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## Association Of Socio Demographic Characteristics With Condom Used At Last Sexual Intercourse Among Adults 15 To 49 Years Between Côte D'Ivoire And Senegal An Examination Of Measure Demographic Health Survey Data 2005

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## ABSTRACT

**Background:** HIV/AIDS is one of the world's most serious health challenges. Sub-Saharan Africa remains the region most heavily affected by HIV, with 69% of the people living with HIV in the world. Côte d'Ivoire has a high HIV prevalence rate and Senegal a low prevalence rate. The main research question is whether or not the HIV risk behavior of Ivorian differs from the HIV risk behavior of Senegalese in terms of selected categorical and continuous variables. In other words, if using condoms at last sexual intercourse differs between Côte d'Ivoire and Senegal.

**Methods:** Cross-sectional data from the Measure Demographic and Health Survey (MDHS) involving 9,686 Ivorian and 18,363 Senegalese from 2005 were used. The Pearson Chi-square test were performed to determine any significant relationship between the variables across the two countries with respect to socio-demographic and HIV risky behaviors status. Univariate and multivariate analyses were performed to test the significance of any association between the independent and the dependent variables (Condoms used at last sexual intercourse). Throughout all the analysis performed, a p-value of 0.05 and confidence interval of 95% were used to determine any statistical significance.

**Results:** Logistic regression models showed that Côte d'Ivoire respondents had decrease odds of using condoms during their last sexual intercourse (OR=0.7; 95% CI 0.62 - 0.79) as compared to Senegal and the difference was statistically significant at  $p < 0.05$ . In Côte d'Ivoire and Senegal, wealth and education have been consistently found to be positively associated with condoms used at last sexual intercourse.

**Conclusion:** HIV risk behaviors seem to be associated with condoms used and marital status. The results in our study suggest a possible relation with condoms used, HIV prevalence and polygamy in Senegal, so men use condoms less frequently with marital partners. More studies need to assess the role of polygamy in the transmission and/or acquisition of HIV in Sub-Saharan Africa.

**Key words:** HIV/AIDS, Risky behaviors, Condoms used, Côte d'Ivoire, Senegal

**ASSOCIATION OF SOCIO DEMOGRAPHIC CHARACTERISTICS WITH  
CONDOM USED AT LAST SEXUAL INTERCOURSE AMONG ADULTS 15 TO  
49 YEARS BETWEEN CÔTE D'IVOIRE AND SENEGAL  
AN EXAMINATION OF MEASURE DEMOGRAPHIC HEALTH SURVEY  
DATA 2005**

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**APPROVAL PAGE**

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2005

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## **DEDICATION PAGE**

The following thesis document is dedicated to my family for their constant support and love.

## **ACKNOWLEDGEMENTS**

I am thankful to God who has guided me through each step of my life. I thank the Lord for all His blessings.

I would like to thank my dear mother, my brothers (Lohic Alain, Pierre-Joseph, Jean-Gabriel, Robert-Georges, Paul-Jerome) and sisters (Mireille, Christiane, Michelle) and the rest of my family for all their support and love. You always believe in me.

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## CHAPTER I

### INTRODUCTION

#### **1a. Background**

HIV/AIDS remains one of the world's most serious health challenge. According to The Global Report provided by UNAIDS, globally 34.0 million [31.4 million–35.9 million] people were living with HIV at the end of 2011 (UNAIDS, 2012). Moreover, an estimated 0.8% of adults aged 15-49 years worldwide are living with HIV, although the burden of the epidemic continues to vary considerably between countries and regions (UNAIDS, 2012). Sub-Saharan Africa remains the region most heavily affected by HIV, with 69% of the people living with HIV in the world (UNAIDS, 2012). The region also accounted for 71 per cent of the world's AIDS-related deaths in 2011 (UNAIDS, 2012). Most transmission in this area occurs in heterosexual relationships, both in the context of risky behaviors like transactional and commercial sex and in longer-term relationships, including marriage. HIV is less widespread in West Africa than in Southern and East Africa, with prevalence estimated to be under 2% in Benin, Burkina Faso, Gambia, Ghana, Guinea, Liberia, Mali, Mauritania, Niger, Senegal and Sierra Leone. In Côte d'Ivoire, prevalence is estimated at 3.4%, and in Nigeria at 3.6% (UNAIDS/WHO, 2009). Both AIDS viruses, HIV-1 and HIV-2, co-circulate in Senegal. HIV-2 was first appeared in Senegal, but like in other West African countries, the prevalence of HIV-2 remained low and is decreasing (Barin et al., 1985; Hamel et al., 2007). Today HIV-1 predominates and remains below 1% in the general population but can reach up to 20% in population

groups with high risk behavior like female sex workers (FSWs) or men having sex with men (MSM) (UNAIDS).

In most other regions of the world, HIV preferentially affects injecting drug users, men who have sex with men and sex workers. Risky behaviors continue to be an important way of HIV transmission among adults in many parts of the world. In Eastern Europe and Central Asia, epidemics that were one time distinguished principally by transmission among injecting drug users are now more and more characterized by important sexual transmission (UNAIDS, 2012). The epidemic in Asia, which has long been concentrated in injecting drug users, sex workers and their clients, and men who have sex with men, is steadily expanding into lower-risk populations through transmission to the sexual partners of those most at risk (UNAIDS, 2012).

The HIV epidemic began in sub-Saharan Africa, at the end of the 1970s and early 1980s and less than one person per 1000 was infected with HIV before 1985 (De Cock, 1996). Almost thirty years after, the prevalence of HIV infection had considerably increased in this region. Approximately 1 in each 20 adults (4.9%) is living with HIV in Sub Saharan Africa (UNAIDS 2012). Côte d'Ivoire and Senegal are two African countries located in Sub-Saharan Africa precisely in the western part of Africa. Both countries have the same national language in common which is French besides a number of other African languages. Senegal stands for one of Africa's success stories in the fight against AIDS. The first reports of AIDS in Senegal came in 1986, when six cases were identified (Meda et al., 1999). Senegal has worked hard to prevent HIV from spreading, and has maintained one of the lowest rates of infection in sub-Saharan Africa. According

to UNICEF, in Senegal the HIV prevalence of the adult (aged 15-49) in 2009 is estimated at 0.9% (UNICEF, 2009). Senegal has a concentrated HIV epidemic with high prevalence rates in most-at-risk groups (such as commercial sex workers) but low levels in the general population (CDC/DGHA Senegal, 2012). In comparison, Côte d'Ivoire has an estimated HIV prevalence of 3.4 percent among adults 15 to 49 years old (CDC/DGHA Côte d'Ivoire, 2012). Côte d'Ivoire remains one of the countries most affected by HIV in West Africa. The first case of AIDS in the country was detected in 1985, and Côte d'Ivoire now has a generalized epidemic (USAID, 2010).

### **1b. Purpose of study**

There are no studies about the risk behavior of Ivorian and Senegalese towards HIV/AIDS and other STDs. The Demographic Health Survey (DHS) funded by the United States Agency for International Development (USAID), has collected nationally representative data on HIV/AIDS in more than 80 countries including Côte d'Ivoire and Senegal. The Demographic Health Survey contains a group of questions that serve as indicators of the knowledge and risk behaviors of the respondents towards HIV/AIDS. The primary purpose of this study is to analyze the Measure Demographic and Health Survey (MDHS) towards HIV risk behavior among adults 15 to 49 years old between these two countries from Sub Saharan Africa. Côte d'Ivoire has a high HIV prevalence rate and Senegal a low prevalence rate. First, the study reviews the literature for an accurate understanding of the HIV issue among these two countries and analyzes the behavior of people toward HIV. Second, the study examines the attitudes of the Ivorian and the Senegalese found in the MDHS survey in 2005 and displays the results by

gender, age, area, education level, marital status and wealth index. Also, a comparative analysis is conducted to underline possible similarities and discrepancies between respondents in these two African countries in regards to HIV risk behaviors. This study is important because behavior is associated with increased risk for the acquisition of HIV/AIDS among populations. The results of this study will help shed light on how differences in attitudes and practices may afford some insight to explain the difference in HIV prevalence in the two nations. As a final point, findings can help inform directions for future preventive efforts and also propose recommendations for public health interventions in order to reduce HIV risk behavior that have an effect on the populations in these two West African countries.

### **1c. Research Questions**

The main research question is whether or not the HIV risk behavior of Ivorian differs from the HIV risk behavior of Senegalese in terms of selected categorical and continuous variables. In other words, if using condoms at last sexual intercourse differs between Côte d'Ivoire and Senegal. Not using condom during last intercourse is a very significant HIV risk behavior. In order to reach a conclusion, the following questions will be addressed:

**Question #1:** What percentage of adults 15-49 years old MDHS 2005 sample used condom during last sexual intercourse in Côte d'Ivoire and Senegal?

**Question #2:** How do condoms used during last intercourse in adults MDHS 2005 sample differ between Côte d'Ivoire and Senegal?



## **CHAPTER II**

### **REVIEW OF THE LITERATURE**

A number of findings have revealed that HIV/AIDS is a major issue in Sub-Saharan Africa and risk behaviors have been shown to fuel the spread of the epidemic. The literature review examines the findings about risk behaviors about HIV/AIDS in Sub-Saharan Africa, to have a better understanding about HIV issue in Africa. The following chapter is dedicated to presenting scientific literature that supports inclusion of the variables of interest in this study. Hence, this section looks at the HIV/AIDS prevalence and data in Côte d'Ivoire and Senegal among gender, age, area, education level, marital status, wealth index and emphasis on understanding of the HIV problem among these two countries by analyzing the behaviors of people toward HIV.

Sexual risk behavior is defined as having sexual intercourse with a casual acquaintance and not using condoms, and having multiple sexual partners (Booyesen, 2004). The risk depends on the partner's infection status, the sexual practices employed and the protective measures used. More than personality factors and risk perception, variables such as behavioral intentions and attitudes toward condoms are associated with HIV-protective behavior. Using condoms during intercourse is a very noteworthy behavior. Not using a condom at last intercourse can be thought of as a marker, a surrogate for generally risk behavior, and this is the reason that condoms used at last sexual intercourse may be a good end point or outcome.

Prevention programs promote condoms as the method of protection. Individuals are also advised to reduce the number of sexual partners and to avoid anonymous sexual partners.

## **2a. Knowledge about HIV/AIDS and STDs**

In Africa in general, there is still misinterpretation about how HIV is spread or how to protect against infection, although most African people have heard of HIV and AIDS. Hence, concerning awareness of HIV/AIDS, these two African surveys revealed that more men than women had heard about HIV/AIDS. These nationwide representative surveys conducted in Ethiopia and Nigeria found that 97-98% of the men had heard of AIDS in comparison with only 86-90% of women (Ethiopia DHS, 2005 & Nigeria DHS, 2003). Many African countries have social and cultural taboos about discussing sex. The authors of this article highlight that African women often do not feel comfortable looking for information about HIV/AIDS, sexually transmitted infections and condoms, even among health-care professionals (Burgoyne & Drummond, 2008). They pursue this point by adding that this lack of knowledge, and incapacity to comfortably access knowledge about sexual and reproductive health, puts African women at greater risk for HIV infection (Burgoyne & Drummond, 2008). In this survey conducted in Côte d'Ivoire among teenagers, most respondents stated that they had heard about AIDS and demonstrated good knowledge about HIV/AIDS (Toure et al., 2005). Senegal conducted a combined survey in the region of Thiès in the center of Senegal in order to collect data on sexual behaviours and prevalence of HIV, gonorrhoea, Chlamydia infections and syphilis in the community. This survey shows that 95% of the respondents have a good

knowledge about sexual transmission of HIV/AIDS and STDs (Gueye Ndiaye et al., 2009).

### **2b. Type of area (urban versus rural)**

The 2005 demographic Health Survey in Senegal posited that the HIV prevalence is 0.5% among men and 0.8% in females in rural area (DHS & Gueye Ndiaye et al., 2006). Moreover, there is a difference between people living in rural and urban areas. The large majority (95%) of Nigerian women living in urban areas were aware of AIDS as compared to 82% of women living in rural areas (Nigeria DHS, 2003). Similarly, almost all women living in urban areas in Ethiopia have a good practical knowledge of AIDS as compared with only 88% women living in rural areas (Ethiopia DHS, 2005). This article bolsters the notion that urban Sub-Saharan African women have enhanced knowledge about HIV/AIDS than their rural counterparts, due to the difficulty in running education campaigns in inaccessible areas (Burgoyne & Drummond, 2008). Besides, the authors of this finding support that condom use was lower in rural than in urban areas (OR=0.2 in Burkina Faso, 0.5 in Malawi, and 0.3 in Uganda) (Madise et al., 2007). In this Senegalese survey, the HIV prevalence in rural area is more important among women as compared to men which prove a feminization of the HIV epidemic in Senegal (Gueye Ndiaye et al., 2009). In Côte d'Ivoire, young females living in rural areas (such as north-west region for example) were significantly less likely than those in urban zones to practice sexual abstinence (Koffi & Kawahara, 2008).

## **2c. Education**

Education gives women more opportunities for employment and gender equality (UNAIDS, 2006), and increases the probability of protection against HIV infection (Burgoyne & Drummond, 2008). In this study about Côte d'Ivoire, secondary or higher education people appear to be more accustomed to condom used at last sex as compared to people without formal schooling (Zellner, 2003). In Lesotho, all women with secondary education and above had heard of AIDS whereas only 80% of women without any education knew about AIDS (Lesotho DHS, 2004). Similar trends were identified in Ethiopia (Ethiopia DHS, 2005) and Nigeria (Nigeria DHS, 2003). The interaction between schooling status and sex in Uganda points out that being in school is considerably associated with advanced condom use among females (47 percent compared with 41 percent of those not in school) and among males however, about 55 percent who were not in school reported to have used a condom compared with 41 percent of those in school (Madise et al., 2007).

## **2d. Marital status and HIV risk behaviors**

Although the use of condoms among young people in sub-Saharan Africa is still very low, there are clues that their use is growing especially among those who are not married (Cleland, 2006). The odds of having used a condom were significantly lower among Ivorian married men than among Ivorian single men (Zellner, 2003). Besides, the comparison between married men and married women showed that married men have greater possibility of condom use compared with married women in Côte d'Ivoire, which may reflect men's greater tendency to engage in extramarital affairs (Zellner, 2003).

Furthermore, this study states that married men in Zimbabwe were more likely to use condoms with extramarital sexual partners than with their wives (Mbizvo et al., 1994). In Senegal, the analysis of HIV prevalence according to gender and matrimonial status demonstrates that there are more women HIV infected than men and also, people who are married are more HIV contaminated than people who are not married and these differences are not statistically significant (Gueye Ndiaye et al., 2009). A large number of HIV-1 infections in Africa occur in married couples. The results of this study bolster that the greater part of linked couples (93%) reported the husband as internal source of infection because these husbands most frequently (82%) reported an occasional sexual relationship as external source of infection (Jennes et al., 2012). This result underlies a big issue in Africa: the risk of married women for acquiring HIV as a result of the occasional sexual relationships of their husbands.

## **2e. Wealth status**

The authors of this source demonstrate an association between wealth status, age at first sexual intercourse and condoms use among adolescents. In Malawi and Uganda the poorest adolescents were less likely to have used condoms with their last sexual partner compared with the wealthiest (Madise et al., 2007). Besides, in Ghana, approximately 72 percent of the wealthiest females used a condom, compared with 44 percent of the poorest and 32 percent of the middle quintile (Madise et al., 2007). The results of this analysis also show that wealth status (when interacted with gender) has a significant association with multiple sexual partnerships in Ghana and Uganda, but not in Burkina Faso and Malawi (Madise et al., 2007).

## **2f. Condoms used**

Because attitudes towards female condoms have not been examined as extensively as attitudes towards male condoms in Africa, this review will be concerned with attitudes towards male condoms unless otherwise stated. Condoms are promoted as one of the primary prevention methods for HIV infection because they can prevent pregnancy and reduce the risk of HIV and other sexually transmitted infections. Condom use is a critical element of combination prevention and one of the most efficient technologies available to reduce the sexual transmission of HIV. Although levels of reported condom use appear to be increasing in several countries with a high prevalence of HIV infection, recent data from nationally representative surveys indicate declines in condom use in Benin, Burkina Faso, Côte d'Ivoire and Uganda (UNAIDS, 2012). UNAIDS highlight in its final report that increases in risky sexual behavior are found in Côte d'Ivoire, Guyana and Rwanda (2012). AIDS knowledge and condoms used are linked because accuracy of knowledge may therefore influence the degree to which persons acknowledge their behavior as risky and the types of precautions they take to reduce their risk (Zellner, 2003). Moreover, Zellner explains in his finding that the probabilities of having used a condom in Côte d'Ivoire decreased as age increased and were significant for men aged 35 or older (2003). Overall, about 43 percent of males and females who were sexually active in the 12 months before the survey stated that they had used condoms with the last sexual partner (Madise et al., 2007). In Senegal, women reported having fewer sexual risk behaviors than men (Gueye Ndiaye et al., 2009). The authors talk about a research conducted in Benin, Guinea and Senegal in which condom

use at last sexual intercourse is related to perceived control and intention to use a condom or ask for the use of a condom is influenced by different variables such as perceived control, attitude, and moral norm (Godin et al., 2008).

### **2g. Paid sex**

Infection is usually thought to take place during unprotected sex, including paid sex. In Ghana, for example, paid sex alone is estimated to be the cause of 32% of all new HIV infections (UNAIDS 2010:30). In Côte d'Ivoire, Vuylsteke et al. reveal that condom use was very low. Although 72.6% of the female sex workers (FSW) reported consistent condom use with clients only 26.4% did so with the regular partner (2012). However, this finding also realized in Côte d'Ivoire shows dissimilar results. In 1992, 20% of female sex workers reported consistent use of condoms during their most recent working day and by 1998 this proportion had increased to 78% (Ghys et al., 2002). Moreover of the 738 female sex workers interviewed in 1997 in the four largest cities in Senegal (Dakar, Saint-Louis, Kaolack and Ziguinchor), 94% said they had used a condom the last time they had sex with a regular client and 98% with a new client (Meda et al., 1999). The number of sex workers per 1000 males was highest in Kisumu, Kenya and Ndola, Zambia and around 70% of sex workers in Cotonou (Benin) reported use of a condom with the last client, markedly higher than in the other cities (Kenya, Zambia and Cameroon) (Morison et al., 2001).

### **2h. Number of sexual partners**

Furthermore, among those who reported having had casual sex in Dakar in the last 12 months, 67% of men and 45% of women reported using a condom in their last sexual

intercourse with a casual partner (Meda et al., 1999). Overall, about 20 and 34 percent of sexually experienced female and male adolescents, respectively, did not have a sexual partner in the 12 months before the study (Madise et al., 2007). However, 12 percent of boys compared to about 5 percent of girls report that they had two or more sexual partners during the year before the survey (Madise et al., 2007). In Malawi, a higher proportion of older adolescents who were sexually active in the 12 months before the survey also reported to have had two or more partners as opposed to just one partner (OR = 4.3). The age at first sex was not significantly associated with the number of sexual partners in Burkina Faso and Ghana (Madise et al., 2007). In Senegal, this study bolsters the idea that multiple partnerships is more frequent among men than women, among those who had their first intercourse at an early age, among rural migrants, and among those who had a good knowledge of AIDS (Lagarde et al., 1996).

## **2i. Age at first intercourse**

This article reveals that age at first sexual intercourse was lowest for men and women in Kenya and highest for men and women in Benin (Ferry et al., 2001). In Kisumu (Kenya) and Ndola (Zambia), more women had their first sexual intercourse younger than age 15 than in Cotonou (Benin) and Yaoundé (Cameroon) (Ferry et al., 2001). Furthermore, Lagarde et al. describe behavioral changes during the last years in a rural community in Senegal (1996). They posit that age at first sexual intercourse decreased by approximately 10 years on average for men in Senegal (Lagarde et al., 1996). In this source, the researchers found that characteristics of premarital conduct such as age at sexual debut, length of acquaintance with debut partner and number of



premarital partners were significantly associated with extramarital intercourse in men later in life in four countries (Côte d'Ivoire, Tanzania, Lusaka and Thailand). As a matter of fact the length of previous acquaintance with the first sexual partner had a large and statistically significant association with extramarital intercourse in Côte d'Ivoire (White et al., 2000). Men and women in Yaoundé reported the highest life-time numbers of partners. Men reported a median of 10 lifetime partners in Yaoundé, compared with 5 in Kisumu, and 4 in Cotonou and Ndola (Ferry et al., 2001).

## **2j. Summary**

Most studies have shown how HIV/AIDS and STDs are linked to gender, marital status, education, socio economic status, and different risk behaviors such as condoms used or not during intercourse, paid sex, age at first sexual intercourse or number of sexual partners in Africa in general and particularly in Côte d'Ivoire and Senegal. Women are vulnerable and most-at-risk populations for HIV/AIDS and STDs in Africa and also in Côte d'Ivoire and Senegal. Research has demonstrated that risky sexual health behavior might increase the risk for HIV/AIDS.

## **2k. Theoretical basis of the study**

Examination of risky sexual behaviors of the population in Côte d'Ivoire and Senegal are important. Health Belief Model is the behavioral theory that examines and follows the behaviors, attitudes and the beliefs of individuals in response to a health-related condition. Therefore, behaviors attitudes and beliefs are related to health conditions of each individual in the society.

Chapter 3 will focus on the methodology used to answer the study research question.

## **CHAPTER III**

### **METHODS AND PROCEDURES**

#### **3a. Data Source**

The data for this study were obtained from the Measure Demographic and Health Survey (MDHS). The Measure Demographic and Health Surveys (DHS) project, funded principally by the United States Agency for International Development (USAID) with support from other donors and host countries, has conducted over 260 nationally representative and internationally comparable household surveys by advancing global understanding of health and population trends in more than 90 countries since its inception in 1984. Measure DHS has collected, processed, analyzed and disseminated surveys in Sub-Saharan Africa including Côte d'Ivoire and Senegal. The three core questionnaires in MDHS surveys are the Household Questionnaire, the Women's Questionnaire, and the Men's questionnaire. There are also several standardized modules for countries with interest in other topics, such as malaria, domestic violence or maternal mortality and HIV/AIDS. Also, all these additional modules are incorporated into the Household, Women's, or Man's questionnaires. DHS surveys are designed to collect data on marriage, fertility, family planning, reproductive health, child health, and HIV/AIDS.

The household, the woman's and the men's questionnaire from an analytical point of view, contain the analytical units of household information, household member's information, women's information, children's information (of the interviewed women), and men's information. And if an HIV test was done, there are the HIV

results. Household's questionnaires include a household schedule, which is used to identify eligible men and women for individual questionnaires.

For Senegal, Individual Recode (IR) is a dataset that has one record for every eligible woman as defined by the household schedule. It contains all the data collected in the woman's questionnaire plus some variables from the household. Male Recode (MR) is the dataset that has one record for every eligible man as defined by the household schedule. For Côte d'Ivoire, IR contains all the data collected for every eligible man and woman as defined by the household schedule.

For both countries, HIV Test data (AR) has one record for every individual for which blood was drawn for HIV testing. In 2004, DHS began collecting blood for HIV testing but because of the sensitivity of the data instead of merging the results of HIV testing to the individuals a file that is distributed separately was created. This file can be linked to the household members (PR), the women (IR) or men files (MR).

This study was exempted from review process since the research involved anonymous survey procedures pre-authorized for use by the Measure Demographic and Health Survey (DHS). We decided to choose the year 2005 for Senegal, because we didn't have more recent data from Côte d'Ivoire due to the recent socio-political situation. The data available for Côte d'Ivoire was only for 2005 and because we are doing a comparative analysis, we therefore chose this year for Senegal.

The 2005 Ivorian survey was conducted by the Institut National de la Statistique (INS), National Statistics Institute, on behalf of the Ministry of Health and the fight against HIV/AIDS in Côte d'Ivoire. The survey was conducted from August to October

2005. The 2005 nationally representative data from Senegal was conducted by the Centre de Recherche pour le Développement Humain (CRDH), Center for the research and Human development. The survey was conducted from February to June 2005. Multistage sampling techniques were used in both countries to randomly select the areas, the households and the individuals to be surveyed. Both questionnaires contain the same variables and the same codes making data comparisons feasible across the two countries.

### **3b. Study Population**

The Ivorian sample size contains 5183 women and 4503 men aged 15 to 49 years old and among them 4588 women and 3930 men have been tested for HIV. The Senegal sample contains 14602 women and 3761 men aged 15 to 49 years old and among them 4278 women and 3226 men have been tested for HIV. The variables selected for the present study are the same for both countries and were merged in a single file for specific statistical analyses. The data in the recode file are in a standardized format allowing easy comparison of data between the two countries. The merged file includes female and male data for the two countries. Two additional variables were computed (gender and country) for Senegal and only one (country) for Côte d'Ivoire. These additional data were added to the final data set in order to be able to run analyses related to gender within a specific country.

Finally, the HIV test performances and results were retrieved from a different file and merged with the final data by using participant ID Number, Cluster number and Household number as the matching variables.

### 3c. Study design and Variable List

Cross-tabulation procedures were used to describe the distribution of the categorical variables of interest and independent T test procedures were used to describe the distribution of the continuous variables of interest across the two countries. A number of independent variables were used to understand the HIV health risk behavior of the respondents from Côte d'Ivoire and Senegal. These included three main groups such as the socio-demographic variables, HIV knowledge and HIV risk behavior.

#### ✚ Independent variables

##### ➤ Socio-demographic variables

The socio-demographic variables was assessed by country, current age, place of residence (areas), education level, current marital status and gender.

#### **Country:**

Country was recode 1=Côte d'Ivoire and 0=Senegal. We compute this new variable into the final dataset in order to run the appropriate analysis to compare the two countries.

#### **Gender:**

Gender was classified as 1=males and 2=females for both countries.

#### **Current age:**

We used current age as a continuous variable and we also categorize age by age group to predict an association between specific age groups and HIV risk behavior.

#### **Type of place of residence:**

Type of place of residence or area was categorized as urban=1 and rural=2.

**Education level:**

Education level was classified into four groups: no education, primary education, secondary education and higher education level. It is important to note that the category of primary education contains both people with complete and incomplete primary education. This also applies for the secondary education.

**Marital status:**

Marital status was divided into two categories married and not married.

**Wealth index:**

Wealth index was categorized into three groups: poor, middle and rich.

➤ *HIV knowledge*

HIV knowledge was measured by assessing three variables: if the respondent ever heard about sexually transmitted disease, AIDS and other sexually transmitted diseases. These variables were identified and each variable was categorized as yes or no.

➤ *HIV risk behavior*

HIV risk behaviors were classified into four groups: history about sexual activity, prevention risky behavior, diseases and HIV testing.

Regarding history about sexual activity, three variables were identified and each of them was categorized as yes=1 or no=0. The variables were condom used at first sexual intercourse, age at first intercourse and total number of sexual partner the last 12 months.

Concerning prevention risky behavior, four variables were identified and each variable was classified as yes or no. The independent variables for prevention risk

behavior were used condom every time had sex with last sex partner, paid intercourse, condom used during paid sex and recent sexual activity.

Regarding the group disease, we assessed if the respondents had any STDs, genital sore/ulcer or genital discharge in the last 12 months. These variables were classified as yes =1 or no=0.

The HIV testing was evaluated to determine if the participants in both countries had ever been tested for HIV, when was last time they were tested, if they did get the test results, if they even know a place to get AIDS test. These variables were classified as yes or no. Finally the blood test results of the respondents were categorized as HIV negative, HIV1 positive, HIV2 positive and indeterminants (those with inconclusive results). It's important to mention that the HIV test was anonymous for all participants and it was not possible to inform them about their test results.

#### Dependent variable

The dependent variable used for the univariate and multivariate analysis was condoms used at last sexual intercourse. This variable was a true indicator of risky sexual behavior because using condoms during intercourse is a very significant behavior and infection is accounted to take place during unprotected sex. Condom used at last sexual intercourse was categorized as yes (good behavior) and no (bad behavior) for the logistic regression and multivariate analysis.

### **3d. Statistical Methods**

The Statistical Package for the Social Sciences (SPSS) version 19.0 was used to truncate, organize and analyze the data in MDHS 2005 for Côte d'Ivoire and Senegal and

make the data suitable for the study. Descriptive statistics were performed to explain the distribution of the data according to the different variables of interests. An independent T-test was used to compare the means and the standard deviations for the continuous variables such as current age, age at first sexual intercourse and total number of sexual partners the last 12 months. A significant difference will be assumed at a p-value less than 0.05.

The Pearson Chi-square ( $X_2$ ) test were performed to describe the absolute values, the distribution of the categorical variables and to determine any significant relationship between the variables across the two countries. P-values for  $X_2$  square tests were reported for each categorical variable in the data set. The interpretation of the results will be provided in accordance to their p-values with a significance level ( $\alpha=0.05$ ).

*a. Logistic Regression*

Condom used at last sexual intercourse (coded as 0 for bad behavior and 1 for good behavior) was the dependent variable in the models. Binary logistic regression was conducted to determine the degree of association between the dependent variable with the selected independent variables such as socio-demographic (country, current age, area, education level, current marital status and gender), HIV knowledge (Heard about STDs, AIDS and other STDs) and HIV risk behavior variables. Hence, univariate and multivariate analyses were performed to test the significance of any association between the independent and the dependent variables. Univariate analysis will take into account each independent variable at a time and its association with a dependent variable. For example, the association between gender and condoms used at last sexual intercourse is a



univariate analysis. Initially, the data were examined by country when running the analyses in order to compare Côte d'Ivoire and Senegal at every step.

***b. Multivariate data analysis***

The multivariate data analysis involves observation and analysis of all the statistical variables of interest at the same time. The main purpose of this procedure is to determine which variable is a good predictor of the relationships hypothesized according to the association with the outcome variables. A multiple logistic regression will determine which predictors are important and how they affect the HIV risk behavior of the respondents from both countries. Moreover, this complex analysis will permit us to calculate an odds ratio and report a p-value that measures the importance of a predictor variable on the response variable controlling for potential confounders. Throughout all the analysis performed, a p value of 0.05 and confidence interval of 95% were used to determine any statistical significance.

## **CHAPTER IV**

### **RESULTS**

#### **4a. Basic socio-demographic**

The demographic characteristics of the respondents who were included in the study with respect to gender, age, area, education level, marital status and wealth index are presented in table 1. A total of 9,686 adults 15-49 years old from Côte d'Ivoire and 18,363 adults 15-49 years old from Senegal participated in the survey.

**Table 1.** Basic Socio-demographic characteristics of adults 15-49 from Côte d'Ivoire and Senegal

<b>Variables</b>	<b>Côte d'Ivoire % N = 9686</b>	<b>Senegal % N = 18363</b>	<b>p value</b>
<b>Gender (%)</b>			
Males	46.5	20.5	
Females	53.5	79.5	<0.05
<b>*Age (year)</b>	<b>*28.06 ± 9.46</b>	<b>*28.13 ± 10.20</b>	<0.05
<b>Age group</b>			
Adolescents (15-19)	22.6	25.9	
Young adults (25-34)	37.4	35.2	
Active adults (35-49)	40	38.8	<0.05
<b>Area (%)</b>			
Urban	43.1	44.4	
Rural	56.9	55.6	<0.05
<b>Education level (%)</b>			
No education	52.5	59.2	<0.05
Primary	23.5	24.9	<0.05
Secondary	21.1	14.9	<0.05
Higher	2.9	1.1	<0.05
<b>Marital Status (%)</b>			
Not married	61.4	38.0	<0.05
Married	38.6	62.0	<0.05
<b>Wealth Index (%)</b>			
Poorer	43.5	38.7	<0.05
Middle	19.5	24.3	<0.05
Richer	37	37.1	<0.05

\*Mean age ± Standard deviation

The results indicated that there were more females than males in both countries and the difference is statistically significant between Côte d'Ivoire (CI) and Senegal (S) ( $p < 0.05$ ).

The mean age were almost similar (28 years old) and was statistically significantly different between CI and S ( $p < 0.05$ ). In both countries, the active population

(35 to 49 years old) represented the majority of the respondents and the difference is statistically significant between Côte d'Ivoire and Senegal ( $p < 0.05$ ).

There were significant differences between Côte d'Ivoire and Senegal regarding area ( $p < 0.05$ ). There were more people in rural area than urban area in both countries.

About education level, people with no education represented nearly half of our population in both countries and the difference was statistically significant ( $p < 0.05$ ).

In Côte d'Ivoire, there were more people who are not married (61.4%) compared to Senegal (38%) whereas people who were married are few in CI (38.6%) and more in S (62%) and the difference was statistically significant between these two countries ( $p < 0.05$ ).

The poorer represented the majority of our study population in both countries and the difference was statistically significant ( $p < 0.05$ ).

#### **4b. Basic HIV knowledge**

The majority of the study population had a good level of acquaintance with HIV/AIDS and STDs and there was a statistically significant difference between Côte d'Ivoire and Senegal for all the HIV knowledge variables ( $p < 0.05$ ) (Table 2).

**Table 2.** Basic HIV knowledge characteristics of adults 15-49 from Côte d'Ivoire and Senegal

<b>Variables</b>	<b>Côte d'Ivoire (%)</b>	<b>Senegal (%)</b>	<b>p value</b>
<b>Heard sexual Transmit disease</b>			
No	10.6	3.0	<0.05
Yes	89.4	97.0	<0.05
<b>Ever heard of AIDS</b>			
No	12	3.3	<0.05
Yes	88	96.7	<0.05
<b>Heard about other STDs</b>			
No	32.7	63.1	<0.05
Yes	67.3	36.9	<0.05

#### 4c. HIV risk behavior

Table 3 displays the basic HIV risk behavior characteristics of adults 15-49 from Côte d'Ivoire and Senegal. We divided the HIV risk behavior in four main groups: history of sexual activity, prevention risk behavior, history of any Sexual Transmitted Diseases (STDs) and HIV testing.

**Table 3.** Basic HIV risk behavior characteristics of adults 15-49 from Côte d'Ivoire and Senegal

Variables	Côte d'Ivoire (%)	Senegal (%)	p value
<b>Condom used at first sexual intercourse</b>			
No	68.8	89.3	<0.05
Yes	31.2	10.7	<0.05
<b>*Age at first intercourse</b>	*23.90 ± 26.48	*45.95 ± 43.00	<0.05
<b>*Total number of sexual partner last 12 months</b>	*6.70 ± 15.84	*3.13 ± 11.997	<0.05
<b>Last intercourse used condoms</b>			
No	82.7	92.8	<0.05
Yes	17.3	7.2	<0.05
<b>Paid intercourse</b>			
No	97.3	98.8	<0.05
Yes	2.7	1.2	<0.05
<b>Condoms used during paid sex</b>			
No	33.0	36.0	
Yes	67.0	64.0	0.776
<b>Recent sexual activity</b>			
Sexual active in last 4 weeks	40.3	43.3	
Not sexual active in last 4 weeks	59.7	56.7	0.274
<b>Used condoms every time had sex with last sexual partner</b>			
No	30.7	20.7	<0.05
Yes	69.3	79.3	<0.05
<b>Had any STD in last 12 months</b>			
No	96.0	99.0	<0.05
Yes	4.0	1.0	<0.05

<b>Had any genital discharge in last 12 months</b>				
No	88.3	94.1	<0.05	
Yes	11.7	5.9	<0.05	
<b>Had any sore/ulcer in last 12 months</b>				
No	96.0	97.2	<0.05	
Yes	4.0	2.8	<0.05	
<b>Ever been tested for AIDS</b>				
No	91.9	94.8	<0.05	
Yes	8.1	5.2	<0.05	
<b>Did get the test results</b>				
No	15.4	7.9	<0.05	
Yes	84.6	92.1	<0.05	
<b>Blood test results</b>				
HIV negative				
HIV positive	95.6	99.2		
HIV2 positive	4.2	0.6		
Indeterminant	0	0.2	<0.05	
	0.2	0		
<b>Know a place to get AIDS test</b>				
No	72.0	60.0	<0.05	
Yes	28.0	40.0	<0.05	
<b>When was last time were tested</b>				
Less than 12 months	37.6	37.1		
12-23 months	18.9	18.8		0.971
2 years or more	43.5	44.1		

\*Mean  $\pm$  Standard deviation

Regarding history of sexual activity, the prevalence of not having used condoms at first sexual intercourse in Senegal was higher (89.3%) than in Côte d'Ivoire (68.8%) and the difference was statistically significant ( $p < 0.05$ ). The mean age at first intercourse in Senegal was statistically significantly higher than in Côte d'Ivoire while the mean of total number of sexual partner the last 12 months was higher in Côte d'Ivoire than in Senegal and the difference was statistically significant ( $p < 0.05$ ).

Concerning prevention risk behavior, 92.8% of the Senegalese population didn't use condoms during their last intercourse compared to 82.7% of Ivorian and the

difference was statistically significant ( $p < 0.05$ ). More Ivorian males paid for sex (2.7%) compared to their Senegalese counterparts (1.2%) and the difference was statistically significant ( $p < 0.05$ ). During these paid intercourses, the proportion of Ivorian using condoms was higher (67%) than the proportion of Senegalese that used condoms (64%) but the difference was not statistically significant ( $p = 0.776$ ). Similarly, for the variable “recent sexual activity”, more Ivorian didn’t have sexual activity in last 4 weeks (59.7%) compared to the Senegalese (56.7%) but the difference was not statistically significant ( $p = 0.274$ ). A lower proportion of Ivorian used condoms every time they had sex with last sexual partner (69.3%) than Senegalese (79.3%) and the difference was statistically significant ( $p < 0.05$ ).

Regarding the history of any Sexual Transmitted Diseases, there was a statistically significant difference between Côte d’Ivoire and Senegal for having any STD or genital discharge or genital sore in the last 12 months and the large majority of the study population didn’t have any STDs.

About HIV testing, only 5.2% of Senegalese reported ever having been tested for HIV compared to 8.1% of Ivorian and the difference was statistically significant ( $p < 0.05$ ). Besides, 92.1% of those Senegalese who had the HIV test got their test results as compared to 84.6% of the Ivorian and this difference was statistically significant ( $p < 0.05$ ). Furthermore, more Ivorian (72%) didn’t know a place to get HIV test, while 40% of Senegalese did, and the difference was statistically significant ( $p < 0.05$ ). Both countries have practically the same prevalence about the last time the subjects were HIV tested (less than 12 months), 37.6% for Côte d’Ivoire and 37.1% for Senegal but the



difference was not statistically significant ( $p=0.971$ ). Finally, concerning blood test results, 0.6% of Senegalese subjects were HIV positive compared to the Côte d'Ivoire (4.2%) and the difference was statistically significant ( $p<0.05$ ).

#### **4d. Selected independent variables by condoms used at last sexual intercourse for Côte d'Ivoire**

Table 4 shows the distribution of selected independent variables by condoms used during last intercourse (dependent variable) among adults 15-49 years old from Côte d'Ivoire. There is a statistically significant difference between condom used at last sexual intercourse (good behavior) and condom not used at last sexual intercourse (bad behavior) for all the basic socio- demographic variables ( $p < 0.05$ ).

**Table 4.** Distribution of selected independent variables by condoms used during last intercourse among adults 15-49 from Côte d'Ivoire (n= 7675)

Variables	Used condom during last sexual intercourse (%)		p value
	Yes	No	
<b>Gender</b>			
Males	65.2%	41.6%	
Females	34.8%	58.4%	<0.05
<b>*Age (year)</b>	*24 ± 6.9	*30 ± 8.97	<0.05
<b>Area</b>			
Urban	58	38.9	
Rural	42	61.1	<0.05
<b>Education level</b>			
No education	22.3	60.1	
Primary	27.3	23	<0.05
Secondary	42.1	14.8	
Higher	8.3	2.1	
<b>Marital Status</b>			
Not married	87.8	47	
Married	12.2	53	<0.05
<b>Wealth Index</b>			
Poorer	25.3	48.1	
Middle	18.2	20.1	<0.05
Richer	56.5	31.9	

\*Mean age ± Standard deviation

Among Ivorian people who used condoms at last sexual intercourse, 58% were from urban areas but the difference was statistically significant. The greater part (87.8%) of not married respondents from Côte d'Ivoire used condoms at last sexual intercourse and the difference was statistically significant. The large majority (60.1%) of Ivorian participants with no education did not use condoms at last sexual intercourse as compared to only 22.3% who did but the difference was statistically significant. Half of Ivorian respondents with rich socio economic status (51.3%) did use condoms during their last sexual intercourse but the difference was statistically significant.

#### 4e. Selected independent variables by condoms used at last sexual intercourse for Senegal

Table 5 shows the distribution of selected independent variables by condoms used during last intercourse (dependent variable) among adults 15-49 years old from Senegal. There is a statistically significant difference between condom used at last sexual intercourse (good behavior) and condom not used at last sexual intercourse (bad behavior) for all the basic socio- demographic variables ( $p < 0.05$ ).

**Table 5.** Distribution of selected independent variables by condoms used during last intercourse among adults 15-49 from Senegal (n=11751)

Variables	Used condom during last sexual intercourse		p value
	Yes	No	
<b>Gender</b>			
Males	65.2%	16.4%	<0.05
Females	38.9%	83.6%	
<b>*Age (year)</b>	*26.46 ± 7.78	*31.88 ± 9.78	<0.05
<b>Area</b>			
Urban	70.1	37	<0.05
Rural	29.9	63	
<b>Education level</b>			
No education	20.1	71.7	<0.05
Primary	38.5	19.6	
Secondary	38.1	7.9	
Higher	3.3	0.9	
<b>Marital Status</b>			
Not married	76.9	6.6	<0.05
Married	23.1	93.4	
<b>Wealth Index</b>			
Poorer	24	45.6	<0.05
Middle	24.7	24.4	
Richer	51.3	30	

\*Mean age ± Standard deviation

Among participants from Senegal who used condoms at last sexual intercourse, 70% were from urban areas but the difference was statistically significant. In Senegal, 93.4% of married respondents did not use condoms at last sexual intercourse but the difference was statistically significant. The great majority of Senegalese participants (71.7%) with no education did not use condoms at last sexual intercourse but the difference was statistically significant. Almost half of Senegalese respondents with poor socio economic status (45.6%) did not use condoms at their last sexual intercourse but the difference was statistically significant.

#### **4f. Univariate analysis with condoms used at last sexual intercourse as the dependent variable**

The results of univariate analysis of the association between the dependent variable “used condoms during last intercourse” with each of the independent variables between Côte d’Ivoire and Senegal are shown in Table 6. The magnitude of association between the independent variables and outcome variable are quantified using the odds ratio from the logistic regression models.

**Table 6.** Univariate analysis of association between the uses of condoms during last intercourse with other factors among adults 15-49 from Côte d'Ivoire and Senegal

Variables	Côte d'Ivoire		Senegal	
	OR	95% CI	OR	95% CI
<b>Age (Years)</b>	0.91	0.90 - 0.92	0.94	0.93 - 0.94
<b>Gender</b>				
Males (Referent)				
Females	0.38	0.34 - 0.43	0.13	0.11 - 0.14
<b>Area</b>				
Rural (Referent)				
Urban	2.17	1.93 - 2.45	4.00	3.44 - 4.66
<b>Education</b>				
High (Referent)				
No education	0.09	0.07 - 0.12	0.07	0.05 - 0.12
Primary	0.30	0.23 - 0.40	0.52	0.34 - 0.81
Secondary	0.72	0.55 - 0.94	1.28	<b>0.82 - 1.99</b>
<b>Wealth Index</b>				
Rich (Referent)				
Poor	0.30	0.26 - 0.34	0.31	0.26 - 0.37
Middle	0.51	0.44 - 0.60	0.59	0.50 - 0.71
<b>Marital status</b>				
Married (Referent)				
Not married	8.09	6.82 - 9.61	46.97	39.37 - 56.04
<b>Condom used at first intercourse</b>				
Yes (Referent)				
No	0.11	0.09 - 0.13	0.04	0.03 - 0.05
<b>Age at first intercourse</b>	0.97	0.96 - 0.97	0.97	0.97 - 0.97
<b>Total number of sexual partner in last 12 months</b>	1.00	1.00 - 1.01	0.86	<b>0.64 - 1.14</b>
<b>Recent sexual activity</b>				
Not sexual active in last 4 weeks (Referent)				
Sexual active in last 4 weeks	1.05	0.65 - 1.68	0.47	<b>0.21 - 1.09</b>
<b>Paid intercourse</b>				
No (Referent)				
Yes	2.09	1.37 - 3.17	2.76	1.24 - 6.12
<b>Condoms used during paid sex</b>				
Yes (Referent)				
No	0.126	0.04 - 0.40		

<b>Had any STD in last 12 months</b>				
No (Referent)				
Yes	1.24	0.95 - 1.63	1.43	<b>0.85 - 2.40</b>
<b>Had any genital discharge in last 12 months<sup>1</sup></b>				
No (Referent)				
Yes	0.85	0.71 - 1.02	0.71	0.53 - 0.95
<b>Had any sore/ulcer in last 12 months</b>				
No (Referent)				
Yes	0.77	0.57 - 1.05	0.62	0.40 - 0.97
<b>Ever been tested for AIDS</b>				
Yes (Referent)				
No	0.53	0.44 - 0.64	0.66	0.52 - 0.84
<b>Did get the test results</b>				
Yes (Referent)				
No	1.754	1.108-2.777	0.730	<b>0.249-2.136</b>
<b>Blood test results</b>				
HIV negative (Referent)				
HIV positive	0.67	0.47 - 0.96	0.52	<b>0.13 - 2.22</b>
HIV2 positive			0.74	<b>0.09 - 5.77</b>
<b>Know a place to get AIDS test</b>				
Yes (Referent)				
No	0.28	0.24 - 0.32	0.36	0.32 - 0.42
<b>When was last time were tested</b>				
Less than 12 months (Referent)				
12-23 months	0.90	0.54 - 1.50	0.62	<b>0.31 - 1.24</b>
2 years or more	1.06	0.71 - 1.56	0.40	0.22 - 0.72
<b>Heard about STDs</b>				
Yes (Referent)				
No	0.08	0.04 - 0.13	0.04	0.01 - 0.30
<b>Ever heard about AIDS</b>				
Yes (Referent)				
No	0.11	0.07 - 0.17	0.04	0.01 - 0.27
<b>Heard about other STD</b>				
Yes (Referent)				
No	0.33	0.28 - 0.39	0.37	0.32 - 0.42

### Age

As shown, the odds ratios for age in both countries were similar (OR=0.9) and age was statistically significant (95% CI 0.90 - 0.92 for Côte d'Ivoire and 95% CI 0.93 - 0.94 for Senegal).

### Gender

In both countries, females were less likely to use condoms during last intercourse than males (OR=0.38; 95% CI 0.34 – 0.43 for Côte d'Ivoire) (OR=0.12; 95% CI 0.11 – 0.15 for Senegal) and the difference was statistically significant. Males were used as the reference group for the analysis.

### Areas

In Côte d'Ivoire, there was twice more increase risk behavior in urban area than rural area (OR=2.17; 95% CI 1.93 – 2.45) as compared to Senegal where there was four times more risk behavior in urban area than rural area (OR=4; 95% CI 3.44 – 4.66) and the difference was statistically significant for both countries. Rural area was used as the reference group for the analysis.

### Education

For both countries, the participants who had no education or had primary education level were less likely to use condoms during last intercourse than those who had higher education level and the difference was statistically significant. However, for secondary level of education, Senegalese respondents were more likely to use condoms during last sexual intercourse than those in higher education level and the difference was not statistically significant (OR= 1.28 95% CI 0.82 – 1.99). For Côte d'Ivoire,

participants in secondary level of education were less likely to use condoms during last intercourse than those who had higher education level and the difference was statistically significant (OR=0.72 95% CI 0.54 - 0.94).

#### Socio economic status

Ivorian respondents with poor economic status had a 71% decreased odds of using condom during last sexual intercourse, using the rich group as the reference group (95% CI 0.26 – 0.34) and the difference was statistically significant. The same trends were observed with the Senegalese survey respondents where poor participants had 70% decreased odds of using condom during last sexual intercourse (95% CI 0.26 – 0.37) and the difference was statistically significant.

#### Marital status

According to the univariate analysis of the Ivorian respondents, not married participants (OR=8 95% CI 6.82 – 9.61) were found to have significantly increased odds of using condom during last intercourse. Meanwhile, not married Senegalese respondents (OR= 46.98 95% CI 39.37 – 56.04) were also found to have significantly increased odds of using condom during last intercourse. Married participants were used as the reference group for the analysis.

#### Condoms used at first intercourse

Respondents from Côte d'Ivoire and Senegal who used condoms at first intercourse had respectively 89% decreased odds (OR= 0.11; 95% CI 0.09 - 0.13) and 96% decreased odds (OR= 0.04; 95% CI 0.027 - 0.046) of using condom during last intercourse and the difference was statistically significant. In other words, condoms used at first intercourse



were “protective” against using condoms at last intercourse. Hence, people who used a condom the first time, were unlikely to use a condom during the last time they had intercourse. Condom used at first intercourse was used as the reference group for analysis.

#### Total number of sexual partners

There was no association between the total numbers of sexual partner in last 12 months and condoms used at last sexual intercourse (OR= 1.00; 95% CI 1.001 – 1.008) for the Côte d’Ivoire . However in Senegal, there is a negative association for the total numbers of sexual partner in last 12 months (OR= 0.86; 95% CI 0.645 – 1.145) and the difference was not statistically significant.

#### Recent sexual activity

There was also no association between recent sexual activity and condoms used at last sexual intercourse (OR= 1.05; 95% CI 0.65 – 1.68) for Côte d’Ivoire and the difference was not statistically significant. However in Senegal, there was a negative association for recent sexual activity (OR= 0.47; 95% CI 0.21 – 1.09) and the difference was not statistically significant. Not sexual active in last 4 weeks was used as the reference group for analysis.

#### Paid sex

For both countries, there were two more times increase odds of paid intercourse and condoms used at last sexual intercourse for respectively Côte d’Ivoire and Senegal (OR= 2.09; 95% CI 1.37 – 3.17 ) and (OR= 2.76; 95% CI 1.25 – 6.12 ). In other words, people who paid sex are two times more likely to have used condoms at their last sexual

intercourse than people who did not paid sex, and the differences were statistically significant. Not had paid intercourse was used as the reference group for the analysis.

#### *Used condoms during paid sex*

Respondents from Côte d'Ivoire who didn't use condom during paid sex had 87% decrease odds of using condoms during last intercourse (OR= 0.13; 95% CI 0.04 – 0.40) as compared to those who used condoms during paid sex, but the difference was statistically significant. Used condom during paid sex was used as the reference group. However, the univariate analyze of the Senegalese respondents regarding condoms used during paid sex was excluded from the analysis because the sample size was too small (N=25).

The variable “used condoms every time had sex with last sexual partner” was excluded from the univariate analyze for both countries because of its correlation with the dependent variable.

#### *Sexual Transmitted Diseases*

The association between having any STDs in last 12 months with using condoms during last sexual intercourse was tested. Respondents who had any STDs in last 12 months in Côte d'Ivoire demonstrated increased odds of 24% of having used condoms during last sexual intercourse (OR= 1.24; 95% CI 0.95 – 1.63) and the association was not statistically significant. Similarly, the association was found to not be statistically significant in Senegalese participants (OR= 1.43; 95% CI 0.85 – 2.4). In Côte d'Ivoire, respondents who both had any genital discharge (OR= 0.85; 95% CI 0.71 – 1.02) and had any sore/ulcer (OR= 0.77; 95% CI 0.57 – 1.05) in last 12 months were not significantly

associated with using condom during last sexual intercourse. Conversely, in Senegal, respondents who both had any genital discharge (OR= 0.71; 95% CI 0.53 – 0.95) and had any sore/ulcer in last 12 months were significantly associated with using condom during last sexual intercourse (OR= 0.62; 95% CI 0.40 – 0.97). The variable “didn’t have any genital discharge or sore/ulcer in last 12 months” were used as the reference group for the analysis.

#### HIV test

In both countries, never been tested for HIV was significantly associated with used condoms during last sexual intercourse. Participants who had never been tested for AIDS were less likely to use condoms during last sexual intercourse in Senegal and Côte d’Ivoire.

Ivorian participants who did not get the test results are 1.75 more likely to use condom during last sexual intercourse than those who did get their test results and the difference was statistically significant (OR= 1.75; 95% CI 1.11 – 2.78). On the contrary, Senegalese participants who did not get the test results are 0.73 less likely to use condom during last sexual intercourse than those who did get their test results and the difference was not statistically significant (OR= 0.73; 95% CI 0.25 – 2.14).

#### HIV blood test results

The association of HIV blood test results with using condom at last sexual intercourse was also tested. Respondents who tested positive to HIV1 in Côte d’Ivoire demonstrated 33% decreased odds of having used condom at last sexual intercourse (OR= 0.67; 95% CI 0.47 – 0.96). Nevertheless, blood test results for HIV2 were not analyzed

because the sample size was too small ( $N < 15$ ). In Senegal, respondents who were tested positive respectively for HIV1 (OR= 0.53; 95% CI 0.13 – 2.22) and HIV2 (OR= 0.74; 95% CI 0.09 – 5.77) demonstrated 47% decrease odds and 26% decrease odds of using condom at last sexual intercourse but the association was not statistically significant. HIV negative was used as reference group for analysis.

*Know a place to get HIV test*

In both countries, participants who didn't know a place to get AIDS test were less likely to use condoms during last intercourse than those who did (OR=0.28; 95% CI 0.24 – 0.32 for Côte d'Ivoire) (OR=0.37; 95% CI 0.32 – 0.42 for Senegal) and the difference was statistically significant. Respondents who did know a place to get AIDS test were used as the reference group for the analysis.

*Last time did HIV test*

There were no significant differences for Ivorian and Senegalese who were tested last time in 12-23 months. Besides, participants from Côte d'Ivoire who were tested since 2 years or more have 6% increase odds (OR=1.06; 95% CI 0.71 – 1.56) of have used condoms during their last sexual intercourse and the association was not statistically significant. Conversely, participants from Senegal who were tested since 2 years or more have 60% decrease odds (OR=0.4; 95% CI 0.22 – 0.72) of having used condoms during their last sexual intercourse when compared to people who were tested less than 12 months, but the association was statistically significant. Respondents who were tested less than 12 months were used as our reference group for analysis.

### Heard about STDs

In both countries, never had heard about STDs, AIDS or other STDs were significantly associated with not used condoms during last sexual intercourse. Participants who heard about STDs, AIDS or other STDs were less likely to used condoms during last sexual intercourse.

### **4g. Multivariate analysis**

To determine whether the associations in the univariate model were not dependent of other covariates, multivariate logistic regression was performed with different categories of independent variables such as basic socio-demographic variables (see table 7). Basic HIV risk behavior characteristics were eliminated from multivariate analysis because of their high correlation with the dependent variable (used condom during last intercourse) and other variables in the model.

**Table 7.** Multivariate analysis of association between used condoms during last Intercourse with basic socio-demographic characteristics among adults 15-49 from Côte d'Ivoire and Senegal

Variables	Côte d'Ivoire		Senegal	
	OR	95% CI	OR	95% CI
<b>Age (Years)</b>	0.92	0.91 - 0.93	0.99	0.98 - 1.00
<b>Gender</b>				
Males (Referent)				
Females	2.71	2.34 - 3.13	2.97	2.46 - 3.59
<b>Area</b>				
Rural (Referent)				
Urban	1.43	1.21 - 1.70	2.19	1.70 - 2.82
<b>Education</b>				
High (Referent)				
No education	0.20	0.15 - 0.28	0.25	0.14 - 0.45
Primary	0.45	0.32 - 0.62	0.73	0.41 - 1.31
Secondary	0.66	0.48 - 0.90	1.05	0.59 - 1.87
<b>Wealth Index</b>				
Rich (Referent)				
Poor	0.55	0.45 - 0.67	1.26	0.94 - 1.69
Middle	0.71	0.59 - 0.87	1.02	0.80 - 1.29
<b>Marital status</b>				
Married (Referent)				
Not married	3.55	2.94 - 4.30	20.39	16.43 - 25.31

In Côte d'Ivoire, the multivariate analysis showed a high statistical difference for groups in regard to age, gender, area, education level, wealth index and marital status. The Ivorian and Senegalese females had increased odds of using condoms during their last sexual intercourse (OR=2.7; 95% CI 2.34 – 3.13 for Côte d'Ivoire and OR=2.97; 95% CI 2.46 – 3.60 for Senegal).

Living in urban area was found to be associated with more condoms used at last sexual intercourse for both countries.

For Côte d'Ivoire, high education level and wealthy participants were respectively shown to more likely have used condoms at their last sexual intercourse. However, not married Ivorian were 3.6 more likely to have used condoms at their last sexual intercourse than those who were married and the association was statistically significant (OR=3.55; 95% CI 2.94 – 4.30).

For Senegal, there were not a statistically significant difference for primary and secondary level of education but those who attended primary education were less likely to have used condoms during their last intercourse (OR=0.73; 95% CI 0.41 – 1.31) and those who attended secondary level of education were more likely to not use condoms at their last sexual intercourse (OR=1.05; 95% CI 0.59 – 1.87). At the difference of Côte d'Ivoire, wealthy Senegalese respondents were less likely to have used condoms during their last sexual intercourse than poor or middle income participants and the association was not statistically significant.

Not married Senegalese were 20 times more likely to use condoms at their last sexual intercourse than those who were married and the association was statistically significant (OR=20.39; 95% CI 16.43 – 25.31). Conversely, not married Ivorian were 3.6 more likely to use condoms at their last sexual intercourse than those who were married and the association was statistically significant (OR=3.55; 95% CI 2.94 – 4.3).

Table 8 shows multivariate logistic regression performed with independent variables such as basic knowledge characteristic variables.

**Table 8.** Multivariate analysis of association between used condoms during last intercourse with basic HIV knowledge characteristics among adults 15-49 from Côte d'Ivoire and Senegal

Variables	Côte d'Ivoire		Senegal	
	OR	95% CI	OR	95% CI
<b>Heard STDs</b>				
Yes (Referent)				
No	0.14	0.08-0.26	0.07	0.01-0.49
<b>Heard about other STD</b>				
Yes (Referent)				
No	0.46	0.38-0.54	0.38	0.33-0.44

The variable ever heard of AIDS was excluded of the multivariate analysis because of its highly correlation with the other variables in the model.

For both countries there were statistically significant differences for the variables knowledge about STDs and other STDs. Furthermore, respondents from the two countries who did not hear about STDs and other STDs were less likely to have used condoms during their last sexual intercourse than those who have knowledge about STDs and other STDs.



#### 4h. Univariate analysis of country by condom used at last sexual intercourse

Condom used at last sexual intercourse was the dependent variable in the models. Binary logistic regression was conducted to determine the degree of association between the dependent variable with the selected independent variables, country. Hence, univariate analysis was performed to test the significance of any association between used condoms during last intercourse with country (Table 9).

**Table 9.** Univariate analysis of association between used condoms during last intercourse with one of the independent variables (country)

Variables	OR	95% CI	p value
<b>Country</b>			
Senegal (Referent)			
Côte d'Ivoire	2.68	2.44- 2.94	<0.05

Côte d'Ivoire is the country where people are three times more likely to have used condoms during last intercourse than Senegal (OR=2.68; 95% CI 2.44 - 2.94) and the difference was statistically significant. Senegal was used as the reference group for the analysis.

#### 4i. Logistic regression of the selected variables with condoms used during last sexual intercourse

To determine whether the associations in the univariate model were not dependent of other covariates, multivariate logistic regression was performed with different categories of independent variables such as basic socio-demographic variables (see table 10). Basic HIV risk behavior characteristics were eliminated from multivariate analysis

because of their high correlation with the dependent variable (used condom during last intercourse) and other variables in the model.

**Table 10.** Multivariate analysis of association between used condoms during last intercourse with some independent variables

<b>Variables</b>	<b>OR</b>	<b>95% CI</b>
<b>Country</b>		
Senegal (Referent)		
Côte d'Ivoire	0.70	0.62 - 0.79
<b>Age (Years)</b>	0.95	0.95 - 0.96
<b>Gender</b>		
Males (Referent)		
Females	0.34	0.31 - 0.38
<b>Area</b>		
Rural (referent)		
Urban	1.72	1.50 - 1.98
<b>Education</b>		
High (Referent)		
No education	0.21	0.16 - 0.28
Primary	0.52	0.40 - 0.69
Secondary	0.77	0.58 - 1.01
<b>Wealth Index</b>		
Rich (Referent)		
Poor	0.73	0.62 - 0.86
Middle	0.82	0.71 - 0.95
<b>Marital status</b>		
Married (Referent)		
Not married	8.85	7.63 - 10.25

The multivariate analysis shows that Côte d'Ivoire respondents have decrease odds of using condoms during their last sexual intercourse (OR=0.7; 95% CI 0.62 - 0.79)

as compared to Senegal and the difference was statistically significant at  $p < 0.05$ . This is a critical finding compared to the univariate analysis.

Females are less likely to use condoms during their last sexual intercourse than males and the difference was statistically significant.

There are increase odds of using condoms at last sexual intercourse for participants living in urban areas as compared to those in rural areas and the difference was statistically significant.

High education level respondents were respectively shown to more likely have used condoms at their last sexual intercourse as compared to no education, primary and secondary education level. The difference was statistically significant for no education and primary level but it was not statistically significant for secondary education level.

Rich respondents were more likely to have used condoms at their last sexual intercourse as compared to poor and middle class participants and the difference was statistically significant.

Not married were 8.8 more likely to have used condoms at their last sexual intercourse than those who were married and the association was statistically significant.

## **CHAPTER V**

### **DISCUSSION AND CONCLUSION**

The main objective of the present study was to identify differences in the distribution of sexual behavior risk factors and of factors such as condoms used during last sexual intercourse, which could explain the difference rate of spread of HIV between Côte d'Ivoire and Senegal populations. The following parameter of high risk sexual behavior was using condoms at last sexual intercourse for both countries. Condom use is an integral indicator of risky sexual behavior and, as a result, is a potential predictor of future HIV infection rates.

Ivorian and Senegalese participants of the MDHS had in whole a good level of knowledge about HIV/AIDS and STDs. In Côte d'Ivoire and Senegal, people with no education represented the majority of the subjects interviewed. This finding may be explained by the poor level of literacy in African countries. As a matter of fact, according to United Nations Educational, Scientific and Cultural Organization (UNESCO) - Institute for Statistics, more than 1 in 3 adults cannot read in Sub Saharan Africa and the literacy rate is 63% (UNESCO, 2010). The majority of the respondents that used condoms at last sexual intercourse came from urban areas. Media campaigns about HIV/AIDS play an important role in the prevention of HIV/AIDS in urban areas; hence people from urban area tend to use more condoms than people from rural areas. An important finding about our results is the marital status of the MDHS participants. In Côte d'Ivoire, there are more people who are not married as compared to Senegal where

most half of the participants are married. Furthermore, a large majority of Ivorian who are not married used condoms at their last sexual intercourse and almost all married Senegalese respondents did not use condoms at their last sexual intercourse. One explanation possible is the fact that Senegal is a Muslim country in which polygamy is practiced and people may be inclined to get married earlier according to the Islam religion and Senegalese men has relatively few extra marital partners. Also, there seems to be a pattern of more non-spousal partners in Côte d'Ivoire than in Senegal. In both countries, the large majority of participants were from lower socio economic status which represents the trend in most African countries.

Ivorian participants had their first sexual intercourse much earlier than their Senegalese counterparts and also Côte d'Ivoire reported the highest total number of sexual partners in the last 12 months as compared to Senegal. Besides, more Ivorian males paid for sex compared to Senegalese males. The number of participants who answered these questions about sexual behavior was small. Henceforth, this source reports that there is evidence that men under-reported their contacts with sex workers (Morison et al., 2017). These findings may under-estimates our numbers. However, a great number of respondents from Senegal did not use condoms during their last sexual intercourse. This result may be explained by the fact that a great number of Senegalese in our study are married; therefore they were not using condoms during their sexual intercourse with their steady (marital) partners.

In Côte d'Ivoire and Senegal, we observed a low HIV testing percentage overall. More subjects from Côte d'Ivoire reported having ever been tested for HIV compared to

their counterparts; however the large part of Ivorian respondents didn't know a place to get HIV tested. This finding is consistent with this research about HIV testing in Côte d'Ivoire where HIV testing prevalence was 9.5% among women and 6.1% among men (Jean et al., 2012). They explained that in Côte d'Ivoire, there exist a number of Barriers to HIV testing such as region of residence, socioeconomic conditions (poverty, low education, employment status, stable partnership), and sexual behavior. It is important to specify that in our study population, we found some cases of HIV type 2 in Senegal and none in Côte d'Ivoire. This is consistent with this study where the searchers found in a community study in rural Senegal, some human immunodeficiency virus type-2 (HIV-2) seropositive cases (Le Guenno et al., 1992).

In Côte d'Ivoire and Senegal, wealth and education have been consistently found to be positively associated with condoms used at last sexual intercourse. These findings are consistent with previous studies indicating that wealth and education have been reliably found to be completely correlated with HIV testing (Gage & Ali, 2005; Cremin et al., 2009). Similarly, these researchers bolster that HIV prevalence has been reported to be positively correlated with socioeconomic level and education in many sub-Saharan African countries (Forston, 2008; Fox, 2010). Thus, individuals with high education and wealth may perceive themselves more at risk, and therefore have a better understanding about HIV risk factors or they may have a higher recourse to HIV testing compared to those less well-off. Additionally, this result might reflect the fact that HIV promotion may fail to reach the most deprived segments of the population. Third, adverse living conditions associated with low socioeconomic level may constitute by themselves

barriers to purchase of condoms. Further studies are needed to understand the process leading to social distribution of condoms used in populations. These results strongly advocate that educational programs should target the poor and those with low educational attainment in order to address prevention of HIV risky sexual behavior. Furthermore, in countries like Côte d'Ivoire and Senegal, where the vast majority of the people live below the poverty line, efforts to promote HIV risk sexual behavior should be widespread.

In both countries, few women used condoms at last sexual intercourse. Previous research supports this assertion by positing that females were less likely to declare using condom in general even though a higher proportion declared having used condom during the last occasional sexual intercourse (Hounton et al., 2005). One of the reasons for this might be the fact that women in Africa do not have social influence regarding sexual behavior. It is very difficult for a married woman to impose the use of condoms to her husband. Moreover, it is probable that as in other areas of sub-Saharan Africa, partner violence, marriage dissolution, and a lack of autonomy and empowerment are probable disincentives for women to undergo condom using, even if they know their partners are unfaithful.

Results from the logistic regression analyses showed that for both countries there were a positive association between paid sex and condoms used at last sexual intercourse. An important finding in this univariate analysis is that in Côte d'Ivoire, respondents are three times more likely to have used condoms during their last sexual intercourse than Senegal. However, after running the multivariate analysis, we demonstrated that Ivorian participants are less likely to have used condoms during their last sexual intercourse. This

results is in accordance with previous findings that highlight an increase in sexual risk behavior in Côte d'Ivoire (UNAIDS, 2012). This study is important because it may explain the difference in prevalence of HIV among these two countries. In Côte d'Ivoire and Senegal, not married subjects had striking positive association with condoms used at last sexual intercourse when compared to married respondents. HIV is lower in countries where the practice of polygyny is common, and within countries it is lower in areas with higher levels of polygyny (Reniers & Watkins, 2010). The results in our study suggest a possible relation with condoms used, HIV prevalence and polygamy in Senegal, so men use condoms less frequently with marital partners. In this study about polygyny and the spread of HIV in Sub-Saharan Africa, the authors found a negative ecological relationship between polygyny and HIV prevalence (Reniers & Watkins, 2010). Hence, this study bolsters that polygyny creates small isolates of concurrent partnership in which the virus is trapped until one or more of the (infected) spouses start a new relationship (Reniers & Watkins, 2010). These arguments presented so far imply that polygyny delays HIV epidemic growth compared to facilitating a more rapid and pervasive spread of the virus among extra-marital relationship in monogamous marriage. Furthermore, polygamous marriage may apply greater control over female sexuality or restrict sexual activity among young people. That process may induce an even lesser risk of transmitting HIV if the young woman is inside a marriage, so she could not look for multiple partnerships. We conclude by invoking the practice of polygamy as a fewer risk of multiple partnerships and henceforth a way to reduce the spread of the HIV virus. More



studies need to assess the role of polygamy in the transmission and/or acquisition of HIV in Sub-Saharan Africa.

### **5a. Study Limitations**

This study relies on a large nationally representative sample, with a high response rate in two West African countries. To our knowledge, this is the first work on the topic in Côte d'Ivoire and Senegal investigating the role of such an extensive range of measurements as HIV risky sexual behaviors. We acknowledge some limitations to this study. Data were collected in 2005 and have not been updated due to the political situation in Côte d'Ivoire. Therefore, we were constrained to limit our Study for Senegal to the same year 2005 to do our comparative analysis. One other limitation of the study is the use of secondary data. Even though, Measure DHS is a robust and well sampled data set, it provided only few ways of looking at HIV risk sexual behavior. A chance of self-report bias is present as variables such as education, socio-economic level and sexual behavior are self-reported in Measure DHS. Misclassification bias might have occurred when participants were classified into different categories. Additional limitation is that the survey questionnaire type may induce behavioral desirability bias. Individuals may be reticent or embarrassed to express their real sexual behavior in face-to-face interviews. It is challenging to validate the respondents' answers. Thus, the results of the study may underestimate the true level of HIV risk sexual behaviors in both countries. Furthermore, the statements issued are theoretical, how people respond to the survey statements or questions may be dissimilar than what they would truly do in a specified circumstances. Moreover, the cross-sectional nature of the survey only allows for an association between

variables of interest at the same point of time. Any cause and effect relationships could not be established. Hence, the cross-sectional nature of the study impedes any causal interpretation of the measured associations. Finally, the data were not weighted in order to represent the population from which the samples were drawn. The weighting process gives more suitable answers when conducting prevalence studies. Since the study was about a comparison of attitudes between the two countries, there was not a significant impact on the results analysis. This study was limited to a comparison between Côte d'Ivoire and Senegal in terms of the relationships between selected variables and condoms used at last sexual intercourse. Some associations have not been analyzed, such as respondents' knowledge about HIV/AIDS or about the usual means of transmission of HIV infection. The investigation focused more on condoms used at last sexual intercourse, which might be a reflection of one risky sexual behavior.

### **5b. Recommendations**

The results of this study showed the importance of condom utilization in HIV sexual behavior in both Côte d'Ivoire and Senegal. Future research is needed to validate the actual findings and measure the potential relationship between HIV status and condoms used during sexual intercourse. The Demographic Health Survey is one of the rare studies that select questions to assess HIV risk sexual behavior in Africa. Other organizations and researchers should test the reliability of such surveys by using a varied range of criteria to elaborate a valid risk sexual behavior investigation. The prevalence of HIV infection is decreasing in Côte d'Ivoire, which is most likely due to massive education campaigns taking place throughout the country. Condoms use and sexual risk

behaviors are interconnected; consequently program implementers and stakeholders should increase their prevention programs to touch a number of people in the populations. Community and religious leaders are good ways to touch and inform the populations about sexual risk behaviors and HIV/AIDS. Since education is considerably associated with sexual risk behaviors, it is essential for the Ministry of Education in both countries to integrate HIV education and prevention into their curriculums.

### **5c. Conclusion**

This study is important because it determines the behavioral risk and trends among a national sample of adults from two African countries. Some sexual risk behaviors such as condoms used during last sexual intercourse may vary on the basis of marital status, education, socio economic status and gender. The results of this study help provide useful insights to public health professionals who are developing upstream health prevention methods in the fight against HIV/AIDS in Sub Saharan Africa. The findings of this study have several implications for HIV behavioral risks of men and women and marital status. To control the spread of the HIV epidemic, it is essential to address risky sexual attitudes among populations. Hence, by adopting safe sexual behaviors, the spread of HIV virus and others STDs will decrease among people. In a nutshell, mobilization of the community, political involvement, policy development and health education are indispensable to challenge sexual attitudes and fight against the spread of HIV/AIDS in Africa.

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