putnam et al, 2001). In Africa, traditional marriage practices allow men to have more sexual partners than women and encourage older men to have sex with much younger women. Early marriage prevents girls from having control over their own bodies and from making decisions in matters of sexuality and reproduction. This prohibits them access to information on HIV and negotiate safer sex with their partner. The lack of financial resources and education encourages girls to throw themselves into the arms of wealthy men, usually very old, all in the name of securing a livelihood. The high risk of HIV infection in women in the age groups 25-29 and 30-34 reflect these women's strong desire for marriage and motherhood. With their strong need to get married and have children, they no longer have protected sex, especially with a partner they have been with for a long period of time. In Côte d'Ivoire, many young women enter a free union and do not use condoms. Of the 3564 women in our sample, only 190 women reported having safe sex, resulting in 5.3% practicing safe sex and 94.7% being at high risk of contamination (see annex, from our estimation , EIS-CI, 2009).
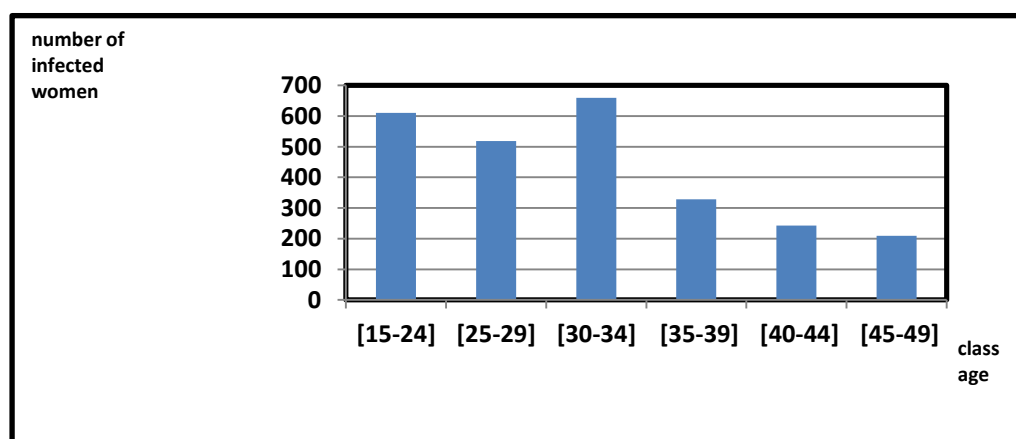

Figure 3: HIV prevalence by age classes Source: from 2005 EIS-CI, data.

All regions of Côte d'Ivoire are affected by this pandemic. The analysis of HIV prevalence among women by region is important or the identification of the most affected areas and regional emphasis on general awareness and the distribution of antiretroviral drugs (AZT) to provide increased opportunities for survival in infected women. The data shows that the most affected areas are: major cities other than Abidjan, the south rural, and the rural center. In Côte d'Ivoire, women in rural and urban areas are concerned. Control programs should be more pronounced in the three areas mentioned above.

Several awareness-raising campaigns were carried out in Abidjan since the discovery of the first cases of AIDS in 1985.Thisexplains the low number of infected women in Abidjan.
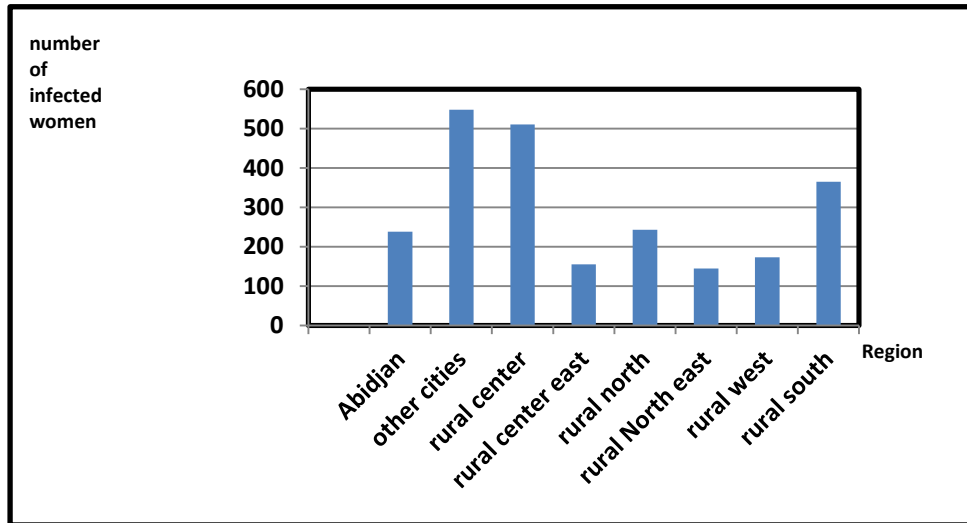
Figure 4: HIV prevalence by region , Source: from 2005 EIS-CI, data.

The adverse effects of HIV–AIDS

AIDS produces adverse effects on the health of HIV-infected women and their children. These effects include but are not limited to: mother-child transmission, early menopause, body transformation, and undoubtedly declining labor productivity.

Women with HIV, though having the desire to have a child like any other woman, can transmit HIV to their babies during pregnancy, childbirth, and breastfeeding. Today, medical advances have brought more hope to women living with HIV. They can become mothers if antiretroviral treatments begin early in the pregnancy. Transmission from mother to child becomes a very important challenge for women and a source of motivation to participate in treatment programs. In the absence of treatment, the mother may pass the virus to her baby during pregnancy, during childbirth, or during breastfeeding. In the absence of antiretroviral therapy (zidovudine or other chemotherapies) the rate of transmission of HIV from mother to child did go up to 37% in Haiti (John et al, 1999). This is why women increasingly accept to be tested during pregnancy. They can also deliver vaginally without contaminating the baby. Only breastfeeding is not advised since the breast milk can transmit the virus to the baby.

Thanks to antiretroviral (ARV) treatment, the baby can then monitored for the next 18 months, the time required for its body to eliminate the antibodies that his mother transmitted to him through the placenta, these antibodies will disappear gradually, and the child will become negative.

Several studies have shown that, despite the risks to the child, the recommendations of the medical teams were not always followed. When mothers dare not disclose their HIV status to the fathers, they tend to maintain normal breastfeeding, particularly because of the pressures they face at home. The mothers' ability to prevent transmission depends primarily on their personal autonomy, their level of education, and the support they receive from NGOs. The policy of Preventing Mother to Child Transmission (PMCT) under the protection of the newborn against HIV is not accessible to the majority of women in West and Central Africa in general, and Côte d'Ivoire in particular. Only 23% of women receive PMTCT in West and Central Africa. In Côte d'Ivoire, according to a report on the health sector in 2009, 56% of consultation sites did not provide PMTCT services and 60% of pregnant women did not have access to PMTCT services. According to another report conducted in 2010 on AIDS in Côte d'Ivoire, among 13722 pregnant women who tested positive, 8120 (59%) received a first ARV treatment and 6379 (46%) children born to HIV positive mothers received first treatment. This remains insufficient and shows the poor performance of PMTCT and pediatric care in Côte d'Ivoire. The mother to child project in Yopougon neighborhood helped increase the demand for comprehensive PMTCT services and improve the care of children living with HIV/AIDS and their families. 2005 EIS-Data analysis shows that of a sample of 3564 women screened, 2,326 were infected (65.3 %). Among those diagnosed with HIV, 2032 transmitted the virus to their babies during pregnancy, childbirth, or breastfeeding, resulting in 87.36 % of infected women giving the

virus to their child. This means that access to antiretroviral therapy in pregnant women is very low and also many of them do not know their status. One of the consequences of HIV for these women is early menopause. Usually, the age of menopause is between 45 and 50 years for women in good health. However, studies have shown that HIV-positive women have signs of early menopause including irregular or lack of menstruation, hot flashes, etc. There is also a transformation of the body of AIDS patients that can occur. The first symptoms are facial acne, weight loss, and these patients can become stunted growth. They experience severe abdominal pain and headaches. With all these difficulties, women living with HIV will no longer have enough energy to undertake activities as compared to healthy women. This will cause a decrease in their productivity and the level of production.

Gender inequality and HIV-AIDS

Inequality between women and men in access to education, employment opportunities, and decision–making in the household are risk factors of HIV infection among women. Gender differences are used to describe each individual's role, behaviors, activities, and attributes that a given society considers appropriate for men and women. However, in sub-Saharan Africa, there is increasing inequality between men and women at all levels. In all sectors other than the food sector, women are less represented than men. The low standard of living and the low level of education of women are a result of gender inequality between men and women. In Côte d'Ivoire, the number of women with access to all spheres of decision-making is still insufficient compared to men. In 2013, 5 women were appointed ministers out of 29 positions (17.24%); 6 women were elected deputies out of 255 seats (2.35%), and six women were appointed judges out of 450 seats (13.33%). Gender inequality in terms of access to education, employment, and well-paid jobs leads to a difference in HIV prevalence between men and women. Access to education provides better job which is a source of poverty reduction in Cameroon where HIV prevalence among women ages 15-49 years (6.8%) is higher than in men of the same age group (4.1%). (MOSOKO, J. J., Affana G., 2004). The results of the Demographic and Health Surveys with Multiple Indicators in Côte d'Ivoire (EDS -MICS 2011-2012) show that of a sample of 5671 women ages 15-49 years and 5677 men ages 15-59 years, 4.6% of women contracted the disease against 2.7 % for men.
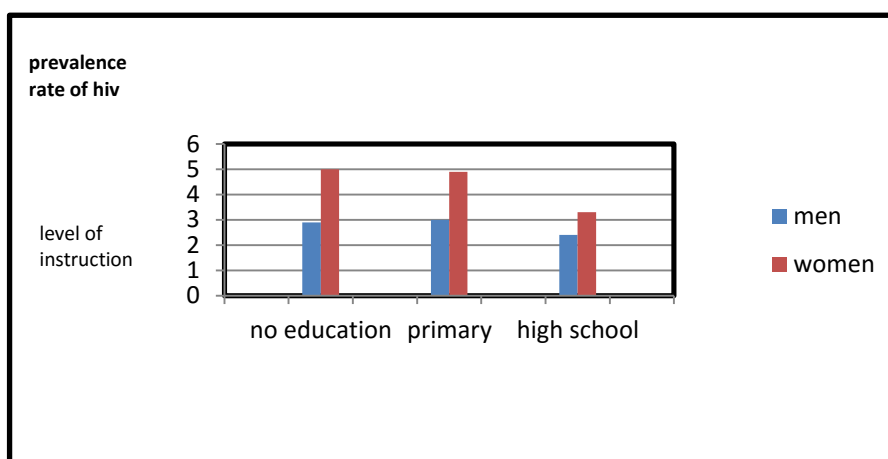

Figure 5: HIV prevalence by education level
Source: from the results of 2011-2012 EDS –MICS

Data

The diagram above presents a difference in prevalence between men and women according to their level of education. Women are more infected than men irrespective of their level of education. 5% of uneducated women are infected with the virus compared to 2.9 % for men; at the primary school level, 4.9% of women are infected compared to 3% for men and at the secondary school level or above 3.3% of women are infected compared to 2.4% for men. This graph also shows that as the level of education increases, the rate of HIV prevalence decreases in both men and women. In

several countries in sub-Saharan Africa, young women (15-24 years) are three to four times more likely to be infected than men of the same age. Young women invariably have less general knowledge about HIV/AIDS than young men (WHO, 2007). In the case of Côte d'Ivoire, unequal prevalence of HIV between men and women is concerned the age group of 15-39 years. Unequal access to education and employment explains the difference in HIV prevalence between women and men. The filter theory states that people with high levels of education have well paid jobs and less low-skills employment. In reality, women do not have the same opportunities and benefits as men in terms of employment. Even with equal qualifications, salaries are never equal. In public administration, for the same function, men's wages are higher than those of women. With the same qualifications and skills, men are appointed to decision-making positions and enjoy certain benefits which are not available for women. Some women with higher social statuses sacrifice their career to take care of their household. They care for the children and particularly in case of illness. When children get sick, women are obliged to abandon their work to take them to the nearest health facility. At this time, men use their time to take care of their business. In fact, women should be rewarded and get bonuses for the multiplicity of tasks. This is not the case in Africa. In Europe and USA, women (mothers) get rewarded for the domestic tasks they performed in their own homes.
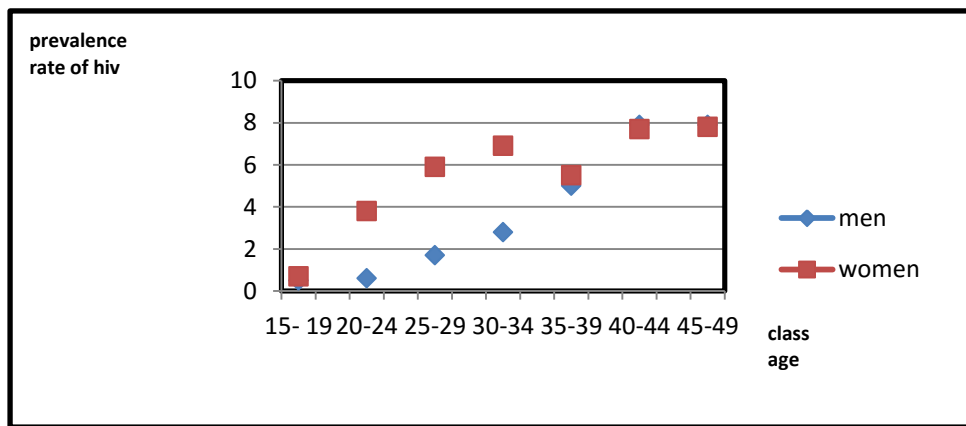

Figure 6: HIV prevalence by gender and by age classes, Source: from the results of 2011-2012 EDS-MICS, data.

The statistical analysis was used to identify relevant predictors of high HIV prevalence among women. Variables such as standard of living, level of education, age, religion, marital status, region, and violence against women will be tested in an econometric approach.

Results of Econometric analysis

The econometric estimation will highlight the correlation between the dependent variable "probability of being infected with HIV" and the explanatory variables used in our analysis. First, the estimation model is presented, then the variables that could explain the prevalence of HIV among women will be discussed and then the results will be interpreted.

Table 2: Econometric regression

Table 2 : Regression coefficients of probit estimates of the determinants of HIV prevalence – women aged 15-49 years in Côte d'Ivoire			
Parameters	**Binary probit[2]**		
variables	β	t [3]	Marginal effects
Constance	1, 431	3,01***	0,688***
Education des femmes[4]			
No education	-1,163	-9,30***	-0,353***
Primary	-0,596	-4,54***	-0,222***
Women age[5]			
15- 24 years	0,190	2,20**	0,065**
25- 29 years	0,225	2,55***	0,076***
30- 34 years	0,307	3,32***	0,104***
35-39 years	0,128	1,37	0,044
40- 44 years	-0,203	-2,29**	-0,074**
Woman lives with spouse[6]	-0,040	0,74	0,014
Woman is household head[7]	0,061	0,69	0,021
Regions[8]			
Others cities	0,353	4,70	0,118***
Rural center	0,222	2,57***	0,075***
Rural center- East	0,610	4,79***	0,180***
Rural north	-0,149	-1,74*	-0,054*
Rural north- East	0,225	2,00**	0,075**
Rural west	0,426	3,69***	0,135***
Rural south	0,666	6,55***	0,200***
Standard of living[9] (wealth index)			
low	-0,318	-4,68***	-0,112***
average	-2,822	-3,99***	-0,103***
Religions[10]			
Muslims	-0,448	0,99	-0,159
Animists	-0,490	1,08	-0,183
Other religion	-0,391	-0,75	-0,148
Victims of violence[11]	0,182	2,70***	0,062***
Pseudo R2[12]	0,1521		
LR chi2(24)[13]	700,02(0,000)		
Log likelihood[14]	-1951,6164		
N[15]	3564		

(1)In the estimation of binary probit model, the dependant variable is the probability of being infected by HIV. The marginal effects are partial derivatives of the characteristics; (2) « two-tailed » probability that the coefficient is equal to zero ; (3) the t is the ratio between β and standard error; (4) Base=high school ; (5) Base= 45-49 years ; (6) yes =1 ; (7) yes i=1 (8) Base= Abidjan ; (9) Base= rich ; (10) Base= Christians ; (11) coded 1=yes 0otherwise; (12) Pseudo R^2; (13) LR = the ratio of likelihood ; (14)= Log likelihood; N= number of observation.

Note: the values in parentheses are les P-value. *** = significant between 0 et 1%; ** =significant between 2 et 5% et *= significant at 10%.

From 2005 EIS-CI, data.

Discussions

In the estimation model, there are two types of variables: (i) the dependent variable (explained) and independent variables [5](predictor).

The dependent variable is qualitative and nominal. It takes the value 1 if the individual is infected with HIV during testing at the time of the survey and 0 otherwise. The dependent variable is thus the probability of being infected with HIV.

These results highlight the linkages between socio-economic variables, cultural variables, and the likelihood of contracting HIV and call for several observations:

Effects of education

Firstly, there is a very significant negative effect of education on the risk of HIV infection. The result of the previous statistical analysis is confirmed by the econometric estimation. All things being equal, a high level of education is associated with a low

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[5] See table 2

probability of being infected by the virus. Studies have shown that level of education is a major determinant of the risk of HIV infection no matter the target used (women, youth, men, professional trades, etc.). The level of education influences the probability of being infected by the virus through different channels. The effect of education can be explained by access to information, services, health care and labor market. Also, sex education at school educates students on known methods of prevention and treatment of HIV.

Effects of Age

Secondly, Age is also one of the factors explaining the prevalence of HIV/AIDS among women. The coefficients associated with different age groups are significantly positive with the exception of the women ages 40-44. Women ages 15-39 are positively correlated with the risk of HIV infection. An increase in age up to 39 years leads to an increase in the probability of HIV prevalence, all things being equal. At this age, there is a high prevalence of HIV; this is to say that the number of women infected is high. These results are the same as those found in a study in Burkina Faso from a micro-econometric analysis (Lachaud, 2005). The age group 40-44 years old is negatively related to the probability of being infected. This means that the risk of infection decreases with age (confer Figure 3). Adult women have achieved a high maturity level and, with low sexual desire, are less exposed to risk.

No significant Effects of head household status

Thirdly, Living with a spouse or not does not explain significantly correlate with the prevalence of HIV. The coefficients associated with the variables "woman living with a spouse and female head of household" are not significant.

Effects of region

Fourthly, HIV is spread in all regions (rural/urban) of Côte d'Ivoire since the coefficients of the variable "regions" are positive and significant. However, the coefficient of the north in rural areas is negative and significant. The risk of infection is low in the rural north.

Effects of living standards

Fifthly, the standard of living in terms of wealth index for women has a negative and highly significant impact on the probability of being infected with HIV. When the standard of living increases, all other things being equal, the probability of HIV prevalence decreases. In fact, women who have enough financial resources may

require their partners to use condoms during sexual intercourse. They have access to health care services for HIV prevention, screening, and antiretroviral treatment in case of infection. Wealthy women make decisions to get tested in health centers without the consent of their husbands. They are autonomous and independent in terms of economic power and adopt risk reduction behaviors. If infected, they have no fear of being abandoned by their husbands. They can take care of all expenses for their children and pay to have access to antiretroviral treatment to increase their chances of survival.

No significant effects of religion

Sixthly, the cultural variable "religon" in our study did not have a significant impact on the risk of HIV infection in Côte d'Ivoire.

Finally, violence against women plays a significant role in the prevalence of HIV-AIDS in Côte d'Ivoire. The coefficient on this variable is positive and highly significant. There is a positive relationship between violence and the risk of infection in women. When women suffer more physical and sexual abuse, the chances of contracting the virus are increasing, all things equal. With regard to forced sex, women are more likely to be infected with HIV. They encounter strangers who are likely to be infected. Sexual assault and other forms of violence against women is a risk factor for HIV (Michael Fleshman, 2007). Violence is one of the factors that prevent women from asking their sexual partners to use condom or refuse unwanted sex. Between 29% and 62% of women worldwide have suffered violence from their intimate partners (WHO, 2005). Some women living with HIV are also likely to suffer violence or be expelled from their homes if they reveal their HIV status. In this case, they can not to be tested even if this is for free and benefit from antiretroviral therapy. Research conducted in three countries show that women are generally accused of bringing HIV into the family (ICRW, 2003). This is discrimination against women.

Conclusion and Recommendations

This research has highlighted the main socioeconomic determinants of HIV/AIDS among women. Variables such as level of education, standard of living in terms of wealth index, age group 15-39 years, region, and violence against women explain significantly high prevalence of HIV in the female population of Côte d'Ivoire. This study went further and identified subgroups including the poor, the illiterate, the victims of sexual and physical violence, girls ages 15- 39 years for specific actions in terms of prevention and treatment. This decline in the prevalence rate is

explained by the success of some of the prevention programs implemented by national and international policy makers.

It should encourage development actors to strengthen and implement specific programs and take into account gender inequalities to reduce the prevalence of HIV. From the selected determinants, the study recommends:

- The introduction of sex education in schools to show the modes of transmission and how to behave to avoid it HIV. Children should not play with worn objects. Health educators should educate teenagers on abstinence and promote the use of male and female condoms when having sex.
- The integration of a section on the prevention and treatment of HIV/ AIDS in literacy programs for women, in order for them to obtain the information necessary to make appropriate choices on sexual and reproductive health.
- Mandatory testing of all pregnant women and treatment in case of infection early in pregnancy to prevent transmission of the virus from mother to child.
- Strengthening of the program (PMTCT) to allow greater access to HIV-positive women.
- The medical and social care of all women living with HIV.
- Reducing inequalities between men and women in terms of access to education, job opportunities, and decision-making. One must offer the same chances of success to both sexes.
- The implementation of priority actions in terms of employment of women in all sectors (formal, informal, agricultural). The actions of the government and donors should encourage women to take charge while providing them with funding. Access to finance allows women to undertake income-generating activities.
- Strengthening voluntary testing programs as a means of prevention and mass awareness about the modes of transmission and risk behaviors in all regions of Côte d'Ivoire.

Notes

1. Prevalence is a health indicator that measures the number of people infected with the disease in the population at a given time. The prevalence rate is the number of patients over the total population multiplied by 100.
2. The presentation was inspired by Lachaud (2002).
3. Singh, Squire, Strauss (1986), Pitt, Rosenzweig (1986), Appleton, Song (1999).
4. The health production function is: $H = (Z, L_{h,} d, U_{h,} V_h)$, where: $L_{h,}$ = time spent on health, d =observable characteristics of household

members (age, etc.). . Uh = inherent in community characteristics (health centers, etc.). V_h =Unobservable household characteristics. The earnings function is: $W = (d, U_{w,} V_w)$ where $U_{w,}$ = appropriate community characteristics influencing the demand for labor, and V_w = unobservable household characteristics (ability, etc). The production function of marketable good Z is: $Q_x = Q(L_q, L_{O,} A, d, U_q, V_q)$, where: $L_{q,}$ = household labor allocated to production, $L_{O,}$ = external work , A =active productive household $U_{q,}$ = determinants of productivity at the community level (time) , and V_q = unobservable determinants of productivity at the household level (soil quality) . The budget constraint can be written: $P_z Z + P_s S + X = P_q Q + W_o L_O + Y$, where: W_o = Salaries for individual employees, property prices $P_j(j = z, s, q)$ Y =income transfers. Finally, the constraint of time allocated to leisure.
5. Blood samples were collected from all men and women of all eligible households who voluntarily agreed to submit to the test. The protocol for HIV testing is based on the anonymous-related protocol developed by the DHS (Demographic Health Surveys) project and approved by the Ethics Committee (Internal Board Committee) ORC Macro.
6. Mataka, UN Special Envoy for AIDS in Africa is a citizen of Botswana. She was General Director of the National AIDS Network of Zambia and Vice-Chair of the Global Fund to fight against AIDS, tuberculosis and malaria.

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