4-8-2014 12:00 AM

The Association Between Women's Autonomy and Women's HIV/AIDS Knowledge and Attitudes in Ethiopia

Fadumo Rirash, *The University of Western Ontario*

Supervisor: Dr. Bridget L. Ryan, *The University of Western Ontario*
Joint Supervisor: Dr. Amanda Terry, *The University of Western Ontario*
A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in Epidemiology and Biostatistics

THE ASSOCIATION BETWEEN WOMEN'S AUTONOMY AND WOMEN'S HIV/AIDS KNOWLEDGE AND ATTITUDES IN ETHIOPIA

Thesis format: Monograph

by

Fadumo Rirash

Graduate Program in Epidemiology and Biostatistics

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science

The School of Graduate and Postdoctoral Studies
The University of Western Ontario
London, Ontario, Canada

Abstract

Low autonomy resulting from gender inequalities in women has been identified as a contributing factor to the disproportionate impact of HIV/AIDS on women, especially in Sub-Saharan Africa.

This study explored the association between women's autonomy and HIV/AIDS knowledge and attitudes in Ethiopia using the 2005 and 2011 Ethiopia Demographic and Health Surveys. The women's spouses' perceptions of the women's autonomy and socio-demographic variables associated with HIV/AIDS knowledge and attitudes identified by the literature were included in the analyses. Multiple linear regression identified positive associations between women's autonomy (and men's perception of women's autonomy), socio-demographic variables including education and mass media exposure and women's HIV/AIDS knowledge and attitudes.

This study underscores the importance of autonomy, education, and mass media to initiatives addressing the impact of HIV/AIDS on women. High autonomy, in addition to comprehensive knowledge and positive attitudes with respect to HIV/AIDS, are important to HIV/AIDS prevention in women.

Keywords

HIV, AIDS, HIV/AIDS, HIV/AIDS knowledge and attitudes, HIV/AIDS prevention, Ethiopia, Sub-Saharan Africa, Autonomy, Women's autonomy, Autonomy perception, Gender-inequalities, Developing countries

Acknowledgments

I am deeply grateful to my supervisors and advisors: Drs. Bridget L. Ryan, Amanda Terry and Amardeep Thind for their guidance, support, advice and encouragement over the course of writing this thesis. Your insight, experience, and expertise which you have so generously shared with me, has made this thesis possible. I could not have imagined a better team to have worked with than the three of you. A very special thanks to Dr. Adbur Rab who provided valuable advice and guidance that contributed to this thesis during his short time on my thesis committee. Much thanks to Drs. Kathy Speechley, Anita Kothari and Lorraine Davies for taking time off their busy schedules to adjudicate my thesis examination.

I would also like to acknowledge the professors and staff of the department of Epidemiology and Biostatistics at Western for imparting some of their knowledge to us and for providing a great environment to learn epidemiology. I must also acknowledge Dr. Kathy Speechley and Rebecca Waldie for giving us a very warm welcome to the program and for being great sources of information along the way. I also owe thanks to my peers and friends: Sally, Kariym, Soraya,Omar, Shirley, Aren, JJ, Hargurinder, Cindy, Amidu, and Mat for making my graduate school experience memorable.

Finally, I am grateful to my family and friends for their continued encouragement, love and support. This work is dedicated to Hassan Hussein Rirash who has been the greatest parent, friend, and inspiration.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

AIDS	Acquired Immuno-Deficiency Syndrome
ANC	Antenatal Care
ART	Anti-Retroviral Therapy
DHS	Demographic and Health Surveys
EDHS	Ethiopia Demographic and Health Surveys
FHAPCO	Federal HIV/AIDS Prevention and Control Office
GDP	Gross Domestic Product
HIV	Human Immuno-deficiency Virus
IEC	Information Education and Communication
IMB	Information-Motivation-Behavioural skills theory
MDG	Millennium Development Goals
MTCT	Mother to Child Transmission
PASDEP	Programme for Accelerated and Sustained Development and Ending Poverty
PLWHA	People Living With HIV/AIDS
PMTCT	Prevention of Mother to Child Transmission
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/ Acquired Immune Deficiency Syndrome
USAID	United States Agency for International Development
VCT	Voluntary Counselling and Testing
WHO	World Health Organization

Chapter 1

Introduction

The human immuno-deficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) pandemic remains one of the most significant global public health challenges of our time, despite a global focus and commitment to eradicate the disease. Since the disease was identified in 1981,over 75 million people have become infected and 36 million have lost their lives to the epidemic.[1,2] HIV/AIDS is the leading cause of death in Sub-Saharan Africa.[1–3] According to the Joint United Nations Programme on HIV/AIDS (UNAIDS), in 2012, 35.3 million people were living with HIV/AIDS globally with 70 % of those infected residing in Sub-Saharan Africa, a region where slightly over 10 % of the world's population resides.[4,5] In 2012, 1.6 million deaths world-wide were attributed to HIV/AIDS and 1.2 million or 76 % of these deaths occurred in Sub-Saharan Africa. [1,2] In addition, 70 % of the 2.3 million new infections reported globally in 2012 also occurred in Sub-Saharan Africa. [1]

HIV/AIDS has had a tremendous impact in Sub-Saharan Africa, which is the epicenter of the disease, both socially and economically.[6] HIV/AIDS does not affect just the individual but also their families, communities and countries. [7] HIV/AIDS has had a devastating impact on the development and economy of Sub-Saharan Africa, since the majority of those infected are adults, between the ages of 15 and 49 years, who are in their most productive years. [4,6,8] HIV/AIDS increases overall morbidity and mortality rates among infected adults, thereby decreasing a country's gross domestic product (GDP) or economic output (i.e. through decreased labour product) while increasing imports of expensive healthcare goods.[9,10] Decreases of 2 to 4% in the growth rates of countries across Sub-Saharan Africa have been reported, [10] and several studies have found negative correlations between HIV/AIDS and labour productivity in Ethiopia, [11] Kenya,[12] and, South Africa.[6] A decreasing GDP has important implications for a population's demographic and health indicators; decreases in a country's GDP can result in less funding for education and basic healthcare services. [9] Hence a decreasing GDP

can result in the lack of sufficient resources for the detection and prevention of diseases such as HIV/AIDS which can adversely affect the spread of the disease.[9] The impact of HIV/AIDS is even more pronounced at the household level, where the illness or death of the household's main provider leads to loss of income; this can compound the pervasive poverty in many Sub-Saharan countries.[6,9] Women in particular have been disproportionately impacted by the epidemic.[2] Globally, more than half of all HIV infections occur in women and during 2012, 57% of all people living with HIV/ AIDS in Sub-Saharan Africa were also women.[4] Although the prevalence of the disease varies among countries across Sub-Saharan Africa, in every region including Ethiopia, women bear the heaviest burden of this epidemic. [4,13,14]

This disparity in HIV/AIDS infection has been partially attributed to the biological make-up of women.[9,15–18] The physiology of women's reproductive systems put them at an increased risk of acquiring HIV infections from sexual intercourse compared to men. [9,15–18] Some studies have estimated that the risk of HIV infection from a single intercourse for women is two [17] to eight times higher than it is for men. [16] In addition, the use of oral contraceptives, menstruation, cervical erosion, and infection with other sexually transmitted infections increases the risk of HIV infection in women. [9,15–18]

Moreover, gender inequalities resulting from socio- cultural, political, religious, and economical factors result in the socio-economic disadvantage of women (i.e. women have less opportunities to obtain an education and employment). [19] Consequently, in developing countries in Sub-Saharan Africa, where wide disparities in the social and economic status of men and women exist, women have to rely on men for financial support.[19]

Women's economic dependency on men results in low autonomy in women; that is the lack of control over their lives and the inability to exercise their own choice in the decisions that affect their health and well-being as well as the health of their families. [17–25] Research has shown that women's autonomy has important implications for many aspects of women's lives: family planning and contraceptive use ; access to and utilization of healthcare; antenatal services; and child health and infant survival.[19,23,26–42]

Furthermore, more recent research, [22,25,43–45] has identified low autonomy in women as a contributing factor to the impact of HIV/AIDS on women. Women who have low autonomy are unable to negotiate safe sex practices with their husbands or partners which makes them vulnerable to HIV infection.[45] In addition, women's lack of education and economic resources prevents them from seeking out HIV prevention information and resources.[45] Women across Sub-Saharan Africa have lower HIV/AIDS knowledge and more negative attitudes than men.[3,13,14,21] Hence, women's low autonomy fuels the HIV/AIDS epidemic while hindering prevention and treatment efforts. [22,44]

What makes HIV/AIDS in women even more troublesome and tragic is that the disease does not affect just the women; maternal to child transmission of HIV continues to maintain the epidemic in children in low income developing countries.[4] In Sub-Saharan Africa, 90% of all HIV infections in children are the result of mother to child transmission (MTCT).[4] Without a current cure or vaccine to combat the disease, prevention remains the best strategy to manage the epidemic and to prevent new infections. [22,44] Having accurate and comprehensive HIV/AIDS knowledge and positive attitudes toward the disease and to people living with HIV/AIDS (PLWHA) are the cornerstones to changing people's behaviours and practices thereby facilitating the control, prevention and treatment of the disease.[7,43,44] The few studies,[22,25,43] outside of Sub-Saharan Africa, that have examined the association between women's autonomy and their HIV/AIDS knowledge, attitudes, and practices have found positive associations. Therefore, enhancing women's autonomy holds a great potential in addressing the disparities seen in women's HIV/AIDS knowledge and attitudes and the resulting disproportionate impact of the disease on women.

Importance of this study

This study assessed the relationship between women's autonomy and HIV/AIDS knowledge and attitudes in Ethiopia, while controlling for socio-demographic factors such as the women's and their spouses' age, education, religion, mass media exposure, women's employment and the couple's residence (urban vs. rural) and wealth index. These factors have been found to affect women's autonomy and HIV/AIDS knowledge

and attitudes.[19,21–30,32,36,37,43–46] To date, there are no known studies examining the relationship between women's autonomy and women's HIV/AIDS knowledge and attitudes in Ethiopia or in Sub-Saharan Africa. Consequently, this research intended to address this knowledge gap by advancing our understanding of the relationship between women's autonomy and women's HIV/AIDS knowledge and attitudes.

Chapter 2

Literature Review

This chapter provides background demographic and health information on Ethiopia, the country of interest for this study (section 2.1). Next, this chapter describes some of the drivers of the HIV/AIDS epidemic in Sub-Saharan Africa, including HIV/AIDS knowledge and attitudes, and the role of two behavioral change theories in HIV/AIDS prevention (sections 2.2.1-2.2.4). Sections 2.2.5-2.2.8 describe the main modes of HIV/AIDS transmission in Sub-Saharan Africa, the impact of HIV/AIDS on women, as well as the roles that women's autonomy and men's perceptions of women's autonomy play with regard to HIV/AIDS prevention. The socio-demographic variables included in this study are listed in section 2.2.9 and section 2.3 provides the rationale for and objectives of this study.

2.1 Ethiopia: Background

2.1.1 Geography

The Federal Democratic Republic of Ethiopia, or Ethiopia for short, is a Sub-Saharan country located in east Africa in a region commonly known as the Horn of Africa. [47] It is the most populous landlocked country in the world and is bounded by Somalia and Djibouti to the east, Eritrea to the north, Sudan (now Sudan and South Sudan) to the west and Kenya to the south (refer to Figure 1 for a map of Ethiopia).[47,48] Ethiopia covers a total land area of 1.1 million km^2, which is divided into 9 geographical states called Oromiya, Amhara, Affar, Tigray, Somali, Benishangul-Gumuz, Gambela, Harari, and Southern Nations Nationalities and Peoples (SNNP) as well as, two city administrations called Addis Ababa and Dire Dawa. [13] The Capital, Addis Ababa, is the country's largest urban city and had a population of 2.86 million in 2009. [48]

Ethiopia's topography ranges from high mountains such as the Ras Dashen measuring 4,550m above sea level to valleys that lie 110m below the sea level. The country's climate varies with its geographical topography with temperatures ranging from 47

degrees Celsius at the lowlands to about 10 degrees Celsius in the highlands.[13] There are three main seasons in Ethiopia: 1) dry season which runs from September to February; 2) tropical rainy season which runs from March to April and; 3) warm temperate season that runs from May to August, with May being hot and dry followed by rains from June to August. [47] The hottest temperatures occur between March and May and the coldest temperatures occur from November to January. [13]

Figure 1: Map of Ethiopia

Source: Central Intelligence Agency (1999)[49]

2.1.2 Population

As of July 2013, Ethiopia had a population of 93.9 million with an average growth rate of 2.9% per year. [48] The median age was 17.5 years with a life expectancy at birth of 59 years and 62 years for males and females respectively.[48,50] The total fertility rate was 5.31 children per woman and infant mortality rate was estimated to be about 58.3 per 1000 live births. [48] The probability of dying for children under age 5 was 68 per 1000 live births while the death rate for the general population was 306 and 265 individuals per 1000 for males and females respectively. [50] Children account for the vast majority of the population with children under the age of 14 years comprising 43.3% of the population. [50]

Ethiopia is a multi-ethnic country with more than 80 ethnicities and languages. [48] The four most prevalent ethnic groups are Oromo (34.5%), Amahara (26.9%), Somali (6.2%) and Tigray (6.1%). [48] The most common languages are Oromo and Amahric, the country's two official languages spoken by 33.8% and 29.3% respectively followed by Somali and Tigrayan which are spoken by 6.2 and 5.9% respectively. [48] Ethiopia's major religions are Orthodox Christianity practiced by 43.5% of the population followed by Islam which is practiced by 33.9%, Protestants comprised 18.6%, African Traditional religions accounted for 2.6% while 0.7% self identified as Catholics and 0.7% self identified as others according to the 2007 census.[48]

In 2011, the majority of the population (83%) was residing in rural regions while 17% resided in urban locations. [13,48] During that same year, Ethiopia's literacy rate (the number of people aged 15 years and over who can read) was very low at 39% and more males than females were literate (49.1% of males were literate compared to 28.9% of females in 2009). [48] The average years of schooling for this population was about 9 years with females having only an eighth grade education while males reached up to grade 10 on average in 2011.[48]

Unemployment is high in Ethiopia, particularly among the youth, with 24.9% of all youth (aged 15-24) being unemployed. [48] Unemployment among male youth was estimated to

be about 19.5% while unemployment among female youth was much higher at 29.4% in 2006. [48]

2.1.3 Economy

Ethiopia is a poor country with 29.2% of the population living under the poverty line (surviving on less than a $1.25 a day)[51] at the end of 2010. [48] Ethiopia's economy is based mainly on agriculture, a sector that produces about 43% of the country's GDP, about 60% of its exports, and employs about 85% of the country's labour force. Of the remaining 15% of the country's labour force, 5% worked in industry while the remaining 10% were employed by the service sector in 2010.[48,52] The agriculture sector is susceptible to droughts and poor cultivation practices which have led to several well documented famines in the country.[52] The country's main agricultural products include coffee, various grains and cereals, khat (an herbal stimulant), potatoes and sugarcane.[47,48] Major exports are coffee, leather products, oilseeds, khat, and live animals. [47]

Ethiopia's GDP per capita was 1,300 US dollars in 2009, classifying it as a low-income country. [13,48,53] Ethiopia's economy experienced rapid growth of 11% per year from 2005 to 2011 and the GDP growth rate was estimated to be 8.5% in 2012.[13,53] This economic growth was attributed to the growth and expansion of agriculture, the industry sector, entrepreneurship and good governance practices.[13,53]

2.1.4 Health Status and Healthcare

Because Ethiopia is a poor country, it struggles to provide basic healthcare services to its citizens. In 2011, the country spent 4.7% of its GDP or 52 US dollars per capita on healthcare.[50] Ethiopia is a member of the United Nations (UN) and has ratified and pledged to attain the UN's eight millennium development goals (MDGs) which are: 1)" Eradicate extreme poverty and hunger" [51]; 2) "Achieve universal primary education" [51] ; 3**) "**Promote gender equality and empower women" [51]; 4) "Reduce child mortality"[51]; 5) "Improve maternal health"[51] ; 6) "Combat HIV/AIDS**,** malaria and other major diseases" [51]; 7**)**"Ensure environmental sustainability"[51] ; and 8)"Develop a global partnership for development"[51] In its efforts to accomplish these MDGs and improve the country's

overall health and economic standing, Ethiopia established programs and strategies such as the Programme for Accelerated and Sustained Development and Ending poverty (PASDEP).[54] The core strategy of PASDEP is to improve the population's health through primary prevention of important diseases such as HIV/AIDS, malaria, maternal and childhood diseases, diarrheal diseases and tuberculosis.[54] The government has endorsed programs such as the Health Sector Development Plan (HSDP) which has delivered basic healthcare services such as HIV/AIDS prevention and treatment services.[54] Sustained efforts have resulted in successes toward attaining the MDGs: from 2005 to 2010, there were reductions in infant mortality rates (from 77 to 59 deaths per 1000 live births), under age 5 child mortality (from 123 to 88 per 1,000 births) and malnutrition in children under age 5 was reduced from 46.7% in 1990 to 35% in 2005.[54] In addition, the number of women receiving antenatal care (ANC) increased from 28% in 2005 to 34% in 2010.[54] Overall, the country has made great strides toward achieving the MDGs and their efforts have been fruitful; the percent of the population living under the poverty line fell from 38.7% in 2005 to 29.6% in 2009.[53]

Even though the country has made committed and sustained efforts to improve the health of its population through various programs, mandates, and strategies, there remain many challenges. For example, although services such as Prevention of Mother to Child Transmission (PMTCT) and anti-retroviral therapy (ART) are available in Ethiopia, the country is facing problems reaching all individuals who need it. In 2010, PMTCT was available in only 54% of ANC clinics.[54] In addition, only 40% of pregnant women who had been tested for and confirmed to be HIV-Positive were receiving ART and, less than a quarter of babies born to HIV-Positive mothers received prophylaxis.[54]

2.1.5 Epidemiology of HIV/AIDS in Ethiopia

The first cases of HIV in Ethiopia were identified and reported in 1986 and it is believed that the disease started in the country in the late 1970s to the early 1980s. [54] The most common strain of HIV in Ethiopia is HIV-1 subtype C.[54] The prevalence of HIV/AIDS was estimated to be about 1% in 1989 and rose to 5.2% by 1996 but eventually declined steadily over time.[54] The two main sources of HIV data have been the sentinel

surveillance systems established by the government in ANC clinics and the Demographic and Health Surveys (DHS) implemented by the United States Agency for International Development (USAID).[54] Sentinel surveillance systems have been useful for collecting HIV data from specific age groups, particularly women between the ages of 15-24 years, who are the most frequent users of ANC clinics.[54] The sentinel surveillance data have shown HIV prevalence rates of 5.6%, 3.5% and 2.6% among women aged 15 to 24 years for 2005, 2007 and 2009 respectively.[54] Urban regions were disproportionately impacted by the disease with prevalence rates of 11.5% and 5.5% for 2003 and 2009 respectively; the sentinel surveillance HIV prevalence rates in rural areas were lower at 4.6% and 1.4% for 2003 and 2009 respectively.[54]

The Ethiopia Demographic and Health Surveys (EDHS) showed population HIV prevalence rates of 1.4% in 2005 and 1.5% in 2011.[13,14] HIV disproportionately impacts women with the total population prevalence being 1.9% among women, and 1.0% among men in 2011. [13] In addition, urban populations were disproportionately impacted by the disease with a total urban population prevalence of 4.2%; prevalence among urban women and men was 5.2% and 2.9% respectively in 2011. [54] In contrast, the total rural population prevalence of HIV was 0.6%, with an average prevalence of 0.8% among women and 0.5% among men. [54] UNAIDS' HIV prevalence estimate in adults aged 15 to 49 years was 1.3% in 2012. [55] In 2012, the number of people living with HIV/AIDS in Ethiopia was estimated at just under 800,000, with 590,000 being adults and 170,000 being children (aged 0-14). [54] Of the 590,000 adults living with HIV/AIDS, 64.4% (380,000) were women. [54] As of 2012, nearly one million (900,000) children between the ages of 0 and 14 years have been orphaned by HIV/AIDS in Ethiopia. In addition, in 2012 alone, a total of 47,000 deaths were attributed to HIV/AIDS in the country.[48,55]

Groups that are recognized to be at high risk for HIV infection in Ethiopia include sex workers, truck drivers, mobile laborers, and particularly women who are part of a sero-discordant couple, where one individual is HIV-positive while the other is HIV-negative.[56,57] According to the 2005 EDHS, prevalence of HIV among the 2,968 couples who were surveyed was 2.1%; and 1.8% of the 2.1% were sero-discordant.[54] HIV Prevalence was 1.1% among the 6,745 couples who were surveyed in the 2011 EDHS;

and 0.6% of the 1.1% were sero-discordant.[54] Of the 1.1% HIV prevalence among couples in 2011, in 0.7% the women were HIV positive and in 0.4% the men were HIV positive.[54]

2.1.6 Ethiopia's response to the HIV/AIDS epidemic

Over the last decade, the government of Ethiopia has been dedicated to responding to the HIV/AIDS epidemic. Ethiopia endorsed its National HIV/AIDS Policy in 1998 to mobilize government groups, non-governmental organizations, and communities to respond to the epidemic, and ease some of the impacts (i.e. social and economical) of the epidemic.[54] In 2002, the government of Ethiopia declared HIV/AIDS a national public health emergency and launched the Federal HIV/AIDS Prevention and Control Office (FHAPCO) with plans to expand its National HIV/AIDS policy.[54] FHAPCO established the National AIDS Council as well as regional and sub-regional AIDS committees and advisory boards. A major objective of the National HIV/AIDS policy was to promote gender equality and the involvement of women and youth in its strategies.[54] With the help of its various committees, FHAPCO established strategies and programs to respond the epidemic such as the voluntary counselling and testing (VCT) services, ART, and PMTCT services.[54] Additionally FHAPCO implemented information education and communication (IEC) campaigns to educate the general population and to encourage protective behavioral changes.[54] Many media campaigns and educational community conversations were launched to increase HIV/AIDS knowledge and attitudes and to reduce stigma in order to increase and enhance HIV/AIDS control, prevention and treatment.[54]

2.2 HIV/AIDS drivers in Sub-Saharan Africa/ knowledge and Attitudes

This section provides an overview of the HIV/AIDS situation in Sub-Saharan Africa, including the causes and drivers of the epidemic (section 2.2.1). A discussion of HIV/AIDS knowledge and attitudes including definitions and pertinent background information and theories of behavior change follow (sections 2.2.2-2.2.4). In addition, the impact of HIV/AIDS on women is discussed (section 2.2.5). Also, the concept of women's autonomy including its definition and background as well as its association with

HIV/AIDS knowledge and attitudes are discussed at length (sections 2.2.6-2.2.7). Sections 2.2.8 explain the association between men's perception of women's autonomy and women's HIV/AIDS knowledge and attitudes, followed by a list of the socio-demographic variables included in this study.

2.2.1 Drivers of HIV/AIDS in Sub-Saharan Africa

The devastation of Sub-Saharan Africa by HIV/AIDS has been attributed to factors such as poverty, civil war and conflict, urbanization and modernization, and cultural and religious beliefs and practices resulting in high risk behaviors.[21,58]

Rapid urbanization in developing countries has led to large migrations of people from rural to urban regions in search of better work opportunities and standard of living.[58] However, this rapid urbanization in many African countries such as Kenya and Ethiopia has led to increased poverty in urban areas due to the lack of jobs for large percentages of these growing populations, predominantly among young adults. [58–60] In addition, rapid urbanization has led to the deterioration of infrastructure and living conditions by resulting in the growth of urban slums that overwhelm already scarce healthcare services and resources. [9,21,58] Frustrations resulting from poverty and high unemployment rates have been shown to result in risky practices in young men and women such as unprotected sex, prostitution, and drug use, all factors known to increase HIV/AIDS infection.[21]

In addition, modernization has led to the connection of regions, economies, and countries as well as the rapid spread of HIV by mobile laborers, truck drivers, and others who travel across borders.[58] In 2012, the prevalence of HIV/AIDS was highly heterogeneous across Sub-Saharan Africa, with some regions having high prevalence rates while others had low prevalence rates. The highest HIV/AIDS prevalence rates occur in countries in the southern region of the continent including Swaziland (28.3%) %), Lesotho (24.7%), Botswana (24.4%), and South Africa (18.4%).[4] The lowest prevalence of HIV/AIDS in Sub-Saharan Africa include countries in the central region of the continent such as the Democratic Republic of Congo (1.2%) ; countries in the north west region including Burkina Faso (1.1%), Mauritania (0.6%) ,and Senegal (0.6%); and countries in East

Africa including Eritrea (0.9%), and Ethiopia (1.5%).[4] Heterogeneity in prevalence rates can also be seen within the same country; differences in prevalence rates are observed between urban and rural regions and between provinces, districts, and communities. These differences are due to factors including differences in education, economic status, mass media exposure, and cultural and religious beliefs resulting in different practices and behaviors.[58,61]

In the absence of a cure or an effective vaccine, the best strategy against this epidemic remains primary prevention resulting from changes in sexual behavior.[22,25,43,45] Behavior change depends on having accurate and comprehensive HIV/AIDS knowledge and accepting attitudes toward the disease and people living with the disease.[62] UNAIDS has identified three strategies for addressing the global fight on HIV/AIDS:"1) The reduction of new infections through primary prevention efforts; 2) improving treatment access, utilization, and support and; 3) addressing human rights and gender-inequalities".[4] Addressing these three goals simultaneously is important in effective responses to the HIV/AIDS epidemic; and for all three goals, knowledge, attitudes, and the promotion of gender-equality and human rights are important.

2.2.2 HIV/AIDS Knowledge

It is well known that HIV/AIDS knowledge is vital to HIV preventative and protective behaviors such as: abstinence; the consistent use of condoms; limiting the number of sexual partners; fidelity; avoidance of breastfeeding by HIV-positive mothers; and the delaying of marriage and childbearing among women.[63–68] Having accurate knowledge about how HIV is transmitted and prevention methods allows individuals to recognize their own risk and facilitates changes in high risk behaviors.[43,61,66,69,70] Numerous studies have shown positive association between HIV/AIDS knowledge and the adoption of risk reducing behaviors such as: the use of condoms, [66,69–73]; having being tested for HIV/AIDS; the use of VCT services [74–77]; and treatment adherence.[75,78–80] These studies have found that the non-use of condoms was associated with having insufficient knowledge about HIV/AIDS and that condom use was the highest among individuals with higher knowledge about how HIV is transmitted as well as the correct methods of

prevention. In addition, these studies indicate the importance of knowledge for having being tested and the utilization of HIV/AIDS VCT services which are important cornerstones to HIV/AIDS control, prevention and treatment. [81] Having HIV/AIDS knowledge has also been found to be essential in reducing MTCT of HIV/AIDS,[82–86] the most important driver of HIV/AIDS infections in infants and children.[2,82,87]

The large DHS have been collecting information on HIV/AIDS knowledge, attitudes, and practices in over 60 countries since 1988. [88] From these surveys, much is now known about the relationship between people's HIV/AIDS knowledge, attitudes, practices, and behaviors in different countries across the globe. Large organizations such as the World Health Organization (WHO), UNAIDS, and USAID use information collected by surveys such as the DHS to monitor HIV/AIDS incidence and prevalence and to evaluate their HIV/AIDS response programs and strategies.[88]

The DHS defines general HIV/AIDS knowledge as knowing the two most common methods of HIV prevention: 1) "The consistent use of condoms and; 2) limiting the number of sexual partners to one faithful partner who is not infected, in those who have heard of HIV/AIDS".[13,14] Comprehensive knowledge is defined by the DHS as knowing the two most important methods of avoiding HIV infection (i.e. "limiting the number of sexual partners to one partner who is not infected and who is faithful and the consistent use of condoms")[13,14]; being able to reject the two most common misconceptions about the disease in the area (i.e. a person can get HIV from a mosquito bite or from sharing a meal with an HIV-positive person)[13,14] ; and knowing that a person who looks healthy can carry the HIV/AIDS virus.[13 14] Although general knowledge is high across Sub-Saharan Africa, the epidemic continues to escalate unabated.[3, 65, 89] Comprehensive knowledge is considered to be more important than general knowledge for individuals to be able to protect themselves from HIV infection. [3,13,14,69]

Comprehensive knowledge enables individuals to practice preventative behaviors. Ignorance such as the belief that HIV/AIDS only happens to specific type of individuals, or certain risk groups, or than it is the will of God, as well as misconceptions about the modes of transmissions (i.e. that a person can get HIV from sharing food with an infected

individual, or from mosquito bites, or that a healthy looking individual cannot have HIV/AIDS) put individuals at risk of infection.[69,89] Therefore, having comprehensive knowledge about how HIV is transmitted as well as the correct methods of prevention are essential in HIV prevention.[3] Over 30 countries in Sub-Saharan Africa now have DHS available; and the DHS in each country assesses comprehensive knowledge in adults aged 15-49 years using a representative sample of the population. Hence, the DHS surveys have been an informative source of information with regards to people's HIV/AIDS knowledge and attitudes in countries across Sub-Saharan Africa.[3]

UNAIDS has been interested in monitoring population knowledge levels (i.e. people between the ages of 15 and 49 years) as well as the comprehensive knowledge of specific age groups (i.e. young men and women aged 15-24 years who have the highest risky behaviours). [4] Comprehensive knowledge remains low across Sub-Saharan Africa. Only in three countries (Swaziland, Kenya, and Namibia) did a large number of young people (men and women aged 15-24 years) have comprehensive HIV/AIDS knowledge.[3] Furthermore, in 2009, the average comprehensive knowledge for adults aged 15-49 years across Sub-Saharan Africa varied from 7% in Chad to 54% in Rwanda for women, and from 11% in Benin to 58% in Rwanda for men. [89] The average comprehensive knowledge of men and women in Sub-Saharan Africa is about 30% and 20% respectively.[89] Therefore, the majority of countries in Sub-Saharan Africa have failed to meet the United Nations General Assembly Special Session (UNGASS) on HIV/AIDS' goal of achieving 95 percent comprehensive knowledge across the globe by 2010, especially among young adults. [3,90] In Ethiopia, comprehensive knowledge is low much like the rest of Sub-Saharan Africa; in 2011, only 32% of men and 19% of women aged 15-49 years had comprehensive knowledge, a slight increase from 2005, when 16% of women and 30% of men had comprehensive knowledge.[13,14,65]

Several studies have found that although HIV/AIDS knowledge is necessary, that knowledge alone is not sufficient to influence people's practices and behaviors.[63,66,69,79,91–93] Theories of behavioural change including Bandura's Social-cognitive theory, Azjen's Theory of Reasoned Action, the Health Belief Model (HBM), the Theory of Planned Behavior and the Information-Motivation-Behavioural (IMB)

skills theory all stipulate the necessity of knowledge for behavioural change.[79,94–96] However, others factors such as the belief that the outcome is worth the effort, the belief that one is capable of carrying out an action to bring about the outcome, as well as the perception of disease severity and personal risk are also necessary for effective behavior change.[66,94,95] Ochako et al., [21] found that men and women who perceived themselves to be at risk of contracting HIV and who had knowledge that condoms would prevent infection were more likely to use condoms than those who had knowledge but did not perceive themselves to be at risk. Hence, HIV/AIDS knowledge is critical to the fight against HIV/AIDS and has been an important focus of UNAIDS' and WHO's initiatives to reduce HIV/AIDS.[4,97] In 2008, the WHO reported that only 38% of women across the globe had comprehensive HIV/AIDS knowledge, further highlighting the danger of being a woman in the era of HIV/AIDS.[97]

2.2.3 HIV/AIDS Attitudes

HIV/AIDS knowledge is also important for reducing stigma and discrimination thereby improving people's attitudes toward people infected or affected by HIV/AIDS.[17, 81, 98] Stigma has been both a consequence of HIV/AIDS and an important driver of the epidemic. [17] Stigma resulting in discrimination and negative attitudes toward PLWHA has been a key barrier in the many efforts, initiatives, and programs aimed at the control, prevention and treatment of the disease globally but especially in Sub-Saharan Africa.[7,43,61,99–103] HIV/AIDS attitude is defined as the view, perception or feelings that people hold toward HIV/AIDS and PLWHA.[100, 102] Addressing negative attitudes toward HIV/AIDS and to PLWHA is paramount in any strategy intended to increase testing, support, care, treatment and prevention of HIV/AIDS and the long-term reduction of the epidemic and its many psychological, social and economical impacts.[80,81,99,100,102–107]

Negative attitudes toward HIV/AIDS and PLWHA are the result of deep rooted stigma resulting from societies' cultural and religious beliefs. [7,103] Culture and religion often stipulate what behaviors are moral and acceptable, and what behaviors are immoral and should be punished. [7,107] Stigma is the process of reducing an individual or group's worth in the eyes of society by attributing unfavorable characteristics to the individual or group

and the subsequent behavior of discrimination against that individual or group. [7,108] Stigma, which is often rooted in ignorance, misinformation, and stereotypes, results in fear of, and the discrimination against, PLWHA and hinders HIV/AIDS prevention, treatment and support. [81,103,105, 106]

Many people across Sub-Saharan Africa are religious.[7] Religion has played both supportive and detrimental roles in the HIV/AIDS epidemic.[7] Religions stipulate how individuals should conduct themselves and identify certain behaviors, especially those related to sexuality, as immoral.[7] Many societies hold strong beliefs that the HIV epidemic is God's vengeance against individuals or groups as a result of their immoral practices.[77,102,104] Thus, religion can promote stigma, discrimination, and negative attitudes against PLWHA by labeling them as "sinners" and by making the assumption that the disease is the result of individuals having engaged in immoral practices.[7] On the other hand, religion can play a positive and supportive role in the lives of PLWHA as many people (including PLWHA) turn to religion as a coping mechanism during times of illness.[7] Therefore religion can also provide comfort and support for PLWHA.[7]

Stigma, discrimination and negative attitudes toward HIV/AIDS and PLWHA are pervasive in Sub-Saharan where the HIV/AIDS epidemic has been the most devastating.[77,107] Stigma and the resulting discrimination and negative attitudes toward PLWHA lead to the labeling, stereotyping, social distancing and alienation, the denial of services and human rights, the enforcement of discriminatory laws and policies, and even in acts of violence against the individual or groups.[7,102] In addition, stigma often results in self-stigma and low self-esteem which in turn result in secrecy, denial and high risk practices among PLWHA that maintain the spread of the disease.[7,103,104] Stigma is a multi-layered construct and three types of HIV/AIDS related stigma have been identified: 1) self stigma where an individual blames him or herself; 2) perceived stigma where the individual fears that people will stigmatize him or her if they find out his or her HIV positive status and; 3) enacted stigma where people actively discriminate against HIV-positive individuals.[103]Hence, stigma in its various forms can exist and manifest itself at many different levels such as the individual, community, institutional and legislative levels affecting all aspects of an infected or affected person's life.[101,102,103] At the

individual level, stigma and the resulting discrimination and negative attitudes affect the health and well-being of the individual as the individual experiences feelings of shame, self-blame, low self worth, fear of abandonment, and violence. [106,103] This fear leads to secrecy and denial, which are barriers to getting tested and treated and to the practice of preventative behaviors.[7 81,99,103] Even when individuals are aware of their HIV-positive status, fear of blame, abandonment, discrimination, ostracism, and violence deter them from sharing their results. [7,54, 103] Discrimination against PLWHA include people's refusal to eat with, socially engage with, or buy goods from HIV-positive individuals have been reported.[74, 103] Furthermore, the de-valuing of PLWHA leads to the erroneous assumption that they cannot contribute to society and leads to the loss of status.[7]

Since many societies in Sub-Saharan Africa are communal, [7,101] an individual's HIV-positive status and also its consequent stigma, discrimination and negative attitudes do not affect just the individual but also their families and communities.[7,101]As a result, PLWHA do not bring shame and discrimination to just themselves but to many others. Studies have shown that some families of PLWHA hide individuals, thereby preventing them from seeking treatment and social support, while others encourage the individuals to avoid disclosure of their status in order to avoid discrimination and rejection by their communities.[7] Yet others,[105] have shown that some communities deny the existence of AIDS altogether in their communities and attribute deaths among PLWHA to other causes. Hamra et al.,[101] found that stigma even affects family members' ability to seek treatment and support for HIV-positive orphans. Stigma, discrimination and negative attitudes at the institutional level result in the loss of jobs, the denial of healthcare services, educational opportunities, and social- welfare and support for PLWHA. [103,105] In healthcare settings, discriminatory practices such as the denial of drugs and treatment, confidentially breaches, being ignored or verbally abused, early discharges, and not receiving protocol services because doctors and healthcare personnel believe that patient was going to die anyway have been reported. [103]

Hence, HIV/AIDS stigma and the consequent discrimination and negative attitudes present one of the key challenges faced by HIV/AIDS prevention and treatment programs and initiatives across Sub-Saharan Africa.[7,80,81,99,100] Numerous studies have reported that

negative attitudes have been a key factor in the low uptake of VCT services.[77–87,92,99,100,105] Fear of social isolation, loss of employment or income and the abandonment by families, spouses, and communities remain important obstacles to the uptake of VCT services and treatment for PLWHA.[80 ,102–104] Moreover, the unabated spread of the disease is the direct consequence of HIV positive individuals transmitting the infection to others either knowingly or unknowingly due to the fear of this deep rooted stigma, discrimination and negative attitudes.[7,80,81] Studies have found that stigma and its consequent discrimination and negative attitudes were associated with test avoidance,[81] the perception of adverse testing outcomes and the lack of testing benefits,[74,81] the non-disclosure of HIV status,[102] and increased high risk behaviors among PLWHA. [81, 102]

Like HIV/AIDS, stigma and negative attitudes impact women disproportionately.[7] In many Sub-Saharan societies, gender inequalities exacerbate women's vulnerability to HIV/AIDS.[7] The process of stigmatization is linked to power.[7,102,105] Many cultures expect women to be naïve about sexuality and to remain pure until marriage.[7] Hence, many women do not seek out reproductive health information and services and they are often reluctant in negotiating safe sex practices.[7] These same power imbalances also lead to women being made the scapegoats for HIV transmission.[109] Women are often accused of being responsible for HIV infection when many studies have shown that men are generally the vector for the disease as a consequence of their extramarital relations and practices of polygyny in some African countries where a man has multiple wives. [7] Therefore, many women fear being accused of extramarital relationships and avoid VCT services. Even in cases where women do seek out testing and know their HIV-status, they are often reluctant to share the results due to the fear of abandonment, divorce, and violence by their husbands and social stigma and alienation by their families and communities.[7,102, 108]

Comprehensive and accurate knowledge of HIV/AIDS is associated with less stigma and more positive attitudes toward PLWHA.[81,101] Therefore, HIV/AIDS knowledge remains the single most effective way of combating stigma and the resulting negative attitudes toward PLWHA and the encouragement of test seeking, support and treatment for HIV/AIDS.[81,101] Addressing stigma will result in more positive attitudes in individuals

and communities and the uptake of HIV services and support and the control and decrease of the epidemic. [104]

Surveys such as the DHS have been instrumental in monitoring the progress and changes in HIV/AIDS attitudes in many countries across the globe. Attitude is measured in the DHS by asking respondents if they would: "1) keep a family member's HIV infection a secret; 2) care for a family member or relative who is infected with HIV; 3) buy vegetables from a vendor who has the AIDS virus and; 4) whether they feel a female teacher infected with HIV should be allowed to continue teaching children in school."[13, 14] The DHS use these questions to assess people's attitudes toward PLWHA. For example, the DHS considers an individual who responds "no, I would not want to keep a family member's HIV infection a secret" to be showing positive and accepting attitudes toward PLWHA while one who responds "yes, I would want to keep a family member's HIV infection a secret" would be considered to be showing negative and non-accepting attitudes toward PLWHA. Hence, the DHS uses respondents' answers to these questions to gauge attitudes toward PLWHA.

In Ethiopia, positive attitudes toward PLWHA have increased to 17% for women and 28% for men in 2011 from 2005, when 11 % of women and 17% of men expressed accepting attitudes. [13, 14] Overall, across Sub-Saharan Africa and in Ethiopia, HIV/AIDS comprehensive knowledge and attitudes remain low; women have lower levels of knowledge and more negative attitudes than men which hampers HIV response efforts in this disproportionately affected population. [13, 14]

2.2.4 Theories of behavioral change and HIV/AIDS prevention

To address the HIV/AIDS knowledge and attitudes gaps and the consequent HIV/AIDS disparities in women in Ethiopia and across the Sub-Saharan Africa, several of the more than 30 behavioral change theories have been applied to HIV/AIDS prevention and treatment programs.[93,110,111] The social-cognitive theory which has been modified from Bandura's social learning theory is the most comprehensive of the behavioural change theories and has been utilized to facilitate HIV/AIDS prevention and treatment programs. [96,106] In this theory, knowledge about the disease (what it is, how it is transmitted, and

how it can be prevented) is a necessary condition for behavioural change to occur.[96,112] In addition, self motivation to perform preventive measures resulting from the understanding of disease severity, personal risk and the benefits of prevention, and the expectation that taking the preventative measures will result in the expected outcome (i.e. protection) are also needed.[96] As well, individuals need to feel capable of performing the behaviors (i.e. have self-efficacy); thus facilitators of behavioural change such as skills, tools, services, and support are also essential. Moreover, barriers to prevention behavior such as the lack of skills, services, support and negative attitudes resulting from fear of being stigmatized need to be removed.[96,110,112] Hence, the comprehensiveness of this theory in addressing the various factors that affect behavior change has made it a successful behavior change facilitator with respect to HIV/AIDS prevention and treatment programs and strategies.[96,110,112] Figure 2 demonstrates how the social cognitive theory is used to facilitate HIV prevention and highlights the importance of knowledge and attitudes to behavioural changes and HIV prevention.

Another theory that has received much attention in recent years is the Information-Motivation-Behavioural skills (IMB) theory, which is geared to toward contraceptive use and HIV prevention.[106] This theory stipulates that behavior change programs require the transfer of accurate HIV knowledge, and the motivation of individuals to acquire knowledge and to act on it, to facilitate behavioral change such as HIV preventative behaviors, and medication adherence. [106] Thus, prevention and treatment adherence programs must not only provide appropriate and accurate knowledge about the disease but they must motivate individuals to change their attitudes (by increasing their perception of risk and self-efficacy) and by providing the necessary tools, skills and support while removing barriers such as negative attitudes to facilitate behavior change.[93,106] Studies have shown the IMB theory to be moderately effective in HIV prevention programs.[110–114] Figure 3 provides an illustration of how the IMB theory is applied to HIV prevention programs. Hence, the social cognitive and the IMB theories demonstrate the importance of knowledge and attitudes to high risk behavioural change and the fight against HIV/AIDS

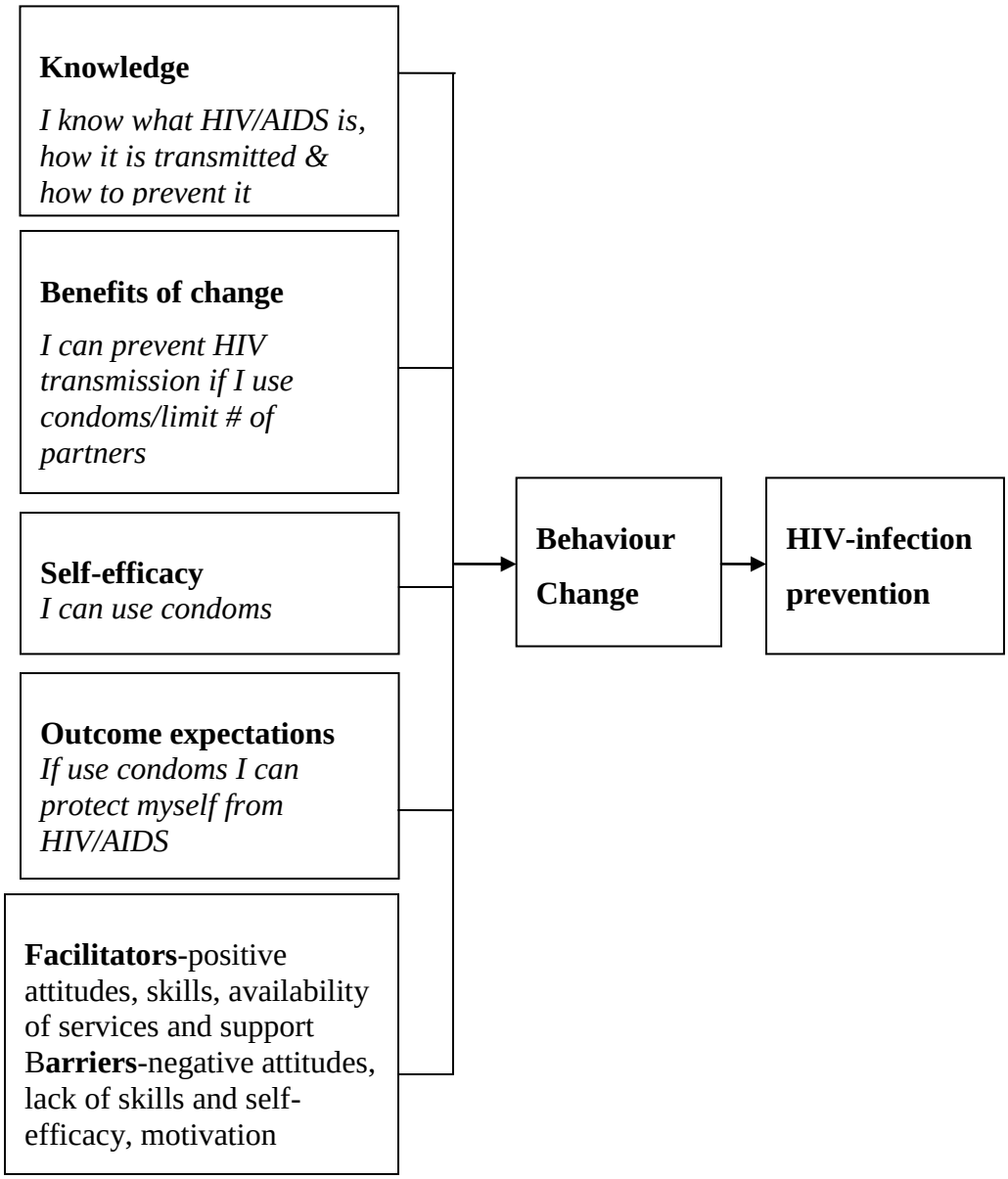

Figure 2: Social Cognitive Theory applied to HIV/AIDS prevention
Adapted from Munro et al.(2007)[110]

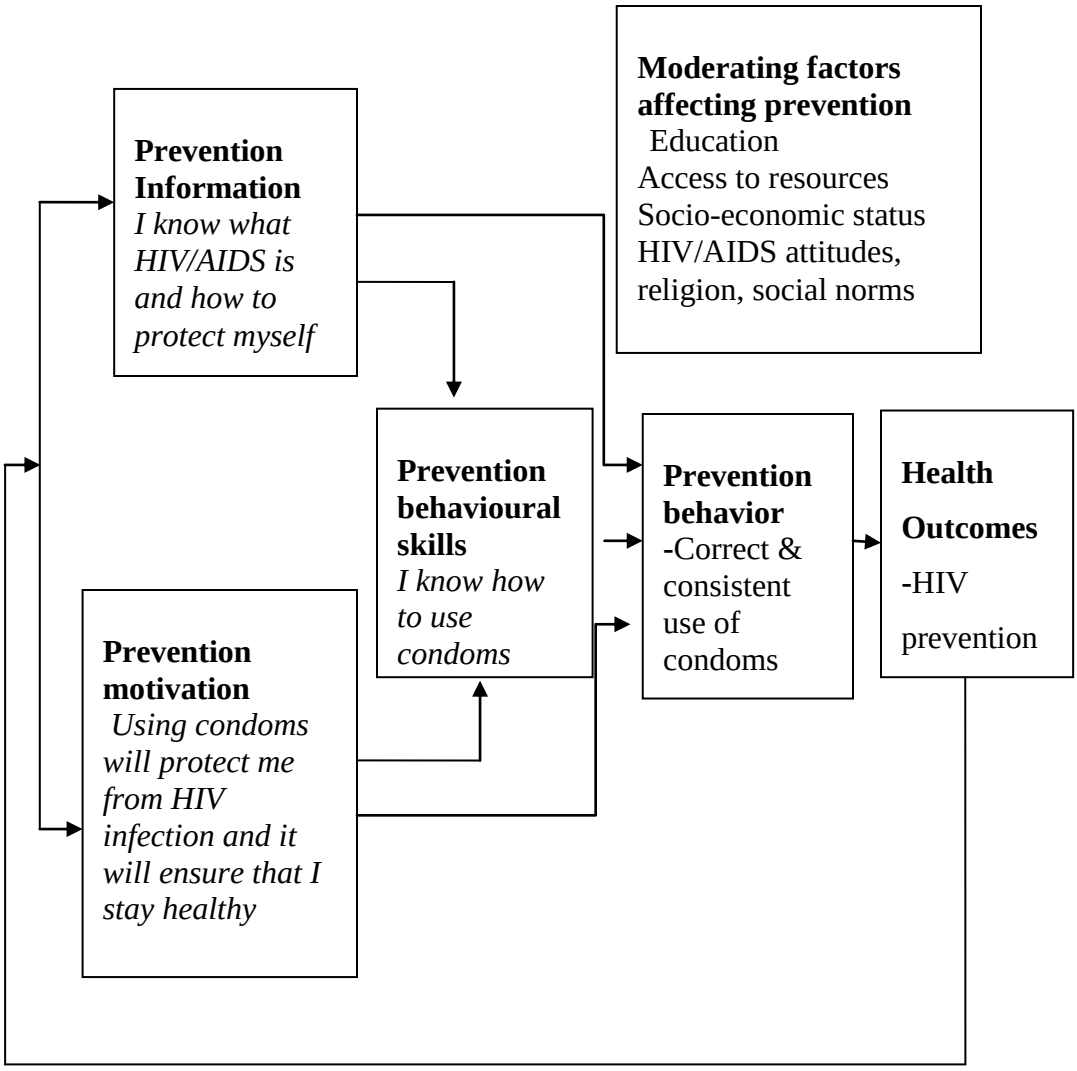

Figure 3: Information-Motivation-Behavioral skill (IMB) theory applied to HIV/AIDS prevention

Adapted from Munro et al.(2007)[110]

2.2.5 Transmission of HIV/AIDS and the disease's impact on women

Connell's theory of gender and power explains the disproportionate impact of HIV/AIDS on women across the globe and especially in developing countries.[16,115–118] This theory stipulates that there are three social constructs that depict men's and women's gendered relations:1) the sexual division of labor; 2) the sexual division of power and; 3) the structure of cathexis.[115] The sexual division of labor pertains to the men and women's allocations to different occupations, with women generally being allocated to lower status jobs than men. [16,115–118] Social mechanisms maintain the sexual division of labor with women doing "women's work" such as child rearing and household labor while men are responsible for generating the household income.[16,115] Thus, this sexual division of labor manifests in gender inequalities with women becoming dependent on men for financial support. Women's dependence on men puts them at risk for adverse health outcomes such as HIV/AIDS.[16,118] Women who depend on their partner for financial support are less likely to negotiate preventative behaviors and are more likely to engage in risky behaviors such as prostitution. Thus the manifestation of this sexual division of labor and the consequent financial dependency of women on men results in socio-economic risk factors for women.[16,118]

The second dimension of the gender and power theory pertains to the sexual division of power between men and women. Power is defined as "having power to act or change or having power over others."[16] The sexual division of labor resulting in the financial dependency of women on men leads to the sexual division of power with men having more power over women.[16,118] This sexual division of power further increases the inequalities between the genders with women being at disadvantage and vulnerable to the manifestations of this power difference such as violence against women.[16,17,118] Power differentials hence increase women's vulnerability to HIV/AIDS and other adverse health outcomes.

The third component of the gender and power theory, cathexis (also known as the affective attachments and social norms), pertains to the affective or emotional attachments between men and women and the surrounding social norms influencing these relations. [16,115] Cathexis leads to beliefs and stereotypes such as that younger women are attracted to older men and vice versa. [16,115] These stereotypes and beliefs become perpetuated in populations further increasing gender inequalities; large age differences between men and women are known to increase power imbalances further exacerbating women's vulnerability to HIV/AIDS infection and other adverse health outcomes.[4,16,118]

These three components of the gender and power theory overlap and are interdependent. [16,115] In addition, these three components can manifest at different levels of society . Hence, the division of power is rooted in societies through historical and socio-political forces that maintain the division of power between the genders and the attribution of different social roles on the basis of an individual's gender. [16,115] Therefore, gender-determined roles result in inequalities that disadvantage women while empowering men. Consequently, gender-inequalities resulting from the power imbalances have led to the differential distribution of HIV risk factors between men and women, with women being more vulnerable.[16,18,119] In societies, where the manifestation of gender-inequalities are pronounced as a result of higher power imbalances that are due to the socio-economic disadvantage of women , women are especially more disproportionately impacted by HIV/AIDS than men.[17,18] For instance, in Sub-Sahara Africa, where the transmission of HIV is mainly through heterosexual sex, women in marriages or in long-term cohabiting relationships are particularly vulnerable to HIV infection.[57,120–122] One study that estimated the percentage of heterosexual HIV transmissions occurring in marriages or cohabiting relationships (using the 2001/2002 Zambia DHS and the 2005 Rwanda DHS) found that between 60% and 94% of new heterosexual HIV infections occurred in marriages or long-term cohabiting relationships.[57]

In Ethiopia and many other Sub-Saharan cultures, marriage is the sanctioned institution for having children and having many children is not only encouraged but is expected.[122] This expectation places pressure on the women to continue bearing children and discourages contraceptive use that would be protective against HIV/AIDS.[122] Marital

status has been found to influence women's risk perception and sexual practices.[99,122] Women who are married or are in long-term cohabiting unions naively believe that marriage or unions confer safety to them and are less likely to use preventative methods.[7,16,122] Hence, marriage and monogamous relationships ironically expose women to high rates of HIV infection as well as the risk of transmission of the infection to their children through MTCT.[69] A study by Tamiru and et al, [122] looked at fertility and HIV/AIDS in Ethiopia and found that even when women perceived themselves to be at risk of HIV infection, their desire for more children out-weighted their desire to engage in HIV preventative practices such as contraceptive use.

Studies have shown that women engage in HIV preventative behaviours (i.e. the use of condoms) less often than men do.[16,93,123] Fear of being accused of promiscuity and the consequent violence against women are important barriers to the use of prevention methods such as condoms among women in Sub-Saharan Africa.[3,7,69,119] Sub-Saharan Africa has the highest rates of intimate partner violence (i.e. violence against women by their husbands or sexual partners) in the world.[124] In 2013, the WHO reported that intimate partner violence was the highest in central Sub-Saharan Africa at 65.6%; it was also high in the east, south, and west regions of Sub-Saharan Africa at 38.8%, 29.7% and 41.8% respectively, well above the average global estimates of 26.4%.[124] Several studies have shown that gender violence increases women and girls' risk of acquiring HIV/AIDS.[125–127] In addition, pregnant women are often afraid of being blamed for passing the infection to their babies and thus avoid prenatal care and testing and vital treatment for themselves and their children.[77,81,99] Therefore, fear of violence, stigma, discrimination and negative attitudes remain major barriers for girls and women's access to reproductive health services and resources.[4,77,97] As a result, married and cohabiting women often engage in unsafe sex practices even when they may be aware that their partners are engaging in extramarital sexual relations. [128] In addition, young women who are not married in these countries often resort to sleeping with older men for money and gifts in order to survive, which exposes them to high risk of HIV infection.[21] HIV/AIDS knowledge and attitudes are therefore of little use to women if they feel powerless to negotiate safe sex practices with their husbands or partners. The WHO has acknowledged that gender inequalities such as violence against women and girls, rape,

and un-equal access to education and economic opportunities are hampering efforts in the fight against this global epidemic. [97] In fact, these gender inequalities have led not only to high incidence and prevalence of the disease in women but women are also acquiring the disease at younger ages than their male counterparts.[4,17,127]

Having HIV/AIDS impacts women's lives in many ways.[4] Women who have HIV/AIDS are almost 2 times more likely to acquire a tuberculosis infection in Sub-Saharan Africa compared to men of the same age who are infected with HIV.[4] They are also at an increased risk of cervical cancer.[4] In addition, when women become pregnant, there is a risk of passing the infection to their children through MTCT.[4] 2.9 million children were living with HIV/AIDS in Sub-Saharan Africa in 2012 and the majority (90%) of these infections were the result of MTCT.[2] Fortunately, preventative practices such as consistent condom use, limiting the number of sexual partners and fidelity are effective in HIV prevention.[2,7] Moreover, ART is fairly effective in improving the quality of life of PLWHA and in decreasing AIDS related deaths.[4] In addition, treatment of HIV with ART greatly reduces the transmission of the infection through sex as well as MTCT by reducing the viral load.[2, 7] Furthermore, ART has been found to decrease tuberculosis infection, the leading cause of death in AIDS patients in developing countries and particularly in Sub-Saharan Africa.[2] However, inadequate levels of HIV/AIDS knowledge and negative attitudes resulting from stigma and gender-inequalities remain key barriers to accessing HIV services and treatment in Sub-Saharan Africa. In 2012, only 34% of all people eligible for ART actually received it.[2]

2.2.6 Women's Autonomy

Although the numerous factors previously discussed contribute to the disproportionate impact of HIV/AIDS on women, one factor that has received a lot attention in recent years is women's autonomy. Low autonomy resulting from gender- inequalities has been named a major contributor to the disparities in HIV/AIDS infection among women.[25,43,45,122,129] Women's autonomy was defined by Dyson and Moore as "the technical, social and psychological ability to obtain information and use it as the basis of decision making about one's private concerns and close relations".[31] Jejeebhoy and

Sathar,[32] defined women's autonomy as the "control women have over their own lives and the extent to which they have an equal voice with their husbands in matters affecting themselves and their families, control over material and other resources, access to knowledge and information, the authority to make independent decisions, freedom from constraints on physical mobility, and the ability to forge equitable power relationships within families." Thus, women's autonomy pertains to women's status or power in their households and whether or not they have a say in the decisions that affect them and their families. In the literature, Jejeebhoy's five interdependent components of autonomy are well recognized: 1) autonomy of knowledge, 2) decision- making autonomy, 3) autonomy of movement, 4) emotional autonomy and 5) economic/self-reliance autonomy.[33]

According to, Jejeebhoy,[33] the autonomy of knowledge stipulates that women who are free to obtain information and knowledge through a formal education or as a result of their exposure to the world are better able to navigate their lives and have a much better understanding of their world.[33] For instance, access to mass media such as television, radio, newspapers and magazine and/or attendance at worship services and community gatherings are all informal ways that women can acquire knowledge and information which might then help them with making decisions about their own lives.[33–35] Decision-making autonomy pertains to women's abilities to contribute to the decisions pertaining to their households, their own health as well as the health of their families.[33] Thus women's decision-making ability is a reflection of their influence and power in their households compared to their partners or husbands.[19] The autonomy of movement component encompasses women's ability to move about freely to conduct their daily affairs without requiring permission from their spouses or other family members.[33] Emotional autonomy pertains to women's freedom to social relationships, their abilities to form strong emotional bonds with their husband and their abilities to feel safe from spousal abuse and domestic violence.[33] The last component of women's autonomy, economic autonomy/self-reliance, pertains to women's ability to control or access economic resources (.i.e. house hold income or through employment) and to feel confident and reliant on their own abilities.[33] Hence, autonomy affects women's ability to make decisions regarding their private affairs, particularly their own health and well-

being as well as the health and well-being of their families. As a result, autonomy is important in all aspects of women's lives. [32]

Women's autonomy is a multi-dimensional concept that encompasses the five interdependent components described above. This multi-dimensional concept of autonomy comprises both agency and resources; agency being the women's ability to exercise her rights and freedoms in the various facets of life including psychological, reproductive, economic, and socio-cultural aspects and having the resources to do so.[130] Thus, agency is the process by which a woman exercises her own free choice in decisions affecting herself and her family and resource is the physical, social and emotional aspects that enable her to carry out this choice.[32,33]

Large surveys such as the DHS are now collecting information on some components of women's autonomy in countries across the globe to further our understanding of how women's autonomy affects various outcomes important in the lives of women such as HIV/AIDS. The DHS uses indicator questions to gauge the components of women's autonomy; generally the DHS focus on women's decision-making, emotional and movement autonomy. However, the measured components may differ between countries. For instance, in South Asia, where women's movement autonomy is very limited, DHS focuses on this component. However, in Sub-Saharan Africa, where women enjoy higher levels of movement autonomy as a result of the expectation of women to contribute to the household income, DHS focuses on decision-making, emotional and economic/self-reliance autonomy. Questions aimed at assessing the decision-making autonomy of the women focus on who in the household has the final say on purchasing and preparing food, taking care of the children's education and well-being, the number of children to have, making major and minor household purchases as well as who decides on the healthcare needs of the women and the use of the household income.[13, 14, 131] Questions assessing the women's autonomy of movement generally ask the women whether or not they require permission to go to places such as the market place, hospitals, health clinics, and to relatives or friends' houses.[13 ,14] Questions assessing women's economic autonomy ask the women whether or not they have access to their spouse's earnings; who decides how to spend the household's income; whether or not the women can work

outside the home and if they do work, who decides on how to spend those earnings.[13,14] The DHS assesses women's emotional autonomy by asking them whether or not wife-beating is justified under various circumstances and whether the women fear their husbands and other family members. Additionally, to assess emotional autonomy, the DHS asks the women whether or not refusing sex with their husbands or partners is justified under various circumstances.[13,14,131]

Women's autonomy is measured relative to that of men and many of the components of autonomy are cultural context dependent.[24,31] Hence, autonomy is strongly influenced and affected by the existing social and cultural environment.[20,24,31] A key assumption of the concept of autonomy is that in all cultures women are part of a gender stratified social system governed by shared norms and values where men have control over women and the decisions that affect women's lives.[24] Therefore, an individual woman's autonomy does not exist in isolation from her environment.[24] In addition, the various components of autonomy do not have the same weight or importance in all cultural contexts; women may have high autonomy in some components while being deprived of other components even within the same cultural context and often across cultures.[20,24,31] Therefore, the components of autonomy that are the most important in South Asia differ from those in Southeast Asia which differ from those in Africa and elsewhere. Consequently, autonomy varies between cultures and countries and sometimes even sometimes even within the same country due to differences in the prevailing cultural norms practiced.[132]

In Sub-Saharan Africa and particularly in east Africa, the normative societal organization is based on patriarchal systems where men exercise power over women.[133] Various cultural and religious beliefs and traditions restrict women's autonomy and place them in subordination to men.[19,26,27,44,133] In many African societies, lack of control over their own sex lives and the sex lives partners put women at risk to infections such HIV.[17,128] Cultural and religious beliefs that encourage women to have little knowledge and experience of sexual matters before marriage and that stipulate monogamy after marriage, often lead to ignorance in women.[7] This lack of knowledge with respect to reproductive health puts women at high risk of infections including HIV.[134–136] In addition, some cultural practices discourage women from refusing sex with their husbands or even in

asking him to use a condom, which also puts them at high risk of HIV-infection.,[134–136] These same cultural and religious beliefs often encourage displays of masculinity in men such as the early sexual initiation and numerous sex partners.[135] In some African cultures, the practice of polygyny (i.e. having multiple wives) and extramarital relations by men makes women vulnerable to infection.[135] Furthermore, practices such as bridal dowries (payments to a bride's family by the husband) in some societies perpetuate the idea that women are the men's property.[134–136] Moreover, discriminatory cultural practices and values encourage the education of boys and deny girls equal opportunities to inheritance, education and employment thereby making them economically dependent on men.[134–136] In many societies in Sub-Saharan Africa, marriage of young girls or women to much older men is common due to this economic dependency. [134–136] Consequently, women and especially married women are subordinate to men and are unable to negotiate safe sex practices or refuse sex. [134,135] Even with unmarried women, sex with older men in exchange of gifts or money is a strategy for survival.[58]

The described gender-inequalities limit women's autonomy in Sub-Saharan Africa. Women are often expected to participate in the daily activities that generate their household's income.[26] Thus, these women have some mobility, decision- making and economic autonomy.[26] However, these women have less autonomy in other aspects such as emotional autonomy and the autonomy of knowledge.[26] Even with respect to the components of autonomy that women are permitted to exercise, they are still in subordinate position to the men who have the ultimate power over all the decisions.[19,26] Women are permitted to exercise certain aspects of autonomy only as far it benefits their households and often women are limited from participating in the most important decisions.[19,26] For women who disobey their husbands, wife beating is a common practice, especially in East Africa.[27]

Over the last 30 years, there has been much interest in women's autonomy and its effect on women's lives. The large majority of studies have focused on how women's autonomy affects important outcomes such as the uptake of contraception and family planning, child survival and immunizations, maternal and child healthcare seeking and utilization, prenatal and delivery care as well as women's positions in their households.

The majority of these studies are from Asia.[23,24,28,29,31,32,34,36–39,41] Of these studies, those focusing on how autonomy affects women's reproductive behavior , and family planning[23,24,26–28,35,38,44,136] have found that women with higher autonomy generally participated more actively with regard to decisions affecting their reproductive behavior. One study ,Balk 1994), [36] found that, in rural Bangladesh, women's autonomy strongly affected whether or not women had a say in decisions related to the number of children to have. Another study by Sujatha and Reddy, [37] using the India National Family Health Surveys II (1998-990) and III (2005-06) reported that married women who had higher education and therefore higher autonomy of knowledge had less son preference (an indicator of high autonomy in South Asian women), decreased total fertility rate, and increased median months since previous birth. Moursund and Kravdal, [38]found a weak but significant association between women's decision-making autonomy and contraception use in India. Al-Riyami et al.,[137] also found that more autonomous women were more likely to use contraception in Oman. A different study, [30]found an inverse relationship between women's autonomy and their fertility behaviour in Oman.

Likewise, studies investigating the effect of women's autonomy on child health, infant survival, and maternal healthcare utilization,[29,138–140] found strong associations. Sharma and Kader,[29] looked at the effect of women's decision-making autonomy on infant birth weight among married women in rural Bangladesh; they found that women with lower decision-making autonomy were significantly more likely to have babies with low birth weight than women with higher decision-making autonomy. Bloom et al., [138] found that women who had higher autonomy of movement were more likely to use maternal healthcare services in a city in north India than women whose freedom of movement was more restricted. Also, Beegle et al.,[139] found that married women in Indonesia who had more control over the household economic resources (and therefore had higher economic autonomy) were more likely to use prenatal and delivery care. As well, Ghuman,[39] in her comparison of 15 pairs of Muslim and Non-Muslim communities in Thailand, Malaysia, and India found that infant mortality was associated low autonomy in women.

Fewer studies in Sub-Saharan Africa,[19,26,27,44,45,61,130,136] have examined the effect of women's autonomy on important outcomes such as family planning and contraceptive

use, and maternal and child healthcare utilization. These studies have shed light on the importance of women's autonomy in addressing the gender inequalities faced by African women with regard to many aspects of their lives. For instance, Hogan et al.,[136] found that literacy and women's autonomy were the most important factors in reducing the total fertility rate in Southern Ethiopia. Thus, increasing women's autonomy is key factor in reducing fertility in one of the most rapidly growing populations in Africa.[52] Furthermore, Woldemicael,[26] found that several components of women's autonomy were important in maternal health care utilization in Ethiopia. Wodemicael,[27] also found a strong positive correlation between women's autonomy and their fertility preferences and contraceptive use in Eritrea. A similar association was found in Zimbabwe by Hindin, [44] where women's autonomy was found to be an important means of fertility control.

2.2.7 Women's Autonomy and HIV/AIDS

Few studies,[25,43,46,65] have looked at what effect women's autonomy has on women's HIV/AIDS knowledge and attitudes. A study by Bloom and Griffiths ,[43] using the India 1998-99 National Family Health Survey II, investigated how women's autonomy affected women's HIV/AIDS knowledge and behavior in three states that differed in cultural practices in India. They found that women with higher autonomy had higher knowledge of HIV/AIDS, condoms and the proper methods of using condoms. Another study by Gagnon et al.,[141] examined how women's sexual power affected their HIV/AIDS knowledge, attitudes ,and practices among South Asian women who had recently migrated to Canada. This study found that women who had more power (and thus were considered to be more autonomous) in their relationships with their spouses were more likely to have heard of HIV/AIDS, and more likely to ask their partner to use a condom.[141]

Other studies examined the relationship between women's autonomy and sexual behavior. A study by Hindin and Muntifering,[45] examined how women's autonomy affected their sexual behavior (using the Ghana, Malawi, Mali, Rwanda, Uganda and Zimbabwe DHS) In all six countries, these authors found that women's decision-making autonomy was highly correlated with the timing since their last sexual intercourse, with

the most autonomous women having the longest timing since the last sexual intercourse. Ung et al., [46] also looked at married women's ability to negotiate safe sex practices with their husbands (using the Cambodia DHS from 2010); they found that women with higher decision-making, economic, and movement autonomy were likely to successfully negotiate safe sex practices compared to women who had lower autonomy.

Similarly, Chacham et al.,[25] examined the association between young women's autonomy and their susceptibility to HIV/AIDS in Belo Horizonte, Brazil. They found that gender inequalities such as domestic violence against women, high unemployment rates among the women compared with their male counterparts, and high levels of poverty reduced women's autonomy. The low autonomy in the women in their relationships made them highly susceptible to HIV/AIDS infection.[54] Pettiford et al.,[142] used a nationally representative sample of 11,904 South African men and women aged 15-24 years to investigate the relationship between condom use and HIV sero-status. This study also assessed women's power in their relationships through the questionnaire. In a subsample of 4,066 sexually experienced South African women aged 15-24 years, those who had more sexual power in their relationships (and were therefore more autonomous) were more likely to have consistently used condoms. They also found that inconsistent condom use was associated with HIV–positive status among these young women.

Lastly, a study by Stephenson,[65] examined the effect of community factors on young peoples' HIV/AIDS knowledge (using the 2003 Burkina Faso, 2003 Ghana and 2001/2002 Zambia DHS). He found that women from communities where women married later and had their first child later had higher levels of knowledge compared to women from communities where early marriages and childbearing were common. Stephenson,[65] attributed the higher levels of knowledge in women from communities with higher mean age of marriage and child bearing to education and employment which increased women's autonomy. Thus, these older and more autonomous women had more opportunities to access information which would in turn increase their knowledge.[65]

These studies demonstrate the importance of women's autonomy in the various aspects of women's lives including their reproductive behavior and HIV/AIDS. However the

research on women's autonomy is not without criticism. The multi-dimensionality of women's autonomy makes it a difficult concept to define and quantify.[20,24,31] Although the previously described components and definitions of autonomy are generally well recognized in the literature, there is still no concrete agreement on the definition of autonomy or how it should be operationalized and measured. The concept of women's autonomy is used interchangeably with other concepts such as women's status, women's empowerment, gender-inequality, and women's position in the literature.[20,24,31] This creates confusion since these concepts actually measure different components of gender-equality.[143] Furthermore, this ambiguity in the definition, operationalization, and use of the concept of autonomy makes deciphering the literature and understanding the importance of women's autonomy on various outcomes challenging.[31,144,145]

In addition, much of the early research on the association between women's autonomy and various outcomes used indirect proxies of women's autonomy such as education and employment.[19,143,145,146] However, it was soon realized that the multi-dimensional concept of autonomy could not be adequately captured by these single proxies. The use of single proxies often distorted the channels measuring autonomy and were also inadequate in capturing the context dependency of this construct.[145] For example, with research that examined the effect of education on fertility, it became difficult to determine if education decreased fertility directly or if education increased women's autonomy which in turn decreased fertility.[145] Moreover, the use of single proxies made it difficult to determine the components of autonomy that were actually being measured.[19,26,27,136,143,145,146] Using education as proxy measure for autonomy in Africa, researchers found that education did not increase women's autonomy significantly unless it generated employment.[26,136] Therefore, single proxies were inadequate in capturing all the components of autonomy and its nuances.[19,26,27,136,143,145,146]

As such, research on women's autonomy has moved away from the use of indirect proxies to using more direct indicators that measure the different dimensions of autonomy such as women's participation in household decisions (decision-making autonomy), access to and control over economic resources (economic/self-reliance autonomy), freedom of movement to conduct their daily affairs (movement autonomy),

their education and exposure to the world (knowledge autonomy), and freedom from abuse and domestic violence (emotional autonomy).[143] These direct measures of women's autonomy clarify the pathways through which economic and social variables affect women's autonomy. Hence the use of the direct measures of women's autonomy prevent confounding the causes and effect of women's autonomy.[145,147]

Even more recent research (i.e. Jejeebhoy and Sathar (2001)),[32] has faced criticism. This study summed the different dimensions of autonomy into a single construct with the underlying assumption that all the components have the same weight and importance as well as a perfect correlation.[143] Agarwala and Lynch,[143] argued that this assumption was incorrect given that other studies have found varying and weak correlations between the five dimensions of women's autonomy. They assert that each component of autonomy should be measured and tested separately.[143] Furthermore, ignoring the cultural context can also produce unexpected results. For example, studies carried out in Pakistan to measure how women's autonomy influences women's contraceptive use found no significant correlation even though the literature indicated otherwise.[20] In the context of South Asia, researchers,[20] argue that the phenomenon of son preference (the preference of sons over daughters in South Asian cultures) is a stronger predictor of women's autonomy than the previously named five components of autonomy and should be included in the autonomy construct. Furthermore, since community and cultural norms influence autonomy, researchers,[20] questioned the usefulness of measuring women's individual autonomy. The concept of autonomy over emphasizes women's independent autonomy while in reality, in many cultures, women rarely make decisions alone.[20,40] As well, the measure of autonomy fails to account for the important and prominent influence of men on decisions regarding the household, women and women's issues.[20] Evidence from the literature suggest instead to measure community autonomy which would take into account contextual factors thereby better capturing how autonomy influences women's lives. Due to these reasons, researchers argue against the current measures of autonomy and its assumption of universal applicability by neglecting important background contextual factors; they assert that autonomy should include different components in different contexts instead of fitting the same definition of autonomy to all contexts.[20,40,143] Another problem with current research on women's autonomy is that

even large surveys such as the DHS only measure some components of women's autonomy such as decision-making, emotional and physical autonomy. This makes it difficult to determine the full effect of autonomy on various outcomes.[19]

In summary, evidence from the literature indicates that each dimension of autonomy should be measured directly and analyzed separately to allow for the most accurate and robust measure of autonomy.[40,143,145] In addition, the measure of autonomy needs to take into account the background contextual factors influencing autonomy.[40,143,145] Finally, efforts should be made to capture this multi-dimensional construct in its entirety to fully understand how women's autonomy influences various outcomes.[19]

2.2.8 The effect of men's perception of women's autonomy on women's HIV/AIDS knowledge and attitudes

As previously discussed, women's autonomy is not measured in isolation from women's environment. Men play an important role, especially for married or cohabiting women, in the decisions that affect women's lives. Therefore, it is important to consider and measure the effect men's perception of women's autonomy has on women's HIV/AIDS knowledge and attitudes. However, only few studies,[28,41,42,139,148,149] have examined the effect men's perception of women's autonomy has on important outcomes such as women's healthcare utilization, prenatal and delivery care, and decision-making. Thapa and Niehof,[148] investigated the effect of women's and men's perception of women's autonomy on maternal healthcare utilization in Nepal. They found that both women's autonomy and men's perception of women's autonomy were important in women seeking maternal healthcare. They also found that increased husband's involvement in maternal health care was responsible for decreased decision-making autonomy among the women. Becker et al.,[42] compared women's and husbands' perceptions of women's decision-making autonomy in Western Guatemala and found that women, compared to their husbands, under-estimated their own decision-making power in their households. They also found that educated women were more autonomous and reported higher decision-making power than uneducated women who generally deferred household decisions to their husbands. Similarly, Beegle et al.,[139] investigated the effect of bargaining power

between couples on the use of prenatal and delivery care in Indonesia. They found that women who were more autonomous, particularly with respect to economy and personal assets, were more influential in the prenatal and delivery care decisions than women who lacked their own personal assets, work-related income or who came from a lower social-status (less educated and wealthy background).

Other studies,[28,41,140,149] that examined agreement on women's autonomy indicators between women and their spouses found that men attribute higher autonomy to women than the women attribute to themselves. Mullany et al.,[28] and Allendorf 2007,[41] examined the effect women's autonomy and husbands' perception of women's autonomy had on women's maternal health care utilization in Nepal. They found that women with higher autonomy had higher decision-making power with respect to maternal healthcare utilization. However, most of the women had low decision-making power compared to the husbands. In addition, these studies found that higher decision-making in women impeded the men's involvement in the women's maternal healthcare utilization.[41] However, communication and joint decision-making between couples was also associated with increased healthcare utilization.[41] These studies concluded that communication and negotiation between couples leads to joint decision-making which can be used as a strategy to improve women's empowerment and women's health and well-being. In addition, education and paid employment increased the women's autonomy and their contributions to their households and to decision-making regarding their own health and the health of their families.[41]

Similarly, a study by Ghuman et al.,[140] that examined women's autonomy and men's perception of women's autonomy on several different outcomes across five south and east Asian countries also found disagreement between the men and women on the perception of women's autonomy. Jejeebhoy,[149] also found that men attributed higher autonomy to the women than the women attributed to themselves in rural India. The authors hypothesized that the men gave responses they felt the interviewers wanted to hear and questioned the validity of this study.

These studies indicate that increasing communication and joint decision-making between couples may be an important strategy for improving the disproportionate impact of HIV/AIDS on women. Open communication and negotiation with respect to the utilization of preventative methods such as contraception can be a strategy for preventing and decreasing HIV infections in women.

2.2.9 Socio-demographic characteristics

In addition to women's autonomy, evidence from the literature has shown that women's age,[21–29,40–44] employment,[24–30,45,57,69,150] education,[19,21–29,31,36–38] religion,[21,22,24,26,27,31,32,39,61,151] mass media exposure,[43,66,69,152–154] and their spouses' age,[148] education,[23,26,38,146,148,152] religion,[21,22,24,26,27,31,32,39,61,151] and media exposure,[153] as well as the couple's residence (urban or rural)[18,26,27,45,61,152] and wealth index,[19,22,27,43,44,69,130] are also associated with the women's HIV/AIDS knowledge and attitudes. Therefore, these socio-demographic variables were included in this study. For a conceptual model of the relationships between women's autonomy (and their spouses' perception of their autonomy), socio-demographic variables, and the women's HIV/AIDS knowledge and attitudes, refer to Figures 4 and 5.

2.3 Current Study: Objectives and rationale

This study investigated the association between married and cohabiting women's autonomy and their HIV/AIDS knowledge and attitudes in Ethiopia. This study also examined the association between the spouses' perception of women's autonomy and women's HIV/AIDS knowledge and attitudes. The goals of this study were to:

1) Examine and analyze the association between women's autonomy (decision-making and emotional autonomy) and women's HIV/AIDS knowledge and attitudes and;

2) Examine and analyze the association between the men's perception of the women's autonomy (decision-making perception and emotional autonomy perception) and women's HIV/AIDS knowledge and attitudes.

Hypotheses

1. Women who have higher autonomy will have more HIV/AIDS knowledge and more accepting attitudes toward people living with HIV/AIDS compared to women with lower autonomy.

2. Women whose spouses' perception of their autonomy is higher will have more HIV/AIDS knowledge and more accepting attitudes than women whose spouses' perception of their autonomy is lower.

These hypotheses are derived from studies that have shown the importance of women's autonomy in important outcomes such as family planning and contraception use,[19,24,26–28,30–32,35–38,40,44,46,61,130,137], the utilization of antenatal and delivery services,[28,41,138,139,148] child health and infant mortality,[29,39] and HIV/AIDS knowledge, attitudes and practices.[22,25,43,46,61,65]

Therefore, women's autonomy was expected to be positively associated with women's HIV/AIDS knowledge and attitudes given that autonomy enhances these other aspects of women's lives.

Significance of this Study

This study is important for several reasons. To date, there are no known studies investigating the relationship between women's autonomy and women's HIV/AIDS knowledge and attitudes in Ethiopia or in Sub-Saharan Africa. Therefore, this study addresses this existing knowledge gap and is expected to contribute to our knowledge of the importance of women's autonomy in addressing the disproportionate impact of HIV/AIDS on women in Ethiopia specifically and broadly in Sub-Saharan Africa.

In addition, since this study utilizes data from two surveys which are five years apart, it is expected to provide insight on how women's autonomy, HIV/AIDS knowledge, and HIV/AIDS attitudes have changed over time. As a result, the findings of this study are expected to be useful in informing current programs and initiatives (i.e. Information Education Communication (IEC) programs, Volunteer Counseling and Testing (VCT) services and prevention of mother to child transmission (PMTCT) programs aimed at increasing women's HIV/AIDS knowledge and attitudes in Ethiopia and other countries in Sub-Saharan Africa.

Furthermore, this study is expected to shed light on what role men's perceptions of women's autonomy play in women's HIV/AIDS knowledge and attitudes in Ethiopia. Therefore, this study is also expected to inform the aforementioned programs and initiatives on what role men should play to effectively address the impact of HIV/AIDS on women.

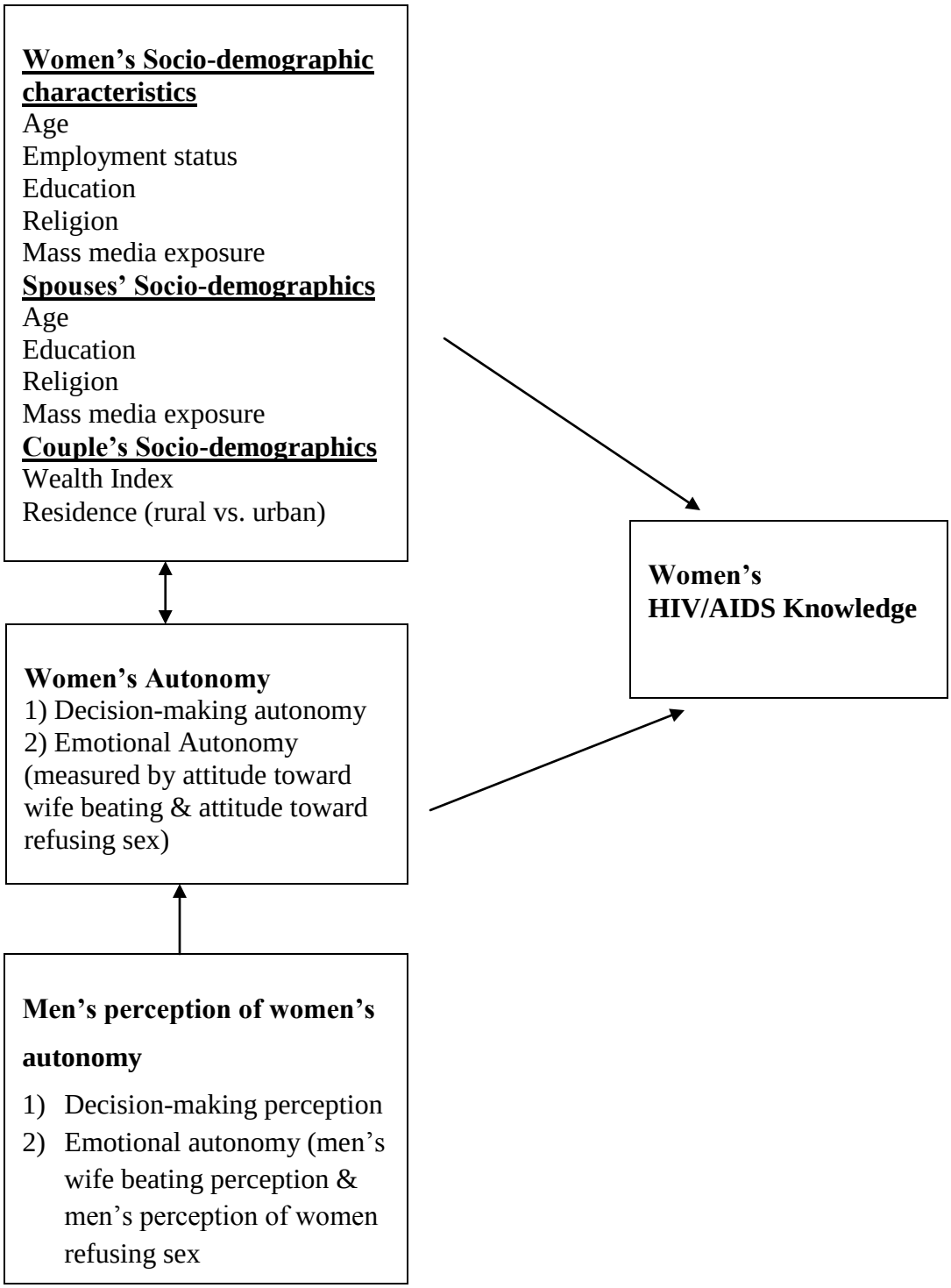

Figure 4: Conceptual framework of the relationships among the socio-demographic factors, women's autonomy & men's perception of women's autonomy and women's HIV/AIDS Knowledge in Ethiopia.

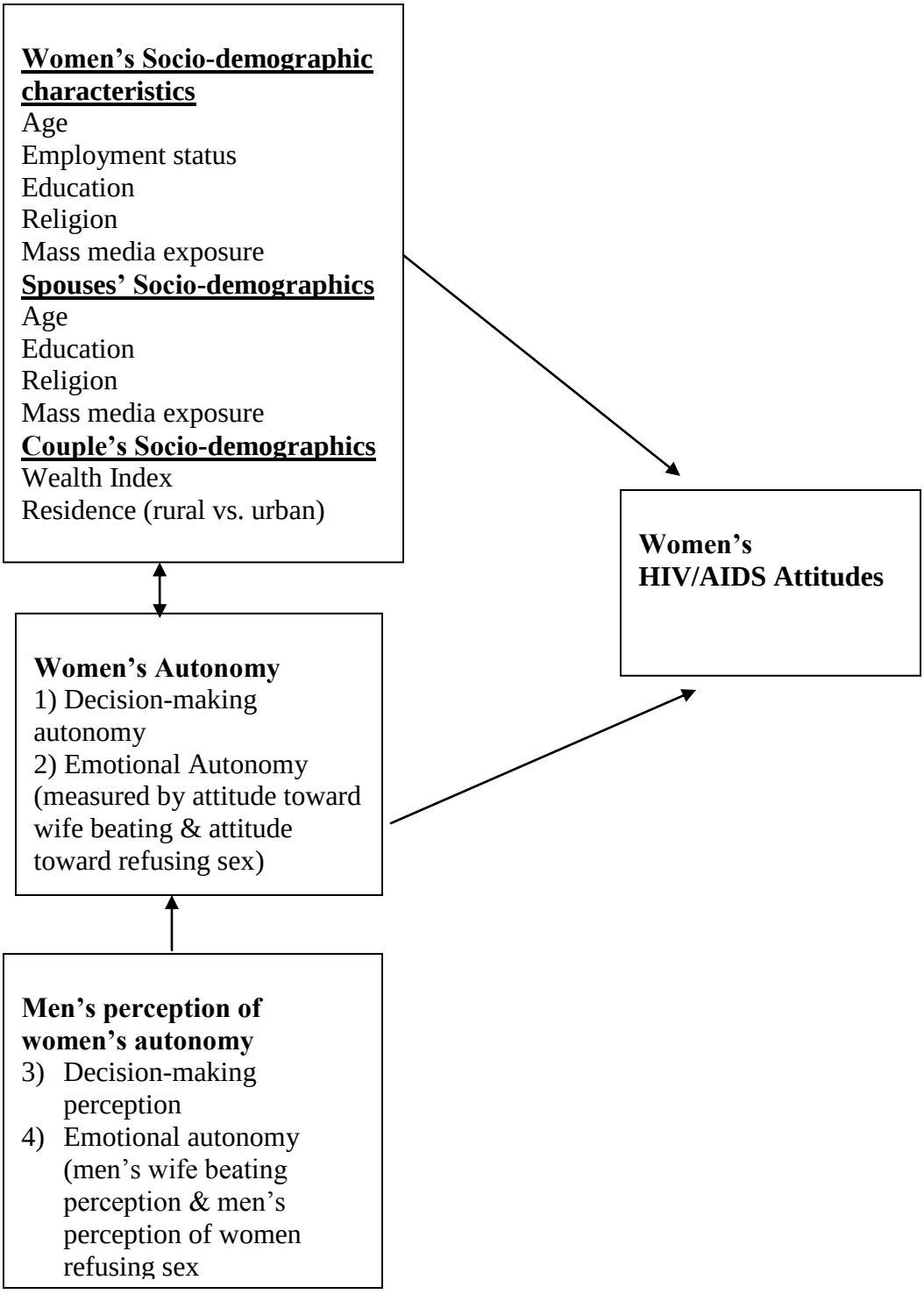

Figure 5: Conceptual framework of the relationships among the socio-demographic factors, women's autonomy & men's perception of women's autonomy and women's HIV/AIDS Attitudes in Ethiopia

Chapter 3

Methods

This chapter describes the source of data utilized in this study including a discussion of the sampling design of the survey (sections 3.1-3.2). Next, this chapter describes the variables used in this study (section 3.3), including dependent variables (HIV/AIDS knowledge and attitudes); key independent variables: women's autonomy (measured by decision making; attitude toward wife beating; and attitude toward refusing sex); men's perception of women's autonomy (measured by decision-making perception; wife beating perception; and men's perception of women refusing sex) ; and socio-demographic variables (i.e., the women's and spouses' age, education, religion, mass media exposure, the women's employment status, and the couple's residence and wealth index). Finally, this chapter discusses the statistical tools and methods utilized for the analyses (section 3.4) and concludes with the model diagnostics that were performed to ensure that the methods used for the analyses were sound (section 3.5).

3.1 Data Source

This study utilized the Ethiopia Demographic and Health Surveys (EDHS) cycles two and three (2005 EDHS and 2011 EDHS). The Demographic and Health Surveys (DHS) are funded by the United States Agency for International Development (USAID) through its MEASURE DHS Project. The MEASURE DHS Project is implemented by ICF international, a consulting company, in over 90 developing countries. [88]

The EDHS are collected by the Central Statistical Agency of Ethiopia (CSA) in conjunction with the Ethiopian Ministry of Health for the purpose of providing policymakers, program planners and evaluators with up to date demographic and health information for research, program planning, evaluation and monitoring. [13,14] The MEASURE DHS project gives the host countries ownership of their data with the intent of assisting developing countries with their development goals. The DHS surveys are standardized and allow for comparative analyzes across surveys from the same country or across surveys from different countries but they do permit each country to contextualize

the survey to its own needs. The surveys are conducted in the country's native language(s) and may include special sections to suit the country's specific needs (i.e. with the inclusion of additional questions). [88]

These cross-sectional surveys collect nationally representative population health information including fertility and family planning, maternal and child health, antenatal and delivery care, adult and childhood mortality and nutrition, malaria exposure prevention, knowledge and attitudes toward HIV/AIDS and other sexually transmitted disease as well as demographic information such as household characteristics. The DHS surveys also collect direct measures of women's autonomy which are of particular relevance for this thesis. To ensure up to date population health information, these surveys are collected about every five years. [88]

The DHS collect demographic and health information on women and men in the reproductive age (for most countries that is women aged 15-49 years and men aged 15-59 years). [88] The sample sizes of the DHS vary between 5000 and 30,000 households (and hence between 5000 and 30,000 men and women). A primary focus of the DHS is fertility and women's and children's health. Hence, some DHS surveys oversample women to collect information on fertility and maternal and child health. [88] The 2005 EDHS sample contained a nationally representative sample of 14,070 women aged 15-49 and 6,033 men aged 15-59. This sample represents 96 percent of the 14,717 women who were eligible and 89 percent of the 6,778 men who were eligible. Similarly the 2011 EDHS interviewed all women age 15-49 years and all men age 15-59 in selected households to produce a nationally representative sample. Of the 17,385 women who were eligible for the interview 95 percent (16,515) successfully completed the interviews and of the 15,908 men who were eligible, 89 percent (14,110) successfully completed the interviews. [13,14] The EDHS consisted of three questionnaires: a household questionnaire, a man's questionnaire and a woman's questionnaire to collect the pertinent population health and demographic information. These questionnaires were modeled after the standardized MEASURE DHS Project survey templates but were modified to meet the needs of Ethiopia.[88] The questionnaires were available in English and translated into the three major languages of Ethiopia: Amharigna, Oromigna, and Tigrigna. [13,14]

This study was limited to married couples or to cohabiting couples who were in stable unions and residing together in the same household. The couples' record data linked the man's and woman's questionnaires for couples who identified each other as husband and wife or stable partners and who permanently resided in the same household. The 2005 EDHS couples record contained 2,968 couples while the 2011 EDHS contained 6,745 couples; however, the HIV/AIDS knowledge and attitudes questions were only asked to men and women who had heard of AIDS. Thus only 85.5% (2,537) of the women in 2005 and 95.7% (6,454) of the women in 2011 had heard of AIDS and the analyses of the dependent variables (women's HIV/AIDS knowledge and HIV/AIDS attitudes) were based on these women. [13,14] Both 2005 and 2011 EDHS were used in this study to examine temporal changes in the independent, dependent and socio-demographic variables between 2005 and 2011.

3.2 Sampling Design

The EDHS sampling frames were based on the Ethiopia Population and Housing Census conducted by the Central Statistical Agency. The 2005 EDHS sampling frame utilized the 1994 census while the 2011 EDHS used the 2007 census.[13,14] These censuses organized the country into 11 geographic regions which are further sub-divided into smaller regions , each containing a convenient number of sampling units called Enumeration Areas (EAs). An EA is a geographic region containing a convenient number of dwellings and is the basic unit of the census; each EA is either completely urban or rural.[14] The census frame contained information about the EAs such as geographic location, whether they were urban or rural, type of residence (private or public dwelling) and the number of households in each EA. On average, urban EAs contained 169 households while rural EAs contained about 178 households. [155]

The EDHS were collected using a two-stage cluster sampling design. In 2005, 540 EAs (145 urban and 395 rural) were selected and in 2011, 624 EAs (187 urban and 437 rural) were selected for the first stage of sampling.[13,14] During this first stage of sampling, systematic sampling with probability proportional to size (PPS) was used where the selection of each EA was based on its size. [13,14] The second stage of sampling consisted

of sampling from the households in the selected EAs. To accomplish this, complete household listing in the selected EAs were compiled. This listing excluded institutional quarters such as army barracks, hospitals, police camps and boarding schools. Following this complete household listing, equal probability systematic sampling was used to select households. In 2005, 14,500 households were selected from the 540 clusters to produce a representative sample of 14, 500 women ages 15-49 and 6,033 men ages 15-59. For 2011, a representative sample of 17,817 households was selected from the 624 EAs to produce a representative sample of 16,515 women ages 15-49 and 14,110 men ages 15-59. For the 2005 EDHS, all women ages 15-49 who were permanent residents of the selected households or who were visitors who spent the night preceding the survey were eligible for the interview. For the 2005 EDHS survey, all men ages 15-59 who were either permanent residents or visitors who spent the night before the interview in every one out of two selected households were eligible. For the 2011 EDHS, all women age 15-49 and all men age 15-59 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.[13,14]

The complexities of the survey data such as non-response, unequal weights, stratification and clustering were accounted for in the analyses by using STATA's *svy* command and incorporating the men's sampling weights (recommended by the DHS for the couples' data), strata (urban/rural) and the primary sampling units for clustering. Not accounting for the complex survey design would lead to unstable regression coefficients and inflated standard errors.[88,156]

3.3 Description of Measures

The following section reviews the variables of interest for this thesis including the two dependent variables:1) women's comprehensive HIV/AIDS knowledge, and 2) women's HIV/AIDS attitudes toward PLWHA; the main independent variable of interest (women's autonomy and the indicators used to assess it); the secondary independent variable of interest (men's perception of women's autonomy and the indicators used to assess it); and the socio-demographic variables (women's, men's & couples') deemed to be

important to both the dependent and/or the independent variables of interest from empirical evidence from the literature. For the sake of brevity, the women's comprehensive HIV/AIDS knowledge will be referred to as HIV/AIDS knowledge and women's HIV/AIDS attitudes toward PLWHA will be referred to as HIV/AIDS attitudes from this point forward.

3.3.1 Dependent Variables

The two dependent variables of this study were women's HIV/AIDS knowledge and women's HIV/AIDS attitudes. These two variables were measured in both the 2005 EDHS and the 2011 EDHS.

HIV/AIDS Knowledge

The first dependent variable of this study was women's HIV/AIDS knowledge which was defined and measured in the EDHS, [3,14] by the following five criteria:

Knowing the two most common methods to prevent HIV infection:

1) "*Consistent condom use"* [13,14] and;

2) "l*imiting the number of sexual partners to one un-infected partner who is faithful"*[13,14] *and*;

Being able to reject the three common misconceptions about the disease in the region which are:

3)"*a person can get HIV from a mosquito bite"*[13,14];

4) "*a person can get HIV by sharing a meal with an infected individual"*[13,14] and;

5)"*a healthy looking person cannot have HIV/AIDS."*[13,14]

In the EDHS,[13,14] the answer categories to the above indicator questions were "yes", "No" or "don't know". For the purposes of this research, incorrect and "don't know" responses were re-coded as "0", correct responses were re-coded as "1", and missing

responses were re-coded as "9" and were excluded from the analysis. Thus knowledge is treated as a continuous variable and ranges from a score of 0-5; a woman who answered all five questions correctly would have a total score of 5 whereas a woman who answered all five questions incorrectly would have a total score of 0. Thus having a higher score indicates better knowledge about HIV/AIDS and is thus desirable.

HIV/AIDS Attitudes

The second dependent variable of this study was women's attitude toward PLWHA and was measured by the following four EDHS questions:

1) "*Would you want to keep a family member's HIV infection a secret?* "[13,14];

2) *"would you care for a relative who is infected with HIV*?"[13,14]

3) "*would you buy vegetables from a vendor who has the AIDS virus*?"[13,14] and;

4) "*should a female teacher infected with HIV be allowed to continue teaching in school*?"[13,14]

In the EDHS,[13,14] the answer categories to these questions were "yes", "no" or "don't know". For the purposes of this study, non-accepting responses as well as the "don't know" responses were re-coded as "0" and accepting responses were re-coded as "1". Women with missing responses were excluded from the analysis. Accepting attitude is defined as responding to each of these scenario questions with an accepting or positive attitude. [13,14] Negative attitude is defined as answering any one of these four questions with a negative response or a non accepting attitude. [13,14] For instance, a woman who replied "no, I would not buy vegetables from a vendor with HIV/AIDS" is considered to be showing a negative or non-accepting attitude toward PLWHA, whereas a woman who replied "yes, I would buy vegetables from a vendor with HIV/AIDS" was considered to be displaying positive or accepting attitudes toward PLWHA. [13,14] Thus in this analysis, women's HIV/AIDS attitude is measured as a continuous variable ranging from 0 to 4, where a total score of 0 represents having a negative or non accepting attitude on all four

scenario questions and a score of 4 indicates having an accepting attitude on all four scenario questions.

3.3.2 Primary Independent Variable of interest: measures of women's autonomy

The main independent variable of this study was women's autonomy. This variable is a composite of the following three EDHS indicator measures: decision-making which measures the women's decision-making autonomy, and attitude toward wife beating and attitude toward refusing sex which are measures of the women's emotional autonomy.

2005 EDHS Women's autonomy indicators

The 2005 EDHS measured women's autonomy through all three indicators: decision making, attitude toward wife beating, and attitude toward refusing sex.

1) Decision-making

Decision making autonomy measures women's overall contribution to decisions regarding the household. For the purposes of this research, the women's decision making autonomy, a direct measure of women's decision making autonomy is referred to as "decision-making" The following questions in the 2005 EDHS,[14] were asked to the women to assess the women's decision-making:

1) *" Who in your family usually has the final say on making large household purchases?"* [13,14]

2*) "Who in your family usually has the final say on making daily household purchases?"*[13,14]*;*

3) *"who in your family usually has the final say on you visiting family or relatives?"*[13,14] *and;*

4*) "who in your family usually has the final say on your husband/partner's earnings?"* [13,14]

Possible responses to the first three decision-making questions were: "the respondent alone, the husband/partner alone, the respondent and husband/partner jointly, other person or someone else."[13,14] Possible responses to who has the final say on the husband/partner's earnings were: "the respondent, the husband/partner, the respondent and husband/partner jointly, the husband/partner does not bring in any money or other."[13,14] Wives whose husbands/partners did not bring in any money (0.34%),[14] were excluded from the analysis. For this study, responses to the above decision-making questions were dichotomized into one of two categories: whether the woman has "a say at all" (either alone or jointly with the husband/partner) coded as 1 or whether she has "no say at all" coded as 0 (that is the husband/partner or someone else makes the decision). This dichotomization of decision making is consistent with what other researchers using the DHS data have done.[23, 30,44, 130,157] A score of decision-making was then computed from these four binary household decision making indicator questions. Thus each woman in the survey may have a decision making score ranging from 0 to 4, where if she has no say in any of the four decisions her total score is 0 and if she has a say in all of the four household decisions her total score is 4. The decision-making scores were kept as a continuous variable to ensure no loss of information in the decision making indicators.

2) Attitude toward wife beating

The 2005 EDHS measured women's emotional autonomy by assessing women's attitudes toward violence against women. The EDHS,[14] asked the women: "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:

1.) *If she goes out without telling him?*

2.) *If she neglects the children?*

3.) *If she argues with him?*

4.) *If she refuses to have sex with him?*

5.) *If she burns the food?"*[13,14]

Response categories for the wife beating questions were: yes, no, or don't know/depends.[13,14] For the purposes of this study, the "yes" and "don't know/depends" response categories were re-coded as 0. The "no" responses were re-coded as 1 as has been done in other studies.[38, 130 ,157] A variable called "attitude toward wife beating" ranging from a score of 0-5 was computed from the above five questions. Therefore, a woman with a score of 0 agreed with wife beating under all five circumstances whereas one with a score of 5 disagrees with wife beating under any of the five circumstances. Respondents with missing data were excluded from the analysis. Thus having a higher score indicated higher disagreement with wife beating and is desirable.

3) Attitude toward refusing sex:

The 2005 EDHS also measured women's emotional autonomy by assessing whether or not women can refuse sex with their partner or spouse. The EDHS, [13,14] survey asked the women "Husbands and wives do not always agree on everything. Please tell me if you think a wife is justified in refusing to have sex with her husband when:

1) *She knows her husband has a disease that can be transmitted through sexual contact?;*

2) She knows her husband has sex with other women? and;

3) She is tired or not in the mood?"

The responses to these questions were: "yes", "no" or "don't know".[13,14] For the purposes of this study, a variable called "attitude toward refusing sex" was created for the women. The "no and "don't know" response categories were re-coded as 0 and the "yes" response categories as 1. Thus for each question, a respondent could agree or disagree with refusing sex and a score ranging from 0-3 was produced for each participant by adding up the responses to the three questions. Again, these indicators were kept as continuous variables and a total score of 0 indicated low autonomy or the belief that a woman is not justified to refuse sex under any of the three circumstances whereas a total score of 3 indicates high autonomy as the woman believes that a woman can refuse sex under all three circumstances. Thus higher scores are desirable as they indicate higher

autonomy of the women. The dichotomization and scoring of this variable is consistent with the literature.[23,26,44,130,137] Respondents with missing data were excluded from the analysis.

2011 EDHS Autonomy Indicators

The 2011 EDHS measured women's decision making autonomy and attitude toward wife beating. Women's attitude toward refusing sex was not measured in 2011.

1) Decision- making

The 2011 EDHS,[13] questions assessing women's decision making autonomy were:

1. *"Who usually makes decisions about making major household purchases?"*[13]
2. *"Who usually makes decisions about health care for yourself?"*[13]
3. *"Who usually makes decisions about visits to your family or relatives?"*[13]
4. *"Who usually decides how your husband's/partner's earnings will be used?"*[13]

The 2011 response categories to the husband/partner's earnings were: " respondent, the husband/partner, the respondent and husband/partner jointly, the husband/partner has no earnings or other person."[13] The response categories for the other three questions were: "the respondent alone, the husband/partner alone, and the respondent and husband/partner jointly, someone else or other." [13] As was done for the 2005 EDHS, a "decision-making" variable was created by re-coding responses as 1 if the woman has any say (either alone or jointly) and coded as 0 if she has no say at all (partner or someone else makes the decisions). For the question regarding the partner's earnings, wives whose partner had no earnings were excluded from the study as were those with missing data for any of the questions. Again, decision-making scores ranging from 0-4 were produced for each respondent by adding the responses for each of the four questions together. Higher scores indicated higher autonomy whereas lower scores indicated lower autonomy.

2) Attitude toward wife beating

The wife beating questions from the 2011 EDHS were the same as those from 2005 EDHS and were also categorized and scored in the same manner described above for the 2005 EDHS. Again this variable was also called "attitude toward wife beating".

For all these autonomy indicators of interest, low scores indicate low autonomy and higher scores indicate higher autonomy.

3.3.3 Secondary Independent Variable of interest: men's perception of women's autonomy

The secondary independent variable of interest for this study was the men's perception of the women's autonomy. This is also a composite variable measured by the men's perception of the women's decision making autonomy (men's decision-making perception), the men's perception of the women's emotional autonomy (men's wife beating perception, and men's refusing sex perception). Both the 2005 and 2011 EDHS surveys asked the men the same questions that were asked to the women to assess decision-making, attitudes toward wife beating and attitudes toward refusing sex.

Men's perception of women's decision-making (measured in 2005 only)

The men's perception of the women's decision making was referred to as "men's decision-making perception" and was also assessed by the same four EDHS questions used to assess women's decision- making in 2005. This indicator was not measured in 2011. The men's responses to the first three questions were: "the respondent alone, the wife/partner alone, the respondent and wife/partner jointly, other person or someone else."[14] Their responses to who has the final say on their earnings were: "the respondent alone, the wife/partner, the respondent and wife/partner jointly, the respondent does not bring in any money or other"[14] Husbands who did not bring any money were excluded from the analysis. The men's responses to these four questions were also dichotomized in the same manner described for the women's decision-making responses above to produce a men's decision-making perception score ranging from 0-4. Again, lower

scores indicated lower perception of the women's decision-making autonomy while higher scores indicated higher perception of the women's decision-making autonomy.

Men's attitude toward wife beating

The five EDHS wife beating questions described previously for the women were also asked to the men and dichotomized and scored in the same manner described for the women. Men's attitude toward wife beating was called "men's wife beating perception" and this score also ranged from 0-5, with a lower score indicating lower autonomy perception and a higher score indicating a higher autonomy perception.

Men's perception of women's abilities to refuse sex (measured in 2005 only)

The questions assessing women's attitude toward refusing sex were also asked to the men and the dichotomization and scoring were the same as described above for the women. The men's attitude toward the women's abilities to refuse sex was referred to as "men's perception of women refusing sex" and again this variable ranged from a score of 0-3; a man with a total score of 0 believes that a woman has no right to refuse sex under any of the three circumstance whereas a man with a total score of 3 believes that a woman has the right to refuse sex under all 3 circumstances. Hence, low scores indicated low autonomy perception of the women and high scores indicated high autonomy perception of the women.

Therefore, the men's decision-making perception and the men's perception of women refusing sex were only measured in 2005 while the men's wife beating perception was measured in both the 2005 and 2011 survey cycles.

3.3.4 Summary of the Independent Variables

In conclusion, the primary independent variable of interest was women's autonomy measured by decision-making, attitudes toward wife beating and attitudes toward refusing sex. With all three indicators of women's autonomy, low scores indicated low autonomy while higher scores indicated higher autonomy. A secondary variable of interest for this study was the men's perception of the women's autonomy measured by

men's decision-making perception, men's wife beating perception and men's perception of women refusing sex which were also based on comparable scoring to that calculated for the women, with lower scores indicating lower perception of women's autonomy while higher scores indicated higher perception of women's autonomy.

Testing for interaction between the women and men's autonomy indicators

Additionally, the impact of agreement/disagreement between the couples on the women's autonomy indicators and this agreement/disagreement's association with the women's HIV/AIDS knowledge and attitudes were explored. To assess agreement on the autonomy indicators between the women and their spouses, the autonomy indicators were first re-coded into binary variables as follows:

1) Women's decision-making and the men's decision-making perception were re-coded as low or high. Decision-making and men's decision- making perception were re-coded as low (or 0) for those women and men scoring below the median score (total scores of 0-2) and high (or 1) for those women and men who scored at the median or higher (total score of 3 or higher) based on the four previously described decision-making questions.

2) The women's attitude toward wife beating and the men's wife beating perception were re-coded as acceptable or unacceptable based on the five previously described wife beating questions. Women and men with total scores of 0-4, and who therefore believed that all or any of the five reasons for wife beating were acceptable were re-coded as believing that wife beating was acceptable (coded as 0). Those with total scores of 5, and who therefore believed that wife beating was unacceptable under any of the five scenarios, were categorized as believing that wife beating was unacceptable (coded as 1).

3) The women's attitude toward refusing sex and the men's perception of women refusing sex were also dichotomized into binary variables. Women and men who scored 0-2 on the three refusing sex questions were categorized as believing that refusing sex was unacceptable (coded as 0). Those who had a total score of 3, and

who therefore believed that refusing sex was acceptable under all 3 circumstances, were categorized as believing that refusing sex was acceptable (coded as 1).

To test the association between the couples' agreement/disagreement on the autonomy indicators and the dependent variables, interaction between the men's and women's binary indicators described above were added to the multiple linear regression models. For each pair of indicators (i.e. women's decision-making & men's decision-making perception; women's attitude toward wife beating and men's wife beating perception; and women's attitude toward refusing sex and men's perception of women refusing sex), there were four possible scenarios between the indicators: 1) 2 scenarios of agreement (they both believe that the woman's decision making is low or high); and 2) 2 scenarios of disagreement (the woman thinks her autonomy is low but the husband or partner may believe that it is high or vice versa). For the purpose of this research, these binary indicators were used as interaction terms in the analyses. The reference category for the three indicator pairs were the category that showed the lowest autonomy. For example, for the interaction between women's decision-making and men's decision-making perception, the reference category was when both the women and men believed that the women's decision making was low; similarly the reference for wife beating is the category when both believe that wife beating is acceptable; and for refusing sex, it is when both believe that it is unacceptable. The main associations between the autonomy indicators as well as associations of any interactions between these binary indicators and each of the dependent variables of this research were examined.

Table1 provide a summary of how the dependent and independent variables were defined.

Table 1. Summary table on how the dependent and independent variables were defined.

Variable	Scale	Interpretation
Dependent Variables		
HIV/AIDS Knowledge 5 questions each scored 1=correct;0=incorrect	0-5	0-low knowledge, incorrect answers to 5 questions 5-high knowledge, correct answers to 5 questions
HIV/AIDS Attitudes 4 questions each scored1=accepting;0=unaccepting	0-4	0-negative attitude, non-accepting on 4 questions 4-accepting attitude, accepting on 4 questions
Independent Variables		
Main independent variable of interest: Women's autonomy (assessed by decision making, attitude toward wife beating & attitude toward refusing sex)		
Decision-making 4 questions each scored 1=has say; 0=has no say	0-4	0-low autonomy, has no say in any of the 4 decisions 4-high autonomy, has say in all 4 decisions
Attitude toward wife beating 5 questions each scored 0=agrees with wife beating;1=disagrees with wife beating	0-5	0-Low autonomy-agree with 5 wife beating scenarios 5-High autonomy-disagree with 5 wife beating scenarios
Attitude toward refusing sex 3 questions each scored 0=disagrees with refusing sex;1=agrees with refusing sex	0-3	0-low autonomy, disagree with refusing sex under 3 scenarios 3-high autonomy, agrees with refusing sex under 3 scenarios
Secondary independent variable of interest: Men's perception of women's autonomy (assessed by men's decision-making perception, men's wife beating perception & men's perception of women refusing sex)		
Decision-making perception 4 questions each scored 1=has say; 0=has no say	0-4	0-low autonomy perception, has no say on 4 decisions 4-high autonomy perception , has a say in 4 decisions
Wife beating perception 5 questions each scored 0=agrees with wife beating;1=disagrees with wife beating	0-5	0-Low autonomy-agree with 5 wife beating scenarios 5-High autonomy-disagree with 5 wife beating scenarios
Men's perception of women refusing sex 3 questions each scored 0=disagrees with refusing sex;1=agrees with refusing sex	0-3	0-low autonomy perception, disagree with 3 refusing sex scenarios 3-high autonomy perception, agrees with 3 refusing sex scenarios

Table 1 (Continued)

Variable	Scale	Interpretation
Dichotomization of couple's autonomy indicators to measure agreement		
Decision-making 4 questions each scored 1=has say; 0=has no say	0 (score 0-2) 1 (score 3-4)	0-2:low decision making autonomy 3-4:high decision making autonomy
Men's decision- making perception 4 questions each scored 1=has say; 0=has no say	0 (score 0-2) 1 (score 3-4)	0-2:low decision making perception 3-4:high decision making perception
Attitudes toward wife beating 5 questions each scored 0=agrees with wife beating;1=disagrees with wife beating	0 (score 0-4) 1 (score 5)	0-4:low autonomy 5:high autonomy
Men's wife beating perception 5 questions each scored 0=agrees with wife beating;1=disagrees with wife beating	0 (score 0-4) 1 (score 5)	0-4:low autonomy perception 5:high autonomy perception
Attitude toward refusing sex 3 questions each scored 0=disagrees; with refusing sex;1=agrees with refusing sex	0 (score 0-2) 1 (score 3)	0-2:low autonomy 3:high autonomy
Men's perception of women refusing sex 3 questions each scored 0=disagrees; with refusing sex;1=agrees with refusing sex	0 (score 0-2) 1 (score 3)	0-2:low autonomy perception 3:high autonomy perception
Agreement Between man and woman in couple	0 0 (reference)	Wife believes she has low autonomy & husband/partner believes she has low autonomy
	0 1	Wife believes she has low autonomy but husband/partner believes she has high autonomy
	1 0	Wife believes she has autonomy but husband/partner believes she has low autonomy
	1 1	Wife believes she has high autonomy & husband believes she high autonomy

3.3.5 Socio-demographic characteristics

A review of the literature identified several socio-demographic variables found to be associated with women's autonomy and women's HIV/AIDS knowledge and attitudes: women's age,[21–29,40–44] employment,[24–30,45,57,69,150] education,[21–23,31,36,43,65,137] religion,[21,22,24,26,27,31,32,39,61,151] mass media exposure,[43,66,69,152–154] and their spouses' age,[148] education,[23,26,38,146,148,152] religion,[21,22,24,26,27,31,32,39,61,151] and mass media exposure,[153] as well as the couples' residence (urban or rural)[18,26,27,45,61,152] and wealth index,[19,22,27,43,44,69,130] Therefore, these socio-demographic variables were included in the analyses.

Age

The EDHS asked each participant "what month and year were you born?"[13,14] and "How old were you at your last birthday?"[13,14] to ascertain their age. The EDHS surveys collected all respondents' current age and the ages of the women ranged from 15-49 years while those of the men ranged from 15-59 years. For the purposes of this study, age was treated as a continuous variable with the goal of determining what effect each one year increase in age has on the women's HIV/AIDS knowledge and attitudes.

Employment status

The EDHS collected information on each respondent's work status by asking each participant "Have you done any work in the last 12 months?"[13,14] and " What is your occupation, that is, what kind of work do you mainly do?"[13,14] The survey identified "work" as work performed outside of the household.[13,14] This study examined the women's employment status only.

Education

The participants' educational background was measured by the EDHS questions "Have you ever attended school?"[13,14] and; if "yes" "What is the highest grade you

completed?"[13,14] The surveys categorized education as: no education, primary, secondary, and higher. Due to the high number of individuals without an education and the small number with higher education, for this study, education was categorized into: no education, primary, and secondary/higher

Religion

The EDHS captured respondents' religion with the question "What is your religion?" [13,14] Possible answers included: "Orthodox Christian, Catholic, Protestant, Muslim, African Traditional religions or Other."[13,14] For the purposes of this study, religion was categorized into three categories: Orthodox Christian, Muslim and Protestant/Other in accordance with research using the EDHS.[19,26] The Protestant/Other category included Protestants, Catholics, African Traditional religions and Others.

Mass media exposure

Mass media exposure is a composite measure of the respondents' exposure to newspaper/magazines, radio and television. The 2005 EDHS collected information on respondents' exposure to each of the three types of mass media by asking:

1. *"Do you read a newspaper or magazine almost every day, at least once a week, less than once a week or not at all?* [14]

2. *"do you listen to the radio almost every day, at least once a week, less than once a week or not at all?"*[14] *and;*

3. *"do you watch television almost every day, at least once a week, less than once a week or not at all?"*[14]

The 2011 EDHS,[13] asked these questions as well, except the "almost every day" category was dropped. Hence, for the 2005 EDHS, the "almost every day" category was combined with the "at least once a week" category to facilitate comparison between the two survey data sets. Therefore, each respondent's mass media exposure was categorized into one of the following three categories: "not at all", "less than once a week", or "at least once a week" (a score of 0, 1 or 2 respectively) for each mass media type. A total

mass media exposure score was then generated by combining each respondent's exposure to all three types of mass media to generate a total score ranging from 0-6. For instance, a respondent who answered "not at all" (0) to each of the three mass media types would have a total score of 0 whereas one who answered "almost every day" (2) to each of the three types of media would have a total mass media exposure of 6. A mean mass media exposure score was produced for both the women and their spouses and these mass media exposure scores were kept as continuous variables.

Residence

Residence reflects the women's current and long-term place of residence and is ascertained by the EDHS question "How long have you been living continuously in (Name of current place of residence)?"[13,14] Ethiopia is divided into urban and rural regions and thus each participant is identified as urban or rural resident according to these geographical divisions. Since only couples who are residing at the same household were considered for this study, residence is measured at the level of the couple.

Wealth Index

Finally, Wealth Index was the last socio-demographic variables of interest for this study. The EDHS measured each household's wealth status as a composite measure taking into account the ownership of household assets such radio, television, telephone, refrigerator, bicycles, water type access, electricity, sanitation facilities, and beds among other assets to produce a composite score of household wealth for each household compared to other households.[13,14] The wealth index of each household is categorized into one of the following quintiles of wealth: poorest, poorer, middle, richer or richest by the EDHS. [13,14] For this study, the wealth index quintiles were used as they were measured by the EDHS.

Missing Data

Based on the 2,537 and 6454 couples from the 2005 and 2011 EDHS respectively who had heard of HIV/AIDS and who were included in the analyses, there was less than 1.0% missing data for knowledge and less than 0.5% missing data for attitudes for 2005. For

2011, there was less than 0.5% missing data for both knowledge and attitudes. For the key independent variables of interest, missing data was minimal as well; for 2005, there was no missing data for attitudes toward refusing sex. Missing data for decision-making, attitudes toward wife beating, men's decision-making perception, wife beating perception and refusing sex perception was less than 0.5%. For both 2005 and 2011, the variables without any missing data were women's age, men's age, women's education, men's education, residence, and wealth index. In addition, 2005 had no missing data for women's religion, 0.6% missing data for women's mass media exposure and 0.3% missing data for men's mass media exposure. Missing data for employment status and men's religion was less than 0.05% for both 2005 and 2011. For 2011, missing data for decision- making was less than 1.5% and less than 0.05% for attitudes toward wife beating and men's wife beating perception. Participants with missing data were excluded from the analyses.

3.4 Statistical Procedures

All statistical analyses were performed using STATA version 11.0. [158] Permission to use the EDHS data was obtained from the MEASURE DHS Project.[88] The aim of this study was to assess the association between women's autonomy indicators and their HIV/AIDS knowledge and attitudes. Furthermore, this research intended to determine the association between the women's spouses' perception of the women's autonomy and their HIV/AIDS knowledge and attitudes. In order to avoid losing information, the women's HIV/AIDS knowledge and attitudes were kept as continuous variables. Univariate, bivariate and multivariable statistics were used for the analyses. The univariate and bivariate analyses provide information on the background characteristics of the data and how each of the independent variables is associated with each of the dependent variables. Multivariable analyses were used to assess the importance of each independent variable in explaining the variability of each dependent variable, controlling for the effect of other independent variables.

Univariate Analyses

Univariate analyses were performed to obtain a preliminary understanding of the characteristics of the research data and the variables included in the analyses models. Descriptive statistics (continuous variables were described with means and standard deviations (SD) and categorical variables were described with frequency distributions and percentages) were calculated to describe and summarize the variables of interest for this study. Differences in the socio-demographic, independent and dependent variables of the 2005 and 2011 EDHS were examined using adjusted Wald test for survey data for continuous variables (similar to two sample t-test) such as age and mass media exposure while Kruskal Wallis was used to examine differences between categorical variables such as education and religion. Differences on the autonomy indicators between the men and women were examined by linear regression in each survey.

Bivariate Analyses

Bivariate analyses were performed to assess whether or not there were any associations between each of the dependent variables (women's HIV/AIDS knowledge and HIV/AIDS attitudes) and each of the indicators of women's autonomy, indicators of men's perception of women's autonomy, and the socio-demographic variables of interest individually. Simple linear regression was used to perform the bivariate analyses.

Multivariable Analyses

A multivariable analysis was performed to evaluate the independent association between each of the independent variables with each of the two dependent variables while controlling for other independent variables of interest. Thus, two multiple linear regression models were run, one for each dependent variable to test this study's two hypotheses.

Hypothesis 1: Women with higher autonomy indicators will have more HIV/AIDS knowledge and more accepting attitudes toward PLWHA compared to women with lower autonomy indicators controlling for other independent variables of interest (significance level is at $P<0.05$).

Hypothesis 2*: W*omen whose spouses' perception of their autonomy is higher will have more HIV/AIDS knowledge and more accepting attitudes toward PLWHA compared to women whose spouses' perception of their autonomy is lower.

The variables included in the multivariable model were supported by evidence from the literature. Model diagnostics confirmed that multiple linear regression was appropriate for this study given that the outcomes of interest (women's HIV/AIDS knowledge and attitudes) were continuous and met the major assumptions of the model: normality, homogeneity and linearity.[156]

Multiple linear regression models the linear relationship between two or more independent variables and a dependent variable by fitting a linear equation to the data observations and is denoted by the following model:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_p x_p.$$ [156]

In the above equation, x1, x2… xp indicate the independent variables that account for the variance in the dependent variable Y. The regression coefficients denoted by β are calculated by the ordinary least squares method (OLS) which fits a best line of "fit" by minimizing the sum of the squared vertical differences between the data points and the line.[156] B_0 represents the intercept or the value of the dependent variable when all continuous independent variables are zero or at the reference level for each of the categorical independent variables.[156] For continuous independent variables, the beta coefficients (B 1, B2 etc) represents the change in the dependent variable with each one unit change in that independent variable while all the other independent variables are held constant.[156] For categorical independent variables (i.e. binary variables with two levels such as 0 and 1), the beta coefficients represents the difference in the dependent variable between two categories (0 and 1) of the independent variable while all the other independent variables are held constant.[156]

3.5 Model Diagnostics: Model assumptions and multi-collinearity

3.5.1 Model Assumptions

Model diagnostics were performed to determine whether the linear regression model fit the data and to ensure that the data did not violate model assumptions: linearity, normality and constant variance. Failure of the data to meet these model assumptions can produce biased coefficients and inflated standard errors which then would ultimately invalidate any statistical inferences.[156]

3.5.2 Multi-collinearity

Linear regression, similar to other regression methods, is particularly sensitive to collinearity between independent variables.[156] To detect multi-collinearity between these variables, multi-collinearity diagnostics using variable inflation factor (VIF) statistics were performed. The VIF detects high collinearity between independent variables and an VIF greater than 10 indicates high collinearity.[156] For this study, high collinearity between women's and men's religion was detected for both the 2005 and 2011 EDHS as both VIFs were greater than 10. Thus men's religion was dropped from the multiple regression models.

Chapter 4

Results

4.1 Univariate Analyses

4.1.1 Distribution of the dependent variables: Women's HIV/AIDS Knowledge and Attitudes

As shown in Table 2, the women had more HIV/AIDS knowledge in 2011 compared to 2005. In addition, the women had more accepting attitudes toward PLWHA in 2011 compared to 2005.

4.1.2 Distribution of the independent variables

Distribution of the primary independent variable: Women's Autonomy

As shown in Table 3, women's decision-making autonomy was higher in 2011 compared to 2005; however, the difference was not significant between the two surveys. The women were also more autonomous with regard to attitudes toward wife beating in 2011 compared to 2005 and the difference was significant at $P<0.05$. The third indicator of women's autonomy, attitude toward refusing sex, was only measured in 2005

Distribution of the secondary independent variable: Men's perception of the women's autonomy

As seen in Table 3, the men's mean wife beating perception which was measured in both survey cycles showed that the men's perception of the women's autonomy by this indicator was higher in 2011 compared to 2005 and this difference was significant. As seen in Table 4, some of the women's autonomy indicators differed significantly from the men and women's perspectives.

Table 2. Distribution of women's HIV/AIDS Knowledge and Attitudes from the 2005 and 2011 EDHS couples data

Dependent Variable	2005 EDHS Couples data N=2537 Mean (SD)	2011 EDHS couples data N=6454 Mean (SD)	P-value
HIV/AIDS Knowledge (score 0-5)	2.58 (1.48)	30.3(1.37)	0.0000
HIV/AIDS Attitudes (0-4 score**)**	1.67 (1.59)	2.18(1.14)	0.000

*Test of significance: Adjusted Wald test for survey data, P-value significant at P <0.05.

Table 3. Distribution of women's autonomy and men's perception of the women's autonomy indicators from the 2005 and 2011 EDHS couples data

Independent Variable	2005 Couples data (N=2537) Mean (SD)	2011 Couples data (N=6454) Mean (SD)	P-Value
Women's autonomy indicators			
Decision-making (0-4 score)	2.90 (1.18)	2.99(1.30)	0.10
Attitude toward Wife beating (0-5 score)*	1.85 (1.79)	2.44(1.96)	0.0015
Attitude toward refusing sex (Score 0-3)*	2.36(0.97)	-	
Spouses' perception of women's autonomy			
Men's decision making perception (score 0-4)	2.80(1.10)	-	
Men's wife beating perception (score 0-5)*	3.46(1.74)	3.73(1.73)	0.0015
Men's perception of women refusing sex (score 0-3)*	2.50(0.95)	-	

Test of significance: Adjusted Wald test for survey data, P-value significant at P <0.05
Note: Attitude toward wife beating and attitude toward refusing sex are measures of women's emotional autonomy. Men's wife beating perception and men's perception of women refusing sex are measures of men's perception of women's emotional autonom

Table 4. Comparing differences between the women's and men's autonomy indicators

Women's Autonomy Indicators	2005 Couples data (N=2537) Mean	Men's Autonomy Indicators	2005 Couples data (N=2537) Mean	P-value
Decision-making (0-4 score)	2.90	Men's decision making perception (score 0-4)	2.80	0.000
Attitude toward Wife beating (0-5 score)*	1.85	Men's wife beating perception (score 0-5)*	3.46	0.000
Attitude toward refusing sex (Score 0-3)*	2.36	Men's perception of women refusing sex (score 0-3)*	2.50	0.000

Linear regression significant at P-value <0.05, for 2011, Attitude toward wife beating & men's wife beating perception were significantly different at P-value <0.05.

4.1.3 Socio-demographics characteristics of the sample

Knowing the distribution of the socio-demographic characteristics of the women and their spouses facilitated the interpretation of the results of this study and its significance. Table 5 shows the distribution of these socio-demographic characteristics.

The average age of the women was about 30 years in both surveys while the average age of their spouses was about 37.4 years and 37 years for the 2005 and the 2011 EDHS respectively. In addition, in 2005, 25.4% of women were employed outside the home while 35.9% were employed in 2011. The difference in the employment of the women between the two surveys was statistically significant.

This univariate analysis showed low levels of educational attainment particularly among the women. In 2005, 75.1% of these women had no education at all, while 19.0% had a primary education and only 5.9% had a secondary or higher education. The 2011 survey showed higher levels of women's education with 65.1% having no education, 28.8% having a primary education and 6.1 % having a secondary or higher education.

Educational attainment was also low for the women's spouses but was higher than those of the women. In 2005, 53.2% of the men had no education, 34.4% had only a primary education and 12.4% had a secondary or higher education. The 2011 EDHS also showed higher levels of men's education with the number with no education being lower at 44.7% and the number with a primary education being higher at 45.1% compared to 2005. The number of men with a secondary or higher education was slightly lower in 2011 at 9.8% compared to 2005. The educational attainment of the men and women differed significantly between the two surveys.

With regards to religion, in 2005, 47.0% of the women were Orthodox Christian, 29.1% were Muslim and, 23.9% were Protestant/Other (this category included Protestants, African Traditional religions, Catholics and other smaller religious groups). From the 2011 survey, 44.4% of the women were Orthodox Christian, 30.0% were Muslim and 25.6% were Protestant/Other. The Spouses' religions were similarly distributed. In 2005, 48.1% of the men were Orthodox Christian, 28.9% were Muslim and 23.0% were Protestant/Other while in 2011, 46.8% of the men were Orthodox Christian, 30.4% were Muslim and 22.8% were Protestant/Other.

Exposure to mass media was higher in 2011 for both the women and their spouses compared to 2005. The women's mean mass media exposure was 0.78 and 1.39 (on a score of 0-6) in 2005 and 2011 respectively. Similarly, the men's mean mass media exposure was 1.57 and 2.19 (on a score of 0-6) for 2005 and 2011 respectively.

Descriptive analyses of these surveys showed that the majority of the couples resided in rural regions of the country (90.3% in 2005 and 82.7% in 2011) while a small minority were residing in urban settings (9.7% and 17.3% for 2005 and 2011 respectively).

The wealth index of the couples did not change to a great extent between the two surveys as seen in Table 5.

Table 5. Characteristics of the women and their spouses from 2005 and 2011 Ethiopia Demographic and Health Surveys, Couples data

Variable	**2005 Couples data** (N=2537) Mean ±SD or n (%)	**2011Couples data** (N=6454) Mean ±SD or n (%)	**P-value**
Women's Socio-demographics			
Women's age (in years)	30.0±8.25	30.2±8.03	0.52
Employment Status			
Unemployed	1892(74.6 %)	4132(64.1%)	0.0001
Employed	644(25.4)	2314(35.9%)	
Women's education			
No education	1905(75.1%)	4201(65.1%)	0.000
Primary	482(19.0%)	1859(28.8%)	
Secondary or Higher	150(5.9%)	394(6.1%)	
Women's Religion			
Orthodox Christian	1192(47.0%)	2844 (44.4%)	0.000
Muslim	738(29.1)	1922(30.0%)	
Protestant/Other	607(23.9)	1640(25.6%)	
Women's mass media exposure(score 0-6)	0.78±1.18	1.39±1.40	0.0000
Spouses' Socio-demographics			
Men's age (in years)	37.4±9.58	37.1±9.60	0.33
Men's education			
No education	1350 (53.2%)	2885(44.7)	0.0001
Primary	873(34.4%)	2937(45.5%)	
Secondary or Higher	314(12.4%)	632(9.8)	
Men's Religion			
Orthodox Christian	1220(48.1%)	2967(46.8%)	0.0001
Muslim	733(28.9%)	1927(30.4)	
Protestant/Other	583(23.0%)	1445(22.8%)	
Men's mass media exposure (score 0-6)	1.57±1.58	2.19±1.66	0.0000
Couples' Socio-demographics			
Type of Residence			
Urban	246(9.7%)	1117(17.3%)	0.0001
Rural	2291(90.3%)	5337(82.7%)	
Wealth Index			
Poorest	434(17.1%)	1232(19.1%)	0.0007
Poorer	558(22.0%)	1375(21.3%)	
Middle	545(21.5%)	1330(20.6%)	
Richer	510(20.1%)	1284(19.9%)	
Richest	490(19.3%)	1233(19.1%)	

Test of Significance: Adjusted Wald test for continuous variables & Kruskal Wallis for categorical variables, P-value significant at P<0.05

4.2 Bivariate Analyses: Women's HIV/AIDS Knowledge

The distribution of the women's HIV/AIDS knowledge from the 2005 and 2011 EDHS were examined by each of the independent variables of interest as shown in Table 6.

4.2.1 Women's HIV/AIDS knowledge by women's autonomy indicators

Higher autonomy in all three indicators of women's autonomy that were measured in the 2005 EDHS were significantly associated with more HIV/AIDS knowledge among the women as seen in Table 6. In addition, higher autonomy in the two indicators measured in 2011(women's decision-making and attitude toward refusing sex) were also associated with more HIV/AIDS knowledge among the women.

4.2.2 Women's HIV/AIDS knowledge by the spouses' perception of the women's autonomy

Higher autonomy in the men's decision-making perception and wife beating perception were significantly associated with more HIV/AIDS knowledge among the women in 2005 (see Table 6). The men's perception of the women's ability to refuse sex (men's perception of women refusing sex) was not significantly associated with the women's HIV/AIDS knowledge in 2005.

In 2011, higher autonomy in the only indicator measured (the men's wife beating perception) was significantly associated with more HIV/AIDS knowledge among the women.

4.2.3 Women's HIV/AIDS knowledge by socio-demographic variables

Women's HIV/AIDS knowledge differed significantly with all the examined socio-demographic variables as seen in Table 6.

Each one year increase in the women's and the men's age had a significant and negative association with the women's HIV/AIDS knowledge. Both the women's employment status and education were associated with more HIV/AIDS knowledge. As seen in Table

6, employed women had more HIV/AIDS knowledge compared to unemployed women. In addition, having primary and secondary or higher education was associated with more HIV/AIDS knowledge among the women during both the 2005 and 2011 surveys. The men's education had a similar association with the women's HIV/AIDS knowledge. During both the 2005 and 2011 surveys, women whose spouses had a primary and secondary or higher education had more HIV/AIDS knowledge than those women whose spouses had no education at all.

Religion had a significant and negative association with the women's HIV/AIDS knowledge. In both 2005 and 2011, Muslim and Protestant/Other women had lower HIV/AIDS knowledge compared to women who were Orthodox Christian. The men's religious orientation had a similar association with the women's HIV/AIDS knowledge. Women whose spouses were Muslim or Protestant/ Other had lower HIV/AIDS knowledge than women whose spouses were Orthodox Christian in both survey cycles.

In addition, both the women's mass media exposure and their spouses' mass media exposure were associated with more HIV/AIDS knowledge among the women for both surveys. However, in each survey, the regression coefficient between the women's own mass media exposure and the women's HIV/AIDS knowledge was larger than that between the spouses' mass media exposure and the women's HIV/AIDS knowledge.

For the couple's variables, residence and wealth index, rural residence had a significant and negative association with the women's knowledge; the HIV/AIDS knowledge of rural residing women was lower in both the 2005 and 2011 EDHS compared to their urban dwelling counterparts. The wealth index of the household had a significant association with the women's HIV/AIDS knowledge with higher wealth index being associated with more HIV/AIDS knowledge as seen in Table 6.

Table 6. Bivariate analysis of Women's HIV/AIDS knowledge by variables of interest from the 2005 & 2011 EDHS couples data (Linear regression).

Variable	2005 EDHS Couples data Knowledge		2011 EDHS Couples data Knowledge	
	Coeff.	**Std.error**	**Coeff.**	**Std.error**
Women's Variables				
Decision making autonomy	0.12*	0.033	0.17*	0.023
Attitude toward wife beating	0.094*	0.024	0.15*	0.016
Attitude toward refusing sex	0.18*	0.042	-	
Women's age (in years)	-0.011*	.0044	-0.0078*	.00336
Employment Status				
Unemployed	Ref		-	-
Employed	0.50*	0.095	0.30*	.058
Women's education				
No education	Ref	-	-	-
Primary	0.96*	0.11	0.76*	0.060
Secondary and Higher	2.05*	0.10	1.66*	0.074
Women's Religion				
Orthodox Christian	Ref	-	-	-
Muslim	-0.47*	0.13	-0.39*	0.10
Protestant/Other	-0.14	0.12	-0.086	0.11
Women's Mass media exposure	0.46*	0.028	0.34*	.020
Spouses' Variables				
Men's decision- making perception	0.15*	0.037	N/A	N/A
Men's wife beating perception	0.13*	0.025	0.10*	0.017
Men's perception of women refusing sex	0.097	0.050	N/A	N/A
Men's age (in years)	-0.012*	0.0037	-0.007*	0.003
Men's education				
No education	Ref	-	-	-
Primary	0.45*	0.087	0.43*	0.061
Secondary and Higher	1.54*	0.12	1.28*	0.091
Men's Religion				
Orthodox Christian	Ref	-	-	-
Muslim	-0.49*	0.13	-0.38*	0.099
Protestant/Other	-0.20	0.12	-0.11	0.11

Table 6 (Continued)

Variables	2005 EDHS Couples data Knowledge		2011 EDHS Couples data Knowledge	
	Coeff.	**Std.error**	**Coeff.**	**Std.error**
Men's mass media exposure	0.27*	0.024	0.25*	.018
Couples' Variables				
Residence				
Urban	Ref	-	-	-
Rural	-1.49*	0.15	-0.97*	0 .087
Wealth Index (for couple)				
Poorest	Ref	-	-	-
Poorer	0.31*	0.13	0.14	0. 068
Middle	0.66*	0.12	0.24*	0.072
Richer	0.70*	0.13	0.38*	0.087
Richest	1.61*	0.14	1.22*	0.090

Note:* P-value significant at P<0.05, Ref=reference category, Coeff. =Beta coefficient estimation Std.error=Standard error

4.3 Bivariate Analyses: Women's HIV/AIDS Attitudes

Table 7 shows the bivariate relationships between women's HIV/AIDS Attitudes and the independent variables of interest.

4.3.1 Women's HIV/AIDS Attitudes by women's autonomy indicators

With respect to the indicators of women's autonomy, for 2005, all three indicators (Decision-making, attitude toward wife beating and attitude toward refusing sex) were positively associated with the women's HIV/AIDS attitudes. With each autonomy indicator, higher autonomy was associated with more accepting HIV/AIDS attitudes. Similarly, in 2011, both higher autonomy with respect to decision-making and attitude toward wife beating were associated with more accepting HIV/AIDS attitudes.

4.3.2 Women's HIV/AIDS Attitudes by the spouses' perception of the women's autonomy

With respect to the men's perception of the women's autonomy, in 2005, all three indicators were also positively associated with the women's HIV/AIDS attitudes. In 2011, increasing levels of the only indicator measured (men's wife beating perception) was associated with more accepting HIV/AIDS attitudes in the women.

4.3.3 Women's HIV/AIDS Attitudes by the socio-demographic variables

The socio-demographic variables significantly associated with the women's HIV/AIDS attitudes were the women's employment status, education, religion, mass media exposure, and their spouses' age, education, religion, and mass media exposure as well as the couple's residence and wealth index (see Table 7).

Women who were employed had more accepting attitudes (indicated by higher scores) than women who were not employed. The women's education also had a significant and positive relationship with their HIV/AIDS attitudes. Women with a primary, and secondary or higher education, had more accepting HIV/AIDS attitudes in both the 2005

and 2011 surveys compared to women who had no education at all. The men's education had a significant and similar association with the women's HIV/AIDS attitudes. In 2005, men's primary education was not significant; however, women whose spouses had a secondary or higher education had more accepting HIV/AIDS attitudes compared to women whose spouses had no education at all. In 2011, women whose spouses had primary, and secondary or higher education, had more accepting HIV/AIDS attitudes than women whose spouses had no education at all.

Both the women's and men's religious affiliation had a significant and negative association with the women's HIV/AIDS attitudes. In 2005, Muslim and Protestant/Other women had less accepting HIV/AIDS attitudes than Orthodox Christian women. In 2011, religion had a similar but smaller association with the women's attitudes; Muslim and Protestant/Other women had less accepting HIV/AIDS attitudes than Orthodox Christian women. In addition, the spouses' religion had a comparable association; in both 2005 and 2011, women whose spouses were Muslim or Protestant/Other had less accepting HIV/AIDS attitudes than women whose spouses were Orthodox Christian.

Both the women's own and their spouses' mass media exposure had significant and positive association with the women's HIV/AIDS attitudes. Higher women's mass media exposure was associated with more accepting HIV/AIDS attitudes in both the 2005 and 2011 EDHS. In addition, higher men's mass media exposure was also associated with more accepting attitudes in the women during both survey cycles.

Each one year increase in the men's age was significantly associated with more accepting attitudes in the women. Residence showed a significant but negative association with the women's attitudes. Rural residing women had less accepting HIV/AIDS attitudes in 2005 and 2011 compared to their urban counterparts. Wealth index had a positive association with the women's HIV/AIDS attitudes with higher levels of wealth being associated with more accepting HIV/AIDS attitudes. In 2005, only the two highest levels of wealth were associated with more accepting HIV/AIDS attitudes while in 2011, each

level of wealth was associated with more accepting attitudes compared to the poorest wealth level as seen in Table 7.

Table 7. Bivariate analyses of Women's HIV/AIDS Attitudes by variables of interest from the 2005 & 2011 EDHS couples data (Linear Regression).

Variable	2005 EDHS Couples data Attitude		2011 EDHS Couples data Attitude	
	Coeff.	**Std.error**	**Coeff.**	**Std.error**
Women's Variables				
Women's decision making autonomy	0.15*	0.024	0.18*	0.019
Attitude toward wife beating	0.11*	0.019	0.15*	0.014
Attitude toward refusing sex	0.14*	0.030	-	
Women's age (in years)	0.0053	0.0030	-0.00073	0.0025
Employment Status				
Unemployed	Ref	-	Ref	-
Employed	0.24*	0.070	0.27*	0.049
Women's education				
No education	Ref	-	Ref	Ref
Primary	0.31*	0.069	0.42*	0.047
Secondary and Higher	1.55*	0.11	1.39*	0.069
Women's Religion				
Orthodox Christian	Ref	-	Ref	-
Muslim	-0.67*	0.082	-0.25*	0.078
Protestant/Other	-0.82*	0.071	-0.44*	0.085
Women's Mass media exposure	0.30*	.024	0.27*	0.015
Spouses' Variables				
Men's decision making perception	0.18*	0.025	N/A	N/A
Men's wife beating perception	0.15*	0.016	0.12*	0.0134
Men's perception of women refusing sex	0.10*	0.035	N/A	N/A
Men's age (in years)	0.006*	0.0026	0.00014	0.0022
Men's education				
No education	Ref	-	Ref	-
Primary education	-0.010	0.064	0.22*	0.047
Secondary and Higher	0.96*	0.097	1.07*	0.071
Men's Religion				
Orthodox Christian	Ref	-	Ref	-
Muslim	-0.62*	0.082	-0.24*	0.077
Protestant/Other	-0.80*	0.074	-0.46*	0.083
Men's mass media exposure	0.17*	0.019	0.21*	0.014

Table 7*(*Continued)

Variable	2005 EDHS Couples data Attitude		2011 EDHS Couples data Attitude	
	Coeff.	**Std.error**	**Coeff.**	**Std.error**
Couple's Variables				
Residence				
Urban	Ref	-	Ref	-
Rural	-1.45*	0.092	-0.99*	0. 071
Wealth Index				
Poorest	Ref	-	Ref	-
Poorer	0.080	0.089	0.14*	0.054
Middle	0.13	0.085	0.18*	0.056
Richer	0.23*	0.087	0.40*	0.064
Richest	1.06*	0.10	1.18*	0.072

Note:*P-value significant at P<0.05, Ref=reference category, Coeff. =Beta coefficient estimation Std.error=Standard error, N/A (not measured)

4.4 Multiple Linear Regression results

For each of the two dependent variables of this study, women's HIV/AIDS knowledge and women's HIV/AIDS attitudes, a separate multiple linear regression model was employed to identify the significant independent variables associated with each of these two dependent variables in each survey (2005 EDHS and 2011 EDHS). For each dependent variable, a full model including the interactions between the women's and men's agreement on the autonomy indicators (i.e. women's decision-making and men's decision-making perception, women's attitude toward wife beating and men's wife beating perception, women's attitude toward refusing sex and men's perception of women refusing sex) was first run and the significance of the interaction was assessed. After concluding that the interaction between the women's and men's autonomy indicators were not significant, each of the models (without the autonomy indicator interactions) was re-run to assess the main associations between each of the independent variables with each of the two dependent variables. Table 12 gives a summary overview of the significant variables associated with each of the two dependent variables from the multiple linear regression results of the two surveys.

4.4.1 Women's HIV/AIDS Knowledge

For the 2005 EDHS multiple linear regression model, none of the women's autonomy indicators were significantly associated with the women's HIV/AIDS knowledge as seen in Table 8.

The socio-demographic variables that were significantly associated with the women's HIV/AIDS knowledge, in 2005, were the women's employment status, education, and mass media exposure and the men's secondary or higher education as well as the couple's wealth index. Women who were employed had more HIV/AIDS knowledge than women who were unemployed. Women who had a primary, or secondary or higher education, had significantly more HIV/AIDS knowledge than women without any education. In addition, women whose spouses had a secondary or higher education also had more HIV/AIDS knowledge than women whose spouses had no education at all. Women with

higher mass media exposure had more HIV/AIDS knowledge. All levels of the wealth index compared to the poorest level had a positive and significant association with the women's HIV/AIDS knowledge with the wealthiest level having the largest association as seen in Table 8.

For the 2011 EDHS multiple linear regression (Table 9), the autonomy indicators associated with HIV/AIDS knowledge were the women's decision-making and attitude toward wife beating. Increasing autonomy in decision-making and attitude toward wife beating were associated with more HIV/AIDS knowledge.

The socio-demographic variables significantly associated with the women's HIV/AIDS knowledge were the women's education, religion, mass media exposure and their spouses' mass media exposure as seen in Table 9. Educated women were more knowledgeable than women without any education. Education had a dosage response effect on the women's HIV/AIDS knowledge with women with a secondary or higher education having the most HIV/AIDS knowledge. In addition, Muslim women had HIV/AIDS knowledge levels that were significantly less than those of Orthodox Christian women. Increases in the women's own mass media exposure and their spouses' mass media scores were also associated with more HIV/AIDS knowledge among women.

Table 8. Multiple Linear Regression results of the women's HIV/AIDS knowledge and independent variables of interest from the 2005 EDHS couples data, (N=2537)

Variable	Coeff.	Std.error	P-value	95% Conf. Interval
Women's variables				
Decision-making	-0.014	0.032	0.66	-0.075,0.048
Attitude toward Wife-beating	0.011	0.025	0.67	-0.038,0.059
Attitude toward refusing sex	0.061	0.040	0.12	-0.017,0.14
Women's age	-0.0060	0.0074	0.42	-0.021,0.0086
Employment				
Unemployed	Ref	-	-	-
Employed	0.42	0.085	0.000	0.26,0.59
Women's education				
No education-reference	Ref	-	-	-
Primary	0.59	0.11	0.000	0.37,0.81
Secondary and Higher	0.68	0.19	0.001	0.30,1.1
Women's Religion				
Orthodox Christian	Ref	-	-	-
Muslim	-0.20	0.11	0.076	-0.42,0.021
Protestant/Other	-0.0025	0.11	0.98	-0.22,0.22
Women's mass media exposure	0.18	0.042	0.000	0.10,0.27
Spouses' Variables				
Men's decision-making perception	0.020	0.034	0.56	-0.046,0.086
Men's wife beating perception	0.029	.023	0.21	-0.075,0.10
Men's refusing-sex perception	0.015	0.045	0.75	-0.075,0.10
Men's age (in years)	-0.0026	0.0066	0.69	-0.016,0.010
Men's education				
No education-reference	Ref	-	-	-
Primary	0.072	0.083	0.39	-0.092,0.24
Secondary and Higher	0.35	0.15	0.018	0.060,0.64
Men's Mass media exposure	0.0014	0.031	0.98	-0.059,0.061

Table 8 (Continued)

Variable	Coeff.	Std.error	P-value	95% Conf. Interval
Couples' Variables				
Residence				
Urban	Ref	-	-	-
Rural	-0.075	0.20	0.72	-0.48, 0.33
Wealth Index				
Poorest	Ref	-	-	-
Poorer	0.27	0.12	0.026	0.031, 0.50
Middle	0.48	0.12	0.000	0.25, 0.72
Richer	0.36	0.14	0.010	0.086, 0.64
Richest	0.64	0.17	0.000	0.31, 0.96

Note: P-value significant at $p<0.05$, Ref=reference category, Coeff. =Beta coefficient estimation Std.error=Standard error, conf. =confidence

Table 9. Multiple Linear regression results of women's HIV/AIDS knowledge and independent variables of interest from the 2011 EDHS couples data (N=6454)

Variable	Coeff.	Std.erorr	P-value	95% Confidence Interval
Women's Variables				
Decision-making	0.078	0.021	0.000	.036,0.12
Attitude toward wife beating	0.061	0.014	0.000	.00033,0.088
Women's age (in years)	-0.00051	.0047	0.91	-0.010,0.090
Employment status				
Unemployed	Ref	-	-	-
Employed	0.081	0.049	0.10	-0.016,0.18
Women's education				
No education	Ref	-	-	-
Primary	0.44	0.060	0.000	0.32,0.56
Secondary and Higher	0.59	0.13	0.000	0.35,0.84
Women's Religion				
Orthodox Christian	Ref	-	-	-
Muslim	-0.27	0.082	0.001	-0.43,-0.11
Protestant/Other	-0.017	0.081	0.84	-0.18,0.13
Women's Mass media exposure	0.15	0.019	0.000	0.11,0.19
Spouses' Variables				
Men's wife beating perception	0.011	0.017	0.51	-0.022,0.044
Men's age	-0.0013	0.0044	0.77	-0.010,0.0073
Men's education				
No education	Ref	-	-	-
Primary	0.035	0.056	0.54	-0.075,0.15
Secondary/Higher	-0.054	0.11	0.62	-0.27,0.16
Men's mass media exposure	0.076	0.018	0.000	0.040,0.11

Table 9 (Continued)

Variable	Coeff.	Std.erorr	P-value	95% Confidence Interval
Couples' Variables				
Residence				
Urban	Ref	-	-	-
Rural	-0.069	0.14	0.61	-0.33,0.20
Wealth Index				
Poorest	Ref	-	-	-
Poorer	0.042	0.064	0.51	-0.083,0.17
Middle	0.084	0.068	0.22	0.050,0.22
Richer	0.044	0.080	0.59	-0.11,0.20
Richest	0.22	0.12	0.079	-0.015,0.46

Note: P-value significant at $p<0.05$, Ref=reference category, Coeff.=Beta coefficient estimation Std.error=Standard error

4.4.2 Women's HIV/AIDS Attitudes

As seen in Table 10, for the 2005 EDHS multiple linear regression model, the autonomy indicators significantly associated with the women's HIV/AIDS attitudes were the women's attitudes toward refusing sex and the men's wife beating perception. Increasing autonomy in attitudes toward refusing sex and men's wife beating perception were associated with more accepting HIV/AIDS attitudes in the women. The socio-demographic variables significantly associated with the women's HIV/AIDS attitudes were women's education, women's religion, and the couple's residence and wealth index. Having a primary education was associated with more accepting HIV/AIDS attitudes while being a Muslim or Protestant/Other was associated less accepting HIV/AIDS attitudes in the women. In addition, rural residence was associated with less accepting HIV/AIDS attitudes in the women compared to urban residence. Furthermore, the highest level of wealth was associated with more accepting HIV/AIDS attitudes in the women compared to the poorest wealth index level.

For the 2011 EDHS multiple linear regression, the autonomy indicators significantly associated with the women's HIV/AIDS attitudes were the women's decision-making, attitude toward wife beating and the men's wife beating perception as seen in Table 11. Increasing autonomy in decision-making, attitude toward wife beating and men's wife beating perception were associated with more accepting HIV/AIDS attitudes in the women. The socio-demographic variables significantly associated with the women's HIV/AIDS attitudes were the women's employment, education, religion, mass media exposure, men's mass media exposure as well as the couple's residence and wealth index. Employed women had more accepting HIV/AIDS attitudes compared to women who were unemployed. Education improved the women's attitudes; having a primary and secondary or higher education was associated with more accepting HIV/AIDS attitudes in the women. However, religion was associated with more negative (and therefore less accepting) attitudes with Muslim and Protestant/Other women having less accepting attitudes than women who were Orthodox Christian. In addition, both the women's own mass media exposure as well as their spouses' mass media exposure was associated with

more accepting HIV/AIDS attitudes. Residence was negatively associated with the women's attitudes with rural women having less accepting HIV/AIDS attitudes compared to their urban residents. In addition, compared to the lowest wealth level, women who came from households belonging to the two highest levels of the wealth index had more accepting HIV/AIDS attitudes compared to women who came from the poorest households.

For a summary of the independent variables significant associated with each of the two dependent variables refer to Table 12.

Table 10. Multiple linear regression results of Women's HIV/AIDS attitudes and the independent variables of interest from the 2005 EDHS couples data (N=2537).

Variable	Coeff.	Std.error	P-value	95% Confidence Interval
Women's Variables				
Decision-making	0.029	0.021	0.18	-0.013,0.071
Attitude toward wife-beating	0.018	0.015	0.23	-0.012,0.049
Attitude toward refusing sex	0.070	0.028	0.013	0.015,0.12
Women's age	-0.0050	0.0056	0.37	-0.016,0.006
Employment status				
Unemployed	-Ref	-	-	-
Employed	0.045	0.058	0.44	-0.069,0.16
Women's education				
No education	Ref	-	-	-
Primary	0.21	0.064	0.001	0.092,0.34
Secondary and Higher	0.30	0.17	0.072	-0.027,0.63
Women's Religion				
Orthodox Christian	Ref	-	-	-
Muslim	-0.40	0.075	0.000	-0.55,-0.25
Protestant/Other	-0.64	0.073	0.000	-0.78,-0.50
Women's mass media exposure	0.041	0.028	0.15	-0.014,0.095
Spouses' Variables				
Decision-making perception	0.031	0.022	0.16	-0.013,0.075
Men's wife beating perception	0.069	0.015	0.000	0.049,0.098
Men's perception of women refusing sex	0.016	0.031	0.061	-0.045,0.077
Men's age	0.008	0.0052	0.13	0.0022,0.018
Men's education				
No education	Ref	-	-	-
Primary	-0.039	0.060	0.52	-0.16,0.079
Secondary or higher	0.19	0.11	0.076	-0.020,0.41
Men's mass media exposure	-0.021	0.021	0.32	-0.061,0.020

Table 10 (Continued)

Variable	Coeff.	Std.error	P-value	95% Confidence Interval
Couples' Variables				
Residence				
Urban	Ref	-	-	-
Rural	-0.56	0.14	0.000	-0.84,-0.29
Wealth Index				
Poorest	Ref	-	-	-
Poorer	0.10	0.081	0.21	-0.059,0.26
Middle	0.090	0.080	0.26	-0.068,0.25
Richer	0.12	0.084	0.150	-0.045,0.29
Richest	0.36	0.10	0.000	0.16,0.55

Note: P-value significant at $p<0.05$, Ref=reference category, Coeff. =Beta coefficient estimation Std.error=Standard error

Table 11. Multiple linear regression results of the women's HIV/AIDS attitudes and the independent variables of interest from the 2011 EDHS couples data (N=6454)

Variable	Coeff.	Std.erorr	P-value	95% Confidence Interval
Women's Variables				
Decision-making	0.098	0.015	0.000	0.068,0.13
Women's attitude toward wife-beating	.052	0.010	0.000	0.032,0.071
Women's age	-0.0001	0.0086	0.92	-0.008,0.0074
Employment status				
Unemployed	Ref	-	-	-
Employed	0.10	0.042	0.014	0.021,0.19
Women's education				
No education	Ref	-	-	-
Primary	0.17	.047	0.000	0.074,0.26
Secondary and Higher	0.31	0.096	0.001	0.13,0.50
Women's Religion				
Orthodox Christian	Ref	-	-	-
Muslim	-0.12	0.058	0.043	-0.23,-0.0035
Protestant/Other	-0.30	0.061	0.000	-0.43,-0.19
Women's Mass media exposure	0.094	0.017	0.000	0.061,0.13
Spouses' Variables				
Men's wife beating perception	0.024	0.017	0.025	-0.0030,0.044
Men's age	0.0017	0.0034	0.61	-0.005,0.0084
Men's education				
No education	Ref	-	-	-
Primary	-0.027	0.047	0.56	-0.12,0.063
Secondary/Higher	0.010	.093	0.92	-0.17,0.19
Men's mass media exposure	0.067	0.016	0.000	0.036,0.097

Table 11 (Continued)

Variable	Coeff.	Std.erorr	P-value	95% Confidence Interval
Couples' Variables				
Residence				
Urban	Ref	-	-	-
Rural	-0.17	0.086	0.045	-0.34,-0.0035
Wealth Index				
Poorest (reference)	Ref	-	-	-
Poorer	0.045	0.051	0.38	-0.054,0.14
Middle	0.043	0.053	0.42	-0.061,0.15
Richer	0.14	0.063	0.032	0.012,0.26
Richest	0.32	0.098	0.001	0.13,0.51

Note: P-value significant at $p<0.05$, Ref=reference category, Coeff. =Beta coefficient estimation Std.error=Standard error

Table 12. Comparison of the significant variables of each dependent variable from the multiple Linear Regression analyses for the 2005 and 2011 EDHS Couples data.

Variable	2005 EDHS Knowledge N=2537	2011 EDHS Knowledge N=6454	2005 EDHS Attitude N=2537	2011 EDHS Attitude N=6454
Women's Variables				
Decision making		0.078		0.098
Attitude toward wife beating		0.061		0.052
Attitude toward refusing sex		N/A	0.070	N/A
Women's age (in years)				
Employment status				
Not working(ref)				
Working	0.42			0.10
Women's education				
No education (ref)				
Primary	0.59	0.44	0.21	0.17
Secondary &Higher	0.78	0.59		0.31
Women's religion				
Orthodox Christian(ref)				
Muslim		-0.27	-0.40	-0.12
Protestant/Other			-0.64	-0.30
Women's mass media exposure	0.18	0.15		0.094
Spouses' Variables				
Decision making perception		N/A		
Wife beating perception			0.069	0.024
Refusing sex perception		N/A		
Spouse's age				
Men's education				
No education (ref)				
Primary				
Secondary &Higher	0.35			
Men's mass media exposure		0.076		0.067

Table 12 (Continued)

Variable	2005 EDHS Knowledge N=2537	2011 EDHS Knowledge N=6454	2005 EDHS Attitude N=2537	2011 EDHS Attitude N=6454
Couples' Variables				
Residence				
Urban (ref)				
Rural			-0.56	-0.17
Wealth Index				
Poorest (ref)				
Poorer	0.27			
Middle	0.48			
Richer	0.36			0.14
Richest	0.64		0.36	0.32

Note: Only the significant variables for each of the two dependent variables are listed

Chapter 5

Discussion

Women's autonomy is associated with outcomes that are important in women's lives such as healthcare utilization, maternal and child health, family planning and contraception use and to their contribution to decisions regarding their households and families.[23,24,26–32,34–46,130,136–143,145,146,148,150,159] The ability of women to contribute to the decisions that affect their health and well-being has important implications especially with respect to HIV/AIDS, a disease that impacts women disproportionately.[25,43,65,141] This study explored the association between women's autonomy and their HIV/AIDS knowledge and attitudes. This study also examined the association between the spousal perception of women's autonomy and women's HIV/AIDS knowledge and attitudes. This is important since the transmission of HIV/AIDS between married or cohabiting couples requires the cooperation of both individuals. Socio-demographic variables such as the women's employment, women's and men's age, education, religion, mass media exposure, the couple's residence, and wealth index were included in the analyses.

It was hypothesized that:1) women who were more autonomous would have more knowledge about HIV/AIDS and would have more accepting attitudes toward PLWHA and 2) that women whose spouses had a higher perception of their autonomy would also have more knowledge about HIV/AIDS and have more accepting attitudes toward PLWHA compared to women whose spouses' perception of their autonomy was lower.

This study found both more HIV/AIDS knowledge and more accepting HIV/AIDS attitudes in the 2011 EDHS compared to the 2005 EDHS among married and cohabiting Ethiopian women. In the 2005 EDHS multiple linear regression, none of the autonomy indicators were significantly associated with the women's HIV/AIDS knowledge. However, higher autonomy in women's attitude toward refusing sex and men's wife beating perception were associated with more accepting HIV/AIDS attitudes in the women. In the 2011 EDHS multiple linear regressions, higher autonomy in women's decision-making and attitude toward wife beating were associated with both more

HIV/AIDS knowledge and more accepting attitudes in the women. In addition, higher autonomy perception (indicated by men's wife beating perception) was also associated with more accepting HIV/AIDS attitudes. Therefore, the hypothesis that the more autonomous women would have more HIV/AIDS knowledge in the 2005 data was rejected since none of the women's autonomy indicators were significant. Similarly for 2005, the hypothesis that women whose spouses perceived as having higher autonomy would have more HIV/AIDS knowledge was also rejected given that none of the men's autonomy perception indicators were significant. However, neither of these two hypotheses could be rejected with respect to women's HIV/AIDS attitudes in 2005. Moreover, these hypotheses could not be rejected with respect to both HIV/AIDS knowledge and attitudes using the 2011 survey data.

The socio-demographic variables found to be significantly associated with women's HIV/AIDS knowledge and attitudes in the multiple linear regressions were women's employment, education, religion, mass media exposure, men's education and mass media exposure, and couple's residence and wealth index. Overall, women's education, mass media exposure, religion and wealth index had the most consistent associations with women's HIV/AIDS knowledge and attitudes in both the 2005 and 2011 surveys.

5.1 The association between autonomy indicators and HIV/AIDS Knowledge and Attitudes

This study found mixed results with regards to the associations between women's autonomy (and spousal autonomy perception) and women's HIV/AIDS knowledge and attitudes. From the 2005 EDHS multiple regressions, none of the autonomy indicators were associated with women's HIV/AIDS Knowledge. However, there were positive associations between some of the autonomy indicators (women's attitude toward refusing sex and men's wife beating perception) and women's HIV/AIDS attitudes. From the 2011 EDHS multiple linear regressions, positive association between women's autonomy (decision-making and attitude toward wife beating) and women's HIV/AIDS knowledge were found. Also in 2011, women's autonomy (women's decision-making, attitude toward wife beating, and men's wife beating perception) were also associated with more

positive (and therefore more accepting) HIV/AIDS attitudes in the women. Overall, this study's findings indicate positive associations between women's autonomy and their HIV/AIDS knowledge and attitudes, with more autonomous women having more HIV/AIDS knowledge and more accepting attitudes toward PLWHA. These positive associations are supported by other studies.[25,43,46,65,141] As discussed in the literature review, women who are more autonomous in their relationships as well as women who are perceived to be autonomous by their spouses have more bargaining power in all aspects of their lives including their own health.[19,26,28,43] Studies have found that more autonomous women are more likely to seek healthcare and information and are more knowledgeable about the availability of resources as well as the correct use of contraception methods such as condoms.[19,43,136] In addition, more autonomous women are knowledgeable about HIV/AIDS ,[43,65,141] have more accepting HIV/AIDS attitudes and are more likely to engage in protective behaviours (i.e. condom use, negotiate safe sex practices, limit the number of partners).[22,43,45,46,61,136] Therefore, autonomy is very important in women's HIV/AIDS knowledge and attitudes and can be instrumental in addressing the disease's impact on women.

The lack of association between some of the women's autonomy indicators and women's HIV/AIDS knowledge and attitudes is likely due to the limited definition of autonomy used in this study. Since the EDHS only measured two of the five components of women's autonomy (decision-making and emotional autonomy), this study was limited to using only these components. The literature indicates that the different components of autonomy have varying relationships with different outcomes, with some components being better predictors of specific outcomes than others.[43,143] Hence, some of the unmeasured components such as economic/self-reliance autonomy (which enable women to access information and resources) and knowledge autonomy (autonomy conferred to women by formal education and exposure to information)[32] may have had stronger associations with this study's dependent variables. Bloom et al.,[43] examined the relationship between women's autonomy and women's HIV/AIDS knowledge and practices in India and found that economic autonomy was the most important determinant of these outcomes. Snelling et al.,[22] and Stephenson,[65] also examined the determinants of women's HIV/AIDS knowledge and sexual behavior and found that higher HIV/AIDS

knowledge and more protective behaviours were associated with higher levels of education. These studies indicate that economic/self-reliance and knowledge autonomy may have been more strongly associated with women's HIV/AIDS knowledge and attitudes in this study. This study found consistent and positive associations between women's education and both women's HIV/AIDS knowledge and attitudes. As discussed in the literature review, education was often used as a proxy measure of women's autonomy in the past because education enhances women's autonomy.[27,143,145,148] The study's positive associations between women's education and women's HIV/AIDS knowledge and attitudes thus indicates that the unmeasured components of women's autonomy may also be positively associated with these variables if education is treated as a proxy measure of women's autonomy.

Comparing the autonomy indicators from the 2005 and 2011 EDHS, the women's autonomy (as measured by their attitudes toward wife beating) was higher in 2011 compared to 2005. In addition, the spouses' perception of the women's autonomy (measured by men's wife beating perception) was also higher in 2011 compared to 2005. The fact that both these indicators showed changes in the same direction (higher autonomy) may reflect changing attitudes regarding wife beating in Ethiopia. Violence against women in the form of wife beating or intimate partner violence is a pervasive phenomenon in Ethiopia. [13, 14, 160, 161] However, the 2005 and 2011 EDHS have shown a decrease in the acceptability of wife beating among both men and women. The percent of women who agreed with wife beating for at least one reason decreased over the last two cycles of the EDHS from 81% in 2005 to 68% in 2011.[13,14] Similarly, the acceptability of wife beating for at least one reason has also decreased among Ethiopian men from 52% in 2005 to 45% in the 2011 EDHS.[13,14] Ethiopia changed its family law in 2000 and its criminal law in 2005 to protect women and children against domestic violence and to encourage gender equality.[13] These developments coincide with the changes in attitudes toward wife beating that were observed in this study.

In addition, comparing the women's autonomy indicators and the men's perception of women's autonomy indicators in each survey cycle, men attributed higher autonomy to the women than the women attributed to themselves except with respect to decision-

making. In 2005, the women attributed higher decision-making autonomy to themselves than the men attributed to them. This is consistent with the literature,[28,41,140,149] which has shown that men generally attribute higher levels of autonomy to the women than the women attribute to themselves. In this study, in 2005, the men's perception of the women's autonomy was higher on two out of three indicators (men's wife beating perception and men's perception of women refusing sex) than the women's own perception of their autonomy (attitude toward wife beating and attitude toward refusing sex). This was also true for 2011, with men's perception of women's autonomy (as measured by men's wife beating perception) being higher than the women's own autonomy perception (as measured by attitude toward wife beating). Jejeebhoy (2002)[149], Becker et al.(2006)[42], and Ghuman et al.(2006) [140] all found a similar trend where women under-estimated their autonomy compared to their husbands. Jejeeboy 2002,[149] in her study of the effect of women's and their spouses' perception of the women's autonomy on contraception use in a rural population in India concluded that the men likely gave what they deemed as socially "acceptable responses" thus over-estimating their wives' autonomy; in contrast, the wives may have under-estimated their own autonomy to conform to social norms. Ghuman and her colleagues,[140] also questioned the validity of the results of their study which looked at women's autonomy according to the women and their husbands in five Asian countries; they also attributed the men's higher perception of the women's autonomy to the social desirability bias. In this study, the social desirability bias likely played a role since Ethiopia is a patriarchal society,[133] where men ultimately have the final say on the decisions concerning their wives and families.

With regard to the one indicator where the women attributed higher autonomy to themselves than their spouses' did (decision-making in 2005), this finding is consistent with a study by Allendorf 2007, [41] that investigated the effect of couple's report of women's autonomy on maternal healthcare utilization in Nepal. This study found that the women attributed higher decision-making autonomy to themselves than their husband's attributed to them. These findings may reflect the men under-estimating the women's decision-making autonomy. Education and paid employment are known to increase women's decision-making autonomy,[146] therefore, for educated women who bring an

income to the household, their higher estimate of their decision-making autonomy may reflect their reality.

5.2 Education

Women's education had the single most consistent association with both the women's HIV/AIDS knowledge and attitudes; this underscores the importance of education in addressing the HIV/AIDS epidemic. Educated women had more HIV/AIDS knowledge and more accepting attitudes in both the 2005 and 2011 EDHS multiple linear regressions. These findings are consistent with other studies .[21, 22, 43, 63, 65, 67, 71, 77, 93, 121, 152,162, 109] Education is believed to change knowledge and attitudes in several different ways.[162] First, education leads to information transfer by increasing exposure to information (either through a formal school curriculum or from mass media or other channels) about HIV/AIDS, its transmission and prevention, as well as to the availability of prevention and treatment resources.[21,67,109,129,162,163] In this study, increasing levels of education were associated with more HIV/AIDS knowledge; these findings are supported by the literature.[22,65–67]

Second, having a formal education alters the thought processes of individuals and enables them to effectively evaluate and understand how their behavior can result in an outcome.[109] This is important not just for HIV/AIDS prevention but for all preventative health behaviors.[96] Therefore, individuals with a formal education are able to understand information about diseases (i.e. HIV/AIDS) and thus have better knowledge to protect themselves.[109] Education enhances socio-cognitive and problem-solving skills, which form the framework of behavioral change theories including the Social Cognitive Theory which has been used for HIV prevention and treatment programs. [110,162] As discussed in the literature review, knowledge is a necessary component for behavior change, but it is insufficient on its own.[63,66,69,79,91–93] However, the socio-cognitive and problem solving skills gained from a formal education enable individuals to examine and evaluate how their behaviors can lead to HIV infection. Thus, having a formal education enhances an individual's understanding of perceived risk and provides the motivation to adopt protective behaviors.[21,96,109] In addition, education in general has been found to increase

self-efficacy, that is the belief that an individual is capable of performing a specific behavior to bring about the expected outcome.[71,96,162] With respect to HIV/AIDS, educated people are more likely to believe that they have control over their behaviors and the disease outcome as opposed to fate or other people.[96,162] For instance, educated women are more likely to use condoms,[22,43,70,109,121,162] negotiate safe sex practices with their partners, and use services such as VCT.[74,75] In fact, studies have shown that HIV/AIDS preventative behaviors increase with increasing levels of education.[22,162] More educated women are more likely to seek out information that will enhance their knowledge and improve their attitudes than uneducated women.[18]

Third, education is thought to influence individuals' social networks, which may consequently influence their behaviors.[109,162,164] For instance, educated people are more likely to associate with other educated individuals who may practice more preventative behaviors (i.e. limiting the number of sexual partners, condom use, and abstinence) whereas uneducated individuals tend to associate with other uneducated individuals who may engage in high risk practices.[162,164] Therefore, social environments and norms can either enhance individuals' protective or risk taking behaviors.[162,164] Moreover, women's education has been found to be associated with their membership in social groups where they may benefit from the membership's support and exposure to HIV/AIDS information and resources.[63,162] Hence, education influences individuals' acquisition and understanding of HIV/AIDS information, risk perception, self-efficacy and their social networks which then influence knowledge and behaviors.

The association between women's education and more accepting HIV/AIDS attitudes that was found in this study is also consistent with the literature, [65,70,75,100,106,109,129,162,164–166] although the exact mechanism in which education affects attitudes is unknown. Few studies,[109,162] have hypothesized a direct effect where education promotes positive attitudes in people toward PLWHA. Education is also thought to indirectly promote positive attitudes in people toward PLWHA through its effect on knowledge.[109,162] By providing factual information on the causes, prevention, and treatment of HIV/AIDS, education has been shown to reduce stigma and the consequential negative attitudes associated with HIV/AIDS.[109,162]

Ethiopia has adopted the UN's MDGs and MDG II is dedicated to achieving universal access to primary education.[90] Although Ethiopia has a long way to go in terms of realizing this goal, there are improvements in the population education levels. For example, the percent of women with a primary education was 27.8% in 2011 compared to 18.7% in 2005; similarly, 43.1% of men in 2011 had a primary education compared to 31.1% in 2005.[13,14] These changes in Ethiopia's education provide a backdrop for the greater women's HIV/AIDS knowledge and more accepting attitudes observed in 2011 as well as the associations between education and these variables.

This study also examined the association between the spouses' education and women's HIV/AIDS knowledge and attitudes; men's education had a less consistent association with these dependent variables than the women's own education. The men's education (secondary or higher) was only associated with more HIV/AIDS knowledge in the 2005 survey and this regression coefficient was smaller than that between women's education and women's HIV/AIDS knowledge. This finding is consistent with other studies by Rahman et al.,[152] and Moursand and Kravdal.[38] These studies found that women's own education was more important to women's health outcomes than the husbands' education. Therefore, the women's own education appears to be more important for women's HIV/AIDS knowledge and attitudes than their spouses' education in this study also.

5.3 Mass media exposure

The other variable consistently associated with the women's HIV/AIDS knowledge in this study was the women's mass media exposure. Higher levels of mass media exposure were associated more HIV/AIDS knowledge in 2005 and both more HIV/AIDS knowledge and accepting attitudes in 2011. The men's mass media exposure was also associated with more HIV/AIDS knowledge and more accepting attitudes in 2011 in the women; however, these regression coefficients were smaller than those between the women's own mass media exposure and the women's HIV/AIDS knowledge and attitudes. These findings are consistent with the literature [43,63–69,100,104,129,147,152,154,165–167] Mass media such as radio, television, newspapers and magazines are thought to directly increase knowledge by exposing individuals to information such as the causes of a

disease, its transmission, prevention, and the availability of resources; mass media can also dispel myths related to a disease or condition. [96,154] Moreover, effective HIV/AIDS educational entertainment programs, that is educational programs that are delivered in an entertaining fashion (based on a behavioral change theory), have been shown to be effective in not only increasing knowledge but also in altering people's attitudes and behaviors.[96,154] These programs promote positive attitude and behavior change by using role models that people can emulate.[96,154] Therefore, educational mass media can directly promote positive attitudes in people through emulation and role models.[96 ,154, 168] In addition, mass media is thought to indirectly promote positive attitudes by increasing knowledge and dispelling myths about HIV/AIDS.[96] Mass media programs such as radio and television soap operas have been popular methods of educating the general population about HIV/AIDS over the last decade in Ethiopia.[54] For example, a study by Farr et al., [154] that examined the effectiveness of a radio soap opera called "The journey of life" that aired between November 2001 to June 2002 in Ethiopia, showed that listeners of the program had more HIV/AIDS knowledge, more accepting attitudes, and more preventative behaviors compared to individuals who were not exposed to this program.

Although exposure to mass media in the general population in Ethiopia has been increasing over the years, the population's overall exposure is low.[13,14] Mass media exposure is more common in urban regions where only a minority of the population resides and women in particular have low exposure levels (in 2011, 53% of men and 68% of women , aged 15-49 years had no mass media exposure in Ethiopia).[13] Given the association between mass media exposure and women's HIV/AIDS knowledge and attitudes, increasing access to mass media may be beneficial to these women.

The association between the spouses' mass exposure and the women's HIV/AIDS knowledge and attitudes was less consistent than with the women's own mass media exposure. In 2011, men's mass media exposure was associated with more HIV/AIDS knowledge and more accepting attitudes in the women. A study by Chatterjee ,[153] on the effect of men's mass media exposure on married women's HIV/AIDS knowledge in Bombay, India, found that mass media exposure was positively correlated with women's

HIV/AIDS knowledge; and that spouses discussed mass media exposure. Hence, men who received HIV/AIDS information through the media may transfer some that information to their wives through discussions thereby enhancing women's HIV/AIDS knowledge and attitudes. However, the women's own mass media exposure had stronger and more consistent associations with the women's HIV/AIDS knowledge.

5.4 Wealth Index

Associations between the couple's household wealth index and the women's HIV/AIDS knowledge and attitudes were found. Women from the wealthier households had more HIV/AIDS knowledge in 2005 as well as more accepting attitudes in both 2005 and 2011. Wealth status had a dosage response effect where higher levels of wealth were associated with higher levels of knowledge. However, only the wealthiest women had more accepting attitudes in both the 2005 and 2011 surveys. This study's finding that higher household wealth was associated with more HIV/AIDS knowledge and accepting attitudes is consistent with the literature.[26,27,43,65,130] These findings are not surprising given that wealth provides women with opportunities, outside of a formal education and mass media exposure which were controlled for in this study, to obtain information and health resources. Wealthier women are more likely to be able to afford travel to areas such as urban centers, community gatherings, hospitals, and health centers where there are opportunities for exposure to information which would, in turn, increase their knowledge and promote more positive attitudes. Since the majority of the population resides in rural regions in Ethiopia, accessing health information generally means travelling to urban locations.[26,27,130] Hence the ability to afford transportation to urban locations is a key barrier to accessing health information even when these services may be free.[133,169] Other studies,[26,133,153,170] have found that women from wealthier households were more likely to use ANC clinic, where HIV/AIDS VCT and PMTCT programs are available in Ethiopia.[19,26,54,136]

5.5 Residence

Rural residence was negatively associated with the women's HIV/AIDS attitudes. Rural women had less accepting attitudes toward PLWHA in both 2005 and 2011. This finding

is consistent with other studies.[18,19,22,26,27,43,169,171] For example, Lal et al.(2000),[171] found that urban residence was associated with more positive attitudes in college students in Kerala, India. In developing countries including Ethiopia, hospitals, health centers, educational institutions, and exposure to information are common in urban locations even though the majority of the population reside in rural locations.[26,169] For example, in Ethiopia, in 2010, 76% of urban women compared to only 26% rural women had access to ANC clinics where VCT and PMTCT programs were available.[54] Hence, the presence of less accepting attitudes among rural women may reflect the lack of access to information and resources that can promote positive changes in HIV/AIDS attitudes. [26,133]

Moreover, some researchers have hypothesized that urban residence fosters in people new values and more positive and liberal attitudes toward others who are different than they are, and to new ideas. [146]

5.6 Religion

Women's religion was associated with less accepting HIV/AIDS Attitudes in both 2005 and 2011 and lower HIV/AIDS knowledge levels in 2011. Muslim and Protestant/Other women had less accepting HIV/AIDS attitudes in both 2005 and 2011 compared to women who were Orthodox Christian. In addition, Muslim women had less HIV/AIDS knowledge levels in 2011 compared to Orthodox Christian women. This study's findings of negative association between religion and women's HIV/AIDS knowledge and attitudes is supported by other studies, [43,151,166,172,173] that explored associations between religious affiliation and HIV/AIDS knowledge and attitudes. These observed differences may be due to variations in the religions' beliefs [151], which were not explored in this study.

5.7 Employment

Employment status was not as consistently associated with this study's two dependent variables as some of the other independent variables such as education and mass media exposure. Women's employment was only associated with more HIV/AIDS knowledge in 2005 and more accepting HIV/AIDS attitudes in 2011. There is lack of studies that

have examined the direct effect of employment on HIV/AIDS knowledge and attitudes; employment is generally measured as part of the larger socio-economic or wealth status of households. However, in this study, the direct association between women's employment and their HIV/AIDS knowledge and attitudes was of interest. Married or cohabiting women's employment may have an effect above and beyond what is indicated by their households' wealth-index by giving women independent access to information and resources.[27,40,44,136,137,140,174] The association between women's employment and women's HIV/AIDS knowledge and attitudes may be through mediation of one of the unmeasured components of women's autonomy, particularly women's economic/self-reliance autonomy, which was not measured by the EDHS. Employment has been shown to increase African women's economic autonomy,[136] and women's economic autonomy is known to increase women's bargaining power with their spouses, their access to information and health services, as well as their knowledge and health seeking behaviors.[26,40,45,136,174] Hence, this study's findings suggest that employment may be acting as a proxy of measure of women's economic autonomy. Women's economic autonomy's association with women's HIV/AIDS knowledge and attitudes are supported by the literature.[25,43,45,46,65,136,139] For example, Bloom et al.,[43] found that economic autonomy (conferred to women by independent access to money through employment) was the single most important factor associated with women's HIV/AIDS knowledge and behaviors in three States in India which differed in cultural practices.

5.8 Study contributions and policy implications

This was the first known study that has examined the relationship between women's autonomy and women's HIV/AIDS knowledge and attitudes in Ethiopia and in Sub-Saharan Africa. This was also the first known study to have examined the association between men's perception of women's autonomy and women's HIV/AIDS knowledge and attitudes in Sub-Saharan Africa. Hence, this study addressed one of the key criticisms of the literature on women's autonomy; that researchers have often treated women's autonomy as an independent variable by neglecting to consider the important role men play in decisions relating to women's lives and health.[26,40,136,148] As discussed in the literature review, women's autonomy is strongly influenced by women's social and

cultural environments and men play a dominant role, especially in developing countries where wide gender disparities exist.[24,122,136,145] Therefore, a key contribution of this study is that it examined both the association between women's autonomy as well as the women's spouses' perception of the women's autonomy and women's HIV/AIDS knowledge and attitudes. Although the findings of this study with regard to the association between women's autonomy (and men's perception of women's autonomy) and women's knowledge and attitudes were mixed, they did indicate an overall positive association warranting further investigation. The incorporation of the men's perception of women's autonomy (and its positive association with the women's HIV/AIDS knowledge and attitudes), as well as the discrepancies between the men and women on the women's autonomy indicate the need to emphasize and encourage cooperative preventative behaviors between couples with respect to HIV/AIDS.

Furthermore, the findings that education and mass media exposure are associated with more HIV/AIDS knowledge and more accepting attitudes in women underscore the importance of these factors in HIV/AIDS prevention efforts. Ethiopia and other countries in Sub-Saharan Africa facing similar impacts of HIV/AIDS on women could use the findings of this research to inform their HIV/AIDS prevention, control and treatment programs and initiatives. These countries should provide women and girls with more opportunities for education given education's association with women's HIV/AIDS knowledge and attitudes. Education has been shown to improve not just women's HIV/AIDS knowledge and attitudes but populations' overall health through the adoption of preventative behaviors and by increasing their socio-economic status through increased employment opportunities.[38,41] In addition, education is also associated with increasing women's autonomy.[28,39,41,149] Ethiopia, by ratifying the UN's MDGs, has pledged to improve the overall health of the population with emphasis on women's health, a group disproportionately affected by health issues including HIV/AIDS. Therefore, emphasis on education will enable Ethiopia and other countries in Sub-Saharan Africa in realizing their MDGs. Specifically increasing education for women and girls will assist these countries with their efforts to achieve the following three MDGs: II "achieve universal primary education"[51]; III: "promote gender equality and empower women"[51] and; VI: "combat HIV/AIDS, malaria and other major diseases."[51]

Mass media exposure, similar to education, exposes individuals to information that can help inform, educate, and motivate them to adopt preventative behaviors across a range of health outcomes including HIV/AIDS.[152,175] Thus, expanding mass media access to its population will also assist Ethiopia in addressing the impact of HIV/AIDS on women by increasing women's HIV/AIDS knowledge and by promoting more accepting attitudes toward PLWHA. The literature shows that women's perception of their personal HIV infection risk is high and therefore this group may benefit from increased media exposure.[162] Given mass media's association with women's HIV/AIDS knowledge and attitudes, the Ethiopia National HIV/AIDS Council and other Sub-Saharan countries' HIV/AIDS campaigns should increase their utilization of mass media to deliver effective HIV/AIDS educational programming. In 2011, 53% of men and 68% of women, aged 15-49 years, had no mass media exposure in Ethiopia. [13] The governments of Ethiopia and other Sub-Saharan countries should examine and address barriers to mass media exposure given this information channel's positive association with more HIV/AIDS knowledge and more accepting attitudes.

5.9 Study limitations

The use of secondary data has strengths and limitations; the primary limitation of this study was the cross-sectional nature of the survey data used. Cross-sectional surveys do not allow inferences of causation between independent and dependent variables. In addition, there may be external factors that confound the relationship between these variables that may not have been controlled for. As a result, we cannot be certain that the observed changes in women's HIV/AIDS knowledge and attitudes are the result of their increased autonomy and other significant variables.

A second limitation of this study was the possibility of social desirability bias. It is plausible that respondents gave answers to the survey that they thought the interviewers wanted to hear or that were "socially" acceptable. The measures of women's autonomy and men's perception of women's autonomy were especially susceptible to this bias as indicated by the observed discrepancies between the men and women on the women's autonomy.

In addition, this study was limited to using only the components of autonomy that were measured by the EDHS instead of all five components that encompass the multi-dimensional construct of women's autonomy. Since the EDHS only measured decision-making autonomy and emotional, this study was limited to using only these two indicators. As discussed in the literature, using only some of the components of autonomy can result in unexpected findings. This study would have benefited from including all the five components of autonomy and may have been better able to detect the relationships between women's autonomy and their HIV/AIDS knowledge and attitudes across both survey cycles. Furthermore, even with the components of autonomy that were measured by the EDHS, some were dropped in the latter survey (i.e. attitude toward refusing sex, men's decision-making perception and men's perception of women refusing sex). Therefore, this study was unable to examine changes in these indicators between the two surveys. More importantly, the lack of consensus on the definition and operationalization of the construct of women's autonomy in the literature could have contributed to the mixed findings of this study with respect to the relationship between women's autonomy (and men's perception of women's autonomy) and the women's HIV/AIDS knowledge and attitudes. Also, there may have been other important contextual factors not captured by the autonomy indicators as measured by the EDHS that affected this study's findings.

5.10 Future Research

Future DHS should aim to collect information that assesses all five components of women's autonomy to allow researchers to fully examine the relationship between women's autonomy and women's HIV/AIDS knowledge and attitudes. Additionally, DHS should collect the same measures over time to allow researchers to study temporal changes. More research, especially longitudinal studies, exploring the relationship between the different components of women's autonomy and women's HIV/AIDS knowledge and attitudes are encouraged to clarify the implications of this relationship to HIV/AIDS prevention programs, strategies, and policies. Furthermore, more research and consensus on the definition and operationalization of the construct of women's

autonomy is needed to advance the understanding of how this construct truly affects important outcomes in women's lives.

5.11 Study Conclusions

Overall, this study found that married and cohabiting Ethiopian women's HIV/AIDS knowledge and attitudes were higher in 2011 compared to 2005. This is encouraging since women are disproportionately impacted by HIV/AIDS and given that HIV/AIDS knowledge and attitudes are cornerstones to HIV/AIDS prevention, control, and treatment.[76,80,81,100,104] This study supports the importance of women's autonomy, education, and mass media exposure in addressing the disproportionate impact of HIV/AIDS on women in Ethiopia and across Sub-Saharan Africa. Addressing these factors may contribute to alleviating the impact of HIV/AIDS on women by increasing women's HIV/AIDS knowledge and by promoting more accepting attitudes toward PLWHA. The positive association between women's autonomy (and men's perception of women's autonomy) and women's HIV/AIDS knowledge in 2011 and HIV/AIDS attitudes in both 2005 and 2011 is encouraging given the current focus on addressing gender inequalities to respond to HIV/AIDS's impact on women by the United Nations and its partners.[4] Ethiopia and other Sub-Saharan countries should focus on improving women's autonomy, education, and mass media exposure since these variables were more consistently positively associated with women's HIV/AIDS knowledge and attitudes. This study's finding that other independent variables were also associated with women's HIV/AIDS knowledge and attitudes (i.e. religion, employment, wealth index, and residence) is important but these variables are less easily amenable to change. For example, addressing variables such as religion would be complex and moving populations to urban locations is impractical. However, Ethiopia and other UN partner countries already have strategies to improve education, mass media exposure and the promotion of gender-equality.[90]

In conclusion, Ethiopia and other countries in Sub-Saharan Africa must increase and emphasize their efforts and funding for education, mass media exposure, and gender-equality promotion in order to address not just the impact of HIV/AIDS on women but

the overall health of their populations. Lastly, Ethiopia and other countries in Sub-Saharan Africa should continue addressing gender inequalities by giving girls and women equal opportunities to education, employment, information, and health services

References

1. World Health Organization. WHO | HIV/AIDS. *WHO*. Available at: http://www.who.int/mediacentre/factsheets/fs360/en/. Accessed January 17, 2014.

2. UNAIDS. HIV/AIDS Fact Sheet 2013. Available at: http://www.unaids.org/en/resources/campaigns/globalreport2013/factsheet/. Accessed January 13, 2014.

3. Wang W, Alva S, Wang S. DHS Analytical Studies 29: HIV-related Knowledge and Behaviors among people living with HIV/AIDS in high HIV prevalence countries in Sub-Saharan Africa. USAID ICF Inernational 2012. *USAID ICF Int*. 2012. Available at: http://measuredhs.com/pubs/pdf/AS29/AS29.pdf. Accessed January 19, 2014.

4. UNAIDS. Global Report: UNAIDS report on the global AIDS epidemic 2013. Available at: http://www.unaids.org/en/resources/campaigns/globalreport2013/factsheet/. Accessed January 12, 2014.

5. Tanaka Y, Kunii O, Hatano T, Wakai S. Knowledge, attitude, and practice (KAP) of HIV prevention and HIV infection risks among Congolese refugees in Tanzania. *Health Place*. 2008;14(3):434-452. doi:10.1016/j.healthplace.2007.07.005.

6. Piot P, Bartos M, Ghys PD, Walker N, Schwartländer B. The global impact of HIV/AIDS. *Nature*. 2001;410(6831):968-973. doi:10.1038/35073639.

7. Mbonu NC, van den Borne B, De Vries NK. Stigma of People with HIV/AIDS in Sub-Saharan Africa: A Literature Review. *J Trop Med*. 2009;2009. doi:10.1155/2009/145891.

8. Alistar SS, Brandeau ML. Decision Making for HIV Prevention and Treatment Scale up Bridging the Gap between Theory and Practice. *Med Decis Making*. 2012;32(1):105-117. doi:10.1177/0272989X10391808.

9. Quinn TC. Global burden of the HIV pandemic. *The Lancet*. 1996;348(9020):99-106. doi:10.1016/S0140-6736(96)01029-X.

10. Dixon S, McDonald S, Roberts J. The impact of HIV and AIDS on Africa's economic development. *BMJ*. 2002;324(7331):232-234.

11. Omer EM, Mariam DH. Impact of HIV/AIDS on labor productivity in Akaki fiber products factory, Ethiopia. *Ethiop Med J*. 2008;46(2):123-131.

12. Fox MP, Rosen S, MacLeod WB, et al. The impact of HIV/AIDS on labour productivity in Kenya. *Trop Med Int Health TM IH*. 2004;9(3):318-324.

13. Central Statistical Authority [Ethiopia], ICF International. *Ethiopia Demographic and Health Survey 2011*. Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Authority and ICF International; 2012.

14. Central Statisitcal Agency [Ethiopia], ORC MACRO. *Ethiopia Demographic and Health Survey 2005*. Addis Ababa, Ethiopia and Calverton, Maryland, USA; 2006.

15. Quinn TC, Overbaugh J. HIV/AIDS in Women: An Expanding Epidemic. *Science*. 2005;308(5728):1582-1583. doi:10.1126/science.1112489.

16. Wingood GM, DiClemente RJ. Application of the Theory of Gender and Power to Examine HIV-Related Exposures, Risk Factors, and Effective Interventions for Women. *Health Educ Behav*. 2000;27(5):539-565. doi:10.1177/109019810002700502.

17. Türmen T. Gender and HIV/AIDS. *Int J Gynecol Obstet*. 2003;82(3):411-418. doi:10.1016/S0020-7292(03)00202-9.

18. Burgoyne AD, Drummond PD. Knowledge of HIV and AIDS in women in sub-Saharan Africa. *Afr J Reprod Health*. 2009;12(2):14-31. doi:10.4314/ajrh.v12i2.7962.

19. Woldemicael G, Tenkorang EY. Women's Autonomy and Maternal Health-Seeking Behavior in Ethiopia. *Matern Child Health J*. 2010;14(6):988-998. doi:10.1007/s10995-009-0535-5.

20. Mumtaz Z, Salway S. Understanding gendered influences on women's reproductive health in Pakistan: Moving beyond the autonomy paradigm. *Soc Sci Med*. 2009;68(7):1349-1356. doi:10.1016/j.socscimed.2009.01.025.

21. Ochako R, Ulwodi D, Njagi P, Kimetu S, Onyango A. Trends and determinants of Comprehensive HIV and AIDS knowledge among urban young women in Kenya. *AIDS Res Ther*. 2011;8:11. doi:10.1186/1742-6405-8-11.

22. Snelling D, Rasugu Omariba DW, Hong S, Georgiades K, Racine Y, Boyle MH. HIV/AIDS knowledge, women's education, epidemic severity and protective sexual behaviour in low- and middle-income countries. *J Biosoc Sci*. 2007;39(3):421-442. doi:10.1017/S0021932006001465.

23. Rammohan A, Johar M. The Determinants of Married Women's Autonomy in Indonesia. *Fem Econ*. 2009;15(4):31-55. doi:10.1080/13545700903153989.

24. Mason KO, Smith HL. Women's empowerment and social context: Results from five Asian countries. *Gend Dev Group World Bank Wash DC*. 2003. Available at: http://www.ngosplatform.net/wp-content/uploads/2012/12/002-92-Womens-

Empowerment-And-Social-Context-Results-From-Five-Asian-Countries-sitersources.worldbank.org_.pdf. Accessed January 5, 2014.

25. Chacham AS, Maia MB, Greco M, Silva AP, Greco DB. Autonomy and susceptibility to HIV/AIDS among young women living in a slum in Belo Horizonte, Brazil. *AIDS Care*. 2007;19 Suppl 1:S12-22. doi:10.1080/09540120601114402.

26. Woldemicael G. Do Women With Higher Autonomy Seek More Maternal Health Care? Evidence From Eritrea and Ethiopia. *Health Care Women Int*. 2010;31(7):599-620. doi:10.1080/07399331003599555.

27. Woldemicael G. Women's autonomy and reproductive preferences in Eritrea. *J Biosoc Sci*. 2009;41(02):161-181. doi:10.1017/S0021932008003040.

28. Mullany BC, Hindin MJ, Becker S. Can women's autonomy impede male involvement in pregnancy health in Katmandu, Nepal? *Soc Sci Med*. 2005;61(9):1993-2006. doi:10.1016/j.socscimed.2005.04.006.

29. Sharma A, Kader M. Effect of Women's Decision-Making Autonomy on Infant's Birth Weight in Rural Bangladesh. *ISRN Pediatr*. 2013;2013:1-8. doi:10.1155/2013/159542.

30. Al-Riyami AA, Afifi M. Determinants of women's fertility in Oman. *Saudi Med J*. 2003;24(7):748–753.

31. Dyson T, Moore M. On Kinship Structure, Female Autonomy, and Demographic Behavior in India. *Popul Dev Rev*. 1983;9(1):35. doi:10.2307/1972894.

32. Jejeebhoy SJ, Sathar ZA. Women's Autonomy in India and Pakistan: The Influence of Religion and Region. *Popul Dev Rev*. 2001;27(4):687–712. doi:10.1111/j.1728-4457.2001.00687.x.

33. Jejeebhoy SJ. *Women's Education, Autonomy, and Reproductive Behaviour: Experience from Developing Countries*. Oxford University Press; 1995. Available at: http://ideas.repec.org/b/oxp/obooks/9780198290339.html. Accessed January 6, 2014.

34. Haque MM, Islam TM, Tareque MI, Mostofa MG. Women Empowerment or Autonomy: A Comparative View in Bangladesh Context. *Bangladesh Sociol Soc*. 2011;8(2):17.

35. Sathar ZA, Shahnaz K. Women's autonomy in the context of rural Pakistan. *Pak Dev Rev*. 2000;39(2):89-110.

36. Balk D. Individual and Community Aspects of Women's Status and Fertility in Rural Bangladesh. *Popul Stud*. 1994;48(1):21-45. doi:10.1080/0032472031000147456.

37. Sujatha DS, Reddy GB. Women's education, autonomy, and fertility behaviour. *Asia-Pac J Soc Sci*. 2009;1:35-50.

38. Moursund A, Kravdal Ø. Individual and community effects of women's education and autonomy on contraceptive use in India. *Popul Stud*. 2003;57(3):285-301. doi:10.1080/0032472032000137817.

39. Ghuman SJ. Women's autonomy and child survival: A comparison of muslims and non-muslims in four Asian countries. *Demography*. 2003;40(3):419-436. doi:10.1353/dem.2003.0021.

40. Govindasamy P, Malhotra A. Women's Position and Family Planning in Egypt. *Stud Fam Plann*. 1996;27(6):328. doi:10.2307/2138028.

41. Allendorf K. Couples' Reports of Women's Autonomy and Health-care Use in Nepal. *Stud Fam Plann*. 2007;38(1):35–46. doi:10.1111/j.1728-4465.2007.00114.x.

42. Becker S, Fonseca-Becker F, Schenck-Yglesias C. Husbands' and wives' reports of women's decision-making power in Western Guatemala and their effects on preventive health behaviors. *Soc Sci Med*. 2006;62(9):2313-2326. doi:10.1016/j.socscimed.2005.10.006.

43. Bloom SS, Griffiths PL. Female Autonomy as a contributing factor to women's HIV/AIDS related knowledge and behaviour in three culturally constrasting States in India. *J Biosoc Sci*. 2007;39(04):557-573. doi:10.1017/S0021932006001623.

44. Hindin MJ. Women's autonomy, women's status and fertility-related behavior in Zimbabwe. *Popul Res Policy Rev*. 2000;19(3):255-282. doi:10.1023/A:1026590717779.

45. Hindin MJ, Muntifering CJ. Women's autonomy and timing of most recent sexual intercourse in Sub-Saharan Africa: a multi-country analysis. *J Sex Res*. 2011;48(6):511-519. doi:10.1080/00224499.2011.554918.

46. Ung M, Boateng GO, Armah FA, Amoyaw JA, Luginaah I, Kuuire V. Negotiation for safer sex among married women in cambodia: the role of women's autonomy. *J Biosoc Sci*. 2014;46(1):90-106. doi:10.1017/S0021932013000151.

47. Crummery DE, Harold GM, Hailemariam A. Ethiopia -- Britannica Online Encyclopedia. Available at: http://www.britannica.com/EBchecked/topic/194084/Ethiopia. Accessed January 21, 2014.

48. Central Intelligence Agency (CIA). The World Factbook:Ethiopia. 2014. Available at: https://www.cia.gov/library/publications/the-world-factbook/geos/et.html. Accessed January 10, 2014.

49. Central Intelligence Agency. Ethiopia. 1999.

50. The World Health Organization. WHO | Ethiopia. *WHO*. Available at: http://www.who.int/countries/eth/en/. Accessed January 14, 2014.

51. United Nations. United Nations Millennium Development Goals. 2014. Available at: http://www.un.org/millenniumgoals/. Accessed January 21, 2014.

52. Milkias P. *Ethiopia*. Santa Barbara, Calif: ABC-CLIO; 2011.

53. The World Bank. Ethiopia Overview. 2013. Available at: http://www.worldbank.org/en/country/ethiopia/overview. Accessed February 25, 2014.

54. Federal Democratic Republic of Ethiopia. Country Progress: Report on HIV/AIDS Response, 2012. 2012. Available at: http://www.unaids.org/en/dataanalysis/knowyourresponse/countryprogressreports/2012countries/GAP%20Report%202012.pdf. Accessed January 15, 2014.

55. UNAIDS. Ethiopia: HIV/AIDS estimates (2012). 2014. Available at: http://www.unaids.org/en/regionscountries/countries/ethiopia/. Accessed January 15, 2014.

56. Eyawo O, de Walque D, Ford N, Gakii G, Lester RT, Mills EJ. HIV status in discordant couples in sub-Saharan Africa: a systematic review and meta-analysis. *Lancet Infect Dis*. 2010;10(11):770-777. doi:10.1016/S1473-3099(10)70189-4.

57. Dunkle KL, Stephenson R, Karita E, et al. New heterosexually transmitted HIV infections in married or cohabiting couples in urban Zambia and Rwanda: an analysis of survey and clinical data. *The Lancet*. 2008;371(9631):2183-2191. doi:10.1016/S0140-6736(08)60953-8.

58. Buvé A, Bishikwabo-Nsarhaza K, Mutangadura G. The spread and effect of HIV-1 infection in sub-Saharan Africa. *The Lancet*. 2002;359(9322):2011-2017. doi:10.1016/S0140-6736(02)08823-2.

59. Odhiambo W, M DK. Urban poverty and labour force participation in Kenya. 2003.

60. Kedir AM, Mckay A. Chronic poverty in urban Ethiopia: panel data evidence. *Int Plan Stud*. 2005;10(1):49-67. doi:10.1080/13563470500159246.

61. Sambisa W. The influence of women's autonomy and status on their adoption of safe sexual behaviors as related to HIV/AIDS in Zimbabwe. 2006. Available at: http://search.proquest.com.proxy1.lib.uwo.ca/docview/305246694/abstract/142C973A0D318343D78/1?accountid=15115. Accessed January 5, 2014.

62. Schopper D, Doussantousse S, Orav J. Sexual behaviors relevant to HIV transmission in a rural African population: How much can a KAP survey tell us? *Soc Sci Med*. 1993;37(3):401-412. doi:10.1016/0277-9536(93)90270-E.

63. Gregson S, Zhuwau T, Anderson RM, Chandiwana SK. Is there evidence for behaviour change in response to AIDS in rural Zimbabwe? *Soc Sci Med*. 1998;46(3):321-330. doi:10.1016/S0277-9536(97)00165-2.

64. Harrison A, Smit J a., Myer L. Prevention of HIV/AIDS in South Africa: a review of behaviour change interventions, evidence and options for the future. *South Afr J Sci*. 2000;96(6):285.

65. Stephenson R. A community perspective on young people's knowledge of HIV/AIDS in three African countries. *AIDS Care*. 2009;21(3):378-383. doi:10.1080/09540120802241889.

66. Adetunji J, Meekers D. Consistency in condom use in the context of HIV/AIDS in Zimbabwe. *J Biosoc Sci*. 2001;33(1):121–138.

67. Barden-O'Fallon JL, deGraft-Johnson J, Bisika T, Sulzbach S, Benson A, Tsui AO. Factors Associated with HIV/AIDS Knowledge and Risk Perception in Rural Malawi. *AIDS Behav*. 2004;8(2):131-140. doi:10.1023/B:AIBE.0000030244.92791.63.

68. Olowookere SA, Fatiregun AA, Adewole IF. Knowledge and attitudes regarding HIV/AIDS and antiretroviral therapy among patients at a Nigerian treatment clinic. *J Infect Dev Ctries*. 2012;6(11):809–816.

69. Akwara PA, Madise NJ, Hinde A. PERCEPTION OF RISK OF HIV/AIDS AND SEXUAL BEHAVIOUR IN KENYA. *J Biosoc Sci*. 2003;35(03):385-411. doi:10.1017/S0021932003003857.

70. Ukwuani FA, Tsui AO, Suchindran CM. Condom Use for Preventing HIV Infection/AIDS in Sub-Saharan Africa: A Comparative Multilevel Analysis of Uganda and Tanzania. *JAIDS J Acquir Immune Defic Syndr*. 2003;34(2):203-213. doi:10.1097/00126334-200310010-00011.

71. Adih WK, Alexander CS. Determinants of condom use to prevent HIV infection among youth in Ghana. *J Adolesc Health Off Publ Soc Adolesc Med*. 1999;24(1):63-72.

72. Shafer M-A, Boyer CB. Psychosocial and behavioral factors associated with risk of sexually transmitted diseases, including human immunodeficiency virus infection, among urban high school students. *J Pediatr*. 1991;119(5):826-833. doi:10.1016/S0022-3476(05)80312-9.

73. MacDonald NE, Wells GA, Fisher WA, et al. High-risk STD/HIV behavior among college students. *JAMA*. 1990;263(23):3155-3159. doi:10.1001/jama.1990.03440230051031.

74. Tenkorang EY, Owusu GA. Correlates of HIV testing among women in Ghana: some evidence from the Demographic and Health Surveys. *AIDS Care*. 2010;22(3):296-307. doi:10.1080/09540120903193716.

75. Chiang HC, Yu KL, Yap SF, et al. Awareness of HIV/AIDS prevention and acceptance of HIV testing among residents in Likoma Island, northern Malawi. *Trans R Soc Trop Med Hyg*. 2009;103(9):885-891. doi:10.1016/j.trstmh.2009.04.008.

76. Iliyasu Z, Abubakar IS, Kabir M, Aliyu MH. Knowledge of HIV/AIDS and attitude towards voluntary counseling and testing among adults. *J Natl Med Assoc*. 2006;98(12):1917-1922.

77. Weiser SD, Heisler M, Leiter K, et al. Routine HIV testing in Botswana: a population-based study on attitudes, practices, and human rights concerns. *PLoS Med*. 2006;3(7):e261. doi:10.1371/journal.pmed.0030261.

78. Melo J, Folgosa E, Manjate D, et al. Low prevalence of HIV and other sexually transmitted infections in young women attending a youth counselling service in Maputo, Mozambique. *Trop Med Int Health*. 2008;13(1):17–20. doi:10.1111/j.1365-3156.2007.01972.x.

79. Fishbein M, Trafimow D, Middlestadt SE, Helquist M, Francis C, Eustace MA. Using an AIDS KABP Survey to Identify Determinants of Condom Use Among Sexually Active Adults From St. Vincent and The Grenadines1. *J Appl Soc Psychol*. 1995;25(1):1–20. doi:10.1111/j.1559-1816.1995.tb01580.x.

80. Obermeyer CM, Osborn M. The Utilization of Testing and Counseling for HIV: A Review of the Social and Behavioral Evidence. *Am J Public Health*. 2007;97(10):1762-1774. doi:10.2105/AJPH.2006.096263.

81. Kalichman SC, Simbayi LC. HIV testing attitudes, AIDS stigma, and voluntary HIV counselling and testing in a black township in Cape Town, South Africa. *Sex Transm Infect*. 2003;79(6):442-447. doi:10.1136/sti.79.6.442.

82. Shetty AK. Epidemiology of HIV infection in women and children: a global perspective. *Curr HIV Res*. 2013;11(2):81-92.

83. Worku G, Enquselassie F. Factors determining acceptance of voluntary HIV counseling and testing among pregnant women attending antenatal clinic at army hospitals in Addis Ababa. *Ethiop Med J*. 2007;45(1):1-8.

84. Kominami M, Kawata K, Ali M, Meena H, Ushijima H. Factors determining prenatal HIV testing for prevention of mother to child transmission in Dar Es

Salaam, Tanzania. *Pediatr Int*. 2007;49(2):286–292. doi:10.1111/j.1442-200X.2007.02355.x.

85. Chopra M, Doherty T, Jackson D, Ashworth A. Preventing HIV transmission to children: Quality of counselling of mothers in South Africa. *Acta Paediatr*. 2005;94(3):357–363. doi:10.1111/j.1651-2227.2005.tb03080.x.

86. Piwoz EG, Iliff PJ, Tavengwa N, et al. An Education and Counseling Program for Preventing Breast-Feeding–Associated HIV Transmission in Zimbabwe: Design and Impact on Maternal Knowledge and Behavior. *J Nutr*. 2005;135(4):950-955.

87. Jebessa S, Teka T. Knowledge and attitude towards mother to child transmission of HIV and it's prevention among post natal mothers in Tikur Anbessa and Zewditu Memorial Hospitals, Addis Ababa. *Ethiop J Health Dev*. 2006;19(3):211-218. doi:10.4314/ejhd.v19i3.10000.

88. MEASURE DHS. MEASURE DHS - Quality information to plan, monitor and improve population, health, and nutrition programs. 2014. Available at: http://www.measuredhs.com/. Accessed January 22, 2014.

89. Mishra V, Agrawa P, Alva S, Gu Y, Wang S. *DHS COMPARATIVE REPORTS 24:Changes in HIV/AIDS-Related Knowledge and Behaviors in Sub-Saharan Africa*. Calverton, Maryland, USA: USAID and ICF Macro; 2009.

90. UNGASS. UNGASS:Declaration of Commitment on HIV/AIDS. Available at: http://www.ecpp.co.uk/ungass.htm. Accessed January 19, 2014.

91. Opt SK, Loffredo DA. College Students and HIV/AIDS: More Insights on Knowledge, Testing, and Sexual Practices. *J Psychol*. 2004;138(5):389-403. doi:10.3200/JRLP.138.5.389-403.

92. Tenkorang EY, Owusu AY. Examining HIV-related stigma and discrimination in Ghana: what are the major contributors? *Sex Health*. 2013;10(3):253-262. doi:10.1071/SH12153.

93. Hounton SH, Carabin H, Henderson NJ. Towards an understanding of barriers to condom use in rural Benin using the Health Belief Model: A cross sectional survey. *BMC Public Health*. 2005;5(1):8. doi:10.1186/1471-2458-5-8.

94. Fishbein M. The role of theory in HIV prevention. *AIDS Care*. 2000;12(3):273-278. doi:10.1080/09540120050042918.

95. Obregon, Collins O. Airhihenbuwa R. A Critical Assessment of Theories/Models Used in Health Communication for HIV/AIDS. *J Health Commun*. 2000;5(sup1):5-15. doi:10.1080/10810730050019528.

96. Bandura A. Health Promotion by Social Cognitive Means. *Health Educ Behav*. 2004;31(2):143-164. doi:10.1177/1090198104263660.

97. World Health Orgaziation. WHO | Gender inequalities and HIV. *WHO*. 2009. Available at: http://www.who.int/gender/hiv_aids/en/. Accessed January 19, 2014.

98. Nyblade LC. Measuring HIV stigma: Existing knowledge and gaps. *Psychol Health Med*. 2006;11(3):335-345. doi:10.1080/13548500600595178.

99. Sambisa W, Curtis S, Mishra V. AIDS stigma as an obstacle to uptake of HIV testing: evidence from a Zimbabwean national population-based survey. *AIDS Care*. 2010;22(2):170-186. doi:10.1080/09540120903038374.

100. Pulerwitz J, Michaelis A, Weiss E, Brown L, Mahendra V. Reducing HIV-Related Stigma: Lessons Learned from Horizons Research and Programs. *Public Health Rep*. 2010;125(2):272-281.

101. Hamra M, Ross MW, Karuri K, Orrs M, D'Agostino A. The relationship between expressed HIV/AIDS-related stigma and beliefs and knowledge about care and support of people living with AIDS in families caring for HIV-infected children in Kenya. *AIDS Care*. 2005;17(7):911-922. doi:10.1080/09540120500100593.

102. Mahajan AP, Sayles JN, Patel VA, et al. Stigma in the HIV/AIDS epidemic: A review of the literature and recommendations for the way forward. *AIDS Lond Engl*. 2008;22(Suppl 2):S67-S79. doi:10.1097/01.aids.0000327438.13291.62.

103. Bond V, Chase E, Aggleton P. Stigma, HIV/AIDS and prevention of mother-to-child transmission in Zambia. *Eval Program Plann*. 2002;25(4):347-356. doi:10.1016/S0149-7189(02)00046-0.

104. Odimegwu C, Adedini SA, Ononokpono DN. HIV/AIDS stigma and utilization of voluntary counselling and testing in Nigeria. *BMC Public Health*. 2013;13:465. doi:10.1186/1471-2458-13-465.

105. Campbell C, Nair Y, Maimane S, Nicholson J. "Dying twice": a multi-level model of the roots of AIDS stigma in two South African communities. *J Health Psychol*. 2007;12(3):403-416. doi:10.1177/1359105307076229.

106. Ayiga N, Nambooze H, Nalugo S, Kaye D, Katamba A. The impact of HIV/AIDS stigma on HIV counseling and testing in a high HIV prevalence population in Uganda. *Afr Health Sci*. 2013;13(2):278-286.

107. Brown L, Macintyre K, Trujillo L. Interventions to Reduce HIV/AIDS Stigma: What Have We Learned? *AIDS Educ Prev*. 2003;15(1):49-69. doi:10.1521/aeap.15.1.49.23844.

108. Campbell C, Nair Y, Maimane S. AIDS Stigma, Sexual Moralities and the Policing of Women and Youth in South Africa. *Fem Rev*. 2006;(83):132-138.

109. Baker DP, Leon J, Collins JM. Facts, Attitudes, and Health Reasoning About HIV and AIDS: Explaining the Education Effect on Condom Use Among Adults in

Sub-Saharan Africa. *AIDS Behav*. 2011;15(7):1319-1327. doi:10.1007/s10461-010-9717-9.

110. Munro S, Lewin S, Swart T, Volmink J. A review of health behaviour theories: how useful are these for developing interventions to promote long-term medication adherence for TB and HIV/AIDS? *BMC Public Health*. 2007;7(1):104. doi:10.1186/1471-2458-7-104.

111. Anderson ES, Wagstaff DA, Heckman TG, et al. Information-Motivation-Behavioral Skills (IMB) Model: testing direct and mediated treatment effects on condom use among women in low-income housing. *Ann Behav Med Publ Soc Behav Med*. 2006;31(1):70-79. doi:10.1207/s15324796abm3101_11.

112. DiClemente RJ, Peterson JL. *Preventing AIDS: Theories and Methods of Behavioral Interventions*. Springer; 1994.

113. Kalichman SC, Cain D, Weinhardt L, et al. Experimental components analysis of brief theory-based HIV/AIDS risk-reduction counseling for sexually transmitted infection patients. *Health Psychol Off J Div Health Psychol Am Psychol Assoc*. 2005;24(2):198-208. doi:10.1037/0278-6133.24.2.198.

114. WHO | Adherence to long term therapies: Evidence for Action. *WHO*. Available at: http://www.who.int/chp/knowledge/publications/adherence_report/en/. Accessed February 10, 2014.

115. Connell RW. *Gender and power: society, the person, and sexual politics*. Cambridge [England]: Polity Press; 1987.

116. Gupta GR. How men's power over women fuels the HIV epidemic. *BMJ*. 2002;324(7331):183-184.

117. Gupta G. Gender sexuality and HIV / AIDS: the what the why and the how. *SIECUS Rep*. 2001;29(5). Available at: http://www.popline.org/node/179021. Accessed February 11, 2014.

118. Sia D, Onadja Y, Nandi A, Foro A, Brewer T. What lies behind gender inequalities in HIV/AIDS in sub-Saharan African countries: evidence from Kenya, Lesotho and Tanzania. *Health Policy Plan*. 2013. doi:10.1093/heapol/czt075.

119. Santow G. Social roles and physical health: The case of female disadvantage in poor countries. *Soc Sci Med*. 1995;40(2):147-161. doi:10.1016/0277-9536(94)E0069-5.

120. Lindgren T, Rankin SH, Rankin WW. Malawi women and HIV: socio-cultural factors and barriers to prevention. *Women Health*. 2005;41(1):69-86. doi:10.1300/J013v41n01_05.

121. Van Loggerenberg F, Dieter AA, Sobieszczyk ME, et al. HIV Prevention in High-Risk Women in South Africa: Condom Use and the Need for Change. *PLoS ONE*. 2012;7(2):e30669. doi:10.1371/journal.pone.0030669.

122. Tamiru M, Hailemariam D, Mitike G. Fertility intention in the era of HIV/AIDS among rural women in Bure Woreda, West Gojam, Amhara Region, Ethiopia. *Educ Res*. 2012;3(4):380-387.

123. Agadjanian V. Gender, religious involvement, and HIV/AIDS prevention in Mozambique. *Soc Sci Med*. 2005;61(7):1529-1539. doi:10.1016/j.socscimed.2005.03.012.

124. World Health Organization. WHO | Global and regional estimates of violence against women. *WHO*. Available at: http://www.who.int/reproductivehealth/publications/violence/9789241564625/en/. Accessed January 13, 2014.

125. Jewkes RK, Dunkle K, Nduna M, Shai N. Intimate partner violence, relationship power inequity, and incidence of HIV infection in young women in South Africa: a cohort study. *The Lancet*. 2010;376(9734):41-48. doi:10.1016/S0140-6736(10)60548-X.

126. Lawoko S. Predictors of Attitudes Toward Intimate Partner Violence A Comparative Study of Men in Zambia and Kenya. *J Interpers Violence*. 2008;23(8):1056-1074. doi:10.1177/0886260507313972.

127. Magadi M, Desta M. A multilevel analysis of the determinants and cross-national variations of HIV seropositivity in sub-Saharan Africa: Evidence from the DHS. *Health Place*. 2011;17(5):1067-1083. doi:10.1016/j.healthplace.2011.06.004.

128. Wolff B, Blanc AK, Gage AJ. Who decides? Women's status and negotiation of sex in Uganda. *Cult Health Sex*. 2000;2(3):303-322. doi:10.1080/136910500422278.

129. Ghosh J, Wadhwa V, Kalipeni E. Vulnerability to HIV/AIDS among women of reproductive age in the slums of Delhi and Hyderabad, India. *Soc Sci Med*. 2009;68(4):638-642. doi:10.1016/j.socscimed.2008.11.023.

130. Upadhyay UD, Karasek D. Women's Empowerment and Ideal Family Size: An Examination of DHS Empowerment Measures in Sub-Saharan Africa. *Int Perspect Sex Reprod Health*. 2012;38(02):078-089. doi:10.1363/3807812.

131. Central Statistical Authority [Ethiopia] E, ORC MACRO. *Ethiopia Demographic and Health Survey, 2000*. Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Authority and ORC MACRO; 2001.

132. Kabeer N. Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment. *Dev Change*. 1999;30(3):435–464. doi:10.1111/1467-7660.00125.

133. Berhane Y, Gossaye Y, Emmelin M, Hogberg U. Women's health in a rural setting in societal transition in Ethiopia. *Soc Sci Med*. 2001;53(11):1525-1539. doi:10.1016/S0277-9536(00)00441-X.

134. Orubuloye O, Caldwell JC, Caldwell P. African women's control over their sexuality in an era of AIDS: A study of the Yoruba of Nigeria. *Soc Sci Med*. 1993;37(7):859-872.

135. Ricardo C, Barker G. *Young men and the construction of masculinity in Sub-Saharan Africa : implications for HIV/AIDS, conflict, and violence*. The World Bank; 2005:1-96. Available at: http://documents.worldbank.org/curated/en/2005/06/6022525/young-men-construction-masculinity-sub-saharan-africa-implications-hivaids-conflict-violence. Accessed January 13, 2014.

136. Hogan DP, Berhanu B, Hailemariam A. Household Organization, Women's Autonomy, and Contraceptive Behavior in Southern Ethiopia. *Stud Fam Plann*. 1999;30(4):302–314. doi:10.1111/j.1728-4465.1999.t01-2-.x.

137. Al Riyami A, Afifi M, Mabry RM. Women's Autonomy, Education and Employment in Oman and their Influence on Contraceptive Use. *Reprod Health Matters*. 2004;12(23):144-154. doi:10.1016/S0968-8080(04)23113-5.

138. Bloom SS, Wypij D, Gupta MD. Dimensions of women's autonomy and the influence on maternal health care utilization in a north indian city. *Demography*. 2001;38(1):67-78. doi:10.1353/dem.2001.0001.

139. Beegle K, Frankenberg E, Thomas D. Bargaining power within couples and use of prenatal and delivery care in Indonesia. *Stud Fam Plann*. 2001;32(2):130-146.

140. Ghuman SJ, Lee HJ, Smith HL. Measurement of women's autonomy according to women and their husbands: Results from five Asian countries. *Soc Sci Res*. 2006;35(1):1-28. doi:10.1016/j.ssresearch.2004.06.001.

141. Gagnon AJ, Merry L, Bocking J, Rosenberg E, Oxman-Martinez J. South Asian migrant women and HIV/STIs: knowledge, attitudes and practices and the role of sexual power. *Health Place*. 2010;16(1):10-15. doi:10.1016/j.healthplace.2009.06.009.

142. Pettifor AE, Measham DM, Rees HV, Padian NS. Sexual power and HIV risk, South Africa. *Emerg Infect Dis*. 2004;10(11):1996-2004.

143. Agarwala R, Lynch SM. Refining the Measurement of Women's Autonomy: An International Application of a Multi-dimensional Construct. *Soc Forces*. 2006;84(4):2077-2098. doi:10.1353/sof.2006.0079.

144. Mason KO. The status of women: Conceptual and methodological issues in demographic studies. *Sociol Forum*. 1986;1(2):284-300. doi:10.1007/BF01115740.

145. Mason KO. *Gender and demographic change: What do we know?* International Union for the Scientific Study of Population Liege (Belgium); 1995. Available at: http://snap3.uas.mx/RECURSO1/unfpa/data/docs/unpf0034.pdf. Accessed January 9, 2014.

146. Heaton TB, Huntsman TJ, Flake DF. The effects of status on women's autonomy in Bolivia, Peru,and Nicaragua. *Popul Res Policy Rev*. 2005;24(3):283-300. doi:10.1007/s11113-005-4082-5.

147. Shiferaw Y, Alemu A, Girma A, et al. Assessment of knowledge, attitude and risk behaviors towards HIV/AIDS and other sexual transmitted infection among preparatory students of Gondar town, north west Ethiopia. *BMC Res Notes*. 2011;4:505. doi:10.1186/1756-0500-4-505.

148. Thapa DK, Niehof A. Women's autonomy and husbands' involvement in maternal health care in Nepal. *Soc Sci Med*. 2013;93:1-10. doi:10.1016/j.socscimed.2013.06.003.

149. Jejeebhoy SJ. Convergence and Divergence in Spouses' Perspectives on Women's Autonomy in Rural India. *Stud Fam Plann*. 2002;33(4):299–308. doi:10.1111/j.1728-4465.2002.00299.x.

150. Mason KO. The Impact of Women's Social Position on Fertility in Developing Countries. *Sociol Forum*. 1987;2(4):718-745.

151. Takyi BK. Religion and women's health in Ghana: insights into HIV/AIDs preventive and protective behavior. *Soc Sci Med*. 2003;56(6):1221-1234. doi:10.1016/S0277-9536(02)00122-3.

152. Rahman M, Rahman M. Media and education play a tremendous role in mounting AIDS awareness among married couples in Bangladesh. *AIDS Res Ther*. 2007;4(1):10. doi:10.1186/1742-6405-4-10.

153. Chatterjee N. AIDS-related information exposure in the mass media and discussion within social networks among married women in Bombay, India. *AIDS Care*. 1999;11(4):443-446. doi:10.1080/09540129947820.

154. Farr AC, Witte K, Jarato K, Menard T. The effectiveness of media use in health education: evaluation of an HIV/AIDS radio [corrected] campaign in Ethiopia. *J Health Commun*. 2005;10(3):225-235. doi:10.1080/10810730590934244.

155. Ministry of Health (MOH), Ethiopia, Central Statistical Agency (CSA) of Ethiopia. Ethiopia - Demographic and Health Survey 2010-2011, Ethiopia - Sampling. Available at: http://www.datafirst.uct.ac.za/dataportal/index.php/catalog/401/sampling. Accessed February 25, 2014.

156. Vittinghoff E. *Regression methods in biostatistics linear, logistic, survival, and repeated measures models*. New York: Springer; 2012.

157. Mistry R, Galal O, Lu M. "Women's autonomy and pregnancy care in rural India: A contextual analysis." *Soc Sci Med*. 2009;69(6):926-933. doi:10.1016/j.socscimed.2009.07.008.

158. Statacorp. *Stata Statistical Software: Release 11.2009*. College Station, TX: StataCorp LP.; 2009. Available at: http://www.stata.com/support/faqs/resources/citing-software-documentation-faqs/. Accessed February 25, 2014.

159. Jejeebhoy SJ. *Women's education, autonomy, and reproductive behaviour: experience from developing countries*. Oxford: Clarendon Press; 1995.

160. Yigzaw T, Berhane Y, Deyessa N, Kaba M. Perceptions and attitude towards violence against women by their spouses: A qualitative study in Northwest Ethiopia. *Ethiop J Health Dev*. 2010;24(1). doi:10.4314/ejhd.v24i1.62943.

161. Kedir A, Admasachew L. Violence against women in Ethiopia. *Gend Place Cult*. 2010;17(4):437-452. doi:10.1080/0966369X.2010.485832.

162. Jukes M, Simmons S, Bundy D. Education and vulnerability: the role of schools in protecting young women and girls from HIV in southern Africa: *AIDS*. 2008;22(Suppl 4):S41-S56. doi:10.1097/01.aids.0000341776.71253.04.

163. Aggleton P, Yankah E, Crewe M. Education and HIV/AIDS—30 Years on. *AIDS Educ Prev*. 2011;23(6):495-507. doi:10.1521/aeap.2011.23.6.495.

164. Latkin CA, Knowlton AR. Micro-social structural approaches to HIV prevention: a social ecological perspective. *AIDS Care*. 2005;17 Suppl 1:S102-113. doi:10.1080/09540120500121185.

165. Corno L, de Walque D. Socioeconomic determinants of stigmatization and HIV testing in Lesotho. *AIDS Care*. 2013;25 Suppl 1:S108-113. doi:10.1080/09540121.2012.736937.

166. Visser MJ, Makin JD, Vandormael A, Sikkema KJ, Forsyth BWC. HIV/AIDS stigma in a South African community. *AIDS Care*. 2009;21(2):197-206. doi:10.1080/09540120801932157.

167. Janz NK, Becker MH. The Health Belief Model: A Decade Later. *Health Educ Behav*. 1984;11(1):1-47. doi:10.1177/109019818401100101.

168. W. Vaughan, Everett M. Rogers, Arvind Singhal, Ramadhan M. Swalehe P. Entertainment-Education and HIV/AIDS Prevention: A Field Experiment in Tanzania. *J Health Commun*. 2000;5(sup1):81-100. doi:10.1080/10810730050019573.

169. Dussault G, Franceschini MC. Not enough there, too many here: understanding geographical imbalances in the distribution of the health workforce. *Hum Resour Health*. 2006;4(1):12. doi:10.1186/1478-4491-4-12.

170. Ahmed S, Creanga AA, Gillespie DG, Tsui AO. Economic status, education and empowerment: implications for maternal health service utilization in developing countries. *PloS One*. 2010;5(6):e11190. doi:10.1371/journal.pone.0011190.

171. Lal SS, Vasan RS, Sarma PS, Thankappan KR. Knowledge and attitude of college students in Kerala towards HIV/AIDS, sexually transmitted diseases and sexuality. *Natl Med J India*. 2000;13(5):231-236.

172. Farid R, Choudhry AJ. Knowledge about AIDS/HIV infection among female college students. *J Coll Physicians Surg--Pak JCPSP*. 2003;13(3):135-137. doi:03.2003/JCPSP.135137.

173. Zou J, Yamanaka Y, John M, Watt M, Ostermann J, Thielman N. Religion and HIV in Tanzania: influence of religious beliefs on HIV stigma, disclosure, and treatment attitudes. *BMC Public Health*. 2009;9:75. doi:10.1186/1471-2458-9-75.

174. Furuta M, Salway S. Women's Position within the Household as a Determinant of Maternal Health Care Use in Nepal. *Int Fam Plan Perspect*. 2006;32(1):17-27.

175. Agha S. The impact of a mass media campaign on personal risk perception, perceived self-efficacy and on other behavioural predictors. *AIDS Care*. 2003;15(6):749-762. doi:10.1080/09540120310001618603.

Curriculum Vitae

Name: Fadumo Rirash

Post-secondary Education and Degrees:
University of Windsor
Windsor, Ontario, Canada
2001-2005 Concurrent B.Sc./Medical Laboratory Science
2007-2009 Biological Sciences (Honours)

The University of Western Ontario
London, Ontario, Canada
2012-2014 M.Sc Epidemiology

Honours and Awards: Western Graduate Research Scholarship (WGRS), 2012 & 2013

Related Work Experience
Medical Technologist
The Detroit Medical Center (DMC)
2006-2012

Research Assistant
DMC/Wayne State School of Medicine
2010-2011

Publications:
Martin, B., Koth, D., Zou W., **Riras ,F**., Smith-Norowitz, T. (2012). Long term persistence of IfE anti-hepatitis A virus antibodies in adult serum post vaccination [Abstract]. The Journal of Immunology, 188, 113.9

Conferences

Poster Presentation. London Health Research Day, London, ON, March 18, 2014. "The role of women's autonomy in women's HIV/AIDS knowledge and attitudes in Ethiopia from the 2005 and 2011 Ethiopia Demographic and Health Surveys."

Oral Presentation. Canadian Society for Epidemiology and Biostatistics (Invited). London, ON, May 9-10, 2014. "The role women's autonomy plays in HIV/AIDS knowledge and attitudes in Ethiopia: Data from the 2005 and 2011 Ethiopia Demographic and Health Surveys."