

**Gender, HIV Prevalence and HIV-Related Knowledge, Attitudes, and
Behavior in Sub-Saharan Africa: A Comparative Study**

Thesis

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Abstract

Introduction: The search is on to find a cure for HIV/AIDS, but for the time being the adage 'prevention is better than cure' could not be more relevant to the HIV/AIDS context. Recently, attention to social and behavioral risk factors gave researchers the opportunity to explore new ways of developing interventions.

Objectives: In an attempt to further explore these risk factors this study is comparing the difference in prevalence between the genders, and assessing the HIV-related knowledge, attitudes, and behavior in two populations; Zimbabwe, an African country with high HIV prevalence, and Senegal, an African country with low HIV prevalence.

Method: The 2010-2011 Senegal DHS and the 2010-2011 Zimbabwe DHS were used secondary data for this study. They were both nationally representative datasets. Sample sizes of study population were 16,271 from Zimbabwe and 20,102 from Senegal. IBM SPSS 22 was used to run chi-square tests for descriptive results of all independent and dependent variables, and binary logistic regression for associations between HIV-related knowledge, attitudes, and behavior and HIV status, as well as the women's status and HIV status, and associations between these factors.

Results: The results showed that in both countries, HIV infection had significantly positive associations with having more than one sex partners (Zimbabwe OR 1.117, Senegal OR 2.779). Moreover, the variables of women's status varied between Zimbabwe and Senegal. HIV status in Zimbabwe was negatively associated with women's participation in decision-making about their own health, while it associated with this variable positively in Senegal (Zimbabwe OR 0.651, Senegal OR 1.969).

Conclusion: Having more than one sexual partner were important indicators for HIV infection in both countries. Women in Zimbabwe seem to be more powerful than women in Senegal. Continued intervention research is warranted as there are clear patterns of risk between Zimbabwe and Senegal that highlight opportunities for more tailored prevention efforts surrounding gender roles, HIV knowledge, attitudes, and sexual risk-taking behavior.

Key words: HIV/AIDS, HIV knowledge, HIV attitude, Sexual behaviors, Women's status, Senegal, Zimbabwe.

Résumé

Introduction: La recherche s'efforce de trouver un remède pour le VIH / sida, mais pour le moment, l'adage « mieux vaut prévenir que guérir » reste le plus pertinent dans le contexte du VIH / sida. Récemment, l'attention portée aux facteurs de risque sociaux et comportementaux a donné aux chercheurs la possibilité d'explorer de nouvelles façons de développer des interventions.

Objectifs: Dans le but d'explorer davantage ces facteurs de risque, cette étude vise à comparer la différence de prévalence entre les sexes, et d'évaluer les connaissances, les attitudes et le comportement relatifs au VIH dans deux populations, soit le Zimbabwe, un pays d'Afrique à forte prévalence du VIH, et le Sénégal, un pays africain avec une faible prévalence du VIH.

Méthode: Les EDS Sénégal 2010-2011 et EDS Zimbabwe 2010-2011 ont été utilisées comme données secondaires pour cette étude. Elles ont servi d'ensemble de données représentatifs au niveau national. Les échantillons des populations étudiées sont de 16 271 pour le Zimbabwe et 20 102 pour le Sénégal. Le logiciel IBM SPSS 22 a été utilisé pour exécuter des tests de chi-carré pour les résultats descriptifs de toutes les variables indépendantes et dépendantes, et la régression logistique binaire pour les associations entre les connaissances, les attitudes et le comportement liés au VIH et le statut du VIH, ainsi que le statut des femmes et le statut du VIH et les associations entre ces facteurs.

Résultats: Les résultats ont montré que dans les deux pays, l'infection par VIH est positivement associée de manière significative au fait d'avoir plus d'un partenaire sexuel (Zimbabwe OR 1,117, Sénégal OR 2,779). En outre, les variables de la situation des femmes varient entre le Zimbabwe et le Sénégal. Le statut du VIH au Zimbabwe est négativement associé à la participation des femmes dans la prise de décision au sujet de leur propre santé, alors qu'il est positivement associé à cette variable au Sénégal (Zimbabwe OR 0,651, Sénégal OR 1,969).

Conclusion: Avoir plus d'un partenaire sexuel est un indicateur important pour l'infection par le VIH dans les deux pays. Les femmes au Zimbabwe semblent avoir davantage de pouvoir décisionnel que les femmes au Sénégal. La recherche continue d'une intervention est justifiée car il existe des modèles de risque évidents entre le Zimbabwe et le Sénégal. Ceux-ci mettent en évidence des possibilités concernant des efforts de prévention plus adaptés aux rôles des sexes, des connaissances et des attitudes par rapport au VIH, et un comportement sexuel à haut risque.

Mots clés: VIH/SIDA, Connaissances en matière de VIH, attitude par rapport au VIH, comportements sexuels, statut de la femme, Sénégal, Zimbabwe.

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Abbreviations and acronyms

AIDS: Acquired Immunodeficiency Syndrome

ART: Antiretroviral Treatment

CDC: Centre for Disease Control and Prevention

DHS: Demographic Health Survey

EA: Enumeration Area

HIV: Human Immunodeficiency Virus

ICF: Inner City Fund

IDU: Injection Drug Users

MDG: Millennium Developmental Goal

MSM: Men who have Sex with Men

MTCT: Mother To Child Transmission

NGO: Non-Governmental Organization

RDT: Rapid Diagnostic Test

STD: Sexually Transmitted Disease

STI: Sexually Transmitted Infection

UN: United Nations

UNAIDS: The Joint United Nation Program on HIV/AIDS

USAID: United States Agency for International Development

WHO: World Health Organization

Chapter 1: Introduction

1.1 Background: HIV/AIDS

The infection

Human immunodeficiency virus (HIV) is a blood-borne virus that infects the T-cells in the immune system, destroying them or impairing their function (WHO, 2014). The human immune system cannot get rid of HIV, which means once someone has it, he/she has it for life (CDC, 2014).

The Acquired Immunodeficiency Syndrome (AIDS) appears in the advanced stages of HIV infection (Barre-Sinoussi et al., 1983; Gallo et al., 1984; Popovic et al., 1984). Clinically, it is diagnosed either by a CD4+ T cell count below 200 cells per μL (200 cells/mm³), as normally the CD4+ T cell count is between 800-1200 cells per μL (800-1200 cells/mm³). AIDS is also diagnosed by the occurrence of distinct opportunistic illnesses that are associated with HIV infection, such as tuberculosis and Kaposi's sarcoma (Daar et al., 2008; Greene, 2007). Known for their efficient same day test results, rapid diagnostic tests (RDTs) are the commonly used serological tests for HIV infection diagnosis. This is vital for same day diagnosis, as well as early treatment and care in high-risk populations. RDTs detect the presence or absence of HIV antibodies (WHO, 2014).

Although HIV is affecting their immune systems, people infected with HIV may feel or look healthy for years. Over time, HIV develops into AIDS by destroying most of the CD4+ T cells in the immune system. Eventually, the body becomes unable to fight infections and diseases. AIDS patients require medical treatment to

prevent death. Without treatment their life expectancy falls to 1-3 years (CDC, 2014).

Antiretroviral treatments (ARTs) are used to halt HIV progression into AIDS and lower its transmission. To date, however, there is no cure for AIDS or vaccines for HIV (NIAID, 2014; Barouch 2008; Richman et al. 2009).

HIV transmission

HIV is found in the body fluids of an infected person, including the blood, the vaginal fluids in women and semen in men, as well as the breast milk. Therefore, the virus is passed from one person to another primarily through sexual contact and blood-to-blood transfusion. HIV does not live on the skin and cannot live very long outside the body. Therefore casual contact, such as holding hands with an HIV infected person does not transmit HIV (CDC, 2014; Hladik and McElrath 2008; Cohen et al. 2011). Additionally, infected pregnant women can pass HIV to their infants. This is called mother-to-child transmission (MTCT), and it could happen during pregnancy, during childbirth and through breast-feeding. HIV can also be transmitted through contaminated needles (WHO, 2014). Even though more than 50 percent of new HIV infections occur among gay and bisexual men, heterosexuals and injection drug users (IDUs) also continue to be significantly affected by HIV (CDC, 2014).

80 percent of adults acquire HIV following exposure at mucosal surfaces. Mucous membranes can be found inside the rectum, the vagina, the opening of the penis, and the mouth. Thus, AIDS is primarily a sexually transmitted disease (Hladik and McElrath 2008; Cohen et al. 2011). Accordingly, Reducing the risk of sexual HIV

transmission has been the focus of many HIV/AIDS prevention programs globally (UNAIDS, 2014; Quinn, 2006).

HIV prevention

While ARTs can help prolong the life of those who are infected with HIV, they are still not a conclusive cure for HIV/AIDS (NIAID, 2014, Richman et al. 2009). Moreover, the most effective way to prevent infectious diseases is vaccination, which is yet to exist for HIV (Cohen et al., 2011). Accordingly, the most adequate methods in controlling the HIV epidemic are those managing the prevention of HIV transmission (Biswas, 2012).

The sociocultural and behavioral sciences play a fundamental role in HIV/AIDS prevention. It has been proved that strategies that are utilized for HIV prevention usually have behavioral components that influence its efficacy (Biswas, 2012). Commonly, these components affect the acceptance and the adoption of a specific prevention strategy (Case et al., 2012).

Studies in many countries with generalized epidemics of HIV showed associations between the decline of HIV prevalence and changes of sexual behavior (Hallett et al., 2006; Gregson et al., 2006; Timothy et al., 2009). Nonetheless, it is still challenging to change people's behaviors and choices, and influence their motivations, as they are mainly influenced by strong sociocultural norms, as well as risk assessment of immediate benefits (Chen et al., 2007;Case, 2012).

Additional obstacles for HIV prevention are stigma and discrimination, as they lead to denying HIV testing, as well as limiting access to healthcare services and education (Holzemer et al., 2009; Sayles et al., 2009). They also cause people living with HIV to withhold information about their status from family members, friends

and health care providers (Tomaszewski, 2012). Thus, it is crucial for society to promote laws and policies that ensure the human rights in accessing HIV prevention, treatment, care and support (NIAIDS, 2014; Case et al., 2012).

Research indicates that using a combination of behavioral, biomedical, and cultural approaches as a unified prevention strategy is the most effective method in preventing the new HIV infection among vulnerable groups, as well as in general population (Gregson et al., 2006; Hankins & Zalduondo, 2010; Cohen et al., 2011).

The global epidemic

In 1981, the first cases of AIDS were recognized in New York and California, where the Centers for Disease Control and Prevention (CDC) reported rare cases of unusual clusters of Pneumocystic carinii pneumonia and Kaposi's sarcoma among homosexual men (CDC, 1981). Today, more than three decades later HIV/AIDS is a global epidemic with more than 36 million people living with it worldwide (WHO, 2014). The world was witnessing an extraordinary number of new HIV infections in the year 2000. A reported 8500 people were becoming newly infected with the virus everyday, as well as 4300 people, who were dying of AIDS-related illnesses (UNAIDS, 2014).

A fact sheet, however, published by The Joint United Nation Program on HIV/AIDS (UNAIDS) in 2014 indicated that new HIV infections have fallen by 38 percent since 2001. This is attributed for the most part to countries trying to achieve Target 6A of the Millennium Developmental Goals (MDG). Countries have been working to achieve MDG6, which is 'Halting HIV/AIDS by 2015 and beginning to reverse it', through three strategies including: the prevention of new HIV infection among young people; the prevention of mother to child transmission; and

improving treatment and care for children and young people who are infected (WHO, 2014).

The global prevalence of HIV/AIDS in 2013 was 0.8 percent among adults aged 15-49 years with considerable variations of the burden of the epidemic between regions and countries. For instance, although globally there has been a decline in new HIV infections, this trend was not applicable to all the regions of the world. The Caribbean with the rate of 42 percent and sub-Saharan Africa with the rate of 25 percent, were the regions that had the highest rate of decline from 2001 to 2011 (UNAIDS, 2012). Contrarily, HIV incidence inflated from 19,000 to 25,000 in the Middle East and North Africa since 2001. This accounted for more than 31 percent of increase in the region (UNAIDS, 2014). After remaining relatively stable for several years since an initial peak in 2000, the number of new infections in Eastern Europe and Central Asia started to increase again in the late 2000s. The region now has 0.6 percent of adults living with HIV. Western and Central Europe and North America have also seen an increase in the number of new HIV infections by 6 percent (UNAIDS, 2014).

Similarly, AIDS-related deaths have fallen by 35 percent globally since 2005. This decline was caused by the scaled-up antiretroviral therapy (ART) and the decrease of HIV new infection cases. Since 1995, ARTs have prevented 7.6 million deaths globally, including 4.8 million deaths in sub-Saharan Africa. They have also helped gain approximately 40.2 million life years since the start of the epidemic (UNAIDS, 2014).

Even though the incidence of HIV and the mortality of AIDS have dropped since the early 2000s, the global prevalence of HIV/AIDS has increased. The number

is rising because more people are living longer because they are receiving ARTs, alongside the number of new HIV infections, which despite the fact that is declining, is still very high (UNAIDS, 2014).

Sub-Saharan region

HIV/AIDS is a major public health concern and cause of death in Sub-Saharan Africa. In 2014, out of the 36.9 million HIV-positive people worldwide, 25.8 million people were living in sub-Saharan Africa. It was also the region that accounted for almost 70% of the global total of new HIV infections (WHO, 2014).

Populations in many parts of sub-Saharan Africa are becoming trapped in a vicious cycle of the HIV epidemic, leading to high mortality rates among young and economically productive age groups (Asamoah-Odei et al., 2004). Moreover, epidemiological evidence suggests unacceptably high HIV prevalence and incidence rates among women in the region, constituting 58 percent of all people living with HIV (UNAIDS, 2014).

A multitude of factors increase the vulnerability of people and communities to HIV acquisition including biological, behavioral, socioeconomic and cultural risks (Rameej & Daniels, 2013). Thus, interventions to control HIV should not only target individuals, but also aim to change those aspects of cultural and socioeconomic context that populations live in (Gregson et al., 2006).

1.2 Study rationale

Increasing knowledge of HIV/AIDS can be a powerful mean of fostering positive attitudes and building safe behaviors among populations. Hence, a clear

understanding about knowledge, attitudes and behaviors among any population is very important for planning to control or prevent the spread of HIV.

Furthermore, studies have proven that the transmission of HIV/AIDS is intermixed with individual behavior and social context (Chen et al., 2007; Baral et al. 2012). Indeed, without expansion of the research base in the social and behavioral sciences, and without inclusion of social and behavioral sciences as integral components of biomedical interventions, the campaign against HIV/AIDS will be incomplete and less effective than it could be (Hankins & Zaldondo 2010). Research has also shown that a wide variety of gender-based factors may influence population's risks of HIV infection (Halperin & Epstein, 2004; Hankins & Zaldondo 2010; Pongou & Serrano, 2013). However, there is shortage in the literature of comparative studies of these factors within countries, as well as between them.

1.3 Research objectives

My study is a methodological research that aims to advance knowledge about the influence of HIV-related knowledge, attitudes, and behavior, as well as women's status in two different settings on HIV risk. Through descriptive analysis and a series of logistic regression models, my research is identifying statistically proven phenomena and scalable social differences between Zimbabwe and Senegal.

The essence of asking my research questions is to yield empirical data, which indicates how these HIV-related factors and women's empowerment factors affect HIV prevalence, and how to possibly influence these factors in return. This should

ultimately help in designing and implementing tailored HIV/AIDS prevention strategies based on social and behavioral interventions.

1.4 Research Questions

In order to compare HIV-related knowledge, attitudes, and behavior between an African country with high HIV prevalence, Zimbabwe, and an African country with low HIV prevalence, Senegal, to understand the mechanism in which these components cause the HIV prevalence to be high in one country and low in the other. Secondly, to analyze cultural factors specific to women's status that has proven to be significant in increasing the risks of HIV-infection in women more than men. Lastly, to explore the causes of these phenomena as well as their impact on each country, my study addresses the following questions:

- 1) How are the HIV-related knowledge, attitudes, and behavior factors, and the women's empowerment factors, among people aged 15-49 years, in an African country with high HIV prevalence, Zimbabwe, different from an African country with low HIV prevalence, Senegal?
- 2) What are the HIV-related knowledge, attitudes, and behavior factors, and the women's empowerment factors, associated with being HIV positive in an African country with high HIV prevalence, Zimbabwe, and an African country with low HIV prevalence, Senegal?

1.5 Thesis outline

My thesis includes five chapters and I have written it using a monograph approach. The chapters are:

1. Chapter one is the introduction, and provides background on HIV/AIDS as an infection, its ways of transmission, as well as its prevention. It also contains sections introducing the global epidemic of HIV and the sub-Saharan region. This chapter also contains the study rationale, the study objectives, the research questions, and the thesis outline.
2. Chapter two presents the literature review, which I have completed for this study. It includes details about the HIV epidemic in sub-Saharan Africa, Senegal and Zimbabwe, the HIV risk factors that my study is concerned with, and discusses HIV prevention theories.
3. Chapter three explains the methodological approach that I used to answer the research questions.
4. Chapter four presents the findings and the analysis conducted for the study.
5. Chapter five discusses the findings and integrates them with theoretical framework of the study, and explores the future directions that the findings can be used for. It also presents the strength and the limitations of the study, and it includes the conclusion.

CHAPTER 2: Literature Review

2.1 The epidemic in sub-Saharan Africa

Sub-Saharan Africa has been the region that bears the highest burden of the global HIV (UNAIDS, 2014). HIV epidemics, however, have varied considerably across its sub-regions. In 2013, the HIV prevalence among people aged (15-49) was 4.5 percent, ranging across the region from 0.2 percent in Madagascar to 26.5 percent in Swaziland (WHO, 2013).

In the mid-1980s, HIV and AIDS were virtually unheard of in southern Africa. Now, it is the worst affected region and widely regarded as the 'epicenter' of the global HIV epidemic. Nine countries: Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe, have adult HIV prevalence rates of over 10 per cent. In 2012, Swaziland had the highest HIV prevalence rate of any country in the world (26.5 percent). HIV prevalence is also particularly high in Botswana (23 percent) and Lesotho (23.1 percent). South Africa remains the country with largest HIV epidemic, with over 6 million people infected (UNIADS, 2013).

Polygamous relationships, as well as multiple partners have been highlighted as key drivers of HIV transmission in these countries (Reiners & Watkins, 2010), with women disproportionately infected compared to their male counterparts (UNAIDS, 2012). Indeed, social norms shape sexual networks, which are quite extensive in some countries and cause wider spread of HIV/AIDS (Pongou & Serrano, 2013; Halperin & Epstein, 2004). Unemployment, labor migration, and displacement as a result of conflict have also contributed to the HIV epidemic in this region (Case et al., 2012).

In comparison, West Africa's HIV prevalence is categorized as relatively low and stable. West African countries have only been moderately affected by HIV and AIDS. Most countries in this sub-region have an HIV prevalence that is 2 percent or less, except for Côte d'Ivoire that has a 3.4 percent, Nigeria at 3.6 percent, Gabon at 5.2 percent and Cameroon with prevalence as high as 5.3 percent (UNAIDS, 2013). Even though Nigeria's prevalence is relatively low, it comes second to South Africa's in terms of numbers of HIV infected people. This is because of its large population (UNAIDS, 2013). The main factor of HIV transmission in West Africa is sex work. It accounts for 10-32 percent of new infections (Baral et al., 2012; UNAIDS, 2013).

Being described as moderate to high, the HIV prevalence in East Africa comes second to Southern Africa. The overall prevalence has been declining in selected areas of the sub-region. For instance, Kenya's prevalence has dropped from a high of 14 percent to 6 percent (UNAIDS, 2013). Recently, the new threat to this sub-region's HIV prevalence has been the IDUs (UNODC, 2014).

Nonetheless, progress in HIV prevention and response has been made within sub-Saharan Africa. This is due to increased investments in the HIV response by national governments and international development partners since the beginning of the millennium (Chen et al., 2007). New HIV infections declined by 39 percent between 2000 and 2014, and the number of AIDS-related deaths in sub-Saharan Africa fell by 48 percent between 2005-2014 (UNAIDS, 2014).

Due to the increase in availability of ART and improved quality of care and support for people living with HIV in sub-Saharan Africa, 10.7 million people are accessing antiretroviral treatment, up from fewer than 100 000 people in 2002. This accounts for 41 percent of all people living with HIV in the region (Cohen et al.,

2012). In addition, since 2009, there has been a 48 percent decline in new HIV infections among children (UNAIDS, 2014).

Despite the overall progress in combating HIV epidemics in sub-Saharan Africa, many challenges still face the health sector response to HIV. In the most affected parts of the region, there is a chronic shortage of human resources of health services. This is mainly because the health workers themselves are often living with HIV (Biswas, 2012). Moreover, there is high comorbidity level because of existing diseases such as tuberculosis and frequent outbreaks of other communicable diseases, further affecting the already-weakened health systems (Biswas, 2012; Case et al., 2012). Additionally, in most countries issues of high levels of stigma and discrimination related to HIV/AIDS influence national legal frameworks negatively. They make them unable to effectively uphold the rights of all HIV infected people, making them unable to access high quality HIV prevention, treatment, care and support services (Holzemer et al., 2009; Sayles, 2009; Tomaszewski, 2012).

Furthermore, HIV and AIDS have had an enormous impact on labor and productivity. The majority of people living with HIV/AIDS in this region are of working age 15-49 years old (UNAIDS, 2013). Indeed, the combined impact of the epidemic on households, healthcare and productivity has halted, even reversed economic development in parts of sub-Saharan Africa (Asamoah-Odei et al., 2004).

2.2 Senegal

Senegal, shown in **Appendix A**, is a Sahelian country of about 14.1 million of population with a national territory of 196,722 square kilometers. It lies on Africa's west coast and known for its French colonial heritage and natural attractions. The

official language of Senegal is French and the capital of the country is Dakar. Islam is the predominant religion in Senegal, as 92 percent of the country's population is estimated to be Muslim (WHO, 2014).

Senegal is bordered to the west by the North Atlantic Ocean. On land, the nation's longest border is with Mauritania to the north. To the east is the border with Mali. In the southeast is Guinea and to the south-southwest is Guinea-Bissau. Senegal has a near-enclave within its borders, with the small nation of the Gambia in its interior. Senegal is a lower middle-income country, which its economy is centered mostly on commodities and natural resources (DHS, 2011).

Unlike most countries in sub-Saharan Africa, Senegal has been a model for the HIV response in the West and Central African region. It is amongst the countries with the lowest HIV prevalence, despite the regional surrounding epidemic (USAID, 2010). In 2011, HIV prevalence among people aged 15-49 years was 0.7 percent (DHS, 2011), which was similar to the prevalence existing in 2005 (DHS, 2005). Thus, indicating the stabilization of the HIV epidemic in Senegal.

HIV in Senegal is concentrated amongst female commercial sex workers and MSM. HIV prevalence among sex workers, however, has decreased from 19.8 percent in 2006 to 18.5 percent in 2011 (UNAIDS, 2012). According to the USAID Senegal HIV/AIDS Health Profile (2010), HIV prevalence rates vary among the general population on a regional basis. For instance, the regions that border Guinea-Bissau to the south, including Kolda and Ziguinchor had more than 2 percent of HIV prevalence. Furthermore, HIV prevalence is disproportionate between the genders. It is 0.8 percent among women aged 15 to 49, which is higher than the men's with the rate of 0.5 percent (DHS, 2011).

UNAIDS (2012) attributes a number of reasons for Senegal's success in controlling the HIV epidemic, including the country's conservative sexual norms and active public and private stakeholder engagement since the initial HIV crisis in the mid-1980s. The country has also made major efforts in the past decade to scale-up access to HIV prevention, treatment, care and support for its population, with a focus on key populations at higher risk. Additionally, Senegal has championed condom use among sex workers and the general population and rates of use increased threefold within the span of a decade. Despite the success, some challenges for HIV prevention exist, such as population movement across borders, and high HIV prevalence among sex workers and MSM.

2.3 Zimbabwe

Zimbabwe is a landlocked country, covering an area of 390,757 square kilometers. It is bordered by Mozambique on the east, South Africa on the south, Botswana on the west, and Zambia on the north and northwest, as shown in **Appendix B**. It is part of a great plateau, which constitutes the major feature of the geology of southern Africa. Zimbabwe's capital is Harare. The country's economy is diversified but mining and agriculture are by far the Zimbabwe's major foreign currency earning sectors. Between 60-70 percent of Zimbabweans belong to mainstream Western Christian denominations such as Roman Catholicism, Anglicanism and Methodism (DHS, 2011).

With around 15 percent of its 14.15 million population, living with HIV, Zimbabwe is experiencing one of the harshest HIV/AIDS epidemics in the world (WHO, 2014). Zimbabwe was once one of southern Africa's most vibrant,

productive, and resilient countries. Nonetheless, the nation has faced a series of political and economic unrests over the past few decades, which have led to the excessive decline of Zimbabweans' standard of living and a breakdown in public health, education, and infrastructure. In a country that has had a tense political and social climate, it has been difficult to respond to the crisis (DHS, 2011).

Zimbabwe's high mortality and illness rates are a result of an under-resourced health delivery system, which is overstretched by the high burden of HIV, TB, and maternal and childhood illnesses (UNAIDS, 2012). The country's population is estimated to have decreased by four million people between 2002-2006 and the average life expectancy is just under 53 (UNDP, 2013). In the end of 2011, there were one million children living in Zimbabwe who had been orphaned as a result of parents dying from AIDS (UNAIDS, 2012).

Many barriers still exist to accessing HIV prevention and treatment in Zimbabwe. Due to Zimbabwe's declining economy, the country faced several challenges in making ARTs available. There has been a shortage of ARTs over the last decade. In fact, in 2002 the government declared the treatment shortage as a national emergency. Furthermore, it was reported in 2005 that the cost of ARTs quadrupled (UNAIDS, 2012). Additionally, in spite of high profile awareness campaigns in the country, HIV/AIDS remain highly stigmatized in Zimbabwe. People living with HIV are often perceived as having done something wrong, and discrimination is frequently directed at both them and their families. Thus, many people choose not to get HIV tested for the fear of being socially alienated, losing their partner or losing their job (DHS, 2011).

HIV prevalence among pregnant women aged 15-49 is 16 percent and MTCM accounts for the highest number of HIV infections, after the primary route of transmission, which is heterosexual sex (DHS, 2011; UNAIDS, 2012).

2.4 HIV-related factors

HIV knowledge plays a key role in HIV prevention. Without available vaccine or cure, public knowledge about HIV is the most fundamental tool to fight against the HIV epidemic (WHO, 1999). Several studies including a recent one in Namibia indicated that there is a significant association between people's knowledge and their attitudes towards HIV/AIDS and sexual behaviors (De Beer et al., 2012).

Similarly, people's attitudes towards HIV/AIDS influence HIV prevalence immensely in communities. A study by Sayles and colleagues (2009), found that people living with HIV experienced high levels of stigma were more than four times more likely to report poor access to care. In Nigeria, more than 1 in 5 people living with HIV reported to be refused for health services because of their HIV status (UNAIDS, 2012). Even though, reducing stigma and discrimination has been addressed at the national AIDS response in 81 percent of countries worldwide, the levels of stigma and discrimination are still unacceptably high in many countries (UNAIDS, 2010).

Sexual behaviors including early sexual debut, multiple sex partners and condom use are pivotal factors in HIV prevalence. A recent systematic review about early sexual debut as a risk factor for HIV infection among women in sub-Saharan Africa showed significant association between early sexual debut and HIV infection

(Stockl et al., 2013). Moreover, two studies in Zimbabwe demonstrated that young people having first sex intercourse before the age of 15 years had an increased risk for HIV transmission (Pettifor et al., 2004; 2009).

People who have multiple sex partners are considered to have the highest risk of acquiring HIV (Case et al., 2012). People's chances of getting HIV or other STDs are positively proportional to the number of sex partners they have (CDC, 2007). In Zambia, A study about multiple sex partners and perceived risk of HIV infection indicated that having multiple sexual partners was the strongest predictor of being HIV infected (Meekers, 2009).

Condom use is one of the most efficient methods to reduce the sexual transmission of HIV. In 1999 and in 2002, Weller and Davis conducted studies about the effectiveness of condom use in HIV prevention. The 2002 study found that the proportionate reduction in HIV seroconversion with condom use was approximately 80 percent, while the study in 1999 presented the effectiveness at 87 percent. Additionally, Pinkerton and Abramson (1997) showed that consistent use of condom was 90 to 95 percent more effective in HIV prevention and that consistent condom users were 10 to 20 times less likely to be infected with HIV when exposed to the virus, compared to inconsistent or non-users. Nonetheless, a systematic review regarding condom use in sub-Saharan Africa indicated that condom use in the region was generally rare, due to many barriers including poverty; gender and sexual norms, and beliefs and attitudes about HIV (Maticka-Tyndale, 2012). However, the study also found increasing trends of condom use among single women in many countries and increasing acceptance and condom use among some university students.

2.5 Women's Status and Empowerment

Gender roles and relations play a huge role when designing policies and programs that address population's health (UNAIDS, 2013). The HIV/AIDS epidemic has also highlighted the need to understand how gender inequalities in power and resources affect the spread of the infection (Glynn et al., 2001).

Far too many women are still powerless against the threat of HIV, especially in Sub-Saharan Africa, where women and girls represent about 60 percent of HIV infections (UNAIDS, 2012). Current HIV prevention strategies such as condoms, although effective, are not practical for women who are at risk for violence, who want to have children and those who cannot persuade their husbands or partners to use them. Therefore, women still lack an effective way to protect themselves against HIV infection (Pinkerton & Abramson, 1997; Glynn et al., 2001). In addition, gender norms related to "masculinity can encourage men to have more sexual partners and older men to have sexual relations with much younger women", putting more women in risk of HIV infection as indicated by the WHO (2013).

Furthermore, women in most African countries start having sexual intercourse younger than men, increasing their risk of contracting HIV earlier in life (Pettifor et al., 2009). In almost all Sub-Saharan the countries HIV prevalence among women peaks between 25-34 (DHS, 2013).

2.6 Theoretical framework: HIV prevention theories in health policy

While information and knowledge can play a significant role in shaping attitudes, the relationship between attitudes and behavior could be less strong.

Thus, it is the responsibility of the policy makers to use evidence-based research data to plan and implement disease prevention strategies and inform the public regarding these prevention strategies (Monroe, 2006).

Furthermore, Behaviors that place people at risk for HIV acquisition and transmission are often the result of many complex factors operating at multiple levels (Durantini, 2006). Theories of behavior change usually address one or more of these levels, which include individual, interpersonal, community, and structural and environmental factors. For instance, at a structural and policy level, the Theory of Gender and Power views the differences in power dynamics, and relationship-investment between women and men as structures, which can produce inequalities for women and increase women's risk and vulnerability to HIV (Goldman & Schmalz, 2001). While at an individual level, the Health Belief Model proposes that in order for individuals to change their behaviors they must first believe they are susceptible to a particular condition, and that the severity of that condition is serious, and finally, receive instructions on how to change their behaviors (Rosenstock et al., 1994). Many researchers and providers use a combination of factors from several theories to guide their programs.

CHAPTER 3: METHODS

3.1 Ethics clearance

In January of 2015 I received an email from the Office of Research Ethics and Integrity at the University of Ottawa with my ethics clearance. The email stated “After a discussion with a Protocol Officer, it was determined that you do not need ethics approval for your project using data from the Demographic Health Surveys Program. In accordance with Article 2.2 of the Tri-Council Policy Statement”. Reasons being that data from the DHS is legally and publically accessible to the public. Law also appropriately protects the data of the DHS.

3.2 Demographic Health Survey (DHS)

USAID founded the MEASURE DHS program in 1984. The program is implemented by Inner City Fund (ICF) International and a number of partner organizations through a contract with USAID. DHS surveys produce the nationally representative household surveys, which provide data for various monitoring and impact evaluation indicators in the areas of population, health, and nutrition among participating countries (ICF International, 2012).

There are two main types of DHS surveys. The first type is Standard DHS Surveys that are conducted about every five years with large sample sizes ranging from 5,000 to 30,000 households. The second is the Interim DHS Surveys. They focus on the collection of information on key performance monitoring indicators but may not include data for all impact evaluation measures. These surveys have shorter questionnaires with smaller sample sizes than Standard DHS surveys and

are conducted between rounds of DHS surveys. The DHS surveys consist of many different topics, including but not limited to: anemia, child health, education, HIV-related knowledge, attitudes, and behavior, HIV prevalence, household and respondent characteristics, wealth, women's empowerment, and other modules. Finally, once repeated in a country, DHS surveys provide data for longitudinal analyses (ICF International, 2012).

Selection of the countries and the variables

The two countries that I chose for this comparative study are Senegal and Zimbabwe. Even though Senegal is surrounded by countries that have high HIV prevalence, Senegal was able to keep a low HIV prevalence of less than 1 percent for more than a decade (UNAIDS, 2012). An ideal polar country to compare Senegal with would have been one of the countries of the southern African region, which have HIV prevalences higher than 20 percent (South Africa, Lesotho, Swaziland or Botswana) (WHO, 2014). The DHS records of these countries, however, are outdated, with South Africa's being the most recent conducted in 2005 (DHS, 2011). Zimbabwe ranked fifth after these countries in HIV prevalence (DHS, 2011).

In my study, the information on socio-demographic characteristics, and HIV-related knowledge, attitudes, and behavior and women's status in both Zimbabwe and Senegal were obtained from Male and Female Questionnaires. In addition, HIV status was based on the results of HIV blood testing.

Variables of HIV-related knowledge, attitudes, and sexual behavior, as well as the variables for women's status in this study were selected and categorized based on the MEASURE DHS online tools for HIV/AIDS Survey Indicators Database. The HIV/AIDS Survey Indicator Database offers an internationally accepted, consistent

method for measuring factors related to HIV prevention across countries, such as prevention and treatment spending and policies, knowledge and availability of methods of prevention, and attitudes towards people with HIV.

Furthermore, the indicators used in this database were drawn from guides from UNAIDS, the United Nation General Assembly Special Session on HIV/AIDS, the Millennium Development Goals, the President's Emergency Plan for AIDS Relief, and the Global Fund to Fight HIV/AIDS, Malaria and Tuberculosis.

It is worth noting that from 1999 to present the Standard questionnaires have several distinct advantages in measuring gender over earlier core questionnaires. First, questions on gender are based on a conceptual framework developed by the gender advisory group. This includes the treatment of gender as a social construction and the emphasis on gender inequalities resulting from the social construction of gender. Second, DHS collect nationally representative samples, providing the opportunity to generalize women's position from the samples to the general population. These surveys are especially good for providing snapshots of attitudes about gender norms in a society. Finally, DHS questions are fairly uniform and provide the potential for comparison across contexts.

3.3 Sample design

Senegal

According to the Senegal 2010-11 DHS, the survey was conducted by the National Agency of Statistics and Demography (Agence Nationale de la Statistique et de la Démographie) using a representative sample of women aged 15-49 years and

men aged 15-59 years. The sample was based on a stratified two-stage cluster design. In the first stage, enumeration areas were drawn from the 2002 General Census of Population and Housing. Probability proportional to size was used to select the clusters in each enumeration area. 391 clusters were selected, including 147 clusters in urban areas and 244 clusters in rural areas. In the second stage, a systematic sample of households was drawn from a listing of households in each of clusters, which consisted of 21 households on average per cluster. All women aged 15-49 years in the households were eligible for the individual interview. In each cluster, among the 21 households, 8 households were selected for conducting men interview. All the men aged 15-59 years in those households were eligible for the interview. All eligible men and women were also eligible for HIV testing. Three types of questionnaires, including the Household Questionnaire, the Male and the Female Questionnaires, developed from the questionnaires in the MEASURE DHS program were used in the survey (ICF International, 2012).

Zimbabwe

The sample for the 2010-11 ZDHS was designed to provide population and health indicator estimates at the national and provincial levels. The sample design allows for specific indicators, such as contraceptive use, to be calculated for each of Zimbabwe's 10 provinces (Manicaland, Mashonaland Central, Mashonaland East, Mashonaland West, Matabeleland North, Matabeleland South, Midlands, Masvingo, Harare, and Bulawayo). The sampling frame used for the 2010-11 ZDHS was the 2002 Population Census.

Administratively, each province in Zimbabwe is divided into districts and each district into smaller administrative units called wards. During the 2002

Population Census, each of the wards was subdivided into enumeration areas (EAs). The 2010-11 ZDHS sample was selected using a stratified, two-stage cluster design, and EAs were the sampling units for the first stage. Overall, the sample included 406 EAs, 169 in urban areas and 237 in rural areas. Households were the units for the second stage of sampling. A complete listing of households was carried out in each of the 406 selected EAs in July and August 2010. Maps were drawn for each of the clusters, and all private households were listed. The listing excluded institutional living facilities, such as army barracks, hospitals, and boarding schools (ICF International, 2012).

Sample weights

DHS surveys require the use of sample weights during analysis to ensure that the sample is representative. Individual sample weights are normalized separately for women and men. Thus, the total weighted number of women equals the total unweighted number of women, and the total weighted number of men equals the total unweighted number of men. Women and men are normalized separately because all non-HIV calculations are performed on women and men separately. DHS does not provide survey estimates on the joint population of women and men combined for anything other than HIV prevalence.

The normalized weight is a relative weight which is valid for estimating means, proportions and ratios, but not valid for estimating totals. It is also not valid for pooled data from different surveys. If one needs to estimate population totals based on DHS data or to pool data from different surveys together, the standard weight should be de-normalized.

3.4 Study populations

Senegal

Among 8,212 household selected for the sample, 8,029 households occupied were identified during data collection. 98 percent (7,902 households) of the existing households successfully completed the interview. Of 16,931 women aged 15-49 years within these households that were eligible for the interview, 15,473 women (92.7 percent) were interviewed. Within the eligible men aged 15-59 years (5,668), 87 percent (4,629 men) completed the interview. This study used only the data from men and women aged 15-49 years, so the sample sizes in Senegal were 4414 for men and 15688 for women.

The men's survey was conducted in a subsample of eight households per cluster. The main objective of the men's survey is to gather information on knowledge and attitudes concerning STIs and AIDS. Given that only a subsample of men aged 15-49 were interviewed, compared to typically all women of the same age, the combined sample of women and men becomes not nationally representative. The two samples of women and of men are, however, individually representative. To adjust this I had to de-normalize the weights when I pooled the women's and the men's surveys for analysis.

Zimbabwe

A representative sample of 10,828 households was selected for the 2010-11 ZDHS. All women age 15-49 and all men age 15-49 who were either permanent residents of the selected households or visitors who stayed in the household the night before the survey were eligible to be interviewed. In addition, one eligible

woman in each household was randomly selected to be asked additional questions about domestic violence.

A total of 10,828 households were selected for the sample, of which 10,166 were occupied during the survey fieldwork. The shortfall was largely due to members of some households being away for an extended period of time and to structures that were found to be vacant at the time of the interview. Of the 10,166 existing households, 9,756 were successfully interviewed, yielding a household response rate of 96 percent. A total of 9,831 eligible women were identified in the interviewed households, and 9,128 of these women were interviewed, yielding a response rate of 93 percent. Of the 8,723 eligible men identified, 7,143 were successfully interviewed, yielding response rate of 86 percent.

The principal reason for nonresponse among both eligible men and women was the failure to find them at home despite repeated visits to the households. The lower response rate among men than among women was due to the more frequent and longer absences of men from the households.

3.5 Data variables

Independent variables:

1. Socio-Demographic Characteristics

Age

The age of participants was identified by two questions: 'in what month and year were you born?' and 'how old were you at your last birthday?'. The answers of these two questions were then compared and corrected if they were inconsistent. In

the DHS data, the age was put into two variables: the current age of respondent and the age in 5-year groups. This study regrouped the age into four categories, '15-24', '25-29', '30-39', and '40-49'.

Gender

Men and women were interviewed with different sets of questionnaires. Most of questions were the same between men's questionnaire and women's questionnaire, except that women would be asked about the reproductive history and sections dealing with maternal and child health and maternal mortality. The data were also stored into different sets. However, this study used the variables (socio-demographic variables, and variables relating to HIV knowledge, attitudes, and behaviors) that were in common between male and female datasets, so they are able to be merged into just one data set by creating one more variable for Gender, which then categorized into 'Male' and 'Female'.

Residence

The type of place of residence referred to the place of household or the place where the respondents were living. It was categorized into two groups, 'Urban' and 'Rural' areas.

Education

The respondents were asked whether or not they had ever attended school. If they answered 'yes', they would be asked another question about what the highest level of school they attended. The answers were classified into four groups: 'No Education', 'Primary Education', 'Secondary Education', and 'Higher Education'.

Wealth Index

The wealth index is a composite measure of a household's cumulative living standard. It is calculated using easy-to-collect data on a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities. Generated with a statistical procedure known as principal components analysis, the wealth index places individual households on a continuous scale of relative wealth. DHS groups all interviewed households into five wealth quintiles, including 'Lowest', 'Second', 'Middle', 'Fourth', and 'Highest', to compare the influence of wealth on various population, health and nutrition indicators.

Marital Status

The respondents were asked about their marital status, and the answers were grouped into six categories: 'Never married', 'Married', 'Living together', 'Widowed, Divorced', 'Not living together'. However, this study recoded them into three groups: 'Never married', 'Married/Living together', and 'Widowed/Divorced/Not living together'.

2. Variables of HIV-related knowledge, attitudes, and sexual behavior

Variables of HIV-related knowledge, attitudes, and sexual behavior in this study were selected and categorized based on the MEASURE DHS online tools for HIV/AIDS Survey Indicators Database. The HIV/AIDS Survey Indicator Database offers an internationally-accepted, consistent method for measuring factors related to HIV prevention across countries, such as prevention and treatment spending and policies, knowledge and availability of methods of prevention, and attitudes towards people with HIV. The indicators used in this database were drawn from guides from

UNAIDS, the United Nation General Assembly Special Session on HIV/AIDS, the Millennium Development Goals, the President's Emergency Plan for AIDS Relief, and the Global Fund to Fight HIV/AIDS, Malaria and Tuberculosis.

HIV-related Knowledge

i. HIV Prevention Methods

i.a One faithful, uninfected partner

This variable was defined as 'the percent of respondents who say that people can protect themselves from contracting HIV by having sex only with one faithful, uninfected partner'. The question was 'can people reduce their chance of getting the AIDS virus by having just one uninfected sex partner who has no other sex partners?'. The answer 'yes' was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value because the respondents answered 'don't know', 'not sure', or 'depends'. The respondents who answered 'yes' to the question were those who knew that people could reduce the risk of getting HIV by having only one faithful, uninfected partner.

i.b Always use condom

This variable was defined as 'the percent of respondents who say that people can protect themselves from contracting HIV by using condoms'. The question was 'can people reduce their chance of getting the AIDS virus by using a condom every time they have sex?'. The answer 'yes' was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value. The respondents who answered 'yes' to the question were those who knew that people could reduce the risk of getting HIV by always using condom.

i.c Knowledge of HIV prevention methods – Composite of two components

This variable was defined as ‘the percent of respondents who say that people can protect themselves from contracting HIV by using condoms and having sex only with one faithful, uninfected partner’. The variable would use the two questions about HIV prevention methods, ‘can people reduce their chance of getting the AIDS virus by having just one uninfected sex partner who has no other sex partners?’, and ‘can people reduce their chance of getting the AIDS virus by using a condom every time they have sex?’. The answer ‘yes’ was scored 1, and ‘no’ was scored 0. The scores would be combined from the two components and put into two groups: ‘Score 2’ meaning that the respondents knew well about HIV prevention methods, and ‘Score <2’ meaning that the respondents knew just one correct method or did not know any correct methods.

ii. Beliefs about HIV

ii.a A healthy looking person can have HIV

This variable was defined as ‘the percent of respondents who say that a healthy looking person can have HIV’. The question was ‘is it possible for a healthy-looking person to have the AIDS virus?’. The answer ‘yes’ was coded 1, and ‘no’ was coded 0. The ‘don’t know’ category was put as missing value. The respondents who answered ‘yes’ to the question were those who knew that a healthy looking person could have HIV.

ii.b Can NOT get HIV from mosquito bites

This variable was defined as ‘the percent of respondents who reject the misconception that HIV can be transmitted by mosquito bites’. The question was ‘can people get the AIDS virus from mosquito bites?’. The answer ‘yes’ was coded 1,

and 'no' was coded 0. The 'don't know' category was put as missing value. The respondents who answered 'no' to the question were those who knew that HIV could not be transmitted by mosquito bites.

ii.c Can NOT get HIV by sharing food

This variable was defined as 'the percent of respondents who reject the misconception that a person can become infected by sharing food with a person who has HIV'. The question was 'can people get the AIDS virus by sharing food with a person who has AIDS?'. The answer 'yes' was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value. The respondents who answered 'no' to the question were those who knew that HIV could not be transmitted by sharing food with a person having HIV.

ii.d Can NOT get HIV by supernatural means

This variable was defined as 'the percent of respondents who reject the misconception that HIV can be transmitted by supernatural means'. The question was 'can people get the AIDS virus because of witchcraft or other supernatural means?'. The answer 'yes' was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value. The respondents who answered 'no' to the question were those who knew that HIV could not be transmitted by supernatural means.

iii. Comprehensive correct knowledge about HIV

This variable was defined as 'the percent of respondents who correctly identify the two major ways of preventing the sexual transmission of HIV (using condoms and limiting sex to one faithful, uninfected partner), who reject the two most common local misconceptions about HIV transmission (mosquito bites and

sharing food), and who know that a healthy-looking person can have HIV'. The questions included 1. 'can people reduce their chance of getting the AIDS virus by having just one uninfected sex partner who has no other sex partners?'; 2. 'can people reduce their chance of getting the AIDS virus by using a condom every time they have sex?'; 3. 'can people get the AIDS virus from mosquito bites?'; 4. 'can people get the AIDS virus by sharing food with a person who has AIDS?'; 5. 'is it possible for a healthy-looking person to have the AIDS virus?'. For the first, second, and fifth questions, the answer 'yes' was given 1 score, and the answer 'no' was 0. For the third and fourth questions, the answers were recoded, and scored 1 if 'no', 0 if 'yes'. Then, the scores would be summed up from the five components, and set into two categories: 'Score 5', meaning the persons had a comprehensive correct knowledge about HIV, and 'Score <5', meaning the persons did not have a comprehensive correct knowledge about HIV.

iv. Mother-To-Child Transmission of HIV

iv.a Knowledge of MTCT of HIV - Through breastfeeding

This variable was defined as 'the percent of respondents who report that HIV can be transmitted from mother to child through breastfeeding'. The question was 'can the virus that causes AIDS be transmitted from a mother to her baby through breastfeeding?'. The answer 'yes' was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value. The respondents who answered 'yes' to the question were those who knew that the child could get HIV from the mother through breastfeeding.

iv.b Knowledge of Prevention of MTCT of HIV

This variable was defined as ‘the percent of respondents who report that MTCT of HIV can be prevented through ART during pregnancy and avoiding breastfeeding’. Two questions were used for this variable: ‘are there any special drugs that a doctor or a nurse can give to a woman infected with the AIDS virus to reduce the risk of transmission to the baby?’, and ‘can the virus that causes AIDS be transmitted from a mother to her baby through breastfeeding?’. The answer ‘yes’ was scored 1, and ‘no’ was scored 0. The scores from the two questions would be summed up. The ‘Score 2’ meant that the persons knew the means to prevent MTCT of HIV, and ‘Score <2’ meant that the persons did not know all the means to prevent MTCT of HIV.

HIV-related Attitudes

i. Stigma and Discrimination associated with HIV

i.a Buy fresh vegetables

This variable was defined as ‘the percent of respondents who say they would buy fresh vegetables from a vendor whom they knew was HIV positive’. The question was ‘would you buy fresh vegetables from a shopkeeper or vendor if you knew that this person had the AIDS virus?’. The answer ‘yes’ was coded 1, and ‘no’ was coded 0. The ‘don’t know’ category was put as missing value. The respondents who answered ‘yes’ to the question were those who accepted to buy fresh vegetables from a vendor with HIV.

i.b NO secretive

This variable was defined as ‘the percent of respondents who say that they would not want to keep the HIV-positive status of a family member a secret’. The

question was 'if a member of your family got infected with the AIDS virus, would you want it to remain a secret or not?'. The answer 'yes' was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value. The respondents who answered 'no' to the question were those who would not want to keep secret about family member's HIV status.

i.c Willing to care

This variable was defined as 'the percent of respondents saying that they would be willing to care for a family member who became sick with HIV'. The question was 'If a member of your family became sick with AIDS, would you be willing to care for her or him in your own household?'. The answer 'yes' was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value. The respondents who answered 'yes' to the question were those who would take care of a family member with HIV.

i.d A female teacher allowed to teach

This variable was defined as 'the percent of respondents who say that a female teacher who is HIV positive but not sick should be allowed to continue teaching in school'. The question was 'In your opinion, if a female teacher has the AIDS virus but is not sick, should she be allowed to continue teaching in the school?'. The answer 'yes' was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value.

The respondents who answered 'yes' to the question were those who agreed that a female teacher who was HIV positive but not sick should be allowed to continue teaching in school.

i.e Accepting all attitudes - Composite of 4 components

This variable was defined as 'the percent of respondents expressing accepting attitudes towards people with HIV'. It included four component questions: 1. 'if a member of your family became sick with AIDS, would you be willing to care for her or him in your own household?', 2. 'would you buy fresh vegetables from a shopkeeper or vendor if you knew that this person had the AIDS virus?', 3. 'in your opinion, if a female teacher has the AIDS virus but is not sick, should she be allowed to continue teaching in the school?', 4. 'if a member of your family got infected with the AIDS virus, would you want it to remain a secret or not?'. For the first, second, and third questions, the answer 'yes' was given 1 score, and the answer 'no' was 0. For the fourth question, the answers were recoded, and scored 1 if 'no', 0 if 'yes'. Then, the scores would be summed up from the four components, and set into two categories, 'Score 4', meaning that the respondents accepted all four attitudes towards people living with HIV, and 'Score <4', meaning that the respondents did not accept all four attitudes towards people living with HIV.

ii. Attitudes towards negotiating safer sex

ii.a Refuse to have sex

This variable was defined as 'the percent of respondents who believe that, if the husband has a STD, a wife can refuse to have sex with him'. The question was 'if a wife knows her husband has a disease that she can get during sexual intercourse, is she justified in refusing to have sex with him'. The answer 'yes' was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value. The respondents who answered 'yes' to the question were those who agreed that a woman had a right to refuse to have sex with her husband if he had a STD.

ii.b Ask husband to use condom

This variable was defined as ‘the percent of respondents who believe that, if the husband has a STD, a wife can propose condom use’. The question was ‘if a wife knows her husband has a disease that she can get during sexual intercourse, is she justified in asking that they use a condom when they have sex?’. The answer ‘yes’ was coded 1, and ‘no’ was coded 0. The ‘don’t know’ category was put as missing value. The respondents who answered ‘yes’ to the question were those who agreed that a woman had a right to ask her husband to use condom if he had a STD.

ii.c Negotiate safer sex with husband

This variable was defined as ‘the percent of respondents who believe that, if her husband has an STD, a wife can either refuse to have sex with him or propose condom use’. Two questions, ‘if a wife knows her husband has a disease that she can get during sexual intercourse, is she justified in refusing to have sex with him’ and ‘if a wife knows her husband has a disease that she can get during sexual intercourse, is she justified in asking that they use a condom when they have sex?’, were used for this variable. The answer ‘yes’ was given 1 score, and ‘no’ 0 score. The new variable that had the two components were created with two categories, ‘Score 0’ meaning that the respondents did not think a woman should have the right to negotiate safer sex with her husband, and ‘Score ≥ 1 ’ meaning that they accepted that a woman could ask her husband to either use condom or refuse to have sex with him if he had a STD.

iii. Adult support of education on condom use for youth

This variable was defined as ‘the percentage of adults over the age of 18 years who are in favor of young people aged 12-14 years being educated about

using a condom to prevent HIV'. The question was 'should children aged 12-14 years be taught about using a condom to avoid getting AIDS?'. The answer 'yes' was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value. The respondents who answered 'yes' to the question were those who agreed that condom education should have been provided to children aged 12-14 years.

Sexual Behavior

i. First sex intercourse

i.a Median age at first intercourse

This variable was defined as 'the age by which one half of people have had penetrative sex (median age)'. The question was 'how old were you when you had sexual intercourse for the very first time?'. The age was recorded as numeric. In this variable, the median age would be calculated. The mean age was not used because mean is sensitive to extreme values and to the ranges of ages of the persons included in the survey (Irala et al., 2011). Those who answered 'have never had sex' and 'having sex at first union' would not be included since they did not specify the age.

i.a Sex before the age of 15 years

This variable was defined as 'the percentage of people who have had sex before the age of 15 years'. The age of first sex intercourse would be grouped into two categories: <15 and ≥15. For those who answered 'have never had sex' were classified into the group of ≥15, while those who said 'having sex at first union' without specifying the age would be excluded.

ii. Sexual partnerships

ii.a Multiple sex partners

This variable was defined as ‘the percentage of women and men aged 15-49 years who have had sexual intercourse with more than one partners in the last 12 months’. The question was ‘in total, with how many different people have you had sexual intercourse in the last 12 months?’. The answers were recorded as numeric variable, which were then recoded in this study into categorical variable with two groups: having more than one partner, and having one or no partner. Those who had more than one partners were considered as having higher risk sex.

ii.b Condom use with the most recent partner

This variable was defined as ‘the percent of respondent who use condom with the most recent partner every time they have sex in the last 12 months’. The question was ‘was a condom used every time you had sexual intercourse with your most recent partner in the last 12 months?’. The answer ‘yes’ was coded 1, and ‘no’ was coded 0. The ‘don’t know’ category was put as missing value. The respondents who answered ‘yes’ to the question were those who always used condom during sexual intercourse with their last partner in the last 12 months.

iii. Commercial sex

The questions about commercial sex were only included in male questionnaire.

iii.a Paid for sex in the last 12 months

This variable was defined as ‘the percent of male respondents reporting sex with a sex worker in the last 12 months’. The question was ‘in the last 12 months, did you pay anyone in exchange for having sexual intercourse?’. The answer ‘yes’

was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value. The respondents who answered 'yes' to the question were those who paid for sex in the last 12 months.

iii.b Condom use every time paid for sex

This variable was defined as 'the percent of male respondents reporting condom use every time they had sex with a sex worker in the last 12 months'. The question was 'was a condom used during sexual intercourse every time you paid someone in exchange for having sexual intercourse in the last 12 months?'. The answer 'yes' was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value. The respondents who answered 'yes' to the question were those who always used condom when paying for sex in the last 12 months.

3. Selected variables of women's status and empowerment

These questions about women's status were only included in female questionnaire.

i. Women's attitudes toward wife beating by husbands

This variable was defined as 'Women's attitudes toward wife beating by husbands'. This question was subdivided into five questions and presented as 'sometimes a husband is annoyed or angered by things that his wife does. In your opinion, is a husband justified in hitting or beating his wife in the following situations: If she goes out without telling him?, If she neglects the children?, If she argues with him?, If she refuses to have sex with him?, If she burns the food?'. The answer 'yes' was coded 1, and 'no' was coded 0. The 'don't know' category was put as missing value.

By presenting women with different scenarios, this question evaluates the acceptability of spousal violence among women. The degree of acceptability of such violence provides insight into women's attitudes with regards to gender roles and their sense of entitlement with regard to their own rights.

ii. Hurdles faced by women in accessing health care for themselves

This variable was defined as 'Hurdles faced by women in accessing health care for themselves'. The question was subdivided into four yes or no questions and presented as 'Many different sectors can prevent women from getting medical advice or treatment for themselves. When you are sick and want to get medical advice or treatment, is each of the following a big problem or not?: Getting permission to go; Getting money needed for treatment; The distance to the health facility; Having to take transport; Not wanting to go alone'. The answer 'yes' was coded 1, and 'no' was coded 0.

Several barriers-cultural, social, and financial- can prevent women from accessing health care for themselves. This question helps to identify some of these barriers. The information can help inform interventions designed to increase women's access to and use of health services.

iii. Participation in decision-making

This variable was defined as 'Women's participation in decision making'. The women's were asked 'Who, between them and another person, usually makes the decisions about various issues'. The answer would be grouped into two categories: 'themselves' and 'other person'. Women were asked about three issues: 'women's own health', 'making major household purchases', 'visits to her family and relatives'.

This question helps to assess a woman's status through her involvement in decision-making. Women's participation in decisions that affect their lives is an important indicator of their empowerment.

Dependent Variable

1. HIV Status

Respondents' HIV status was identified by the result of blood test for HIV. Before collecting the sample, HIV consent statement explained the objective of the test and how the sample would be collected; informed prospective subjects and/or their caretakers that the testing process was anonymous and so their result would not be available to them; advised them of the availability of free voluntary counseling and testing services; and requested permission for the test to be carried out. At least three blood spots from a finger prick on a special filter paper card were collected, and then a unique random identification number (bar code) of each individual was labeled on the paper card, the questionnaire, a field tracking form. The results of blood testing were entered in a separated data file. The result could be linked in the data to other information about the subject, but persons could not be identified. There were three categories of HIV status: 'HIV negative', 'HIV positive', and 'HIV2 positive'. Due to a very small number, 'HIV2 positive' was recoded to 'HIV positive'. Thus, this study would have only two categories, 'HIV negative' and 'HIV positive'.

I used Statistical Package for Social Scientists (SPSS) version 22 as the software program to manage and analyze the DHS data. (.05) of significance level was used for all types of analysis.

CHAPTER 4: Analysis and Results

1. Descriptive statistics

To answer the first of my research questions, I used descriptive analysis. To provide the descriptive characteristics of all independent and dependent variables of my study, I ran chi-square tests with p-value to compare the statistical significance of each variable between Zimbabwe and Senegal.

1.1 HIV Prevalence

Table 1.1 presents the HIV prevalence in Zimbabwe in (2010-11) and Senegal in (2010-11) amongst people aged 15-49 years. HIV prevalence is significantly different between the two countries, as Zimbabwe's prevalence at (22 percent) is much higher than Senegal's at (<1 percent).

Table 1.1: HIV prevalence among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-11)

HIV Status	Zimbabwe		Senegal		p-value
	N	(%)	N	(%)	
HIV negative	12036	(77.9)	9378	(99.1)	<.001*
HIV positive	3395	(22.3)	84	(0.9)	
<i>Total</i>	15431	(100)	9462	(100)	

Table 1

* p-value <.05

1.2 Socio-Demographic Characteristics

Table 1.2 presents the descriptive analysis of the Socio-demographic characteristics of people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-11). The distribution between Age, Gender, Residence, Education, Wealth Index and Marital Status were significantly different between Zimbabwe and Senegal (p-values <.001).

In both countries, people in the age group of 15-24 years represented almost half of the population, with (42.8 percent) in Zimbabwe and (44.4 percent) in Senegal. Additionally, both countries had more respondents in rural areas than in urban areas. Moreover, in Senegal, (57.5 percent) of the population had not attended school, while (67.5 percent) of the population in Zimbabwe attended secondary education. Additionally, more people in Zimbabwe live in the fourth and the highest wealth index, while more in Senegal live in the lowest, second and third. Finally there were more unmarried couples in Zimbabwe than in Senegal. Finally, both countries had the highest proportion of people who were married or living together among all marital status, (62.1 percent) in Senegal and (57.0 percent) in Zimbabwe.

Table 1.2: Socio-demographic characteristics among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-11)

Age	Zimbabwe		Senegal		p-value
	N	(%)	N	(%)	
15-24	6968	(42.8)	8921	(44.4)	<.001*
25-29	2897	(17.5)	3342	(16.6)	
30-39	4096	(24.8)	4830	(24.0)	
40-49	2481	(14.9)	3009	(15.0)	
Gender					
Men	7493	(46.0)	4414	(22.0)	<.001*
Women	9158	(54.0)	15688	(78.0)	
Residence					
Urban	5845	(36.0)	8077	(40.2)	<.001*
Rural	10426	(64.0)	12025	(59.8)	
Education					
No education	268	(1.60)	11550	(57.5)	<.001*
Primary	4076	(25.0)	4304	(21.4)	
Secondary	10993	(67.5)	3991	(19.9)	
Higher	943	(5.7)	257	(1.3)	
Wealth Index					
Lowest	2681	(16.0)	4740	(23.6)	<.001*
Second	2810	(17.3)	4520	(22.5)	
Middle	3052	(18.7)	4633	(23.0)	
Fourth	3737	(23.0)	3513	(17.5)	
Highest	4064	(25.0)	2696	(13.4)	
Marital Status					
Never married	5418	(33.2)	6862	(34.1)	<.001*
Married/Live together	9287	(57.0)	12475	(62.1)	
Widowed/Divorced/ Not living together	1571	(9.8)	765	(3.8)	
Total	16,271	100	20102	100	

Table 2

* p-value <.05

1.3 HIV-related Knowledge, Attitudes, and Behavior

1.3.1 HIV-related Knowledge

Table 1.3.1 presents the descriptive characteristics of HIV-related knowledge among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-2011). For HIV prevention methods, Zimbabwe had lower percentage of respondents who said that people could protect themselves from contracting HIV by having sex only with one faithful, uninfected partner (90.5 percent), lower percentage of respondents who said that people could protect themselves from contracting HIV by using condoms (81.9%), and lower percentage of respondents who knew both HIV prevention methods (using condoms and having sex only with one faithful, uninfected partner) (77.6 percent), compared to Senegal (93.9 percent, 86.6 percent, and 83.3 percent respectively).

For beliefs about HIV, (87.1 percent) of the respondents in Zimbabwe said that a healthy-looking person could have the AIDS virus, which were significantly higher than the percent of Senegalese people who said so (78.2%). Only 55.6 percent of people in Senegal believed that they could not get HIV from mosquito bites, which is much lower than the number in respondents that believed the same in Zimbabwe (78.2 percent). The difference between the countries was statistically significant (p -value $<.001$). Zimbabwe had significant higher percentage of respondents who knew that HIV could not be transmitted by sharing food with a person who has AIDS (85.3 percent), compared to Senegal (82.8 percent), but lower percentage (91.9 percent) of respondents who rejected that they could get HIV by supernatural means than Senegal (96.4 percent).

People in Zimbabwe had a better comprehensive correct knowledge of HIV/AIDS with score 5 (57.1 percent) than Senegal (39.1%), and the difference was statistically significant (p-value <.001). Regarding MTCT of HIV, respondents in Zimbabwe knew significantly better than Senegalese people. There were about (77.3 percent) of people in Zimbabwe who knew that HIV could be transmitted through breastfeeding, while about (71 percent) of respondents in Senegal knew this. Moreover, Zimbabwe had higher percentage of respondents who knew that MTCT could be prevented by ART and by avoiding breastfeeding (75.9 percent), compared to Senegal (63.8 percent).

Table 1.3.1: Descriptive characteristics of HIV-related knowledge among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-11)

	Zimbabwe		Senegal		p-Value
	N	(%)	N	(%)	
HIV Prevention Methods					
One faithful, uninfected partner	14652	(90.5)	16968	(93.9)	<.001*
Using condom always	13350	(81.9)	13839	(86.6)	<.001*
Knowledge of HIV prevention methods (Score 2) ^a	12698	(77.6)	13126	(83.3)	<.001*
Beliefs about HIV					
A healthy looking person can have HIV	14164	(87.1)	13203	(78.2)	<.001*
Can NOT get HIV from mosquito bites	12698	(78.2)	9335	(55.6)	<.001*
Can NOT get HIV by sharing food	13838	(85.3)	14050	(82.8)	<.001*
Can NOT get HIV by supernatural means	14978	(91.9)	17034	(96.4)	<.001*
Comprehensive Correct Knowledge about HIV					
Comprehensive Correct Knowledge (Score 5) ^b	9280	(57.1)	5323	(39.1)	<.001*
Mother-To-Child Transmission of HIV					
MTCT through breastfeeding	12535	(77.3)	11041	(71.0)	<.001*
Prevention of MTCT (Score 2) ^c	12372	(75.9)	9909	(63.8)	<.001*

Table 3

* p-value <.05;

MTCT: mother-to-child-transmission

a one faithful, uninfected partner + always use condom

b one faithful, uninfected partner + always use condom+ a healthy looking person can have HIV + cannot get HIV from mosquito bites + cannot get HIV by sharing food

c MTCT can be prevented by antiretroviral therapy + avoid breastfeeding

1.3.2 HIV-related Attitudes

Table 1.3.2 demonstrates the descriptive characteristic of HIV-related attitudes among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-2011). For stigma and discrimination associated with HIV, overall, people in Zimbabwe had more positive attitudes toward people living with HIV than those in Senegal. The percentages of respondents in Zimbabwe, who would buy vegetables from a vendor with HIV, who did not want to keep secret about their family member status of HIV positive, who were willing to care for a family member with AIDS, and who agreed that a female teacher with HIV positive, but not sick, should be allowed to continue teaching at school were significantly higher than those in Senegal (p-values <.001). About (39.1 percent) of Zimbabwean people accepted all the four attitudes mentioned above, while only (3.5 percent) of Senegalese people accepted these attitudes.

For attitudes toward negotiating safer sex, a greater percentage of Senegalese people (82.4 percent) agreed that wife was justified to refuse having sex with husband if he had a STD than in Zimbabwe (68.1 percent), and the difference was statistically significant (p-value <.001). The proportion of people in Zimbabwe who agreed that wife could ask husband to use condom if he had a STD was (85.3 percent), which was significantly higher than that in Senegal (82.8%). The percent of people who agreed with the women's ability to negotiate safer sex with husband was significantly higher in Zimbabwe (87 percent) than Senegal (65.4 percent). About (49.1) percent of adults in Zimbabwe aged 18-49 years supported condom education among youth aged 12-14 years, while there was (46 percent) of Senegalese adults supporting condom education.

Table 1.3.2: Descriptive characteristics of HIV-related attitudes among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-11)

	Zimbabwe		Senegal		p-value
	N	(%)	N	(%)	
Stigma and discrimination associated with HIV					
Buy fresh vegetables	11826	(76.6)	7711	(41.0)	<.001*
NO secretive	9181	(56.3)	3787	(20.3)	<.001*
Willing to care	14161	(94.3)	15489	(83.7)	<.001*
A female teacher allowed to teach	11982	(84.6)	9951	(54.4)	<.001*
Accepting all attitudes (Score 4) ^a	6380	(39.1)	619	(3.5)	<.001*
Attitudes towards negotiating safer sex					
Refuse to have sex	11070	(68.1)	3402	(82.4)	<.001*
Ask husband to use condom	13886	(85.3)	15356	(82.8)	<.001*
Negotiate safer sex with husband (Score ≥ 1) ^b	13538	(87.0)	3402	(65.4)	<.001*
Adult (15-49 years old) support of education on condom use for youth (12-14 years old)					
Condom education	7993	(49.1)	6996	(46.0)	<.001*

Table 4

* p-value <.05

a buy fresh vegetables +no secretive + willing to care + a female teacher allowed to teach

b either refuse to have sex or ask husband to use condom

1.3.3 Sexual Behavior

Table 1.3.3 demonstrates the descriptive characteristic of sexual behavior among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-2011). About (9 percent) of people in Senegal had sex before the age of 15 years, compared to about (2 percent) in Zimbabwe. For sexual partnerships, the percentage of people who had more than one partners in the last 12 months in Zimbabwe (4.4 percent) was higher than that in Senegal (2.7%) with a significant difference (p-value <.001). By contrast, there was a significantly lower proportion of Zimbabwean people who used condom with their most recent partner (48 percent), compared to Senegalese people (84.3 percent).

Regarding commercial sex, the percentage of Zimbabwean men who paid for sex in the last 12 months were (1.1 percent) and who used condom every time paid for sex (99.1 percent), and in Senegal the percentages were (1.8 percent, 65.5 percent, respectively).

Table 1.3.3: Descriptive characteristics of sexual behavior among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-11)

	Zimbabwe		Senegal		
First sex intercourse					
	N	(%)	N	(%)	p-value
Sex before the age of 15 years	319	(1.96)	1242	(9.3)	<.001*
Sexual Partnerships					
Multiple sex partners (>1)	717	(4.4)	536	(2.7)	<.001*
Condom use with the most recent partner	7814	(48.0)	847	(84.3)	<.001*
Commercial Sex					
Paid for sex in the last 12 months ⁺	183	(1.1)	43	(1.8)	.002*
Condom use every time paid for sex ⁺	161	(99.1)	19	(65.5)	<.001*

Table 5

* p-value <.05

+ Men only, female data is unavailable.

1.4 Women's status and empowerment

Table 1.4 demonstrates the descriptive characteristic of selected women's empowerment variables among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-2011).

Women in Zimbabwe seem to have much higher tendency to disagree with wife-beating scenarios by husband. (22.3 percent) of the population agree that a husband should beat his wife if she goes out without telling him, compared to (39.9 percent) in Senegal. In Zimbabwe the percentages were: (21.4 percent) for neglecting the children, (15.6 percent) for arguing with him, (16.9 percent) for refusing to have sex with him, and (7.5 percent) if she burns the food. Compared to (40.1 percent, 44.5 percent, 46 percent, and 24.4 percent) respectively.

The biggest hurdle that faced by Zimbabwean and Senegalese women in accessing health care for themselves seem to be 'getting money needed for treatment' with a percentage of around (50 percent for both countries). 'Getting permission to go' is not a big hurdle to Zimbabwean women with a percentage of (7.8 percent) compared to Senegal with (17.9 percent).

Furthermore, women in Zimbabwe seem to have greater participation in decision making about their own health (84.2 percent), household purchases (87 percent) and visiting family and relatives (88.6 percent). Compared to Senegalese women with percentages of (30.6 percent, 26.1 percent and 40.8 percent) respectively.

Table 1.4: Descriptive characteristics of selected women's empowerment variables among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-11).

	Zimbabwe		Senegal		p-value
	N	(%)	N	(%)	
Women's attitudes toward wife-beating by husbands					
If she goes out without telling him?	3630	(22.3)	8021	(39.9)	<.001*
If she neglects the children?	3484	(21.4)	8060	(40.1)	<.001*
If she argues with him?	2540	(15.6)	8945	(44.5)	<.001*
If she refuses to have sex with him?	2751	(16.9)	9247	(46.0)	<.001*
If she burns the food?	1221	(7.5)	4905	(24.4)	<.001*
Hurdles faced by women in accessing health care for themselves					
Getting permission to go	1270	(7.8)	3598	(17.9)	<.001*
Getting money needed for treatment	8140	(50.1)	10232	(50.9)	<.003*
The distance to the health facility	5768	(34.2)	6332	(31.5)	<.001*
Not wanting to go alone	2279	(14.0)	3176	(15.8)	<.001*
Women's participation in decision making					
Women's own health	13707	(84.2)	6151	(30.6)	<.001*
Making major household purchases	14246	(87.5)	5247	(26.1)	<.001*
Visits to hear family and relatives	14424	(88.6)	8202	(40.8)	<.001*

Table 6

* p-value <.05

2. Logistic regression

To answer my second research question, binary logistic regression analysis was conducted. I used univariate and multivariate analysis to analyze the associations between the HIV-related knowledge, attitudes, and behavior and HIV status, as well as between the selected women's empowerment factors and HIV status in both countries. Odds ratios and p-values were calculated to find the associations and to compare them between the two countries.

2.1 Associations between HIV Status and HIV-related Knowledge, Attitudes, and Behavior

2.1.1 Univariate analysis

Table 2.1.1 is the results of univariate analysis that show the associations between HIV status and selected variables of HIV-related knowledge, attitudes, and behavior among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-2011).

In Zimbabwe, among all the selected variables, only six variables showed the significant associations. Those who had knowledge of HIV prevention methods (OR 1.133, p-value .004), and knowledge of prevention of MTCT (OR 1.282, p-value <.001); supported for condom education for youth (OR 1.813, p-value <.002); had more than one sex partners (OR 1.321, p-value <.001); paid for sex in the last 12 months (OR 1.615, p-value .002); and had any STD in the last 12 months (OR 2.629, p-value <.001) were more likely to be HIV positive people. On the other hand, people who had sex before the age of 15 years (OR .235, p-value <.001), were less likely to be HIV-infected persons.

In Senegal, only two variables had significant associations. People who had sex before the age of 15 years (OR 3.212, p-value <.001), and had more than one sex partners in the last 12 months (OR 2.642, p-value .010), were more likely to be people with HIV positive.

Table 2.1.1: Univariate Results of Differences between HIV-related knowledge, attitudes, and behavior among people aged 15-49 years in Zimbabwe (2010-2011) and Senegal (2010-11)

	Zimbabwe		Senegal	
	OR	p-value	OR	p-value
Knowledge of HIV prevention methods (Score2)	1.133	0.004*	0.440	0.221
Comprehensive correct knowledge (Score5)	0.622	0.342	0.639	0.672
Knowledge of prevention of MTCT (Score2)	1.282	<0.001*	1.176	0.917
Accepting all attitudes (Score4)	1.092	0.865	0.653	0.176
Negotiate safe sex (Score≥1)+	0.921	0.248	1.008	0.134
Condom education for youth	1.813	0.002*	0.719	0.325
Sex before the age of 15	0.235	<0.001*	3.212	<0.001*
Multiple sex partners (>1)	1.321	<0.001*	2.642	0.010*
Condom use with the most recent partner	0.348	0.543	1.190	0.965
Paid for sex within the last 12 months +	1.615	0.002*	a	
Condom use every time paid for sex+	0.321	0.345	a	

Table 7

* p-value <.05;

MTCT: mother-to-child-transmission

+ men only, female data is not available;

a no data for respondents with HIV positive in this variable

2.1.2 Multivariate analysis:

Table 2.1.2 is the results of multivariate analysis that show the associations between HIV status and selected variables of HIV-related knowledge, attitudes, and behavior among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-2011) controlled for socio-demographic characteristics (Age, Gender, Residence, Education, Wealth Index, and Marital Status).

In Zimbabwe, after adjusting for socio-demographic characteristics, only two variables showed significant associations. It was more likely that people who supported condom education for youth (OR 1.361, p-value <.001), had more than one sex partners (OR 1.117, p-value <.001), to be HIV-infected people.

In Senegal, there was only one variable that showed significant associations after being controlled for socio-demographic characteristics. People who had more than one partners (OR 2.779, p-value .019), were more likely to be infected with HIV.

Table 2.1.2: Multivariate Results of Differences between HIV-related knowledge, attitudes, and behavior among people aged 15-49 years in Zimbabwe (2010-2011) and Senegal (2010-11) controlled for socio-demographic characteristics (Age, Gender, Residence, Education, Wealth Index, and Marital Status)

	Zimbabwe			Senegal		
	OR	Adjusted p-value	Unadjusted p-value ^c	OR	Adjusted p-value	Unadjusted p-value ^c
Knowledge of HIV prevention methods (Score2)	1.093	0.733	0.004*	0.178	0.405	0.221
Comprehensive correct knowledge (Score5)	0.971	0.712	0.342	0.358	0.548	0.672
Knowledge of prevention of MTCT (Score2)	1.727	0.724	<0.001*	0.885	0.602	0.917
Accepting all attitudes (Score4)	0.605	0.385	0.865	0.424	0.395	0.176
Negotiate safe sex (Score≥1)+	0.483	0.204	0.248	0.598	0.788	0.134
Condom education for youth	1.361	<.001*	0.002*	0.708	0.385	0.325
Sex before the age of 15	1.239	0.462	<0.001*	1.491	0.08	<0.001*
Multiple sex partners (>1)	1.117	<.001*	0.543	2.779	.019*	0.010*
Condom use with the most recent partner	0.669	0.977	0.002*	0.577	0.845	0.965
Paid for sex within the last 12 months +	1.127	0.11	0.345	a		
Condom use every time paid for sex+	b			a		

Table 8

* p-value <.05

MTCT: mother-to-child-transmission;

+ men only, female data is not available

a no data for respondents with HIV positive in this variable

b no data for respondents in some categories of demographic and socioeconomic variables

c unadjusted univariate p-value was added for comparison

2.2 Associations between HIV Status and selected women's empowerment variables

2.2.1 Univariate analysis

Table 2.2.1 is the results of univariate analysis that show the associations between HIV status and selected women's empowerment variables among people aged 15-49 years between Zimbabwe (2010-2011) and Senegal (2010-2011).

In Zimbabwe, among the selected variables, four variables showed the significant associations. Women who agreed that a husband should beat his wife if she neglects the children (OR 1.704, p-value <.001), women who agreed that a husband should beat his wife if she argues with him (OR 1.451, p-value <.001); women who agreed that a husband should beat his wife if she refuses to have sex with him (OR 1.198, p-value .022), were more likely to be HIV positive people. On the other hand. Women who participate in decision making over their own health (OR .650, p-value .006), were less likely to be HIV-infected persons.

In Senegal, only one variable had significant associations. Women who participate in decision making over their own health (OR 2.629, p-value <.001), were more likely to be people with HIV positive.

Table 2.2.1: Univariate analysis of associations between selected women's empowerment variables and HIV status among people aged 15-49 years in Zimbabwe (2010-2011) and Senegal (2010-11)

	Zimbabwe		Senegal	
	OR	p-value	OR	p-value
Women's attitudes toward wife-beating by husbands				
If she goes out without telling him?	0.957	0.131	0.909	0.733
If she neglects the children?	1.704	<0.001*	1.994	0.283
If she argues with him?	1.451	<0.001*	1.176	0.729
If she refuses to have sex with him?	1.198	0.022*	1.653	0.176
If she burns the food?	0.055	0.319	0.008	0.134
Hurdles faced by women in accessing health care for themselves				
Getting permission to go	0.079	0.695	0.271	0.642
Getting money needed for treatment	1.332	0.992	0.375	0.515
The distance to the health facility	1.585	0.289	0.249	0.348
Not wanting to go alone	0.091	0.883	0.227	0.314
Women's participation in decision making				
Women's own health	.650	.006*	2.629	<.001*
Making major household purchases	.981	.675	1.281	0.582
Visits to her family and relatives	1.021	.735	.940	.803

Table 9

* p-value <.05

2.2.2 Multivariate analysis

Table 2.2.2 shows the multivariate analysis of associations between selected women's empowerment variables and HIV status controlled for socio-demographic characteristics (Age, Gender, Residence, Education, Wealth Index, and Marital Status) among people aged 15-49 years in Zimbabwe (2010-2011) and Senegal (2010-11).

After adjusting for socio-demographic characteristics, only one variable showed significant associations in Zimbabwe. Women who participate in decision making over their own health (OR .650, p-value .011), were less likely to be HIV-infected persons.

In Senegal, two variables had significant associations. Women who participate in decision making over their own health (OR 1.969, p-value <.001), and women who getting money needed for treatment is a hurdle they face in accessing health care (OR 1.174, p-value 0.003), were more likely to be HIV positive.

Table 2.2.2: Multivariate analysis of associations between HIV status and selected women's empowerment variables controlled for socio-demographic characteristics (Age, Gender, Residence, Education, Wealth Index, and Marital Status) among people aged 15-49 years in Zimbabwe (2010-2011) and Senegal (2010-11).

	Zimbabwe			Senegal		
	OR	Unadjusted p-value	Adjusted p-value ^c	OR	Unadjusted p-value	Adjusted p-value ^c
Women's attitudes toward wife-beating by husbands						
If she goes out without telling him?	0.969	0.224	0.131	0.348	0.503	0.733
If she neglects the children?	1.847	0.321	<0.001*	0.139	0.780	0.283
If she argues with him?	1.726	0.431	<0.001*	0.314	0.234	0.729
If she refuses to have sex with him?	0.604	0.325	0.022*	0.104	0.215	0.176
If she burns the food?	0.481	0.317	0.319	0.921	0.467	0.134
Hurdles faced by women in accessing health care for themselves						
Getting permission to go	1.309	0.375	0.695	0.992	0.715	0.642
Getting money needed for treatment	1.281	0.724	0.992	1.174	0.003*	0.515
The distance to the health facility	1.091	0.544	0.289	0.651	0.211	0.348
Not wanting to go alone	0.668	0.387	0.883	0.575	0.437	0.314
Women's participation in decision making						
Women's own health	.650	.011*	.006*	1.969	<.001*	<.001*
Making major household purchases	1.084	.814	.675	1.021	.753	0.582
Visits to her family and relatives	1.223	.685	.735	.779	.322	.803

Table 10

* p-value <.05

^c unadjusted univariate p-value for comparison

CHAPTER 5: Discussion and Conclusion

5.1 Discussion of the results

HIV-related knowledge

Results from multivariate analysis found no significant associations between HIV status and all selected variables of HIV-related knowledge including knowledge of HIV prevention methods, comprehensive correct knowledge, and knowledge of prevention of MTCT, in Zimbabwe and Senegal. These results seem to be inconsistent with previous studies that showed association between HIV knowledge and decline in HIV incidence and prevalence (UNAIDS, 2010).

Nonetheless, it can be understood that although HIV knowledge is important for people to know how to avert being infected with HIV, it does not necessarily mean that people with good knowledge about HIV would always change their behaviors. Lindan and his colleagues (1991) demonstrated that 96-98 percent of Rwandan women could correctly identify the three primary routes of HIV infection, but only 16 percent of them reported taking any action to avoid AIDS in the previous year.

Possibly, knowledge is not directly influencing HIV prevalence in my study, but it may modify sexual behavior, which is the main factor for HIV prevention. As explained in the Health Belief Model above, in order for people to change to any proper behavior, they must first, obtain the information on how to do so.

Furthermore, these results may have also been affected by awareness of HIV status that cannot be identified in this dataset. Generally, people who are aware of their HIV status, receive some counseling that could increase their knowledge about

HIV. This could have skewed the results in Zimbabwe, because of its high HIV prevalence, leading to no association between HIV status and HIV knowledge.

HIV-related attitudes

In both countries, people's attitudes toward HIV and women's ability to negotiate safer sex did not significantly associated with HIV status. I believe that people's attitudes toward HIV do not pose any direct risk of HIV infection to the people themselves. Nonetheless, negative attitudes toward HIV are main barrier to HIV prevention, and they also limit people living with HIV to access to health care services (Sayles et al., 2009; UNAIDS, 2012).

The men's attitudes toward women's ability to negotiate safer sex are actually an important factor for HIV infection, especially for female sex workers. However, in this study, it may be because the data did not focus on sex workers, but rather the questions explored relationships between general couples. Hence, significant association between this variable and HIV status was not found.

In Zimbabwe, adult support of condom education for youth positively associated with HIV status. However, this association was not found in Senegal. I believe that this association could be confounded by cultural and religious factors, but I was unable to address these factors, as the data in the DHS classified religions differently in Zimbabwe and Senegal.

Sexual behavior

In both countries, from multivariate analysis, having sex before the age of 15 years had an increased odds of HIV infection, but the association was not statistically significant. In Zimbabwe and Senegal, the data suggested that having more than one sexual partner increased the risk of HIV infection. This result is

consistent with several studies in the literature (CDC, 2007; Meekers, 2009; Case et al., 2012). Having more than one sexual partner increased risk of being HIV infected 1.1 times in Zimbabwe and 2.8 times in Senegal. About condom use with the most recent partner, paid for sex in the last 12 months and condom use every time paid for sex in the last 12 months, their associations with HIV status were not statistically significant. This may be because of a large number of missing data.

Women's status and empowerment

Generally, the descriptive analyses indicate that women in Zimbabwe seem to have stronger statuses than women in Senegal. Zimbabwean women have more negative attitudes towards wife beating. They seem to be less affected by hurdles affecting their access to health care and they are strong participators in household decisions. Moreover, the participation of the women in making their own health decision is negatively associated with HIV status in Zimbabwe, while positively associated with HIV status in Senegal. Possibly, these findings exist because we are comparing Zimbabwe to Senegal, and they have different cultural, religious and gender norms.

Additionally, the hurdle of being unable to get money needed for treatment is positively associated with HIV status in Senegal. This variable is related to the socio-demographic status of Senegalese women, as this variable wasn't statically significant until controlled by socio-demographic characteristics in the multivariate analysis.

5.2 Strengths and limitations of the study

The data used in my study were nationally representative with large sample sizes from both Zimbabwe and Senegal. Therefore, the findings of my study could be generalized to the whole population in both countries. There are, however, a number of limitations that are immanent to employing such results.

First, causality will not be analyzed due to the nature of the cross sectional study, as my study has only indicated associations, not causes and effects. Also, using proportion instead of Chi-square tests would have a stronger fit for my descriptive analysis. Additionally, self-reported data might have potentially led to recall bias. Furthermore, even though the sample sizes of the data from Zimbabwe and Senegal were large, a few variables also had large missing data, which affected the results of the analysis. Finally, understandably, I cannot generalize my findings to all countries with high HIV prevalence nor all countries with low HIV prevalence. Nonetheless, the findings could rather be targeted towards providing insight into steps that will ensure effective health policy implementation in similar settings.

5.3 Future directions

Recommendations for continued intervention research should be warranted as clear patterns of behavioral and social differences have emerged between Zimbabwe and Senegal. This highlights opportunities for more tailored prevention efforts surrounding HIV knowledge, attitudes, and sexual risk-taking behaviors, as well as women's statuses in their cultures. Indeed, areas that should further be

measured and analyzed are the impact of community level behavioral intervention on community level HIV incidence over time.

Moreover, advances in the HIV prevention field need to be stepped up by implementing appropriate HIV prevention packages taking into consideration the impact of gender norms and traditional devaluation of women in some region of Africa, on women HIV prevalence.

5.4 Conclusion

Reducing the spread of HIV and improving care and treatment for people living with HIV and AIDS require addressing social factors and behaviors that put people at risk. My study calls for the application of the knowledge produced from the analysis of these factors. It also insists in the applications for research that will extend existing knowledge and advance the development of prevention and treatment approaches based on evidence based research.

Through analyzing my variables, the findings of my study conclude the following; HIV status in Zimbabwe is positively associated with supporting condom education for youth, and having multiple sex partners. Similarly, HIV status in Senegal is positively associated with having multiple sex partners.

Moreover, the variables of women's status vary significantly between Zimbabwe and Senegal. In Zimbabwe, all the variables under Hurdles faced by women in accessing health care for themselves did not have significant values in Zimbabwe. Contrarily, getting money needed for treatment was positively associated with HIV status in Senegal. Additionally, women's participation in

decision-making about their own health is negatively associated with HIV status in Zimbabwe, while positively associated with HIV status in Senegal.

Thus, the findings suggest that concurrent sexual partnerships are recognized as being significantly responsible for the transmission of STIs, particularly heterosexual HIV transmission. Evidence implies that concurrent partnerships can increase the size of an HIV epidemic, the speed at which it infects a population and its persistence within a population. Additionally, they insinuate that through gender power dynamics, women are embedded in relationships, which increase their risk of HIV infection.

Evidently, the implementation of many HIV treatment and prevention programs needs to take into account social and behavior research, as well as the sociocultural context of women's lives in sub-Saharan Africa.

Appendix A: Map of Senegal and its neighboring countries



Figure 1

Appendix B: Map of Zimbabwe and its neighboring countries



Figure 2

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