2017

HIV Prevalence Determinants Among Young People in Zimbabwe: Sexual Practices Analysis

Joyce Caroline Mphaya
Walden University

Walden University

College of Health Sciences

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Joyce Mphaya

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Review Committee
Dr. Peter Anderson, Committee Chairperson, Public Health Faculty
Dr. Ernest Ekong, Committee Member, Public Health Faculty
Dr. Gudeta Fufaa, University Reviewer, Public Health Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2017

Abstract

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Practices Analysis

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

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August 2017

Abstract

A decline in Human Immunodeficiency Virus (HIV) prevalence rates have been observed among females ages 15 to 19 years and 20 to 24 years in Zimbabwe between 2005 and 2010. However, for males 15 to 19 years, rising trends were observed, whereas for males ages 20 to 24 years, rates fluctuated between 2005 and 2011. The purpose of this cross-sectional study was to examine relationships between sexual behaviors and practices and HIV prevalence among young males and females ages 15 to 24 years in Zimbabwe. Guided by constructs of proximate determinants framework, extracted data from two National Demographic Health surveys of 2005/06 and 2010/11 were analyzed using chi square and binary logistic regression. This study revealed that sexual practices, relationship status, and education status increase the odds of being HIV positive differently among 15 to 19-year-olds and 20 to 24-year-olds based on gender and changes through time. Significant relationship existed between HIV positive serostatus and total number of life time partners among females 15 to 19 years and 20 to 24 years; lack of condom use among males 20 to 24 years in 2005/06; early sexual debut and lower education status among females 20 to 24 years; and being widowed, separated, or divorced among males and females 20 to 24 years in 2010/11. The Odds of being HIV positive for males ages 15 to 19 years was not predicted by sexual practice, creating a need for future study. This study can contribute to positive social change by providing information about the associations between HIV serostatus and the assessed risk factors, which may help promote awareness about HIV infection risk, thereby helping develop and implement targeted public health interventions to reduce the burden of HIV.

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Dedication

I dedicate this dissertation you my two daughters, Flora and Tamanda, who have made me a proud mother by realizing the importance of education and to my late father, who believed in education for his children and made me realise my potential in life.

Acknowledgments

I wish to take this opportunity to acknowledge several special people who contributed to the successful completion of my dissertation journey. First of all, I would like to express my sincere appreciation to my committee chair, Dr. Peter Anderson, for the timely support and guidance and for the ongoing encouragement. I would also like to thank my committee member, Dr. Ernest Ekong, and my university research reviewer, Dr. Gudeta Fufaa, for their constructive feedback and valuable scholarly inputs to my research proposal and dissertation.

I am much indebted to my mother, sister and brothers for their encouragement throughout the journey of my PhD study and for understanding my situation when I was not available for family commitments just to focus on my studies. I owe my children, Flora and Tamanda, for being understanding and constantly encouraging me during times when I felt like giving up on my studies. Last, I am grateful to God for giving me the grace, courage, and strength to complete my study.

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Chapter 1: Introduction to the Study

Introduction

Human immunodeficiency virus (HIV) is a major global public health issue, claiming more than 34 million lives by 2014, with approximately 36.9 million people living with HIV at the end of 2014 (World Health Organization [WHO], 2016). Sub-Saharan Africa carries the most significant burden and accounts for almost 70% of global new infections, with 25.8 million people living with HIV in 2014 (WHO, 2016). Young people have been particularly affected, especially females ages 15 to 24 years, owing to engagement in risky sexual behaviors. Approximately 40% of all new HIV infections occurred in young people ages 15 to 24 years in 2012 (AVERTing HIV and AIDS [AVERT], 2014).

Zimbabwe is one of the countries affected by HIV and has a generalized HIV epidemic that is heterosexually driven and had an adult prevalence of 15% in 2011 (Zimbabwe National Statistics Agency [ZIMSTAT] & ICF International, 2012). Declining trends in HIV prevalence rates have been observed, from 25% in 2002 to 14.7% in 2012, and AIDS-related deaths have decreased from 76,934 in 2011 to 63,853 in 2013 in Zimbabwe (Ministry of Health & Child Care, [MoHCC], 2014). However, the trend is different globally among adolescents between the ages of 15 to 19 years. Although the number of global AIDS-related deaths for all ages fell by 30% between 2005 and 2012, adolescent AIDS-related deaths increased by 50% in that same period (United Nations Children's Fund [UNICEF], 2013). Engagement in sexual intercourse is also higher among females (33%) than among males (24%) in this age group (ZIMSTAT, 2015). According to Marsh et al. (2011), older age of sexual partner was associated with increased risk of HIV infection in women in Mutare, Zimbabwe.

Data from Zimbabwe national surveys by ZIMSTAT & ICF International, (2012) and CSO & Macro International Inc., (2007) have shown disparities in trends in HIV prevalence among males and females ages 15 to 24 years, where declining trends are being observed in young females and uptrends in HIV prevalence are observed among males who are the same age. In this study, I analyzed the trends in prevalence rates and helped define some of the determinants that have contributed to the increase in HIV prevalence rates among the males and reduction in prevalence rates among the females. The information from this study could help public health policy makers, programmers, and practitioners to refine and develop targeted interventions that promote positive social and behavior change toward reduction of HIV prevalence among young people, which could facilitate adoption of safer sexual practices and reduce their vulnerability to HIV infection. Such interventions could lead to improved health outcomes and decreased health care costs because fewer numbers of people would get sick owing to HIV status (Ament et al., 2000). This could lead to efficiencies in use of resources in Zimbabwe.

In this chapter, I provide the background of the study, problem statement, purpose of the study, research questions and hypotheses, nature of the study, conceptual model, assumptions and limitations of the study, delimitations, and significance of the study. I end the chapter with a summary of the chapter and transition to the next.

Background

HIV is a virus that attacks the body's white blood cells, called CD4 cells. Compromised CD4 cells cause a disease called acquired immunodeficiency syndrome (AIDS; WHO, 2015). Two types of HIV exist: HIV-1, which is common in most of the world, and HIV-2, which is uncommon in North America. Both HIV-1 and HIV-2 viruses are transmitted most commonly through unprotected sexual intercourse with an HIV infected partner (Nasrullah et al., 2011). Both HIV-11 and HIV-2 exhibit the same symptoms and eventually lead to AIDS but differs in how they progress. HIV-1 is more infectious, easy to detect, and spreads much faster than HIV-2, whereas HIV-2 is hard to detect, hard to treat, and becomes more infectious in later stages than HIV-1 (AVERT, 2014). The other ways of transmitting HIV are from an HIV-positive pregnant woman to her baby during pregnancy, child birth, and breastfeeding; blood transfusion; and sharing needles and sharp objects with an HIV-infected person (WHO, 2015). There is no cure for HIV, but according to Allen et al., (2015), when HIV is diagnosed early, people can access medicines called antiretroviral treatment (ART) that slow down the damage to CD4 cells and help the immune system to come back to a normal state, which allows the person to live an improved and longer life.

Once the person is initiated on ART, they take the medicine for the rest of their life because stopping the medicine causes the virus to bounce back and destroy the immune system. HIV infection can be prevented by not having sex with a partner who is HIV infected; using condoms during sex to prevent transmission; using ART in HIV-infected pregnant and breastfeeding women as prophylaxis for their babies; avoiding sharing needles and sharp objects; voluntary male medical circumcision; and screening blood for HIV before transfusion (WHO, 2015). Biologically, females are more likely to become infected with HIV through unprotected heterosexual intercourse than men, and in many countries, females are less likely to be able to negotiate condom use and are more likely to be subjected to nonconsensual sex (AVERT, 2014). In addition, some gender roles have heightened risk for HIV among young females and these include sexual ignorance, sexual passivity, and sexual innocence, where societies place high value on virginity for girls (UNAIDS, n.d). This has led to development of HIV interventions that have targeted females to reduce their vulnerability to HIV. As reported by Peltzer, Ramlagan, Chirinda, Mlambo, & Mchunu, (2012), HIV programs have targeted behavioral change among young people, which has shown to reduce HIV prevalence among the population.

Studies by Hargreaves, Slaymaker, Fearon, Howe, (2012); Kayeyi, Fylkesnes, Michelo, Makasa, Sandøy, (2012); and Sandøy et al. (2007) showed that a decrease in high-risk behaviors, having fewer sexual partners, and increased condom use were associated with the decline in HIV prevalence. In addition, Marsh et al. (2011) showed a significant and steady increase in proportion of young people, both males and females, not yet initiating sex and an increase in the proportion of young females reporting no new partners, which has been the driving force behind the observed significant decline trends in HIV prevalence rates.

Mahomva et al. (2006) associated a decline in HIV prevalence among young males and females in Zimbabwe with reduced sexual partners and increased condom use.

Gregson et al. (2005) showed that older age of sexual partner was associated with increased risk of HIV infection in men and women, where young females form partnerships with men 5 to 10 years their senior and young males have relationships with females of a similar age or females who are slightly younger. The substantial age difference between female and male sexual partners in Manicaland in Zimbabwe was the major behavioral determinant of the more rapid rise in HIV prevalence in young females than in men (Gregson et al., 2005). Researchers in Africa have generally shown an association between changes in sexual behavior among young males and females to reductions of HIV prevalence among the age group.

Associations have also been observed between declining patterns of risky sexual behaviors and educational levels among young people with a declining rate of age at first sex among secondary educated groups. (Hargreaves et al., 2012). Similar observations were made in a study in South Africa, which indicated that one additional year of education reduced the hazard of acquiring HIV by 7% (Bärnighausen, Hosegood, Timaeus, & Newell, 2007). The trends in HIV prevalence among young people indicate a stable or increasing prevalence among those with no education, and rates are falling among those with primary or secondary education (Hargreaves, 2010). Furthermore, an association between wealth quintiles where households that fell into the middle 40% of relative wealth had a 72% higher hazard of HIV acquisition than members of the 40% poorest households in South Africa (Bärnighausen et al., 2007). These results indicate a strong relationship between socioeconomic status and trends in HIV prevalence.

Despite research conducted by Gregson et al. (2005) and Marsh et al. (2011), showing an association between HIV prevalence decline and sexual behavioral changes in both males and females, a review of nationally representative surveys showed a different trend in HIV prevalence for males than females (CSO & Macro International Inc., 2007; MoHCC, 2015; ZIMSTAT & ICF International, 2012). Data from the Zambia National Demographic Health Surveys showed a decline in HIV prevalence rate among females ages 15 to 24 years and an increase in HIV prevalence among young males of the same age group (Central Statistical Office [CSO], ICF International, & Ministry of Health [MoH], 2014; CSO, MoH, Tropical Diseases Research Centre [TRDC], University of Zambia, & Macro International Inc., 2009). Similar trends were observed in Zimbabwe after a review of two Zimbabwe Demographic Health Surveys (ZDHSs) and the 2014 HIV estimates that suggested increased HIV trends in males and declines in females (CSO & Macro International Inc., 2007; MoHCC, 2015; ZIMSTAT & ICF International, 2012). The conclusions from previous researchers on HIV prevalence decline correspond to the trends reported in the national surveys for females but not for males (ZIMSTAT & ICF International, 2012; CSO & Macro International Inc., 2007; MoHCC, 2015).

These findings contradict the general associations made by the various researchers on HIV prevalence decline trends and changes in sexual behaviors for both males and females (Hargreaves et al., 2012; Kayeyi et al., 2012; Sandøy et al., 2007). An increase in HIV prevalence among young males may be associated with risk factors including the feeling that young men are sexually knowledgeable, are often expected to pursue numerous sexual partners, and t are often expected to experiment with sex during their adolescent years (UNAIDS, n.d.). The contracting results, therefore, present a gap in the research literature that could be filled by a test of associations between HIV prevalence trends and HIV risk behaviors based on a nationally representative sample.

Although relatively strong empirical evidence suggests a changing association between indicators of relative socioeconomic position and HIV prevalence in sub-Saharan African countries, the behavioral patterns that underlie these trends remain poorly understood (Hargreaves et al., 2012). Understanding these trends, especially among young males, could help identify the drivers of HIV prevalence among young males and implementation of social change policies, practices, and programs that could promote positive behavioral change and practices among young people to reduce their vulnerability to HIV infection. Creating awareness on these issues among public health programmers could provide a better picture of magnitude and severity of risky sexual practices and behaviors and associated drivers that are increasing vulnerability of young males and young females to HIV.

Furthermore, understanding the seriousness of the problem could inform development of public health interventions that reduce new HIV infections among young people and reduce the risk of transmission of HIV from mother to child when pregnant. Reduced HIV cases would mean reduced need for HIV treatment, reduced costs incurred by health care systems. Reduced HIV infection decreases HIV-related adverse health outcomes and results in healthy young people who would be productive at the community and national levels.

Problem Statement

Young females ages 15 to 24 years are two to three times more likely to contract HIV than young males in Zimbabwe (ZIMSTAT & ICF International, 2012). A statistically significant decline of 25% or more in HIV prevalence among young Antenatal Clinic (ANC) attendees by 2008 in eight countries including Zimbabwe was observed in a study by Ghys et al. (2010). The decline was associated with significant changes in sexual behavior in either men or women. Researchers in Uganda have similarly shown a decline in HIV prevalence among young females since the early 1990s, correlated with increased uptake of protective sexual behavior and increased primary and secondary abstinence among young people nationwide (Kirungi et al., 2006). However, the standard reporting of HIV prevalence has lumped together those 15 to 24 years old, making adolescent-specific data limited, which presents a serious impediment to measuring and monitoring progress as it masks differences that may exist between adolescents and young adults (Idele et al., 2014). There is need to disaggregate these age groups in categories of 15- to 19-year-olds and 20- to 24-year-olds, because adolescence is typically a period of experimentation, new experiences, and vulnerability that may predispose them to HIV high risk practices (Idele et al., 2014).

The data from the ZDHS 2005/2006 and 2010/2011 and the 2014 Zimbabwe HIV estimates report indicates varied prevalence trends among males and females ages 15 to 24 years (MoHCC, 2015; ZIMSTAT & ICF International, 2012; CSO & Macro International Inc., 2007). According to CSO & Macro International Inc. (2007); MoHCC (2015) and ZIMSTAT & ICF International (2012), a decline and stabilization in HIV prevalence among females ages 15 to 19 years has been observed, with a rate of 6.2% in 2005/2006 to 4.2% in 2010/2011 and 4.1% in 2014. A similar pattern has been observed among females ages 20 to 24 years from 16.3% in 2005/6 to 10.6% in 2010/11 and 8.9% in 2014. Conversely, for males 15 to 19 years, an unstable trend in HIV prevalence rates has been observed from 3.1% in 2005/2006 to 3.4% in 2010/2011 and 3.2% in 2014, whereas for males ages 20 to 24 years, the rate decreased from 5.8% in 2005/2006 to 3.1% in 2010/2011 and increased to 5.6% in 2014 (CSO & Macro International Inc., 2007; MoHCC, 2015; ZIMSTAT & ICF International, 2012;).

The dynamics underlying this variability are unclear, and literature does not adequately explain the underlying causes of these trends or enable predictions for future programming. The International Group recommended countries to have more rigorous analysis to understand the associations between reported behavioral changes and HIV prevalence (Ghys et al., 2010). Therefore, I addressed the gap that exists in knowledge about sociodemographic determinants (age, educational status, residence, and marital status); socioeconomic determinants (wealth quintile); and sexual behaviors (age at sexual debut, lifetime number of sexual partners, multiple sexual partnerships in the last 12 months, condom use at last high risk sexual activity, age of sexual partner and paid sex) as they relate to HIV serostatus among young males and females ages 15 to 24 years. The existing gap in such information may affect the development of policies, guidelines, and programs that would contribute to reducing HIV infection and risk behaviors among males and females.

Purpose of the Study

The purpose of this study was to examine relationship between sexual behaviors and practices and HIV prevalence within a specified period among males and females ages 15 to 24 years in Zimbabwe. To address this gap, I used the quantitative methods paradigm. I conducted an in-depth secondary data analysis of two ZDHS's for 2005/2006 and 2010/2011. I brought together data from these sources to describe the trends in HIV prevalence and changes in sexual behaviors and practices within a 5-year period as reported at two points in time. Testing these trends would help to ensure targeted interventions that could halt the spread of HIV among young males and females are developed. This could facilitate reduction in HIV risks and improve access to HIV services among young females and young males.

Research Questions and Hypotheses

1. What is the association between sexual behaviors and practices and HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe?

   H_{01}: There is no statistically significant association between sexual behaviors and practices and HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe.

   H_{a1}: There is a statistically significant association between sexual behaviors and practices and HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe.

2. What is the relationship between sociodemographic determinants and HIV serostatus among young males and females ages 15 to 24 years in Zimbabwe at two different points in time?

   H_{02}: There is no statistically significant relationship between sociodemographic determinants and HIV serostatus among young males and females ages 15 to 24 years in Zimbabwe at two different points in time.

   H_{a2}: There is a statistically significant relationship between sociodemographic determinants and HIV serostatus among young males and females ages 15 to 24 years in Zimbabwe at two different points in time.

3. What is the association between socioeconomic determinants and HIV-serostatus among young males and females ages 15 to 24 years in Zimbabwe at two different points in time?

   H_{03}: There is no statistically significant association between socioeconomic determinants and HIV- serostatus among young males and females ages to 24 years in Zimbabwe at two different points in time.

   H_{a3}: There is a statistically significant association between socioeconomic determinants and HIV- serostatus among young males and females ages 15 to 24 years in Zimbabwe at two different points in time.

Conceptual Model

The theoretical base for this study was Davis and Blake's (1956) and Bongaarts's (1978) proximate determinants framework. The proximate determinant framework was initially developed by Davis and Blake (1956) and further developed by Bongaarts (1978)

(UNFPA, n.d.). The framework was then applied in HIV research by Boerma and Weir (2005) who integrated epidemiological and demographic approaches and the HIV proximate determinants provided a link between underlying social/environmental determinants (e.g., socioeconomic variables, education) and biological determinants of HIV risk. Key to the framework is the identification of a set of variables, called *proximate determinants*, influenced by changes in contextual variables or by interventions and that directly affect biological mechanisms to influence health outcomes (Boerma & Weir, 2005). Key to the framework is the identification of a set of variables, called *proximate determinants*, that can be influenced by changes in contextual variables or by interventions and that have a direct effect on biological mechanisms to influence health outcomes (Boerma & Weir, 2005). The framework has been applied extensively in the study of fertility and child survival in developing countries and in HIV studies owing to its nature of having a set of variables that influence change.

The components of proximate determinants framework include underlying determinants, proximate determinants, biological determinants, health outcome, and demographic outcome (Boerma & Weir, 2005). The authors of the framework purport that underlying determinants such as sociocultural, socioeconomic, and demographic characteristics and access to HIV intervention programs influence proximate determinants (sexual practices and behaviors related to HIV). These proximate determinants directly affect biological determinants related to exposure to HIV risk, and this affects the health outcome, which is rate of new HIV infection and the prevalence of

HIV infection. Once individuals have been exposed to HIV infections, it could lead to disease which affects demographics in the form of AIDS-related mortality.

Evidence shows that the framework has facilitated hypothesis generation regarding causal pathways between risk factors and HIV infection, and the framework has been tested using data on adults from Zimbabwe (Robertsona, Gregsona, & Garnett, 2010). The framework has been used to consider how underlying determinants (context and intervention programs) proximate determinants and biological determinants of HIV affect health outcomes and demographic outcomes (Boerma & Weir, 2005). Bärnighausen & Tanser (2009) applied the framework in their study and recommended that proximate-determinants frameworks serve the important purpose of separating behavioral determinants from biological determinants and outcomes and from socioeconomic and cultural determinants.

The framework was relevant to my study because it guided study design, analysis, and interpretation of risk factors or intervention that include social cultural, biological, and behavioral data. In addition, because I used national population based survey data where large number of variables are collected through HIV testing and interview-based information, the framework allowed more extensive analyses of the determinants of HIV infection, by use of multivariate analytical methods. The framework allows for individual-level analyses and suggests pathway analysis as a tool for describing how underlying variables affect the risk of HIV infection (Boerma and Weir, 2005). The framework links well with the purpose of my study, which was to analyze trends in males and females on selected individual characteristics to explain the associations between the different variables. I used the emphasis of the framework on sequence at the population level, with the underlying social, economic, and environmental factors leading to HIV exposure and transmission, to enrich the focus of my study. The essential feature of the framework is the identification of a set framework for HIV/AIDS research of proximate determinants, which are both biological and behavioral in nature.

Nature of Study

The nature of this study was quantitative, and I used a cross-sectional correlation design. Quantitative correlational research compares two entities to determine the effect of one on the other and aims to systematically investigate and explain the nature of the relationship between variables in the real world (Campbell & Stanley, 1963; Creswell, 2012). Correlational studies describe a linear relationship between variables measured as they appear, without applying any manipulation, and analyzed to determine their relatioship. Determining how sexual behaviors and practices, socioeconomic factors, and socio-demographics are associated to the HIV trends should be consistent with the proximate determinant framework, and I analyzed the variables to establish the possible associations that answer the study questions.

Definition of Variables

Age of participant: I used two categories for the ages of participants: (a) 15 to 19 years and (b) 20 to 24 years (ZIMSTAT & ICF International, 2012).

Age at sexual debut: This term refers to the age when individuals have first sexual intercourse (Berry & Hall, 2009).

Age of sexual partner: This refers to partnership between young women and men who are five or more years older than one another, which is sometimes called *intergenerational sex*, (Madlala, 2008).

Condom use at last high risk sexual activity: Condom use is the use of protection during sex to prevent semen (sperm) from entering the woman's vagina when the man ejaculates (The Society of Obstetricians and Gynecologists of Canada, 2012). In this study, *condom use* refers to those who reported using a condom at last sexual intercourse in the last 12 months (ZIMASTAT & ICF International, 2012).

Education: This term refers to educational attainment of the respondent, categorized as (a) no education, (b) primary education, (c) secondary education, and (d) post-secondary (ZIMSTAT & ICF International, 2012).

HIV serostatus: The state of either having or not having detectable antibodies against HIV antigen, as measured by a blood test serologic test (UNAIDS, 2011). In this study, *HIV positive* means that a person has detectable antibodies to HIV on a blood test, and *HIV negative* means that there is no evidence of infection with HIV on a blood test in the individual (UNAIDS, 2011).

Lifetime number of sexual partners: This is defined as how the number of people with whom respondents had sexual intercourse in their lifetime, and are categorized as (a) less than two partners, (b) three to five partners, or (c) more than five partners (Choudhry, Ambresin, Nyakato, & Agardh, 2015).

Marital status: This term was classifiedas (a) ‘never married, (b) married or living together with partner’, (c) divorced or separated, and (d) widowed (ZIMSTAT & ICF International, 2012).

Multiple sexual partnerships in the last 12 months: Sexual partners are people who engage in sexual activity together, and in this study, *multiple sexual partners* refers to those respondents who had sexual intercourse in the last 12 months with more than one partner (ZIMSTAT & ICF International, 2012).

Residence: This was defined as urban or rural based on the respondent’s place of residence (ZIMSTAT & ICF International, 2012).

Transactional sex for young men: These are defined as young men who paid for sex in last 12 months (Choudhry et al., 2015).

Wealth quintile: I categorized this variable as poorest, middle, and richest quintiles. The households in the fourth and the highest quintiles were clubbed together as ‘being the richest wealth quintile, the middle category as the middle wealth quintile, and households in lowest and the second wealth quintiles as being the poorest wealth quintiles (Choudhry et al., 2015).

Assumptions

The assumptions in this study were mostly related to the primary data sources. I assumed that rigorous procedures were followed when conducting the primary studies and that quality measures were taken during design data collection and data entry since limitations of the primary studies in these areas could not be rectified during the secondary data analysis. I also assumed that complete individual level data for all samples included in the study were available for all variables of interest. I further assumed that appropriate statistical analysis was conducted, and that the studies' authors reduced the role of bias and confounding. These assumptions were necessary in this study because the results of this study's analysis depend on the scientific rigor of the primary studies from which the data will be drawn (Garg, Hackam, & Tonelli, 2008).

Scope and Delimitations

In this study, I focused only on behaviors and practices related to HIV transmission among young people ages 15 to 24 years. The study included data sets only for participants who agreed to test for HIV to allow for analysis of associations between variables of interest and HIV test outcomes. Specifically, age at sexual debut, multiple sexual partnerships in the last 12 months, condom use at last high-risk sexual activity, involvement in transactional sex, educational status, marital status, residence, and wealth quintile were associated with the outcomes of HIV.

I delimited this study to the population of Zimbabwe in which the primary studies were conducted. Thus, the results are valid and generalizable to Zimbabwe where primary studies were conducted but could possibly be applicable to other countries in Southern Africa where similar trends and practices are observed. The results may not be generalized to other populations beyond Southern Africa.

Limitations

The reliability of the effect size and conclusions of this study depend on the quality, reliability, and appropriateness of the methods used by the primary surveys. One limitation of this study was that I used secondary data from ZDHS's that were conducted at different points in time. Some of the observed changes in the indicators between the years may be due to bias in the reporting of sexual behavior and practice information among the surveyed young females and men. In addition, as inherent with all cross-sectional studies, this study may neither establish temporality nor causality of the observed associations with the outcome (Chimoyi & Musege, 2014). In addition, cultural factors could be important determinants of sexual behaviors and HIV serostatus but the ZDHS does not capture such information creating a gap in this study on establishment of associations related to cultural practices as distal factors.

Furthermore, I included data from two ZDHS conducted 5 years apart and because the enumeration areas could have been the same for both surveys, chances that some of the participants interviewed in 2005/06 survey when they were ages 15 to 19 years might have been interviewed again during the 2010/11 ZDHS within the ages 20 to 24 years. This may mean a repetition of the same individual information in some cases but limited to few variables but for most of the variables of interest, repetition would give different information based on that age group. Last, self-reporting of sexual behaviors during the DHS could have introduced recall or social desirability bias, which may make generalization of the study findings a challenge. To address these challenges, I included a sufficient sample that is representative of various groups and sample size that gave the recommended effect and power in the analysis.

Significance

This research could fill a gap in understanding of public health programmers, practitioners, and policy makers by focusing on sexual practices and behaviors that are associated with HIV prevalence rates among young people in Zimbabwe. This research is unique because i conducted more rigorous analysis of the associations between reported behavioral changes and HIV prevalence for both young males and females within a specific period (Ghys et al., 2010). The results from this study could provide much needed insights into behavioral, sociodemographic, and socioeconomic determinants that influence HIV prevalence among adolescents. Insight from this study could enable public health practitioners to develop targeted interventions that could help reduce the spread of HIV among young males and sustain the gains in reduction of HIV among young females. The findings from this study could also provide a basis for the development of future policies and programs responding to age specific and gender specific risks and needs for young people in Zimbabwe. Such policies and programs could promote positive social change through improved health outcomes and decreased health care costs since fewer number of people will become sick (Ament et al., 2000). Refined programs could also promote social and behavior change that could affect the trends in HIV transmission among the young and reduce HIV prevalence. Reduced prevalence could improve the lives of individuals and communities through decreased disease related morbidity and mortality and increased productivity.

Summary

Through this study, I set out to define HIV prevalence determinants among young males and females in Zimbabwe. Halting and reversing the HIV prevalence trends among young people in Zimbabwe requires development of targeted evidence-based interventions (Wang et al., 2014). The existing data have shown disparities in HIV prevalence trends between young males and females, where substantial progress has been observed among females and not males. Information gaps exist as to why such disparities exist and I aimed to fill those information gaps. Analyzing nationwide available data from ZDHS ensured that the analyzed data was authentic and the sample was representative to allow for generalization within Zimbabwe and possibly to other neighboring countries. By conducting logistic regression analysis using SPSS package, I determined associations between variables and predictors based on the proximate determinant framework, and established associations that could lead to conclusions about the study findings. This study could contribute to social change in Zimbabwe and other countries around Africa where similar trends in HIV prevalence are observed.

In this chapter, I provided the background of the study, problem statement, and purpose of the study. I also identified the research questions, related hypotheses, and conceptual framework for the study. I presented a brief overview of the assumptions, scope, and limitations. Finally, I provided a brief discussion of the significance of this study and implications for positive social change. I will present a review of the literature in Chapter 2 to support the planned research.

Chapter 2: Literature Review

Introduction

Globally, HIV and AIDS have been reported to affect 36.9 million people living with HIV, of which 70% are in sub-Saharan Africa (WHO, 2016). Young people ages 15 to 24 years are one of the groups hardest hit and have the highest incidence rates, accounting for 40% of all the new HIV infections globally (AVERT, 2014). Adolescents ages 10 to 19 years have also been affected by the HIV virus, and some of these adolescents acquire the HIV virus from their mothers, whereas others acquire the virus through high-risk sexual practices (UNICEF, 2013). High HIV prevalence rates among young people have been associated with various factors including low knowledge on HIV and how it can be prevented, early sexual debut, multiple sexual partners, and low condom use (Marsh et al., 2011; Okudo, 2012). In Chapter 2, I present findings from previous research on factors that are associated with HIV prevalence rates among young people globally, regionally, and in Zimbabwe.

Despite the fact that published studies have reported associations between sexual behaviors, sociodemographic factors, socioeconomic factors, and HIV prevalence rates among young people (Bärnighausen et al., 2007; Hargreaves et al., 2005; Sandøy et al., 2007), few of these studies have established these associations through direct linkage between individual HIV status and their corresponding socioeconomic, sociodemographic, and sexual behavior for young people. Little is known about the direct association of HIV prevalence and practices linked to sexual behaviors, socioeconomic factors, and sociodemographic factors among young people and how these trends have evolved through time in Zimbabwe.

The purpose of this study was to examine relationships between sexual behaviors and practices, sociodemographic and socioeconomic factors and HIV prevalence within a specific period for males and females ages 15 to 19 years and 20 to 24 years in Zimbabwe. Measuring the association of sexual practices with HIV prevalence helps to provide a better picture of the magnitude and severity of the HIV problem in Zimbabwe especially among young people. Given the rising prevalence of HIV among certain groups of young people, especially young males, it is important to understand the trends in factors that have contributed to the rise in HIV prevalence compared with their female counterparts where a decline is observed (CSO [Zambia], MOH, and ICF International, 2014; CSO [Zimbabwe] and Macro International Inc., 2007; CSO, MOH, TDRC, University of Zambia, and Macro International Inc., 2009; ZIMSTAT and ICF International, 2012). Determining the association between sexual practices and behaviors and HIV prevalence, while understanding the sociodemographic and socioeconomic factors that may contribute to it, is an important step for development of appropriate interventions that may contribute to halting HIV transmission globally.

In this chapter, I cover the (a) literature search strategy; (b) conceptual model of the study; (c) description of HIV and AIDS at global, regional, and country levels as they have evolved in time; and (d) factors and trends in HIV prevalence among young people based on their socioeconomic and sociodemographic factors and sexual behaviors. The final section of the chapter is a summary and transition to Chapter 3.

Literature Search Strategy

I obtained Information for this literature review through an extensive computer search that I conducted in the course of 8 weeks. I assessed several online databases, journal websites, theses and dissertations available electronically, and reference lists of relevant articles and research documents. The search was limited to research conducted between 2000 and 2016 and restricted to peer-reviewed articles with full text published in English language. The electronic databases included Academic Search Complete, CINAHL, Dissertations and Abstracts, Educational Resource Complete, MEDLINE, Proquest and PsycINFO. Google Scholar was also used to supplement the research databases. This list provided access to various bibliographic resources relevant to the topic. I used the following keywords to search the databases: *HIV*, *HIV prevalence*, *HIV risk factors*, *young people*, *adolescents*, *sexual practices*, *socioeconomic factors*, *sociodemographic factors*, *HIV trends*, *cross-sectional*, *Demographic Health surveys*, *proximate determinants*, *conceptual framework*, and *theoretical frameworks.* These terms were searched in combination with Zimbabwe and other African countries including Zambia, Uganda, Malawi, South Africa, and Nigeria to compare the available literatures within countries.

In addition to electronic database searches, I reviewed articles cited in other studies on associations of HIV prevalence among young people and examined the reference lists of published literature on HIV and young people to identify studies eligible for inclusion in this literature review. In addition, I reviewed country-level national reports and surveys to avail some country-specific information relevant to the study and these included the Demographic Health Surveys, Multiple Cluster Indicators Surveys, and national annual HIV estimates reports. I further searched and reviewed various sources of literature specific for HIV and AIDS. I searched journals on HIV and AIDS through Google Scholar using the same keywords mentioned previously and searchedWebsites for UNAIDS, UNICEF, and WHO for relevant information and updates based on evidence. I conducted a thorough literature review to determine the appropriate conceptual model for this study, which I describe in the next section.

Conceptual Model

To select the appropriate model to investigate the associations of HIV-prevalence with sexual behavior, sociodemographic and social economic factors, it was important to review the literature on theories and models of behavior change, especially those that have been applied to HIV/AIDS programs. In that respect, I reviwed three theories of behavior in this dissertation project and these included Proximate Determinants Framework, Information-motivation-behavioral skills model of AIDS-preventive behavior, and the Theory of Reasoned Action/Planned behavior. I selected the Proximate Determinants framework as the most appropriate one for this study.

Proximate Determinants Framework

The proximate determinant framework integrates epidemiological and demographic approaches and have been applied extensively in the study of fertility and child survival in developing countries (Robertson, Gregson, & Garnett, 2010; UNFPA, n.d.). The framework was then applied in HIV by Boerma and Weir (2005), who integrated epidemiological and demographic approaches and the HIV proximate determinants provided a link between underlying social/environmental determinants (e.g., socioeconomic variables, education) and biological determinants of HIV risk. The framework has facilitated hypothesis generation regarding causal pathways between risk factors and HIV infection, and has been tested using data on adults from Zimbabwe (Robertson et al., 2010).

The components of proximate determinants framework include underlying determinants, proximate determinants, biological determinants, Health Outcomes and Demographic outcomes (Boerma & Weir, 2005). The framework indicates that underlying determinants like sociocultural, socioeconomic and demographic characteristics and program characteristics influence both behavioral and biological proximate determinants and these proximate determinants have a direct impact on biological determinants related to exposure to HIV risk and this affect the health outcome which is rate of new HIV infection and the prevalence of HIV infection and lead to disease and premature death (Boerma & Weir, 2005).

Underlying determinants. The underlying social, economic, and environmental determinants must operate through proximate determinants in order to affect the biological outcome (Boerma & Weir, 2005). Underlying determinant include factors that may affect HIV infection rates and these were described by Boerma & Weir, (2005); Robertson et al.,, (2010); & Delany-Moretlwe et al., **(**2014) as demographic factors (Age, marital status, sex, residential status); Socioeconomic factors (Education, wealth distribution and employment status); socio cultural factors (Gender, ethnicity, religion, drug and alcohol use, sex work) and HIV interventions (HIV testing, PMTCT, ART, HIV knowledge, and condom use).

Proximate Determinants. The proximate determinants provide a link between underlying determinants and biological determinants of HIV risk (Robertson, Gregson, & Garnett, 2010). Some of the proximate determinants related to this study which are the sexual behaviors and practices include age at sexual debut, number of sex partners in life time, multiple sex partners, and condom use (Boerma& Weir, 2005; Robertson et al., 2010; & Delany-Moretlwe et al., 2014). I linked these determinants to the sociodemographic and socioeconomic determinants and no proximate determinants related to HIV interventions and sociocultural factors was included in the study.

Biological Determinants. Biological determinants are factors related to the transmission of HIV including the average number of secondary cases that arise from any new case of infection, contacts with susceptible infected persons, and the probability of transmission per contact (Boerma & Weir, 2005; Robertson et al., 2010; & Delany-Moretlwe et al., 2014). In this study, I only linked the biological determinants of exposure of susceptible person to HIV infection to the proximate determinants.

Health Outcome. Once individuals have been exposed to HIV infection, it could lead to disease which affects demographics in the form of AIDS related mortality. in this study I included those people that acquired HIV by linking HIV positive serostatus to the underlying and proximate determinants.

Utilization of Proximate Determinant Framework in HIV Research

Proximate determinants has been extensively used by Bärnighausen & Tanser (2009); Robertson et al., (2010); & Delany-Moretlwe et al., **(**2014) in their HIV studies and the researchers recommended that proximate-determinants frameworks serve the important purpose of separating behavioral determinants from biological determinants and outcomes and from socioeconomic and cultural determinants. Robertson, Gregson, & Garnett, (2010) used the framework to assess sexual risks among orphaned adolescents; Delany-Moretlwe et al., (2014) used the framework in their cross-sectional survey to assess HIV prevalence and risk in long-distance truck drivers in South Africa; and Boerma, et al., (2003) used the framework to understanding the uneven spread of HIV within Africa through a comparative study of biological, behavioral, and contextual factors in rural populations in Tanzania and Zimbabwe. The framework was relevant to my study since it guided the study design, analysis and interpretation of risk factors or interventions that included social cultural, biological and behavioral data.

In addition, since my study used national population based survey data where large numbers of variables were collected through HIV testing and interview-based information, the framework allowed more-extensive analyses of the determinants of HIV infection, by use of bivariate analytical methods. The framework allows for individual-level analyses and is appropriate for pathway analysis as a tool for describing how underlying variables affect the risk of HIV infection (Boerma and Weir, 2005). This links well with the purpose of my study where I analyzed trends in males and females on selected individual characteristics to explain the associations between the different variables. The emphasis of the framework on sequence at the population level, with the underlying social, economic, and environmental factors leading to HIV exposure and transmission enriched my study. The essential feature of the framework is the identification of a set framework for HIV/AIDS research of proximate determinants, which are both biological and behavioral in nature.

HIV and AIDS Trends and Burden

HIV and AIDS still remain a global public health issue with approximately 36.9 million people living with HIV at the end of 2014, of which 25.8 million were in Sub Saharan Africa (WHO, 2016). Young people ages 15 to 24 years account for highest number of the infections with girls and women, accounting for 45% of new HIV infections globally and for 60% of HIV infections in Sub Saharan Africa (UNAIDS 2014). Adolescent girls ages 15 to 19 years and young women 20 to 24 years are at greater risk of acquiring HIV compared to their male counterparts in Africa. For instance, for every infected young man in Zimbabwe, Botswana, Namibia, South Africa and Zambia, there were five infected young women in 2014 (UNAIDS 2006). The number of AIDS-related deaths has been declining with 1.5 million [1.4 million–1.7 million] people dying of AIDS-related causes in 2013, down by 35% from the peak of the epidemic in 2005 (UNAIDS, 2014).

Zimbabwe is one of the countries hard hit by the HIV epidemic, and gender differentials are apparent. According to the 2005/2006 ZDHS, HIV prevalence was 21% for women 15 to 49 years compared to 15% for males in the same age group. Among those 15 to 19 years, the prevalence was 6.2% for females versus 3.1% for males. Among those 20 to 24 years, the prevalence was 16.3% for females and 5.8% for males (CSO & Macro International Inc., 2007). Declining trends in HIV new infections among general populations and children have been observed over the years. Among adults ages 15 to 49 year olds, the estimated HIV incidence declined from 2.63% in 2000 to 0.92% in 2014 (MoHCC, 2015). Significant declines in HIV prevalence among young females ages 15 to 24 years were also observed in Tanzania from 8.8% in 1999 to 4.9% in 2002, (OR, 0.53; 95% CI, 0.29–0.97) and this decline was significant among those who had completed primary education and those who were unmarried (Msuya et al., 2007). In addition, significant declines in new HIV infections were observed in children due to increased access to ART by HIV positive pregnant women in low and middle income countries which averted at least 1.3 million new infections among children between 2000 and 2014 although 25 children (0–14 years old) still acquire HIV every hour (UNICEF, 2015).

Declining trends in annual AIDS related deaths were also observed in Zimbabwe from 134,247 in 2004 to 38,616 in 2014 (MoHCC, 2015). The decline in estimated AIDS related deaths in Zimbabwe and globally, is attributable to increased access to Antiretroviral treatment (ART) where by mid-2015, 15.8 million people living with HIV were receiving ART globally (WHO, 2016). The reduction in AIDS related deaths has contributed to the reduction in number of HIV orphans from 690,878 in 2011 to 567,480 in 2014 (MoHCC, 2015). However, inequities have been observed on the declining rates of AIDS related deaths among the general population and adolescents.

Adolescents' ages 10 to 19 years are one of the population groups currently left behind in the global AIDS response. In 2013, two thirds of the 250,000 new infections among adolescents 15 to 19 years were among adolescent girls and there were an estimated 2.1 million adolescents living with HIV in 2012 of which more than 80% lived in sub-Saharan Africa (UNAIDS & UNICEF, 2015). It is estimated that there are 26 new HIV infections among adolescents every hour and in sub Saharan Africa 7 in 10 of the new HIV infections are among girls (UNICEF, 2015). Some of the high risk factors associated with increase to HIV prevalence among adolescents and young people include age, education status, early sexual debut, multiple partners, inconsistent condom use, and economic status (Adedimeji, 2005; Fatusi & Blum, 2008).

Access to ART among adolescents has also been low with less than half of adolescents living with HIV being on treatment globally while in Zimbabwe only 51% of them were on ART in 2014 (UNAIDS & UNICEF, 2015; UNICEF, 2015). The ART coverage has led to tripling of AIDS related deaths among this group since 2000 and yet a declining trends were observed among the adult population and HIV is now the second largest contributor of adolescent mortality globally, and the number one in Africa (UNICEF, 2015; WHO, 2014). The majority of AIDS related deaths occur in adolescents who acquired HIV as babies and survived to their teenage years, either without knowing their HIV status or having slipped out of care (UNICEF, 2015).

Realizing the need to accelerate reduction of new HIV infections and AIDS related deaths, a strong global consensus was reached in 2014 for the world to fast truck the effort towards ending AIDS by 2030 and global targets have been set to be achieved globally and at country levels (UNAIDS, 2015). The agreed targets have been set based on a combination of major scientific breakthroughs and accumulated lessons learned over more than a decade of scaling up the AIDS response worldwide. Some of the evidence has shown that HIV treatment can dramatically extend the lifespan of people living with HIV and effectively prevent HIV transmission (UNAIDS, 2015). The targets that have been set therefore are 90% of people living with HIV know their HIV status, 90% of the people who know their status receive treatment and 90% of the people on HIV treatment have a suppressed viral load so their immune system remains strong and they are no longer infectious by 2020 (UNAIDS, 2014). Similar efforts have been agreed upon globally to accelerate efforts towards adolescents and young people with a target reduction on new HIV infections among adolescents by 75% and AIDS related deaths by at least 65% by 2020 (UNAIDS & UNICEF, 2015).

Achieving these targets will have a huge public health impact since 28 million HIV infections and 21 million AIDS-related deaths could be averted between 2015 and 2030 and the economic return on fast-tracked investment is expected to be 15 times with about US$ 24 billion of additional costs for HIV treatment being averted (UNAIDS, 2014). Zimbabwe adopted the fast track strategy and focus is placed on adolescents and young women. This study could provide insight to areas that need special focus to achieve the targets. Realizing that adolescence is a critical life-transition to young adulthood, it is important to understand determinants that shape health-related behaviors, risk and protective factors which may arise from adolescent’s more immediate environments which could increase their vulnerability to HIV and affect their transitioning to young adult hood (WHO, 2015). Some of the effects of the determinants may be positive or negative depending on the individual and context and these may persist even during young adulthood (ages 20 to 24 years) hence need for this study to understand the two distinct categories of people; those 15 to 19 years and 20 to 24 years.

HIV Knowledge Among Young People

HIV knowledge levels among adolescents in sub Sharan Africa has barely increased over the past 15 years with only 30% of them having comprehensive HIV knowledge (UNICEF, 2015). However, household surveys conducted between 2007 to 2013 revealed an increase in young people's HIV-related knowledge compared to surveys in 2001to 2006, as well as declines in the proportion of young people initiating sex before age 15 and the number of adults reporting multiple sex partner in sub-Saharan Africa (UNAIDS, 2014). Although levels of awareness on HIV among young people in Zimbabwe has remained above 95% over the past decade, comprehensive knowledge that would promote indulgence in safer sexual behaviors have remained low at 56% among females and 52% among males ages 15 to 24 years in 2014 (CSO & Macro International Inc. 2007; ZISTAT 2015; & ZIMSAT & ICF International, 2012). Disparities in HIV knowledge levels were observed based on sociodemographic factors for both young males and females. Those in urban areas had higher knowledge (66% female; 65% Male) than those in the rural areas (51% Female; 47 male); those ages 15 to 19 years had lower knowledge (51% female, 49% male) than 20 to 24 years olds (62% female, 57% male); those with higher education level had highest knowledge levels (84% female, 87% male) than those with primary education (43% female, 35% male); and those from the poorest quantile had lower knowledge (47% female, 43% male) compared to those from highest quintile (65% female, 67% male) and no significant difference was observed between those married and unmarried in 2014 in Zimbabwe (ZIMSTAT, 2015).

Knowledge and information on HIV have shown to delay the onset of sex, frequency of sex and number of partners and increased use of contraceptives like condoms in Nigeria (Okudo, 2012). Inadequate information and low risk perception among young people on HIV and AIDS has increased their vulnerability to engagement in risky behavior and yet knowledge of risky sexual behaviors has shown to promote safer sexual behavior, especially among non-sexually active adolescents or those that are embarking on their sexual debut (Chikovore, Nystrom, Lindmark, & Ahlberg, 2009; UNAIDS & WHO, 2004; Warenius, et al., 2007). In a qualitative study among young people in rural Zimbabwe, Chikovere et al. (2009) indicated that lack of access to HIV prevention information and services contributed to young people indulging in unprotected sex increasing their vulnerability to HIV. This was also indicated by Cowan et al. (2008) in their findings from a cluster randomized trial of a multi-component HIV prevention intervention for adolescents based in rural Zimbabwe. Chirawu et al. (2010) and Cowan et al. (2008) revealed that girls were less likely to know about reproductive health issues than boys ($p < 0.001$) and were less likely to have accessed and used condoms ($p < 0.001$), and that young people feared going for HIV testing because it was associated with being sexually active.

In contrast, other studies of adolescents' behavior have shown a continuation of high risk behaviors among young people with knowledge and information on how to prevent HIV (Olasode, 2014). Despite the fact that information and education have shown to induce behavioral change, it had not shown to sustain the change (Okudo, 2012). Studies have further shown no significant correlation between the use of condoms and number of sexual partners with perceived measure of risk for HIV among sexually active young people despite having high knowledge (Okudo, 2012). Such contrasts in findings of linkages between HIV knowledge and risky sexual behaviors need to be further understood within the context of HIV status of young people which could provide the relationship between the two variables. Despite the fact that studies have shown that high knowledge on HIV acts like a protective factor against HIV transmission, this has not been ascertained by assessing the link among people who have been tested for HIV, their HIV status and knowledge levels. I therefore tested a possible link between HIV knowledge, sexual practices and HIV status among young people in Zimbabwe and provide more insight into the relationship.

Sexual Behaviors and HIV in Young People

Risky sexual practices among young people have been the key drivers of HIV infections especially in sub Saharan Africa (UNAIDS, 2014; Warenius, 2007). Early sexual activity, inconsistent and incorrect condom use, multiple sexual partners, discrimination and stigmatization around HIV/AIDS have been shown to fuel the spread of HIV among this population (UNAIDS, 2014; Stockl et al., 2007; De Walque, 2006). In Malawi the reduction in the proportion of adolescents 15 to 19 years starting sex, the proportion of men having sex with more than one woman and an increase in condom use has been associated with the decline in HIV prevalence between 2000 and 2004 (Bello et al., 2011). Associations have further been observed between sexual determinants like sexual debut, age of sex partners, life time sexual partners, multiple sexual partnerships, condom use at last sex and transactional sex with HIV prevalence among young people (Choudhry et al., 2015; Gregson et al., 2005; Marsh et al., 2011; Michelo, Sandoy & Fylkesnes, 2006; Singh et al., 2005; Zuma, Zolo & Makonko, 2011). However, understanding these associations within the lives of young people in Zimbabwe especially among the adolescents (10 to 19 years) and those 20 to 24 years is critical to the development of targeted interventions that could contribute to the achievement of the global fast track targets for 2020 as well as reduce vulnerabilities to new HIV infections and AIDS related deaths among the young people (UNAIDS, 2015). In this study, I endeavored to provide an analysis of such associations at national level for evidence based programming by various partners.

Sexual debut and age of sexual partner. Early sexual debut has been associated with larger numbers of lifetime partners which have both been associated with greater likelihood of HIV infection in Tanzania and Zambia (Gregson et al., 2005; Michelo et al., 2006). A significant and steady increase in the proportion of young people, males and females, not yet initiating sex and increase in the proportion of young females reporting no new partners has been observed and this could be the driving force behind the observed significant declining trends in HIV prevalence rates in Manicaland, Zimbabwe (Marsh et al., 2011). Sexual behavior data from national surveys in Zimbabwe indicated a reduction in sexual experience before age 15 years among males and females ages 15 to19 years (Mahomva et al., 2006). This is supported by a study by Marsh et al. (2011)

which indicated that the proportion of young males and females not yet initiating sex increased significantly with women having a large reduction (19.2% to 11.8%; p value <0.001) in several African countries including Zimbabwe. Evaluation of data reported from 30 nationally representative sample surveys by Singh et al., (2005) indicated that initiation of sex before age 15 years was less prevalent among young men compared with young women, especially in sub-Saharan Africa and yet opposite patterns were observed in Latin America, where initiation before age 15 was much higher among young men than among young women. In addition, a significant reduction on the number of young people having first sex by age of 15 years was observed through two national surveys in Zimbabwe from 4.5% to 3.9% among females and from 5.2% to 3.6% among males having sex by age 15 years between 2006 and 2011 (CSO & Macro International Inc. 2007; ZIMSTAT & ICF International, 2012). In contrast, sexual initiation was reported between the ages 12 to15 years among the majority of adolescents in Jamaica with more boys initiating sex at an earlier age compared to girls within the same age group (Harris, 2014).

Early sex initiation has been associated with increased HIV risk especially among young girls due to their biological nature and lack of empowerment to negotiate safer sex (Sandøy, 2002). A review of studies from sub-Saharan Africa where HIV tests were included showed consistent evidence of association between early sex and HIV risk (Stockl et al., 2013; Handa, Halpern, Pettifor, & Thirumurthy, 2014). Similarly, a study by Marsh et al. (2011) indicated that increase in HIV prevalence trends among young people subsequent to 2003 was accompanied by significant increases in the number of women ages 20 to 24 years initiating sex in rural Zimbabwe. The association between early sexual debut and social economic status has also been made where findings from a study in Kenya have shown that provision of cash transfers to orphans and vulnerable young people 15 to 25 years reduced the relative odds of sexual debut by 31%, with larger impacts among females (42%) relative to males (26%) (Handa et al., 2014).

Age discordant relationships between adolescent females and older male partners are common (Forbes, 2010; Wood et al., 2011). Age difference with sex partner has shown to be a significant predictor of HIV infection status especially among men having sex with partners of similar age and women with older partners in Zimbabwe (Gregson et al., 2005). Younger age at first sexual intercourse and age of sexual partners were associated with greater risk of HIV infection among the sexually experienced respondents in Nigeria and Zimbabwe (Gregson et al., 2005; Okudo, 2012). Similar observations were made by Marsh et al. (2011) and Sandøy et al. (2007) where older age of sexual partner was associated with increased risk of HIV infection in women in Zambia and Manicaland province, in Zimbabwe. Various studies have shown that age- discordant relationships (Sexual relationship with men or females five years and older) significantly contributed to the variation in HIV prevalence between young women and young men (Gregson et al., 2005; Leclerc-Madlala, 2008). Young women formed partnerships with men 5 to 10 years older than themselves, whereas young men had relationships with women of a similar age or slightly younger in Zimbabwe and Tanzania (Gregson et al., 2005; Hargreaves et al., 2012). Older age of sexual partner was associated with increased risk of HIV-1 infection in men (odds ratio 1·13 [95% CI 1·02–1·25]) and women (1·04

[1·01–1·07]) in Manicaland, Zimbabwe (Gregson et al., 2005). Involvement of young people especially adolescent girls and those 20 to 24 years in venues affiliated with alcohol have shown to increase their involvement in sex with people older than them and increase in number of sexual partners increasing their risk to HIV (Okudo, 2012; Singh et al., 2010).

Another quantitative and qualitative study of alcohol use and high-risk sexual behavior among adolescents and young adults of age 15–21 years in Harare, Zimbabwe revealed that females reported having more sexual older partners than their males counterparts at drinking clubs (60% versus 25%, Chi square t test $p < .001$) (Mataure et al., 2002). Further studies have shown that age discordant relationships were often encouraged by maternal figures in the adolescents' lives as a way out of their current economic situation, which involves exchange of goods, money, and other resources for sex (Crawford & McGrowder, 2008; Mataure et al., 2002). Much of the data that exists in Zimbabwe was based on studies conducted in the rural province of Manicaland. However, data gaps exist on the association between sexual debut and HIV status as well as age of sex partner and HIV status among young people at the national level. In addition, these sexual determinants may affect adolescents 15 to 19 years and those 20 to 24 years differently creating a need to understand the two groups separately. This study could therefore contribute to filling such data gaps by providing national level information which may be representative of the population and could establish a link between the HIV status of those tested and sexual debut and age of sexual partner. Such information could facilitate decision making on programming for adolescents and young people as well as behavioral change among young people.

Lifetime number of sexual partners and multiple sexual partnerships. The number of lifetime sexual partners and involvement in multiple sexual partnerships has shown to be a factor fueling the spread of HIV especially among young people (UNAIDS, 2014). Multiple sexual partnerships has shown to increase the risk of HIV transmission and yet multiple sexual partnerships have been seen to be socially acceptable among males as a proof of masculinity especially in Africa (Crawford & McGrowder, 2008; Harris, 2014; UNAIDS, 2014). Multiple concurrent sexual relationships have significantly been associated with paying for sex among young men (OR adjusted 5.60, CI 2.08 -14.95) and selling sex for something among young women (OR adjusted 8.04, CI 2.55- 25.37) (Choudhry et al., 2015). Young males ages 15 to 24 years reported larger numbers (more than five) of lifetime partners compared to women ($p < 0{\cdot}001$) in Mutare Zimbabwe and South Africa (Gregson et al., 2005; Zuma et al., Makonko, 2011). In another study conducted in five African countries including Zimbabwe, the number of men reporting no new partners declined from 42.1% in 2001 to 32.6% in 2005 ($p = 0.001$) while a steady increase in the proportion of women reporting no new partners (from 69.2% to 76.4%) was observed between 1999 and 2005 (Marsh et al., 2011). Although young males reported having more partners than women in South Africa, they had infrequent sexual acts and greater condom use while females were 22 times more likely (OR = 22.02) to have sexual partners six years older at sexual debut which may have accounted for higher HIV prevalence in young women that males (Zuma et al., 2011).

National surveys in Zimbabwe showed reduction in proportion of females ages 15 to 24 years having more than two sexual partners from 1.8% to 1.3% for females between 2006 and 2014. A different trend was observed for young men increased rate in proportion of males having more than two sexual partners from 19.8% in 2006 to 7.7% in 2012 and 8.8% in 2014, an upward trend which could be associated with the observed increased trend in HIV prevalence among young males compared to young females (CSO & Macro International Inc., 2007; ZIMSTAT, 2015; ZIMSTAT & Macro International Inc., 2012). HIV vulnerability through multiple sexual partner was lower among young females as indicated by Oguamanam, (2012) where significant association between gender and multiple sex partners was observed with females having lower odds of having multiple sex partners, compared to males (OR=0.48; CI=0.40, 0.56; p <0.001). Similar trends were observed among adolescents' ages 15 to 19 years in Canada with 29.4% of young men and 21.8% of young women having multiple sex partners (Rotermann, 2008). Greater number of lifetime partners has also been associated with increased risk of HIV (1·03 [1·00 –1·05]) in Zimbabwe (Gregson et al., 2005).

Despite the reduction in proportion of young females having multiple sexual partners in Zimbabwe, the mean number of sexual partners in lifetime increased from 1.4 in 2006 to 2.0 in 2011 but a declining trend has also been observed to 1.8 in 2014 and a contrasting trend was observed among young males from 3.8 in 2006 to 3.5 in 2011 and an upwards trend to 5.5 in 2014 which suggested increased exposure to HIV infections among the young males (CSO & Macro International Inc., 2007; ZIMSTAT, 2015). This could be contributed by the fact that young women had one older boyfriend to provide money and gifts and one younger boyfriend as a potential husband hence increasing the risk of HIV transmission to younger males (Gregson et al., 2005).

Although most of the studies show a link between reduction in HIV prevalence and the reduction in number of lifetime partners as well as reduction in multiple partners, such studies used data from different sources including the ANC surveillance and national survey which provided an assumed link between the variables (Bello et al., 2011; Mahomva et al., 2006). However, assumed links should be carefully interpreted to ensure that the observed changes in HIV prevalence are consistent with behavioral change and not the natural course of the epidemic (Hallett et al., 2006). The need for understanding individual sexual behaviors and HIV status could therefore provide a stronger base for associating such behaviors with HIV prevalence. On the other hand, it may be difficult to establish a trend based on the same cohort in this study at different points in time since the groups of people involved in the two surveys were different. This study could provide stronger evidence for the association between young people's engagement on multiple sexual partnerships and HIV status which could be linked to reductions or increases in HIV prevalence rates among the young people in Zimbabwe.

Condom use at last high risk sexual activity. Condom use among young females in Zimbabwe has been low despite the observed increase in number of them having sexual partners (Marsh et al., 2011). Among young females ages 15 to 24 years who had more than one sexual partner in Zimbabwe, only 43% compared to 65% young males reported using condom the last time they had sex (ZIMSTAT, 2015). Similar trends were observed in Nigeria where Oguamanam (2012) indicated that the odds for lack of condom use among females were 1.34 times higher, compared to their male counterparts. Reduction in condom use during sexual activity were observed among young males in Zimbabwe from 68% in 2006 to 50% in 2011 which might have increased their vulnerability to HIV despite the reduction in number young males having multiple partners.

Transmission of HIV is assumed to be prevented by consistent use of condoms with the probability of consistent use dependent on the age of both partners (Hallet et al., 2006). In a study conducted in Malawi, Bello et al., (2011) showed significant reductions in the proportion of 15 to19 year olds starting sex, the proportion of men having sex with more than one woman in the previous year and significant increases in condom use by men with multiple partners which was associated with a drop in HIV prevalence rates by 40% among women ages 15 to 24 years. However, it may be difficult to associate condom use only to the reduction in HIV prevalence based on existing evidence. On the other hand, Futterman et al. (1993) indicated that the majority of adolescents who were HIV positive and those who had never been tested, had sex without condoms in New York City, increasing the risk of HIV transmission. Fewer studies have shown the link between lack of condom use and HIV serostatus and this study will endeavor to provide information on the possible association between condom use and HIV serostatus based on individual level data. This information could guide programmers on how to target condom use messages and improve on condom programming initiatives.

Transactional/paid sex. Young people especially girls in African countries have engaged in transactional sex due to low socioeconomic status and rely on older partners for their economic needs increasing their risk to HIV infection (Krishnam, 2004). Studies conducted in Nigeria and South Africa, have shown that HIV infections were 6 times higher in young girls who had no access to economic opportunities ages 16 to 19 years than in boys in the same age group because they depended on older men for support (Krishnam, 2004; Oguamanam, 2012). Some of the reasons given for young women starting sex were enjoyment, money, gifts, and peer-pressure where having fashionable hairstyles and clothes like their friends of similar age motivated the young girls to engage in transactional sex in Zimbabwe (Gregson et al., 2005). Studies have also shown that young males also engaged in commercial sex where in Uganda 5.2% of young men reported paying for sex as well as receiving money as compensation for sex by sugar mummies while 3.7% of young women reported receiving gifts, favors, or money as compensation for sex (Choudhry et al., 2015; Choudhry, Östergren, Ambresin, Kyagaba, & Agardh., 2014). Transactional sex among young men and older women were characterized by economic and power asymmetries and were associated with inconsistent condom use and multiple concurrent sexual partners of varying ages which increased their risk to HIV infections in South Africa (Phaswana-Mafuya et al., 2014).

A reduction in proportion of young males 15 to 24 years who reported paying for sexual intercourse was observed from 3.3% in 2006 to 2.5% in 2011 and the proportion using condom during paid sex increased from 76% to 90% over the same period in Zimbabwe (CSO & Macro International Inc., 2007; ZIMSTATA & Macro International

Inc., 2012). Lower educational attainment (OR adjusted 3.25, CI 1.10 - 9.60) and experience of sexual coercion (OR adjusted 2.83, CI 1.07 - 7.47) were significantly associated with paying for sex among men (Choudhry, et al., 2015). In addition, Stephenson (2009) in a study conducted in three African countries showed that young women from poor households were at risk of sexual risk taking, with their economic status motivating them to engage in transactional sex and to give up negotiating power with respect to condom use. Chimoyi (2014) indicated that 90% of the HIV positive participants reported having engaged in transactional sex in Uganda which could provide evidence for the association between HIV infection and transactional sex. This was confirmed by Choudhry et al (2015) who indicated that paying for sex among young men and having three to five lifetime sexual partners among young women were associated with increased odds of testing positive for HIV.

Despite the fact that studies have shown the increased risk among young people to acquire HIV through indulgence in transactional sex, little information exists on the association between HIV status and transactional sex especially among young people in Zimbabwe. Having such information available could enhance behavioral change programs especially with the rise of commercial sex work in the current economic crisis situation in Zimbabwe. I therefore tested the link between transaction sex and HIV status among young people which could provide a basis for targeted messages and programs. This link could also explain the converse relationship among young men where the numbers of those involved in transactional sex reduced and yet HIV prevalence rose among the same group (CSO & Macro International Inc., 2007; ZIMSTAT & Macro International Inc., 2012).

Sociodemographic Variables

HIV, age and sex. HIV has disproportionately affected people of different ages and sex where females have been affected more than males and young people have been affected more than the older generation (UNAIDS, 2014). Although studies have shown no significant difference in average age at sexual debut between males and females; more young females (33%) engaged in sexual intercourse than young males (24%) in this age group in Zimbabwe and the females were less likely than the males to have used condoms at first instance of sex (odds ratio [OR] = 0.59; $p < 0.001$ in South Africa (ZIMSTAT, 2015; Zuma et al., Makonko, 2011). Young females' risk had further been associated with having sex with older men compared to young males who engaged in sex with their age mates or lower (Marsh et al., 2011).

Data from antenatal surveillance and population surveys in sub-Saharan Africa revealed extremely high levels of HIV infection in teenage females while infection rates in men remained low until their mid-to-late 20s (Gregson et al., 2005). HIV prevalence rates have shown to increase with age and sex where a disparity in prevalence was observed between those ages 15 to 19 years and those 20 to 24 years for both males and females. National surveys conducted in Zimbabwe between 2005/2006 and 2010/2011 showed that the HIV prevalence rates were lower among those ages 15 to 19 years but higher among females than males in that age group (CSO & Macro International Inc., 2007; ZIMSTAT & Macro International Inc., 2012). HIV prevalence among adolescents ages 15 to 19 years was lower than those 20 to 24 years and declining HIV prevalence trends were observed among female adolescents from 6.2% to 4.2% while and upwards trends were observed among adolescent males from 3.1% to 3.4% between 2006 and 2011 (CSO & Macro International Inc., 2007; ZIMSTAT & Macro International Inc., 2012).

On the other hand, a drastic increase on HIV prevalence was observed between adolescents 15 to 19 years and 20 to 24 year olds with a declining trend from 16.3% to 10.6% among females and from 5.8% to 3.8% in males respectively between 2006 and 2011 (CSO & Macro International Inc., 2007; ZIMSTAT & Macro International Inc., 2012). On the other hand, the Zimbabwe 2014 National HIV estimates report has shown an upward pattern in HIV prevalence among young males ages 20 to 24 years from 3.8% in 2010/2011 to 5.6% in 2014and yet a declining trend was observed among females in the same age group from 10.6% to 8.9% within the same period (MoHCC, 2015). A similar pattern has been observed in Zambia over a period of 10 years where a decline in HIV prevalence has been observed among adolescent girls from 6.8% to 4.8% and from 6.6% to 4.8% for those ages 20 to 24 contrary to the males where an increase in HIV prevalence was observed from 1.8% to 4.1% among adolescents and from 4.7% to 7.3% (20 to 24 years) between 2002 and 2014 (CSO, MoH & ICF International, 2014; CSO, MOH, TDRC, University of Zambia, and Macro International Inc., 2009).

Data from these surveys suggested a declining trend in HIV prevalence among females for both age groups while an increasing trend was observed among males 20 to 24 years in Zimbabwe and Zambia which requires understanding of the contributing factors to such trends. There is need to establish the determinants that have increased the risk of HIV among young males ages 20 to 24 years and what might have contributed to the reduction in HIV prevalence among young females and adolescent males in Zimbabwe. I tested such risks among the various age groups and among females and males which could provide guidance to develop programs that could address particular issues identified within a specific population group.

Residence. Various studies suggested that urban youths are better informed about HIV and AIDS than their rural peers and yet HIV prevalence has shown to be higher in urban than rural areas (Hargreaves et al., 2012; Marsh et al., 2011; Zuma et al., 2011). These patterns have been observed in Zimbabwe where HIV prevalence among those ages 15 to 49 years was higher in urban (19.6% females; 13.1% males) compared to those in rural areas (16.8% female; 12.0% males) (ZIMSTAT & Macro International Inc., 2012). However, such patterns are not known among males and females ages 15 to 24 years in Zimbabwe. On the other hand, a study in Malawi indicated significant decline in HIV prevalence among 15 to 19 year olds from 26% to 15% in urban areas and a reduction by 40% among young women ages 15 to 24 years and yet HIV prevalence did not decline in the rural areas (Bello et al., 2011). The decline in HIV prevalence could be associated by the reduction in reported number of sexual partners among sexually active young urban men and women in Zambia (Sandøy et al., 2007).

The converse relationship observed between knowledge level and HIV prevalence rates among the rural and urban populations needs to be understood within the context of risk factors involved. A study conducted in Malawi among antenatal clinic attendees showed strong evidence for behavior change affecting the course of the HIV epidemic in the urban areas and there was no evidence for behavior changes affecting the course of the HIV epidemic in rural areas (Bello et al., 2011). There is therefore a need to establish if such patterns are similar among young people ages 15 to 19 years and those 20 to 24 years in Zimbabwe since existing literature has shown the picture of those ages 15 to 49 years only (ZIMSTAT, 2015). Understanding the causes of this difference could facilitate development of programs and campaigns that could be rapidly expanded to rural and urban areas.

Education attainment and HIV. Education levels attained by young people have also shown to either increase or decrease their vulnerability to HIV (Hargreaves & Glynn, 2002; UNAIDS, 2014). The Health Canada’s Report on the Health of Canadians indicated that poverty and poor educational attainment are the most reliable predictors of poor health (Oguamanam, 2012). The rate of first sex among young people has shown to be lower among more educated males and females (Hargreaves et al., 2012; Michelo, Sandoy & Fylkesnes, 2006). Lower education was associated with having more than one sexual partner and more sexual experience for both females and males and unprotected high risk sex was less common among the more educated in Tanzania and Zambia (Hargreaves et al., 2012; Sandøy et al., 2007). Such patterns could explain trends in HIV prevalence in Zimbabwe among males ages 15 to 49 years where males with no education have a prevalence of 15.8% and those with more than secondary education have lowest prevalence at 9.3% with declining trends as education levels go higher which could be associated with increased condom use among those with higher education (ZIMSTAT & Macro International Inc., 2012).

This was supported by Sandøy et al., (2007) who indicated that young people ages 15 to 24 years with lower-education reported having more than sexual partners than those with higher-education regardless of gender and residence ($p < 0.01$) in Zambia, which could have increased their exposure to HIV infection. However, the patterning among females was contrary to males in Zimbabwe since those with primary and secondary education levels had higher HIV prevalence than those with no education which requires an understanding of the vulnerability factors for girls in school (ZIMSTAT & Macro International Inc., 2012). Sandøy et al., (2007) also indicated that there was a probable association between decline in HIV prevalence with decreased risk behaviors and condom use especially in higher-educated and urban groups in Zambia. However, there is need to understand the association between high HIV prevalence among educated females in Zimbabwe with some of the sexual behaviors that could increase their risk to HIV infection (ZIMSTAT & Macro International, 2012).

A multivariable survival analysis conducted in South Africa, indicated that one additional year of education reduced the hazard of acquiring HIV by 7% ($p = 0.017$) which suggested that increasing educational attainment in the general population could lower HIV incidence (Bärnighausen et al., 2007). This is so because school has been seen to provide a protective environment where sex is less likely to occur, where same age relationships exist and where more opportunity to get HIV information exists hence reducing the risk of HIV infection (Handa et al., 2014). However, the protective effect of education in this study differs from other studies which suggested that educational attainment was not significantly associated, or positively associated, with the risk of HIV infection, and this was in line with the observation made in Zimbabwe among young females (Hargreaves & Glynn, 2002). But overall longitudinal cohort studies conducted in Zambia and Uganda have shown a rapid decline in HIV prevalence among young people with the most education (Sandøy et al., 2007). There is therefore a need to establish if such associations between educational level and HIV prevalence observed among 15 to 49 years are similar to those among 15 to 19 years and 20 to 24 years and assess the possible associations between educational levels and HIV prevalence among the young people by gender in Zimbabwe.

Socioeconomic Variables

The spread of HIV/AIDS has been reported to be fueled by gender inequality in social and economic status (SES) and that HIV/AIDS epidemic has been strongly associated with poverty (UN Women, 1995). Association between SES and HIV infection has been studied by various researchers (Bärnighausen et al., 2007; Wojcicki, 2005; & Krishnam, 2004). Low or high socioeconomic status have shown to either increase or decrease vulnerability to HIV infection among various groups. A review of 36 articles on the association between low SES and the risk of HIV infection in women indicated that 15 articles showed no association between SES and HIV infection while eight revealed a positive correlation between low SES and HIV infection and one showed some evidence of an association between low SES and HIV and some evidence of an association between high SES and HIV prevalence (Wojcicki, 2005)

On the other hand, those with high education and higher social economic status run a risk of HIV infection since they have resources to engage in multiple partnerships while those with low socioeconomic state especially young women are forced to sell sex for money and have limited ability to negotiate condom use increasing their vulnerability to HIV (Bärnighausen et al., 2007). Cross-sectional surveys on HIV serostatus conducted in Africa showed that asset-poorest households did not have the highest risk of HIV but people who lived in households belonging to the middle category of relative wealth did (De Walque, 2005; Shelton, Cassell, & Adetunji, 2008). This was supported by findings from a multivariate analysis conducted in South Africa where it showed that members of households that fell into the middle 40% of relative wealth had a 72% higher hazard of HIV acquisition than members of the 40% poorest households (Bärnighausen et al., 2007). In contrast, studies conducted in Jamaica indicated that high rates of unemployment for both men and women and poverty contributed to increased engagement in commercial sex work and intergenerational sex which increases the vulnerability to HIV infection (Harris, 2014; Figueroa et al., 2008). Moreover, Hargreaves et al., (2002) indicated that no simple association existed between socioeconomic status and HIV infection; in some cases, higher SES was associated with earlier sexual debut and higher alcohol consumption which were associated with high risk to HIV infection.

Several countries including Kenya and Malawi have implemented programs on conditional cash transfers targeting vulnerable groups especially girls to reduce their vulnerability to HIV (Handa et al., 2012; Pettifor et al., 2012). However, based on the findings from various studies which have given contradicting results on associations between HIV risk and social economic status, further studies need to be conducted to establish such link. A multivariate study showed that poverty reduction may not be as effective as anticipated in reducing the spread of HIV as evidenced in a study in rural South Africa (Bärnighausen et al., 2007). On the other hand, a review of studies on impact of cash transfers on HIV behavioral risks showed that nine studies revealed positive results on sexual behavior, and one showed a reduction in HIV prevalence, with lower prevalence among young women in the intervention relative to a control group (Baird et al., 2011; Pettifor et al., 2012). This was evidenced in an evaluation of the major government social welfare program in Kenya which showed that cash transfers to Orphans and Vulnerable Children (OVC)reduced the likelihood of sexual debut by 23% among young people age 15 to 25 (Handa et al., 2014). On the contrary, an evaluation of a conditional cash transfer program in rural Malawi which offered financial incentives to maintain their HIV status for a year showed no effect of the offered incentives on HIV status or on reported sexual behaviors and revealed that males who received the incentives were 9 percentage points *more* likely and women were 6.7 percentage points *less* likely to engage in risky sex (Kohler & Thornton, 2011).

Wealth of the population has also been shown to be associated with HIV prevalence in various countries. The DHS categorizes the population into five wealth quintiles namely lowest (poorest), second, middle, fourth and highest (richest) wealth quintiles (ZIMSAT, 2015). In Zimbabwe, HIV prevalence has been shown to be highest (9.0 % females and 4.3% males) among young people in the fourth wealth quintile (second richest group) (ZIMSTAT, 2012). A significant decline has been observed within the same group from 26.8% to 9.0% among females and from 17.1% to 4.3% between 2005/06 and 2010/11, a phenomenon that requires deeper understanding (CSO & Macro International Inc. 2007; ZIMZTAT & Macro International Inc., 2012). In another study conducted in South Africa, Bärnighausen et al., (2007) showed that members of the asset-poorest households were not at highest risk of HIV acquisition but people who lived in households belonging to the middle category of relative wealth were. The observed lower prevalence among those from poorest household poses a challenge in relating findings from Stephenson (2009) in South Africa and Choudhry et al., (2015) in Uganda which showed that young girls from poorest households engaged in sex in exchange for money. It is therefore important to establish if an association between risky sexual practices, household wealth and HIV status exist among young people in Zimbabwe based on existing data from national surveys. This could provide guidance to public health programmers on which target group to prioritize with which interventions.

Summary and Transition

Chapter 2 presented a literature review for determinants of HIV prevalence among young people ages 15 to 24 years. HIV and AIDS still remain a global public health issue and young people ages 15 to 24 years account for the highest number of HIV infections with girls and women, accounting for 45% of the new HIV infections globally and for 60% of HIV infections in sub - Saharan Africa (UNAIDS 2014; WHO, 2016). HIV knowledge levels among adolescents in sub -Sharan Africa have barely increased over the past 15 years with only 30% of them having comprehensive HIV knowledge

(UNICEF, 2015). Inadequate information and low risk perception among young people on HIV and AIDS has increased their vulnerability to engagement in risky behavior and knowledge of risky sexual behaviors has shown to promoting safer sexual behavior (Chikovore et al., 2009; UNAIDS & WHO, 2004; Warenius et al., 2007). Risky sexual practices including early sexual activity, inconsistent and incorrect condom use, multiple sexual partners, among young people have been the key drivers of HIV infections especially in Sub Saharan Africa (UNAIDS, 2014; Warenius, 2007; Stockl et al., 2007; De Walque, 2006).

Early sexual debut has been associated with larger numbers of lifetime partners which have both been associated with greater likelihood of HIV infection (Gregson et al., 2005; Michelo et al., 2006). Age difference with sex partners has shown to be a significant predictor of HIV infection status especially among men having sex with partners of similar age and women with older partners (Gregson et al., 2005). Multiple sexual partnership has shown to increase the risk of HIV transmission and yet multiple sexual partnerships have been seen to be socially acceptable among males as a proof of masculinity especially in Africa (Crawford & McGrowder, 2008; Harris, 2014; UNAIDS, 2014). Multiple concurrent sexual relationships have been significantly associated with paying for sex among young men. Studies conducted in Nigeria and South Africa, have shown that HIV infections are 6 times higher in young girls ages 16 to 19 who have no access to economic opportunities than in boys in the same age group because they depend on older men for support (Krishnam, 2004; Oguamanam, 2012). Most studies conducted in Zimbabwe have not focused on linking individual level data to determine the link between various determinants of HIV and HIV serostatus at national level. Given the rising trends in HIV prevalence among young males compared to young females over time, determining the factors that contribute to high HIV prevalence among young people ages 15 to 24 years could be important to fill in the literature gap and provide guidance for social change.

In Chapter 3, I provide the details of the study, including the research design and its rationale, description of the sample population, dependent and independent variables, and data analysis techniques.

Chapter 3: Research Method

Introduction

The purpose of this study was to examine relationships between sexual behaviors and practices and HIV prevalence over a period of time among males and females ages 15 to 19 years and 20 to 24 years in Zimbabwe. Studies on determinants of HIV prevalence among young people in Zimbabwe have been conducted on a smaller scale in targeted districts (Hallett et al., 2006; Marsh et al., 2011; & Mataure et al., 2002). However, in this current study, I reviewed and analyzed two national surveys conducted 5 years apart to provide an idea about this public health issue at a national level, which might also be relevant at regional levels.

In the first section of this chapter, I describe the research design and rationale and what secondary data analysis is. In the subsequent section, I describe the study methodology that includes the target population, sampling and sampling procedure, and instrumentation and operationalization of constructs. I finally provide information related to my data analysis plan and ethical procedures, as well as a summary of the chapter and transition to Chapter 4.

Research Design and Rationale

The outcome/dependent variable (DV) for this study was HIV serostatus (HIV positive or negative). The independent variables (IVs) for the study included marital status, educational status, wealth status, residence (urban vs. rural), age-disparate relationships, and sexual behaviors (age at sexual debut, lifetime number of sexual partners, multiple sexual partnerships in the last 12 months, condom use at last high risk sexual activity, and transactional sex).

Study Design

This study was quantitative, cross-sectional and retrospective in nature. I analyzed secondary data from ZDHS to test associations between the independent and dependent variables as well as strengths of the associations. *Secondary data analysis* is defined as using existing data previously collected by another individual or organization and includes survey data, statistics, and records (Long-Sutehall & Sque, 2010). Secondary data analysis was appropriate for this study because secondary data are primarily quantitative, and this study required large data sets to establish potential associations (McArt & McDougal, 2007). The benefits of using secondary data are that (a) researchers have access to large participant data samples that one cannot collect as an individual; generalizability of results is possible because one can obtain a large sample with data on groups of individuals that could not otherwise be accessed in a homogenous population; and, ethically, it is appropriate because it reduces the burden on participants to be interviewed on areas where data have already been collected (McArt & McDougal, 2007). However, one challenge of using secondary data analysis is that the data set of interest may have limitations or missing data that make it unusable for the secondary analysis (Koziol & Arthur, n.d.). Generally, secondary data analysis is increasingly being used in public health research owing to greater availability and accessibility of secondary data bases through computer technology, which can allow researchers conduct studies across countries, and this method is more attractive to donors as it is cost efficient (McArt & McDougal, 2007).

I therefore analyzed data sets from the 2005/06 and 2010/ZDHS in this study. Demographic Health Survey is a cross-sectional, multistage, stratified nationally-representative household survey designed to obtain and provide data for a wide range of monitoring and impact indicators in the areas of population, health, and nutrition (ICF International, 2016). The Zimbabwe surveys were based on nationally representative probability sample that covered the entire country and women age 15 to 49 years and adult men 15 to 54 years were interviewed using standard questionnaires. The surveys collected various information including sexual behaviors, socioeconomic and demographic information and conducted HIV testing to determine HIV prevalence at household level. The data from the two surveys were therefore pooled into one data file system for analysis.

Time and Resource Constraints

In this study, 1 analyzed secondary data from existing two national surveys hence time and resources were not be a major constraint. The advantage of secondary data analysis is that it saves time especially with the recent technology where data is stored electronically and one downloads the data while sitting at their place of convenience although the process of getting approval from the authors of original survey may take time and delay the process of data analysis (McArt & McDougal, 2007). However, in this study, I did not face such delays since application for DHS survey was done electronically and the DHS protocol allows students to use the data for secondary analysis (ICF International, 2016). In addition, since the data was collected by others, there were virtually no costs incurred in data collection hence did not require huge resources to be conducted (Koziol, & Arthur, n.d.). Therefore time and resource were not constraints for this study.

Methodology

Population

The target population for the two ZDHS included all women ages 15 to 49 years and all men ages 15 to 54 years who were either permanent residents of the selected households or visitors who stayed in the household the night before the survey in all the provinces of Zimbabwe (ZIMSTAT & Macro International, 2012). For this study, the study population was defined as all female and male adolescents' ages 15 to 19 years and young people 20 to 24 years included in the 2005/06 and 2010/11 ZDHS who accepted to be tested for HIV.

Sampling and Sampling Procedure

The sampling frame used for the two ZDHS was the Zimbabwe 2002 Population Census. Administratively, there are eight provinces and two cities in Zimbabwe and each province is divided into districts and each district into smaller administrative units called wards. During the 2002 Population Census, each of the wards was subdivided into enumeration areas (EAs). With the exception of the two cities of Harare and Bulawayo, each of the other eight provinces was stratified into four strata in both surveys providing a total of 34 strata.

The sampling procedure for the two ZDHS was stratified, two-stage cluster design. The first stage included enumeration areas (EAs) where 1,200 EAs were selected with probability proportional to size (PPS), the size being the number of households enumerated in the 2002 census. The selection of the EAs was a systematic, one-stage operation carried out independently for each of the 34 strata. The 1,200 EAs were divided into three replicates of 400 EAs each and one of the replicates consisting of 400 EAs were used for the 2005/06 ZDHS while 406 EAs (169 in urban areas and 237 in rural areas) were selected in 2010/11 ZDHS.

In the second stage, a complete listing of households and mapping exercise was carried out for each of the selected EAs. The survey used list of households as the frame for the second stage random selection of households. The listing excluded institutional living Facilities (e.g., army barracks, hospitals, police camps, and boarding schools). Representative probability samples of 10,800 and 10,828 households were therefore selected for the 2005/06 and 2010/11 ZDHS respectively. All women age 15 to 49 years and all men age 15 to 54 years, either permanent residents of the households or visitors in both surveys were eligible to be interviewed. Interviewers made an explanation of the survey to participants before interviews and only those who consented to be interviewed were included in the survey while those who did not agree were not interviewed.

However, due to non-availability of respondents in selected household, the final number of households successfully interviewed were 9,285 (95% response rate) and 9,756 (96% response rate) in the 2005/06 and 2010/11 ZDHS respectively (CSO & Macro International Inc, 2007; ZIMSTAT & ICF International, 2012). A total of 8,907 females (90% response rate) and 7,175 males (82% Response rate) were interviewed in 2005/06 ZDHS while 9,171females (response rate 93%) and 7,480 males (86% response rate) were interviewed in the 2010/11 survey.

Of the total females interviewed, 24% (2,152) and 21% (1,945) were ages 15 to 19 years and 22% (1,952) and 20% (1,841) were 20 to 24 years in 2005/06 and 2010/11 ZDHS respectively. For the males interviewed, 27% (1,899) and 24% (1,735) were ages 15 to 19 years while 20% (1,459) and 19% (1,372) were 20 to 24 years in 2005/06 and 2010/11 ZDHS respectively. Of all people that were interviewed, HIV test results were obtained for 70% (76% females, 63% males) in 2005/06 survey and 75% (80% female & 69% males) in 2010/11 survey. Testing rates among those ages 15 to 19 years was 77% for females and 71% males while for 20 to 24 years was 75% females and 63% males in the 2005/06. In the 2010/11 survey, 79% females and 73% males ages 15 to 19 years and 80% females and 70% males ages 20 to 24 years were tested for HIV.

Sampling and Sampling Procedure for Current Study

For this current study, the sampling frame was the list of all young people ages 15 to 24 years who participated in the two national surveys. In the sample, I included all the participants who met the inclusion criteria as described in this study since all the data were available and could easily be analyzed. Inclusion of all eligible participants increased representativeness of the survey results which could be generalized at country level.

Inclusion and Exclusion Criteria for This Current Study.

In line with the purpose of this study, I considered only a subsample of adolescents and young adults ages 15 to 24 years. The inclusion criteria was adolescents and young adults 15 to 24 years of age, both males and females who were tested for HIV and had an HIV result, residing in both urban and rural areas who participated in ZDHS 2005/06 and ZDHS 2010/11. I selected this group because literature shows that those 15 to 24 years are at high risk of HIV infection and engage in high risk sexual behaviors (Hargreaves, et al., 2012). I included only those who accepted HIV testing since the study aimed to associate the HIV serostatus and determinants at individual level. I restricted the analysis to individuals for whom full data were available on a set of variables relevant to this study (sex, age, urban/rural residence, educational attainment, household asset-wealth, a number of characteristics of sexual behaviors and HIV test results). Therefore, after application the inclusion and exclusion criteria, total of adolescents 3,374 and 2,766 young adults in the 2005/06 survey, and 3,121 adolescents and 2,667 young adults in the 2010/11 survey who were interviewed had an HIV test done were eligible for inclusion in the current study.

Sample Size Calculation and Power Analysis

Computing the accurate sample size involves three values which have to be determined and these include (a) statistical power: the probability that a given statistical test will detect the actual relationship or difference between variables and has an acceptable value power of 80%, (b) alpha: the probability of making the wrong decision when null hypothesis is true predetermined by researchers and use conventional values of

$\alpha = .05$ or $\alpha = .01$ meaning there is only a 5% chance of arriving at the wrong conclusion and has two types error including Type I error which is supporting the alternate hypothesis when the null hypothesis is true and Type II error which is not supporting the alternate hypothesis when the alternate hypothesis is true, and (c) effect size: gives an indication of how strong a relationship is and is calculated by mean difference/standard deviation and Cohen's *d* is one measure of effect size which is based on the *t* statistic (Faul et al., 2007; Trochim, 2006). After application of the inclusion and exclusion criteria, the sample size for this dissertation research study was 11,928 adolescents and young adults, of which 6,216 were females and 5,712 were males from the two surveys. Considering all the samples of 15 to 24 year olds eligible for this study, minimum power of 0.80 and significance level α set at 0.05, an effect size of .032 was used for this study.

Permission to Access Data

Demographic Health Survey data sets are stored by The DHS survey program which is managed by ICF International with support from USAID. To access the ZDHS data sets, I sent a request through online registration for access to data base to the MEASURE DHS who granted permission through email to access and download the data sets for the two surveys. Once data was accessible, I abstracted individual data for all eligible participants and pooled the data in one file from both surveys.

Instrumentation and Operationalization of Constructs

Data for the two surveys was collected using three questionnaires which were adapted from model survey instruments developed for the MEASURE DHS project to reflect population and health issues relevant to Zimbabwe. These included the Household

Questionnaire, the Woman's Questionnaire, and the Man's Questionnaire. Paper based questionnaires were used to collect data for the 2005/06 survey while personal digital assistants (PDAs) were used to record responses during interviews in the 2010/11 survey. The PDAs were equipped with Bluetooth technology to enable remote electronic transfer of files (e.g., transfer of assignment sheets from team supervisors to interviewers and transfer of completed questionnaires from interviewers to supervisors). The PDA data collection system was developed by the MEASURE DHS project using the mobile version of CSPro software which was developed jointly by the U.S. Census Bureau, the MEASURE DHS project, and Serpro S.A (ZIMSTAT & Macro International, 2012).

Household Questionnaire. The Household Questionnaire was used to list all of the usual members and visitors of selected households and the data on age and sex obtained in the Household Questionnaire were used to identify females and males eligible for the individual interviews. Basic information was collected on the characteristics of each person listed, including age, sex, education, and relationship to the head of the household. In this current study, I employed household questionnaire to provide information on the variables relevant to the study including residence (rural versus urban), and household assets (household assets may provide data relative to socioeconomic status of the household measured in wealth quintiles).

Woman's Questionnaire. The Woman's Questionnaire was used to collect information from all women ages 15 to 49 years. The questions asked included the following topics: Background characteristics (age, education etc.); birth history and childhood mortality; knowledge and use of family planning methods; fertility preferences; antenatal, delivery, and postnatal care; breastfeeding and infant feeding practices; vaccinations and childhood illnesses; marriage and sexual activity; women's work and husbands' background characteristics; malaria prevention and treatment; awareness and behavior regarding AIDS and other sexually transmitted infections (STIs); adult mortality, including maternal mortality; and domestic violence. In this current study I employed the woman's questionnaire to provide information on the age, education status, sexual practices variables including age a sexual debut, number of lifetime partners, multiple sexual partners, condom use during last sex and paid sex.

The Man's Questionnaire. The Man's Questionnaire collected much of the same information found in the Woman's Questionnaire but was shorter because it did not contain a detailed reproductive history. The men's questionnaire provided information on a number of variables which included male circumcision, sexual behavior, religious affiliation, marital status, employment status, knowledge of HIV transmission and prevention, HIV/AIDS stigmatization, HIV serostatus, perception of HIV risk of infection, attitudes about HIV/AIDS, use of tobacco, alcohol use, and cultural beliefs. I employed man's questionnaire in the current study to provide information on age, education status, sexual practices variables including age a sexual debut, number of lifetime partners, age of sex partner, multiple sexual partners, condom use and transactional sex.

Anthropometry, Anemia Testing and HIV Testing. The two ZDHS incorporated two "biomarkers" of anemia testing, and HIV testing while the 2010/11 survey included a third biomarker on anthropometry. The protocol for anemia testing and for blood specimen collection for HIV testing was reviewed and approved by the Medical Research Council of Zimbabwe (MRCZ), the Institutional Review Board of ICF Macro (now ICF International), and the CDC.

For anthropometry**,** height and weight measurements were recorded for children age 0 to 59 months, females ages 15 to 49 years, and males ages 15 to 54 years in all the selected households. For anemia testing, blood specimens for anemia testing were collected from all children ages 6 to 59 months, females ages 15 to 49 years, and males ages 15 to 54 years who voluntarily provided written consent to be tested. Hemoglobin analysis was carried out on site using a battery-operated portable HemoCue analyzer and results were provided verbally and in writing. Parents of children and pregnant women with a hemoglobin level under 7 g/dl and other females and males with hemoglobin levels were below 9 g/dl were referred for follow-up care.

HIV Testing. Blood specimens for laboratory testing of HIV from all females ages 15 to 49 years and males ages 15 to 54 years who provided written consent to be tested. The protocol for blood specimen collection and analysis was based on the anonymous linked protocol developed for MEASURE DHS which allows for merging of HIV test results with the sociodemographic data collected in the individual questionnaires after removal of all information that could potentially identify an individual. Blood samples were collected after the interviewers had explained the procedure, confidentiality issues, and the fact that results would not be made available to respondents and after respondent consented to HIV testing. Dry blood sample (DBS) filter papers were used to collect the blood samples and a barcode label unique to the respondent was affixed while a duplicate label was attached to the Biomarker Data Collection Form, and a third copy of the same barcode was affixed to the Blood Sample Transmittal Form to track the blood samples from the field to the laboratory.

Each DBS sample was dried overnight and packaged for storage the following morning. All collected DBS samples and questionnaires were periodically transported to ZCSO (2005/06 survey) and ZIMSTAT (2010/11 survey) in Harare where they were logged in, checked, and transported to the National Microbiology Reference Laboratory (NMRL) for testing. Upon arrival in NMRL, the DBS samples were assigned laboratory numbers, logged into the CSPro HIV Test Tracking System (CHTTS) database, and then stored at -20oC until tested. Based on the approved algorithm, for the 2005/06 survey all samples were tested on the first assay test, an enzyme-linked immunosorbent assay (ELISA), Vironostika HIV Uni-Form II Plus O, bioMerieux. A negative result was considered negative. All positives were subjected to a second ELISA test by AniLab Systems, Finland, compatible with ELISYS 2 (a fully automated ELISA analyzer manufactured by Human of Germany). Positive samples on the second test were considered positive. If the first and second tests were discrepant, the sample was retested with tests 1 and 2. If on repeat of tests 1 and 2 both were negative, the sample was rendered negative. If both were positive, the sample was rendered positive. If there was still a discrepancy in the results after repeating tests 1 and 2, a third confirmatory test, Genetic Systems New LAV Blot I (a Western Blot by Bio-Rad France), was administered. The final result was rendered positive if the tests showed inconsistent results on the repeat ELISAs. The final result was also rendered positive if the Western

Blot confirmed the result to be positive, and rendered negative if the Western Blot confirmed it to be negative. If the results were still discordant, the sample was rendered indeterminate.

For the 2010/11 survey, all samples were subjected to the first assay test, an enzyme-linked immunosorbent assay (ELISA), the Ani Labsystems HIV EIA. A negative result was considered negative. All samples with positive results were subjected to a second ELISA, the Vironostika HIV Uni-Form II Plus O (Biomerieux). Positive samples on the second test were considered positive. If the first and second tests were discordant, a third confirmatory test, the HIV 2.2 western blot (DiaSorin), was administered. The final result was considered positive if the western blot confirmed it to be positive and negative if the western blot confirmed it to be negative. If the western blot results were indeterminate, the sample was considered indeterminate. Each household, whether individuals consented to HIV testing or not, was given an informational brochure on HIV/AIDS and a list of fixed sites providing voluntary counselling and testing services in surrounding districts within the province. The HIV testing protocol stipulated that blood could be tested only after questionnaire data collection had been completed, data had been verified and cleaned, and all unique identifiers other than the anonymous barcode number had been removed from the data file. I employed the HIV testing biomarker in the current study to provide information on HIV serostatus of the selected sample participants.

Validity and Reliability of the Instruments

Validity and reliability were ensured in the Measure DHS questionnaires used in the 2005/06 and 2010/11 ZDHS. Reliability is the degree to which an assessment tool produces stable and consistent answers regardless of who asks the question, when, and where (Creswell, 2009; Measure DHS, 2006). On the other hand validity in data collection means that study findings truly represent the phenomenon one claims to measure, and that question asked would elicit a true and accurate response of the desired measure (Measure DHS, 2009). In the two ZDHS's, translation of the questionnaires into the major local languages of Zimbabwe (i.e., Shona, Ndebele, and English) in which interviews conducted, and pre-testing of the tools prior to administration was done to ensure validity and reliability. The utilization of translated questionnaires minimized errors that could easily arise when interviewers attempted to translate of questions (Measure DHS, 2006).

Field Work

Fourteen and fifteen thoroughly trained teams of interviewers conducted data collection for the 2005/06 and 2010/11 ZDHS respectively. Each team comprised a team leader, a field editor, three to four female interviewers, two to three male interviewers, and a transportation driver. Three of the interviewers on each team also served as biomarker technicians. Fieldwork activities were coordinated and supervised by nine senior staff members from the ZCSO and ZIMSTAT foe the 2005/06 and 2010/11 surveys respectively. Data collection was done over a period of six months for both surveys.

Measurements for Variables

The ZDHS survey codebook was used to identify and score both independent and dependent variables for this study.

Dependent Variable

HIV Serostatus: In both ZDHS's, they obtained HIV Serostatus (dependent variable) through blood testing for HIV and HIV positive and HIV negative results were coded 1 and 0, respectively.

Independent Variables

Age: Age as identified in the 2005/06 and 2010/11 ZDHS was stratified into seven 5 year age bands as follows: 15 to 19 years; 20 to 24 years; 25 to 29 years; 30 to 34 years; 35 to 39 years; 40 to 44 years; and 45 to 49 years. This information was obtained by asking the question on how old were you at last birthday? For this study, data for the first two age bands of 15 to 19 years and 20 to 24 years was included in the analysis.

Age disparate relationships: This information was obtained by asking age of sexual partner

Age at sexual debut: This information was obtained by asking the question "How old were you when you had sexual intercourse for the very first time?"

Condom use at last sex: Information on condom use was obtained by asking condom use during the last time one had sexual intercourse (with this second/third person), and was categorized *yes* =1; *no* = 2.

Educational status: Educational status was categorized in two categories of ever attended school: *yes* = 1; *no* = 2 and highest level of school attended: *primary* = 1; *secondary*= 2; *higher* = 3

Marital status*:* Marital status was categorized into three areas as follows:

Not in union = 1, *currently married=2, formerly in marriage (Divorced, widowed, separated)* = 3.

Multiple sexual partnerships in the last 12 months: The assessment for multiple sex partners was done using the responses from the question: “In total, with how many people have you had sexual intercourse in the last 12 months?”

Number of lifetime sexual partners: Was obtained by asking with how many people one had sexual intercourse in their lifetime?

Residence. Residence was categorized as *urban* = 1 and *rural* = 0.

Risky Sexual Behaviors. Risky sexual behavior in the two ZDHS’s was determined by including questions on condom use during the last sex, Number of sexual partners one had in last 12 months (Multiple sex partners), paid sex, in both ZDHS questionnaires.

Wealth quintile: wealth quintile was categorized as l*owest* = 1, *second* = 2, *middle* = 3, *forth* = 4, and *highest* = 5.

Data Analysis Plan

I conducted data analysis for this study using Statistical Package for the Social Science (SPSS) version 21.0. SPSS is a comprehensive system for analyzing data which is capable of analyzing data to generate tabulated reports, charts, and plots of distributions and trends, descriptive statistics, and complex statistical analysis (Green & Salkind, 2014).

Research Questions and Hypotheses

This study was based on three main research questions, each of which generates related hypotheses:

1. What is the association between sexual behaviors and practices and HIV serostatus in males and females ages 15 to 19 and 20 to 24 years at two different points in time in Zimbabwe?

H_{01}: There is no statistically significant association between sexual behaviors and practices and HIV serostatus in males and females ages 15 to 19 and 20 to 24 years at two different points in time in Zimbabwe.

H_{a1}: There is a statistically significant association between sexual behaviors and practices and HIV serostatus in males and females ages 15 to 19 and 20 to 24 years at two different points in time in Zimbabwe.

2. What is the relationship between socio-demographic determinants and HIV serostatus among young males and females ages 15 to 19 and 20 to 24 years in Zimbabwe at two different points in time?

H_{02}: There is no statistically significant relationship between socio-demographic determinants and HIV serostatus among young males and females ages 15 to 19 and 20 to 24 years in Zimbabwe at two different points in time.

H_{a2}: There is a statistically significant relationship between socio-demographic determinants and HIV serostatus among young males and females ages 15 to 19 and 20 to 24 years in Zimbabwe at two different points in time.

3. What is the association between socioeconomic determinants and HIV-sero status among young males and females ages 15 to 19 and 20 to 24 years in Zimbabwe at two different points in time?

H_{03}: There is no statistically significant association between socioeconomic determinants and HIV- sero status among young males and females ages 15 to 19 and 20 to 24 years in Zimbabwe at two different points in time.

H_{a3}: There is a statistically significant association between socioeconomic determinants and HIV- sero status among young males and females ages 15 to 19 and 20 to 24 years in Zimbabwe at two different points in time.

Statistical Analyses

I used descriptive statistics to describe characteristics of the study sample. The descriptive analysis included frequency tabulations with number and percentages of participants who responded in each category. I used bivariate chi-square and binary logistic regression model to test and examine any associations between and among the various sexual practices, sociodemographic and socioeconomic independent variables on HIV serostatus respectively. Logistic regression analysis is used to determine the association between a dependent variable and one or more independent variables and is used to study situations with categorical outcome variable which should be dichotomous (Green & Salkind, 2014).

The logistic regression analysis was selected because it allowed estimations of equations for both continuous and categorical explanatory variables in one model (Green & Salkind, 2014). In addition, bivariate analyses was used in determining statistical significance of the associations (Green & Salkind, 2014). I tested the hypotheses of this study at 0.05 significance level.

Ethical Procedures

This study used data obtained from previously conducted surveys therefore issues of confidentiality and anonymity were not very relevant as these issues were already addressed by the primary data collectors. The protocol for anemia testing and for blood specimen collection for HIV testing was reviewed and approved by the Medical Research Council of Zimbabwe (MRCZ), the Institutional Review Board of ICF International, and the CDC. In both ZDHS's it was reported that only those who consented to be interviewed were included in the survey and HIV testing was also done to only those that consented to HIV testing after the researchers explained the procedures. The interviewers also explained the option of DBS storage for use in additional testing. Further explanation was provided to respondents that they would not be given the test results and information on where to get tested if they wanted to know their HIV status was provided. Whether or not the individuals consented to HIV testing, each household was given an information brochure on HIV/AIDS with a list of fixed sites providing voluntary counseling and testing (VCT) services.

The removal of personal identifier information when blood samples were sent to the laboratory also ensured protection of the participants. In addition, although ethical concerns were minimal for this study, I submitted the proposal to the Walden Institutional Review Board for approval before proceeding with data analysis. I used the obtained data sets for the sole purpose the authorization was requested and granted for.

Dissemination of Findings

I will share the findings from this study with the MEASURE DHS Project as agreed during the time of request for the data. I will also share the study results during the Walden student research symposium, and the via scientific journal publications. I will also submit the results for publication in other HIV/AIDS or public health journals. I will also share the results to the Zimbabwe programmers and policy makers during meetings and for a where HIV issues are discussed and decisions made.

Summary and Transition

In this chapter I explained research design and approach, research questions and hypotheses and other issues related to secondary data analysis; study population; study sample, power analysis, data collection, data analysis, study variables, measurements of variables, ethical considerations, and dissemination of findings. Secondary analysis involves analysis of data collected by someone else. I conducted a secondary analysis of the 2005/06 and 2010/11 ZDHS data sets and analyzed data sets for those ages 15 to 24 years who had an HIV test during the surveys. Chapter 4 will discuss the data analysis and results of the study.

Chapter 4: Results

Introduction

The purpose of this quantitative study was to examine relationship between sexual behaviors and practices and HIV prevalence within a specified period among males and females ages 15 to 24 years in Zimbabwe. I obtained the secondary data used to examine the associations between the factors and HIV outcome from two ZDHSs for the years 2005/06 and 2010/11(ZIMSTAT & ICF International, 2012; CSO & Macro International Inc., 2007; & MoHCC, 2015). I analyzed the collected data using statistical techniques and SPSS v.21.0 to determine their associations or relationships to HIV test results among young people in Zimbabwe and the results are included in this chapter.

I performed a series of chi-square tests of association and simple binary logistic regression tests to address the hypotheses and RQs. Following the tests, I conducted a binary logistic regression analysis, including all independent variables, to determine which variables were significant in determining the relationship between the sociodemographic, sexual, and socioeconomic risk factors and HIV status of young people in Zimbabwe.

Research Questions and Hypotheses

RQ1: What is the association between sexual behaviors and practices and HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe?

H_{01}: There is no statistically significant association between sexual behaviors and practices and HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe.

H_{a1}: There is a statistically significant association between sexual behaviors and practices and HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe.

RQ2: What is the relationship between socio-demographic determinants and HIV serostatus among young males and females ages 15 to 24 years in Zimbabwe at two different points in time?

H_{02}: There is no statistically significant relationship between socio-demographic determinants and HIV serostatus among young males and females ages 15 to 24 years in Zimbabwe at two different points in time.

H_{a2}: There is a statistically significant relationship between socio-demographic determinants and HIV serostatus among young males and females ages 15 to 24 years in Zimbabwe at two different points in time.

RQ3: What is the association between socioeconomic determinants and HIV-serostatus among young males and females ages 15 to 24 years in Zimbabwe at two different points in time?

H_{03}: There is no statistically significant association between socioeconomic determinants and HIV- serostatus among young males and females ages 15 to 24 years in Zimbabwe at two different points in time.

*H*a3: There is a statistically significant association between socioeconomic determinants and HIV- serostatus among young males and females ages 15 to 24 years in Zimbabwe at two different points in time.

in this chapter 1 begin with a presentation of the data collection procedure, descriptive statistics (frequencies, percentages) for the sample demographic characteristics and frequencies, percentages, and means for the major variables including the following independent variables: Sociodemographic, sexual behaviors (*Age at sexual debut, Lifetime number of sexual partners, Multiple sexual partnerships in the last 12 months, Condom use at last sexual activity, and Transactional sex (paying for sex) for young men*), Socioeconomic (*Wealth quintile*) and the dependent variable (HIV serostatus). I also present Chi-square tests, and binary logistic regression performed to test the hypotheses derived from the research question. The chapter concludes with a discussion of the findings, the analyses performed, and transition into the final chapter.

Data Collection

I conducted data abstraction from Zimbabwe DHS for 2005/06 and 2010/11 files accessed from DHS website in SPSS file format. I abstracted data from three files that contained information from the male questionnaire, the female questionnaire and the HIV test result file. I merged the three files from the two surveys to allow for data analysis and merged files contained all variables from the survey. The next step was to identify the variables of interest for this study and the final merged files by the two age groups of 15 to 19 years and 20 to 24 years contained only data for the variables under study. I conducted data cleaning to ensure inclusion of data sets that met the inclusion criteria.

The total number of young people that participated in the two ZDH surveys was 14,463 of which 7,870 were females and 6,593 were males. Out of those who participated in the survey, 11,928 (82.5%) met the inclusion criteria of which 5,712 (47.9%) were males and 6,216 (52.1%) were females and the data from these participants was analyzed to inform the study results. During data analysis, I noted that one sexual practice variable, age of sexual partner had data for only males in 2005 and there were no data for the rest of the years or other age groups for male and female. As such, I dropped the variable from analysis as the results would not contribute to answering the research question.

Results

All analyses in this study were limited to women and men who were tested for HIV as part of the ZDHS. All data presented were weighted using HIV weights in order to adjust for the sample design and differences in response rates to the ZDHS interview and the HIV testing component.

Univariate Analysis

Sexual behaviors and practices. Sexual behaviors and practices comprised five variables: age at first sex, total number of lifetime sex partners, multiple sexual partners in the last 12 months, condom use during last sex, and transactional sex for men. Table 1 present frequencies of total sample by age at first sex. A total of 11,816 (99.1%) respondents responded to the question on age at first sex and for the two collection periods combined 5,547 (46.9%) never had sex, 513 (4.3%) had first sex below age of 14 years, 1,684 (14.3%) had first sex between 15 to 16 years of age, 2,992 (25.3%) had first sex between 17 and 19 years while 1,080 (9.1%) had first sex between ages 20 to 24 years.

Table 1

Age at Sexual Debut

Age at first sex	Male		Female	
	Frequency	%	Frequency	%
	Year 2005/06			
Not had sex	1,391	52.0	1,471	42.8
≤14	109	4.1	178	5.2
15-16	360	13.4	483	14.0
17-19	567	21.2	948	27.6
20-24	241	9.0	279	8.1
	Year 2010/11			
Not had sex	1,359	53.4	1,326	40.5
≤14	102	4.0	124	3.8
15-16	278	10.9	563	17.2
17-19	537	21.1	940	28.7
20-24	260	10.2	300	9.2

For the variable of total number of lifetime sex partners, 11,895 participants responded to the question and for the two collection periods combined 5,549 (46.6%) never had sex, 3,593 (30.2%) had sex with one partner in their life time, 1.218 (10.2%) had sex with two partners in their lifetime, 641 (5.4%) had sex with three partners in their life time and 894 (7.5%) had sex with four or more partners in their lifetime. Table 2 presents frequency table for number of lifetime partners by year of survey and gender.

Table 2

Number of Sex Partners in Lifetime

Number of partners	Male		Female	
	Frequency	%	Frequency	%
	Year 2005/06			
0	1,391	52.0	1,473	42.8
1	378	14.1	1,415	41.1
2	255	9.5	377	11.0
3	230	8.6	111	3.2
4	416	15.5	61	1.8
	Year 2010/11			
0	1,359	53.4	1,326	40.5
1	363	14.3	1,437	43.9
2	255	10.0	331	10.1
3	194	7.6	106	3.2
4	348	13.7	69	2.1

For the variable of sex with multiple partners in the last 12 months, 11,888 respondents provided answers. A total sample of 6,553 (55.1%) for the two collection periods combined did not have sex in the past 12 months, 4,876 (41.0%) had one sexual partner while 459 (3.9%) had two or more sexual partners in the last 12 months of the surveys (see Table 3).

Table 3

Multiple Sexual Partners in the Last 12 Months

Number of sexual partners	Male		Female	
	Frequency	%	Frequency	%
		Year 2005/06		
0	1,729	64.6	1,714	49.8
1	751	28.1	1,690	49.1
2+	195	7.3	34	1.0
		Year 2010/11		
0	1,586	62.3	1,524	46.5
1	764	30.0	1,671	51.0
2+	186	7.3	44	1.3

A total sample of 5,366 participants responded to the question on condom use during last sex as presented in table 4. A total of 3,978 (74.6%) for the two collection periods combined did not use a condom the last time they had sex while 1,358 (25.4%) reported using a condom the last time they had sex.

Table 4

Condom use with Last Sexual Partner

Condom used	Male		Female	
	Frequency	%	Frequency	%
		Year 2005/06		
No	438	46.3	1,582	91.7
Yes	509	53.7	143	8.3
		Year 2010/11		
No	451	47.5	1,507	87.9
Yes	499	52.5	207	12.1

A total sample of 2,454 males responded to the question on having paid for sex (Transactional sex) in the last 12 months. Table 5 presents frequency table on paid sex in the last 12 months by age category and year. In total, for the two collection periods combined, 2,319 (94.5%) male respondents did not pay for sex while 135 (5.5%) paid for sex in the last 12 months of the survey.

Table 5

Transactional sex for Males

Paid for sex	Male 15 – 19 years		Male 20 – 24 years	
	Frequency	%	Frequency	%
	Year 2005/06			
No	418	97.0	779	93.3
Yes	13	3.0	56	6.7
	Year 2010/11			
No	350	94.9	772	94.3
Yes	19	5.1	47	5.7

Sociodemographic determinants. Sociodemographic determinants comprised five variables: gender, marital status, place of residence, level of education, and religion. Table 6 presents the frequency table for participants by gender with the samples comprising 6,117 participants from the 2005/06 and 5,821 participants from the 2010/11 surveys.

Table 6

Gender

Gender	Frequency	%
	Year 2005/06	
Male	2,677	43.8
Female	3,440	56.2
Total	6,117	100.0
	Year 2010/11	
Male	2,546	43.7
Female	3,275	56.3
Total	5,821	100.0

Marital status was categorized as never married, currently in union (includes those married and living together) formerly in union (includes those widowed, divorced and not living together). Table 7 presents frequency table of a sample of 8,062 (65%) for the two collection periods combined who were never married, 3,360 (28.1%) who were in union and 516 (4.3%) who were formerly in union.

Table 7

Marital Status

Marital status	Male		Female	
	Frequency	%	Frequency	%
		Year 2005/06		
Never married	2,410	90.0	1,814	67.8
Currently in union	228	8.5	1,390	51.9
Formerly in union	38	1.4	237	8.9
		Year 2010/11		
Never married	2,209	86.8	1,629	64.0
Currently in union	300	11.8	1,442	56.6
Formerly in union	37	1.5	204	8.0

Place of residence was categorized as living in urban or rural areas. A total of 4,261 (47.7%) participants for the two collection periods combined lived in urban areas, and 7,677 (64.3%) participants lived in rural areas of Zimbabwe (see Table 8).

Table 8

Place of Residence

Residence	Male		Female	
	Frequency	%	Frequency	%
	Year 2005/06			
Urban	948	35.4	1,305	37.9
Rural	1,729	64.6	2,135	62.1
	Year 2010/11			
Urban	778	30.6	1,230	37.6
Rural	1,768	69.4	2,045	62.4

Education status was categorized as no education, primary, secondary, or higher. For the sample, 2,952 (24.7%) participants for the two collection periods combined had primary or less education, 8,724 (73.1%) had secondary education and 265 (2.2%) had higher education (see Table 9).

Table 9

Education Status

Education level	Male		Female	
	Frequency	%	Frequency	%
	Year 2005/06			
Primary or less	701	26.2	938	27.3
Secondary	1,910	71.3	2,459	71.5
Higher	67	2.5	44	1.3
	Year 2010/11			
Primary or less	582	22.9	731	22.3
Secondary	1,899	74.6	2,456	75.0
Higher	67	2.6	87	2.7

Religion was categorized as traditional, Roman Catholic, Protestants, Pentecostal, other Christians, Muslims and none. Of the total 11,935 respondents, for the two collection periods combined, Apostolic were 3,679 (30.8%) Protestants 2,415 (20.2%), Pentecostal 2,178 (18.2%), no religion 1,466 (12.3%), Roman Catholics 1,136 (9.5%) while 314 (2.6%) were traditional and Muslims (See Table 10).

Table 10

Religion

Religion	Male		Female	
	Frequency	%	Frequency	%
	Year 2005/06			
Roman Catholic	248	9.3	358	10.4
Protestant	557	20.8	892	25.9
Pentecostal	386	14.4	646	18.8
Apostolic	643	24.0	1,049	30.5
Other Christian	101	3.8	170	4.9
None	595	22.2	241	7.0
Traditional/Muslims	145	5.4	84	2.4
	Year 2010/11			
Roma Catholic	246	9.7	284	8.7
Protestant	414	16.3	552	16.9
Pentecostal	391	15.4	755	23.1
Apostolic	786	30.9	1,201	36.7
Other Christian	207	8.1	269	8.2
None	445	17.5	185	5.6
Traditional/Muslims	55	2.2	30	0.9

Socioeconomic status. Social economic status was categorized as five wealth quintiles namely poorest, poorer, middle, richer and richest. Table 11 presents frequency of the total of 1,889 (15.8%) who belonged to the poorest category, 2,140 (17.9%) belonged to poorer category, 2,447 (20.5%) belonged to the middle category, 2,675 (22.4%) belonged to the richer and 2,789 (23.4%) belonged to the richest category for the two collection periods combined.

Table 11

Socioeconomic Status

	Male		Female	
Wealth Quintile	Frequency	%	Frequency	%
	Year 2005/06			
Poorest	405	15.1	591	17.2
Poorer	453	16.9	603	17.5
Middle	597	22.3	641	18.6
Richer	645	24.1	739	21.5
Richest	575	21.5	867	25.2
	Year 2010/11			
Poorest	359	14.1	534	16.3
Poorer	500	19.6	584	17.8
Middle	572	22.5	637	19.5
Richer	594	23.3	697	21.3
Richest	525	20.6	822	25.1

HIV serostatus. On the DV HIV serostatus, 11,928 respondents consented to HIV testing and had their HIV test results. Table 12 presents frequency table of respondents by gender who were tested for HIV and their test results. In total, for the two collection periods combined, 5,712 (47.9%) males and 6,216 (52.1%) females were tested. Out of these 224 (3.9%) males and 573 (9.2%) females tested HIV positive.

Table 12

HIV Serostatus by age and Gender

HIV Status	Male		Female	
	Frequency	%	Frequency	%
	Year 2005/06			
HIV Negative	2,814	95.7	2,848	89.0
HIV positive	125	4.3	352	11.0
Total	2,939	100.0	3,200	100.0
	Year 2010/11			
HIV Negative	2,674	96.4	2,796	92.7
HIV positive	99	3.6	220	7.3
Total	2,773	100.0	3,016	100.0

Bi Variate Analysis and Hypothesis Testing

I conducted a bivariate analysis using chi-square test and tested the hypotheses using binomial logistic regression to examine the three research questions and hypotheses. All variables of interest were included in the bivariate analysis to enable comparison of risk factors for being HIV-positive between data from the 2005/06 ZDHS versus the 2010/11 ZDHS. Separate logistic regression models for men and women and disaggregated by age group (i.e. 15-19 years and 20-24 years) were used to calculate adjusted odds ratios and their 95% confidence intervals (CI) for factors associated with being HIV-positive. Enter method was used for the analysis and separate model were generated for males and females by age categories 15 to 19 years and 20 to 24 years for each of the two survey years. This section presents the results of the hypothesis testing and bivariate analysis.

Hypothesis 1. The first hypothesis examined whether the five sexual behaviors (age at sexual debut, number of lifetime sexual partners, multiple sex partners in the last

12 months, condom use during last sex, and Transactional sex (paying for sex) for men) were significantly associated with HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe.

Bivariate analysis Age at sexual debut and HIV serostatus. To examine the association between age at sexual debut and HIV serostatus, I conducted a chi-square test between the two variables. Table 13 presents a summarized cross-tabulation table for age at sexual debut, proportion of participants that were HIV positive and chi-square test results. As observed, females who started having sex before the age of 14 years were more likely to be HIV positive in both survey years while for males, the highest prevalence was among those who started sex at the age of 15 to 16 years in 2005/06 and those that started sex between 17 to 19 years in the 2010/11 survey.

The results of the chi-square test of association between age at sexual debut and HIV serostatus showed that there was a statistically significant association between age at first sexual debut and HIV serostatus among males ages 20 to 24 years in 2005/06 χ^2 (5, *N* = 1,119) = 19.16, p .002.; among males 20 to 24 years in 2010/11 χ^2 (6, *N* = 1,426) = 14.34, *p* .03.; among females ages 15 to 19 years in 2005/06 χ^2 (5, *N* = 1,810) = 96.34, *p* <.001; among females 20 to 24 years in 2005/06 χ^2 (5, *N* = 1,629) = 35.33, *p* < .001; among females 15 to 19 years in 2010/11 χ^2 (5, *N* = 1,680) = 11.82, *p* .03; and among females ages 20 to 24 years in 2010/11 χ^2 (6, *N* = 1,595) = 33.07, *p* <.001). However, there was no statistically significant association between age at sexual debut and HIV serostatus among males ages 15 to 19 years in year 2005/06 χ^2 (3, *N* = 1,552) = 5.12, *p* .16; and in 2010/11 χ^2 (5, *N* = 1,432) = 3.42, *p* .64.

Table 13

Age at Sexual Debut and HIV Serostatus

	Male 15 – 19 yrs			Male 20 – 24 yrs			Female 15 – 19 yrs			Female 20 – 24 Yrs		
Age at sex debut	N	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV +	P value
						2005/10						
No sex	1,118	2.9%		273	1.4%		1,212	3.1%		259	5.9%	<.001
≤14	77	0.0%	.163	32	1.7%	.002	92	24.8%		86	28.3%	
15-16	201	4.8%		159	9.9%		217	7.3%	<.001	266	16.4%	
17-19	156	3.4%		411	7.8%		267	12.3%		681	19.7%	
20-24	0	0.0%		241	4.7%		0	0.0%		278	15.3%	
						2010/11						
No sex	1063	3.7%		296	2.2%		1092	3.2%		234	2.9%	<.001
≤14	55	2.5%	.635	47	0.0%	.026	67	8.6%		57	22.2%	
15-16	165	1.0%		113	4.2%		253	6.9%	.037	310	15.8%	
17-19	146	4.3%		391	6.0%		261	5.6%		679	10.3%	
20-24	0	0.0%		260	2.9%		0	0.0%		300	9.7%	

Bivariate analysis number of lifetime sexual partners and HIV serostatus. To examine the association between number of lifetime sexual partners and HIV serostatus, I conducted a chi-square test between the two variables. Table 14 presents a summarized cross-tabulation table for number of lifetime sexual partners and HIV serostatus and chi-square test results. The results of the chi-square test of association between number of lifetime sexual partners and HIV serostatus showed that there was a statistically significant relationship between number of lifetime sexual partners and HIV serostatus among young males ages 20 to 24 years in 2005/06 χ^2 (5, N = 1,680) = 11.82, p .03 and 2010/11 χ^2 (5, N = 1,680) = 11.82, p .03; and among females ages 15 to 19 years χ^2 (4, N = 1,813) = 127.99, p <.001 in 2005/06 and χ^2 (5, N = 1,680) = 36.68, p < .001 in

2010/11. However, there was no statistically significant relationship between number of lifetime sexual partners and HIV serostatus among males ages 15 to 19 years in both years 2005/06 χ^2 (5, N = 1,554) = 7.49, p .19 and 2010 χ^2 (5, N = 1,432) = 7.53, p .19.

Table 14

Number of Lifetime sexual partners and HIV Serostatus

	Male 15 – 19 yrs			Male 20 – 24 yrs			Female 15 – 19 yrs			Female 20 – 24 Yrs		
No. Sexual partner	N	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV +	P value
							2005/10					
1	183	5.4%	.186	195	3.3%	<.001	470	8.0%		945	13.5%	<.001
2	92	0.0%		163	6.4%		100	26.9%	<.001	277	26.1%	
3	66	4.1%		164	6.1%		22	27.4%		89	34.8%	
4	94	2.6%		322	10.2%		9	31.9%		52	34.4%	
Don't know	1	0.0%		4	0.0%		0	0.0%		4	72.5%	
							2010/11					
1	163	0.3%	.184	200	1.2%	<.001	486	5.2%		951	7.5%	<.001
2	92	3.5%		163	1.7%		72	8.4%	<.001	259	18.7%	
3	48	7.1%		146	3.9%		18	25.8%		88	24.6%	
4	61	3.5%		287	8.5%		10	21.3%		59	30.1%	
Don't know	5	0.0%		23	6.9%		2	0.0%		3	60.6%	

Bivariate analysis multiple sexual partners in the last 12 months and HIV serostatus. To examine the association between multiple sexual partners in the last 12 months and HIV serostatus, I conducted a chi-square test between the two variables. Table 15 presents a summarized cross-tabulation table for number of sexual partners in the last 12 months and HIV serostatus and chi-square test. The results of the chi-square test of association between number sexual partners in the last 12 months and HIV serostatus showed that there was a statistically significant relationship between number of sexual partners in the last 12 months and HIV serostatus among males ages 20 to 24 years in 2005/06 χ^2 (2, N = 1,123) = 10.69, p <.005 and 2010/11 χ^2 (3, N = 1,116) = 10.08, p

.01.; and among females ages 15 to 19 years in 2005/06 χ^2 (3, *N* = 1,812) = 65.12, *p* <.001 and in 2010/11 χ^2 (3, *N* = 1,681) = 24.05, *p* <.001 . A statistically significant relationship was also observed among females ages 20 to 24 years in 2005/06 χ^2 (3, *N* = 1,628) = 12.92, *p* <.005; in 2010/11 χ^2 (3, *N* = 1,596) = 20.80, *p* <.001. However, there was no statistically significant relationship between number of sexual partners in the last 12 months and HIV serostatus among males ages 15 to 19 years in both year 2005/06 χ^2 (3, *N* = 1,554) = .51, *p* .92 and 2010/11 χ^2 (3, *N* = 1,433) = 1.48, *p* .69.

Table 15

Multiple Sexual Partners and HIV Serostatus

	Male 15 – 19 yrs			Male 20 – 24 yrs			Female 15 – 19 yrs			Female 20 – 24 Yrs		
No. sex partners	N	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV +	P value
2005/10												
0	1,264	3.2%		465	2.9%		1,287	3.3%		427	13.3%	
1	242	2.6%	.918	509	7.7%	.005	507	12.6%	<.001	1,183	17.2%	.005
2+	46	1.9%		149	7.2%		17	22.9%		17	33.8%	
2010/11												
0	1,168	3.6%		418	1.5%		1,157	3.3%		367	8.2%	
1	220	2.3%	.686	544	5.2%	.011	494	6.0%	<.001	1,177	10.8%	<.001
2+	36	1.7%		150	5.7%		15	26.3%		29	33.7%	

Bivariate analysis condom use during last sex and HIV serostatus. To examine the association between condom use during last sex and HIV serostatus, I conducted a chi-square test between the two variables. Table 16 presents a summarized cross-tabulation table for condom use during last sex and HIV serostatus and chi-square test. The results of the chi-square test of association between condom use during last sex and HIV serostatus showed that there was a statistically significant association between condom use during last sex and HIV serostatus among males ages 20 to 24 years in 2005/06 χ^2 (1, N = 657) = 6.37, p .012 and females ages 20 to 24 years in 2010/11 χ^2 (1, N = 1,206) = 13.91, p <.001. There was no statistically significant association between condom use during last sex and HIV serostatus among males ages 15 to 19 years in both 2005/06 χ^2 (1, N = 290) = .77, p .38 and 2010/11 χ^2 (1, N = 547) = .13, p .72; among females ages 15 to 19 years in 2005/06 χ^2 (1, N = 525) = 1.74, p .19 and in 2010/11 χ^2 (1, N = 508) = .29, p .59; and among females 20 to 24 years in 2005/06 χ^2 (1, N = 1,200) = 1.86, p .17.

Table 16

Condom use During Last Sex and HIV Serostatus

	Male 15 – 19 yrs			Male 20 – 24 yrs			Female 15 – 19 yrs			Female 20 – 24 Yrs		
Condom used	N	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV +	P value
2005/10												
No	130	1.6%	.381	308	10.5%	.012	465	12.2%	.187	1,117	17.0%	.173
Yes	160	3.2%		349	5.1%		60	18.7%		83	23.2%	
2010/11												
No	104	1.9%	.719	347	6.3%	.240	446	6.3%	.593	1,068	10.1%	<.001
Yes	153	2.5%		346	4.3%		62	8.6%		138	20.6%	

Bivariate analysis transactional sex for males and HIV serostatus. To examine the association between paid sex and HIV serostatus among males, I conducted a chi-square test between the two variables. Table 17 presents a summarized cross-tabulation table for paid sex for males and HIV serostatus and chi-square test. The results of the chi-square test of association between paid sex and HIV serostatus showed that there was a statistically significant association between paid sex and HIV serostatus among males ages 20 to 24 years in 2010/11 χ^2 (1, N = 819) = 4.33, p .03. There was no statistically significant association between paid sex and HIV serostatus among males ages 15 to 19 years in 2005/06 and 2010/11, χ^2 (1, N = 800) = .99, p .32 and among males 20 to 24 years in 2005/06 χ^2 (1, N = 1,680) = 1.12, p .29.

Table 17

Paid Sex Among Men and HIV serostatus

	Male 15 – 19 yrs			Male 20 – 24 yrs		
Paid sex	N	% HIV+	P Value	Number	% HIV+	P Value
			2005/2006			
Yes	418	3.4%	.502	779	7.3%	.291
No	13	0.0%		56	3.7%	
			2010/11			
Yes	350	2.50%	.479	772	4.1%	.037
No	19	1.80%		47	10.3%	

Hypothesis 1 Testing

I conducted a logistic regression analysis to predict effects of age at first sex, number of lifetime sexual partners, number of sexual partners in the last 12 months, condom use at last sex and paid sex for men on the HIV serostatus of young people.

Statistically significant models were found for females ages 15 to 19 years in 2005/06, for females ages 20 to 24 years in 2005/06 and 2010/11; and for males 20 to 24 years in 2005/06 as seen in Tables 18, 19, 20 and 21. Therefore, there is evidence to reject the null hypothesis when predicting HIV serostatus and sexual practices as a total set of predictors among females ages 15 to 19 years in 2005/06; females ages 20 to 24 years in both 2005/06 and 2010/11 and males ages 20 to 24 years in 2005/06 and there is evidence to accept the null hypothesis when predicting HIV serostatus and sexual practices as a total set of predictors among females ages 15 to 19 years in 2010/11; and males ages 15 to 19 years in 2005/06 and 2010/11 and for males 20 to 24 years in 2010/11.

Table 18

Significant Sexual Practices Predictors of HIV Serostatus

Females	15-19		20-24	
Significant Predictors	2005	2010	2005	2010
Total Lifetime	2.54**			1.60**
Age first sex			1.02*	0.75*
Male				
Significant Predictors				
Condom use during last sex			2.16*	

** p<0.01 and * p<0.05

A statistically significant overall fit model was found $\chi^2(4) = 27.86$, $p < .001$ for females ages 15 to 19 years in 2005/06. The model explained 5.2% (Cox & Snell R^2) or 9.6% (Nagelkerke R^2) of the variance in HIV serostatus. As can be seen in table 19, HIV serostatus was statistically significantly predicted by number of lifetime sexual partners only and not the other sexual practices. The odds ratio for number of lifetime partners (Exp(B) = 2.54, 95% CI = [1.70, 3.78]) indicated that if the number of lifetime partners increased by one point among females ages 15 to 19 years in 2005/06, then odds of being HIV positive increased.

Table 19

2005/06 HIV Serostatus Predictors for Females 15 to 19 Years

	B (SE)	*95% CI for Odds Ratio*		
		Odds Ratio	Lower	Upper
Step 1				
Constant	-2.38** (.58)			
Age first sex	.18 (.16)	.83	.60	1.15
Total Lifetime	.93** (.20)	2.54	1.70	3.78
Sex partners	-.43 (.36)	.65	.33	1.32
Condom use	.25 (.39)	1.28	.60	2.75

Note. R^2= (Cox & Snell), .05 (Nagalkerke). Model $\chi^2(4) = 27.86$, ** *p < .001*

A statistically significant overall fit model was found $\chi^2(4) = 11.42$, $p<.05$ for females ages 20 to 24 years in 2005/06. The model explained 0.9 % (Cox & Snell R^2) or 1.6 % (Nagelkerke R^2) of the variance in HIV serostatus. As can be seen in table 20, HIV serostatus was statistically significantly predicted by total life time partners only and not the other sexual practices. The odds ratio for number of lifetime partners (Exp(B) = 1.02, 95% CI = [1.00, 1.04]) indicated that if the number of lifetime partners increased by one point among females ages 20 to 24 years in 2005, then odds of being HIV positive increased.

Table 20

2005/06 HIV Serostatus Predictors for Females 20 to 24 Years

	B (SE)	*95% CI for Odds Ratio*		
		Odds Ratio	Lower	Upper
Step 1				
Constant	-1.75** (.43)			
Age first sex	-.003 (.004)	1.00	.99	1.01
Total Lifetime	-.02* (.01)	1.02	1.00	1.04
Sex partners	.38 (.27)	1.47	.87	2.47
Condom use	-.26 (.28)	.77	.44	1.35

Note. R^2= (Cox & Snell), .05 (Nagalkerke). Model $\chi^2(4) = 27.86$, ** $p < .001$, * $p < .05$

A statistically significant overall fit model was found $\chi^2(4) = 58.51$, $p<.001$ for females ages 20 to 24 years in 2010/11. The model explained 4.7 % (Cox & Snell R^2) or 9.3 % (Nagelkerke R^2) of the variance in HIV serostatus. As can be seen in table 21, HIV serostatus was statistically significantly predicted by age at first sex and total life time partners. The odds ratio for number of lifetime partners (Exp(B) = 1.60, 95% CI = [1.31, 1.96]) indicated that if the number of lifetime partners increased by one point among females ages 20 to 24 years in 2010/11, then odds of being HIV positive increased. In addition, the odds ratio for age at first sex (Exp(B) = .753, 95% CI = [.596, .952]) indicated that if the age at first sex decreased by one point among females ages 20 to 24 years in 2010/11, then odds of being HIV positive increased.

Table 21

2010/11 HIV Serostatus Predictors for Females 20 to 24 Years

	B (SE)	*95% CI for Odds Ratio*		
		Odds Ratio	Lower	Upper
Step 1				
Constant	-193** (.55)			
Age first sex	-.28* (.012)	.753	.596	.952
Total Lifetime	.47** (.10)	1.603	1.309	1.964
Sex partners	.23 (.23)	1.262	.809	1.969
Condom use	.40 (.26)	.668	.402	1.110

Note. R^2= (Cox & Snell), .05 (Nagalkerke). Model $\chi^2(4) = 27.86$, ** *p* < *.001,* * *p* < .05

A statistically significant overall fit model was found for males ages 20 to 24 years in year 2005/06 $\chi^2(5) = 14.90$, *p* .01. The model explained 2.3 % (Cox & Snell R^2) or 5.5 % (Nagelkerke R^2) of the variance in HIV serostatus among males 20 to 24 years in 2005. As can be seen in table 22, the odds ratio condom use at last sex (Exp(B) = .464, 95% CI = [.253, .854]) indicated that if no condom was used during last sex among males ages 20 to 24 years in 2005, then odds of being HIV positive increased.

Table 22

2010/11 HIV Serostatus Predictors for Males 20 to 24 years

	B (SE)	*95% CI for Odds Ratio*		
		Odds Ratio	Lower	Upper
Step 1				
Constant	-1.61 (.65)			
Age first sex	-.35 (.18)	.706	.493	1.011
Total Lifetime	-.01 (.03)	.990	.936	1.047
Sex partners	.05 (.19)	1.050	.725	1.522
Condom use	-.77* (.31)	.464	.253	.854
Paid sex	-2.19 (1.38)	.112	.007	1.684

Note. R^2= (Cox & Snell), .05 (Nagalkerke). Model $\chi^2(4) = 27.86$, * $p < .05$

Hypothesis 2. The second hypothesis examined whether the five sociodemographic determinants (gender, residence, marital status, religion and education) were significantly related to HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe.

Place of residence and HIV serostatus. To examine the relationship between place of residence and HIV serostatus, I conducted a chi-square test between the two variables. Table 23 present the results of the chi-square test and cross- tabulation for place of residence and HIV serostatus. The results of the chi-square test of association between place of residence and HIV serostatus showed a statistically significant relationship between place of residence and HIV serostatus among females ages 15 to 19 years in 2005/06 χ^2 (1, N = 1,812) = 4.91, p .03 and 2010/11 χ^2 (1, N = 1,680) = 4.77, p .03. There was no statistically significant relationship between place of residence and HIV serostatus among male 15 to 24 years and females 20 to 24 years in both 2005/06 and 2010/11 as shown in table 23.

Table 23

Place of Residence and HIV serostatus

	Male 15 – 19 yrs			Male 20 – 24 yrs			Female 15 – 19 yrs			Female 20 – 24 Yrs		
Residence	N	% HIV+	P Value	No.	% HIV+	P Value	No.	% HIV+	P Value	No.	% HIV +	P value
						2005/10						
Urban	462	3.5%	.511	486	5.1%	.483	646	7.8%	.027	659	14.5%	.075
Rural	1092	2.9%		637	6.1%		1166	5.1%		969	17.7%	
						2010/11						
Urban	385	4.3%	.305	393	4.7%	.212	604	5.8%	.029	626	11.9%	.130
Rural	1047	3.0%		721	3.4%		1076	3.5%		969	9.6%	

Marital status and HIV serostatus. To examine the relationship between marital status and HIV serostatus, I conducted a chi-square test between the two variables. Table 24 present the results of the chi-square test and cross- tabulation for marital status and HIV serostatus. The results of the chi-square test of association between marital status and HIV serostatus showed that there was a statistically significant relationship between marital status and HIV serostatus among males ages 20 to 24 years in 2005 χ^2 (2, N = 1,123) = 70.32, p <.001 and in 2010/11 χ^2 (2, N = 1,114) = 34.19, p <.001, among females ages 15 to 19 years in 2005/06 χ^2 (2, N = 1,813) = 46.17, p <.001; females ages 20 to 24 years in 2005/06 χ^2 (2, N = 1,628) = 20.65, p <.001 and females 20 to 24 years in 2010/11 χ^2 (2, N = 1,594) = 8.62, p <.01. There was no statistically significant relationship between marital status and HIV serostatus among males 15 to 19 years in both 2005/06 and 2010/11 and among females ages 15 to 19 years in 2010/11.

Table 24

Marital Status and HIV Serostatus

Marital status	Male 15 – 19 yrs N	Male 15 – 19 yrs % HIV+	P Value	Male 20 – 24 yrs N	Male 20 – 24 yrs % HIV+	P Value	Female 15 – 19 yrs Number	Female 15 – 19 yrs % HIV+	P Value	Female 20 – 24 Yrs Number	Female 20 – 24 Yrs % HIV +	P value
2005/10												
Never in union	1545	3.0%		865	3.0%		1370	4.2%		444	12.2%	
Currently in union	6	16.7%	.144	222	12.2%	<.001	383	10.4%	<.001	1007	16.4%	<.001
Formerly in a union	2	0.0%		36	30.6%		60	21.2%		177	27.1%	
2010/11												
Never in union	1416	3.3%		793	3.0%		1233	3.9%		396	9.8%	
Currently in union	15	6.7%	.760	285	15.6%	<.001	399	5.2%	.068	1043	9.8%	.013
Formerly in a union	1	0.0%		36	22.9%		49	9.8%		155	17.4%	

Religion and HIV serostatus. To examine the relationship between religion and HIV serostatus, I conducted a chi-square test between the two variables. Table 25 present the results of the chi-square test and cross- tabulation for religion and HIV serostatus. The results of the chi-square test of association between religion and HIV serostatus showed that there was a statistically significant relationship between religion and HIV serostatus among females age 20 to years only in 2010/11 χ^2 (6, N = 1,595) = 17.97, p .006. There was no statistically significant relationship between religion and HIV serostatus among males 15 to 24 years in both years, among females 15 to 24 years in 2005/06 and females 20 to 24 years in 2005/11.

Table 25

Religion and HIV Serostatus

	Male 15 – 19 yrs			Male 20 – 24 yrs			Female 15 – 19 yrs			Female 20 – 24 Yrs		
Religion	N	% HIV+	P Value	N	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV+	P value
						2005/10						
Roman Cath	136	3.7%		112	4.5%		208	4.3%		150	10.7%	
Protestants	337	3.0%		220	2.7%		498	4.2%		394	15.2%	
Pentecostal	233	1.7%		153	5.2%		325	5.8%		321	17.8%	
Apostolic	411	2.2%	.334	232	7.3%	.118	532	7.5%	.055	517	17.0%	.190
Other	64	3.1%		37	0.0%		95	5.3%		75	13.3%	
None	295	5.1%		300	7.3%		112	11.6%		129	22.5%	
Trad/Muslim	78	2.6%		67	9.0%		42	7.1%		42	14.3%	
						2010/11						
Roman Cath	162	3.1%		84	6.0%		156	5.80%		128	10.2%	
Protestants	247	3.2%		167	3.0%		296	6.4%		256	8.2%	
Pentecostal	203	3.4%		188	2.1%		408	4.2%		347	6.3%	
Apostolic	446	2.9%	.967	340	3.8%	.216	582	2.9%	.108	619	11.6%	.006
Other	118	3.4%		89	1.1%		155	4.5%		114	14.9%	.
None	239	4.2%		206	6.3%		70	2.9%		115	17.4%	
Trad/Muslim	16	0.0%		39	2.6%		14	14.3%		16	18.8%	

Education level and HIV serostatus. To examine the relationship between education level and HIV serostatus, I conducted a chi-square test between the two variables. Table 26 present the results of the chi-square test and cross- tabulation for education level and HIV serostatus. The results of the chi-square test of association between education level and HIV serostatus showed that there was a statistically significant relationship between education level and HIV serostatus among males 15 to 19 years in 2010 χ^2 (2, N = 1,434) = 8.28, p .03 and among female 20 to 24 years in 2010 χ^2 (2, N = 1,595) = 10.34, p .006. There was no statistically significant relationship between education level and HIV serostatus among male 15 to 19 years on 2005, males 20 to 24 years in both 2005 and 2010/11 and among female 20 to 24 years in 2005/06.

Table 26

Education Level and HIV Serostatus

Education	Male 15 – 19 yrs			Male 20 – 24 yrs			Female 15 – 19 yrs			Female 20 – 24 Yrs		
	N	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV +	P value
2005/10												
Primary or less	459	3.2%	.881	242	9.0%	.020	532	5.4%	.651	406	18.4%	.394
Secondary	1090	3.0%		820	5.0%		1275	6.4%		1184	15.9%	
Higher	6	0.0%		61	1.0%		5	0.0%		39	12.5%	
2010/11												
Primary or less	360	3.0%	.016	222	3.7%	.590	371	5.3%	.435	360	14.2%	.006
Secondary	1071	3.4%		828	3.7%		1295	4.0%		1161	9.9%	
Higher	3	26.5%		64	6.7%		13	8.3%		74	2.2%	

Hypothesis 2 Testing

Statistically significant associations between HIV serostatus and socio-demographic variables considered in the current study were found for males ages 20 to 24 years in 2005/06, for females ages 15 to 19 years in 2005/06 and 2010/11, females 20 to 24 years in 2005/06 and 2010/11 as seen in Table 27. Therefore, there is evidence to reject the null hypothesis when predicting HIV serostatus and sociodemographic determinants as a total set of predictors among males ages 20 to 24 years in 2005, for females ages 15 to 19 years in 2005/06 and 2010/11, females 20 to 24 years in 2005/05 and 2010/11 and there is evidence to accept the null hypothesis when predicting HIV serostatus and sociodemographic determinants as a total set of predictors among males 15 to 19 years in 2010/11; and males ages 20 to 24 years in 2010/11.

Table 27

Significant Sociodemographic Predictors of HIV Serostatus

Significant Predictors	15-19		20-24	
Females	2005	2010	2005	2010
Place of residence		1.79*		1.66**
Marital status	.47**		1.57**	
Education				.54**
Male				
Marital status			3.80**	

** p<0.01 and * p<0.05

A statistically significant overall fit model was found for males ages 20 to 24 years in year 2005 $\chi^2(4) = 53.55$, $p < .001$. The model explained 4.7 % (Cox & Snell R^2) or 13.2 % (Nagelkerke R^2) of the variance in HIV serostatus among males 20 to 24 years in 2005. HIV serostatus was statistically significantly predicted by marital status only. The odds ratio for marital status (Exp(B) = 3.80, 95% CI = [2.61, 5.52]) indicated that being formerly in union (divorced, widowed, separated) increased the odds of being HIV positive among males ages 20 to 24 years in 2005/06.

A statistically significant overall fit model was found for females ages 15 to 19 years in year 2010 $\chi^2(4) = 12.52$, $p < .05$. The model explained 0.7 % (Cox & Snell R^2) or 2.5 % (Nagelkerke R^2) of the variance in HIV serostatus among females 15 to 19 years in 2010/11. HIV serostatus was statistically significantly predicted by place of residence and marital status. The odds ratio for place of residence (Exp(B) = 1.96, 95% CI = [1.20, 3.20]) indicated that staying in urban areas increased the odds of being HIV positive among females ages 15 to 19 years in 2010. The odds ratio for marital status (Exp(B) =

1.52, 95% CI = [1.01, 2.29]) indicated that being in union decreased the odds of being HIV positive among females ages 15 to 19 years in 2010/11.

A statistically significant overall fit model was found for females ages 15 to 19 years in year 2005/06 $\chi^2(11) = 58.79$, *p <.001*. The model explained 3.2 % (Cox & Snell R^2) or 8.7 % (Nagelkerke R) of the variance in HIV serostatus among females 15 to 19 years in 2005. HIV serostatus was statistically significantly predicted by marital status. The odds ratio of marital status indicated that being in union (Exp(B) = .15, 95% CI = [.07,.30]) or being previously in union (Exp(B) = .45, 95% CI = [.22,.92]) decreased the odds of being HIV positive among females ages 15 to 19 years in 2005.

A statistically significant overall fit model was found for females ages 20 to 24 years in year 2005/06 $\chi^2(4) = 18.96$, *p <.005*. The model explained 1.2 % (Cox & Snell R^2) or 2.0 % of the variance in HIV serostatus among females 20 to 24 years in 2005/06. HIV serostatus was statistically significantly predicted by marital status. The odds ratio for being in previous union (Exp(B) = 1.57, 95% CI = [1.25,1.98]) indicated that being previously married (divorced, widowed, separated) increased the odds of being HIV positive among females ages 20 to 24 years in 2005/06.

A statistically significant overall fit model was found for females ages 20 to 24 years in year 2010/11 $\chi^2(4) = 20.35$, *p <.001*. The model explained 1.3 % (Cox & Snell R^2) or 2.6 % of the variance in HIV serostatus among females 20 to 24 years in 2010/11. HIV serostatus was statistically significantly predicted by place of residence and education status. The odds ratio for place of residence (Exp(B) = 1.66, 95% CI = [1.17,2.35]) indicated that residing in urban areas increased the odds of being HIV positive among females ages 20 to 24 years in 2010/11. The odds ratio for education status (Exp(B) = .54, 95% CI = [.39,.77]) indicated that higher education status decreased the odds of being HIV positive among females ages 20 to 24 years in 2010/11.

A statistically significant overall fit model was found for males ages 20 to 24 years in year 2010/11 $\chi^2(4) = 15.15$, $p < .005$. The model explained 1.3 % (Cox & Snell R^2) or 4.8 % of the variance in HIV serostatus among males 20 to 24 years in 2010/11. HIV serostatus was statistically significantly predicted by marital status. The odds ratio for marital status (Exp(B) = 2.54, 95% CI = [1.60,4.05]) indicated that being in union increased the odds of being HIV positive among males ages 20 to 24 years in 2010/11.

Hypothesis 3 Testing

The third hypothesis examined whether the socio economic status was significantly associated with HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe.

No statistically significant models were found for males and females for wealth as a predictor of HIV serostatus of all age groups in the two survey years. Therefore, there is evidence to accept the null hypothesis when predicting HIV serostatus and socioeconomic status for all male and females ages 15 to 24 years in both 2005/06 and 2010/11.

To examine the association between socioeconomic status and HIV serostatus, I conducted a chi-square test between the two variables. Table 28 present the results of the chi-square test and cross- tabulation for socioeconomic status and HIV serostatus. The results of the chi-square test of association between socio economic status and HIV serostatus showed that there was a statistically significant association between socio economic status and HIV serostatus among females ages 20 to 24 years in 2005/06 χ^2 (4, *N* = 1,629) = 10.39, *p .03*. There was no statistically significant association between socioeconomic status and HIV serostatus among the rest of the groups in both years.

Table 28

Socioeconomic Status and HIV Serostatus

	Male 15 – 19 yrs			Male 20 – 24 yrs			Female 15 – 19 yrs			Female 20 – 24 Yrs		
Wealth quintile	N	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV+	P Value	Number	% HIV +	P value
2005/10												
Poorest	267	3.0%		138	4.3%		318	4.1%		274	17.6%	
Poorer	283	1.8%		170	10.0%		313	7.7%		290	15.9%	
Middle	384	1.8%	.116	213	4.3%	.107	367	5.4%	.257	274	20.4%	.034
Richer	321	4.0%		324	5.2%		358	7.5%		381	18.1%	
Richest	298	4.7%		277	5.1%		456	5.7%		411	11.9%	
2010/11												
Poorest	202	2.5%		157	3.8%		270	2.6%		264	11.4%	
Poorer	324	3.1%		176	3.4%		306	3.9%		278	8.6%	
Middle	338	4.1%	.485	234	3.0%	.142	327	4.0%	.117	310	10.6%	.871
Richer	308	2.6%		286	6.3%		354	6.8%		343	11.7%	
Richest	263	4.9%		262	2.3%		423	4.0%		399	10.3%	

Summary

I conducted this study to test the relationships between HIV serostatus among young people ages 15 to 24 years in Zimbabwe, and socio-demographic variables (place of residence, marital status, religion, and level of education); Sexual behaviors and practices (age at sexual debut, number of lifetime sexual partners, multiple partners in the last 12 months, condom use at last sex and transactional sex for men) and socioeconomic status (wealth quintile). I obtained secondary data representing the variables from the ZDHS for 2005/06 and 2010/11. I conducted a bivariate analysis using chi-square and tested the hypotheses using binomial logistic regression to examine the three research questions and hypotheses.

Research question one aimed to determine the association between sexual behaviors and practices and HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe. There is evidence to reject the null hypothesis when predicting HIV serostatus and sexual practices as a total set of predictors among females 15 to 19 years in 2005/06; females ages 20 to 24 years in both 2005/06 and 2010/11 and males ages 20 to 24 years in 2005. In 2005/06, the odds of being HIV positive was statistically significantly predicted by increase in total number of lifetime sexual partners among females 15 to 19 year olds (OR = 2.54, 95% CI = [1.70, 3.78]) and among females ages 20 to 24 years (OR = 1.02, 95% CI = [1.00, 1.04]) and by lack of condom use at last sex among males ages 20 to 24 years condom use at last sex (OR = .464, 95% CI = [.253, .854]). While in 2010/11, the odds of being HIV positive was statistically significantly predicted by increase total number of lifetime partners among females ages 20 to 24 years (OR = 1.60, 95% CI = [1.31, 1.96]) and by younger age at first sex among females ages 20 to 24 years (OR = .753, 95% CI = [.596, .952]). There is evidence to accept the null hypothesis when predicting HIV serostatus and sexual practices as a total set of predictors among females 15 to 19 years in 2010/11; and males ages 15 to 19 years in 2005/06 and 2010/11 and for males 20 to 24 years in 2010/11.

Research question two aimed to determine the association between socio-demographic determinants and HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe. There is evidence to reject the null hypothesis when predicting HIV serostatus and sociodemographic determinants as a total set of predictors among males ages 20 to 24 years in 2005/06, for females ages 15 to 19 years in 2005 and 2010/11, females 20 to 24 years in 2005/06 and 2010/11. In 2005/06, the odds of being HIV positive was statistically significantly predicted by being formerly in a union (Divorced, widowed, separated) among males ages 20 to 24 years (OR = 3.80, 95% CI = [2.61, 5.52]) and females ages 20 to 24 years (OR = 1.57, 95% CI = [1.25,1.98]); and was statistically significantly predicted by being in a union (OR = .15, 95% CI = [.07,.30]) or previously in a union (Exp(B) = .45, 95% CI = [.22,.92]) among females ages 15 to 19 years. On the other hand, in 2010, the odds of being HIV positive was statistically predicated by not being in a union among males ages 20 to 24 years (OR = 2.54, 95% CI = [1.60,4.05]); and by staying in urban areas among females ages 15 to 19 years (OR = 1.79, 95% CI = [1.07, 2.97]) and females ages 20 to 24 years (OR = 1.66, 95% CI = [1.17,2.35]) and the odds of being HIV positive was statistically predicted by higher education status among females ages 20 to 24 years (OR = .54, 95% CI = [.39,.77]. There is evidence to accept the null hypothesis when predicting HIV serostatus and sociodemographic determinants as a total set of predictors among males 15 to 19 years in 2010/11; and males ages 20 to 24 years in 2010/11.

Research question three aimed to determine the association between socioeconomic status and HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe. There is evidence to accept the null hypothesis when predicting HIV serostatus and socioeconomic status for all male and females ages 15 to 24 years in both 2005/06 and 2010/11. Social economic status was not a statistically significant predictor of HIV status among both males and females in both years. However, a statistically significant association was observed between socio economic status and HIV serostatus among females ages 20 to 24 years in 2005/06 χ^2 (4, *N* = 1,629) = 10.39, *p .03* in 2005/06. Being in the middle class *p .003*, richer *p .02* and poorest *p .04* categories was statistically significantly associated with being HIV positive among females ages 20 to 24 in 2005/06.

In Chapter 5, I interpret the findings; state the study limitations, discuss the implications for social change, and offer recommendations for future research.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

To examine relationship between sexual behaviors and practices and HIV prevalence over a period of time among males and females ages 15 to 24 years in Zimbabwe, I conducted an in-depth secondary data analysis of two ZDHSs for 2005/2006 and 2010/2011. In this study, I used a quantitative methods paradigm and I studied HIV serostatus as the outcome variable. I conducted bivariate analysis using chi-square to examine the association between the IVs and DVs and a logistic regression analysis to predict effects of the IVs on the DVs.

In 2005/06, the odds of being HIV positive was 2.54 times higher among females ages 15 to 19 years and was 1.02 times higher among females ages 20 to 24 years with increasing number of total lifetime sexual partners. The odds of being HIV positive was 0.46 times higher among males ages 20 to 24 years who did not use condoms during last sex compared with those who used condoms. In addition, the odds of being HIV positive was 3.80 times higher among males ages 20 to 24 years and 1.57 times higher among females ages 20 to 24 years formerly in union (divorced, widowed, separated), whereas the odds of being HIV positive among females ages 15 to 19 years decreased by 0.15 for those in union and by 0.45 for those previously in union.

In 2010/11, the odds of being HIV positive among females ages 20 to 24 years was 1.60 times higher with increased total number of lifetime sexual partners compared with those who did not have sex and was 0.75 times more among females ages 20 to 24 years who had first sex by age of 14 years compared with those who never had sex. The odds of being HIV positive increased by 2.54 among males ages 20 to 24 years in union; increased by 1.79 among females ages 15 to 19 years, and by 1.66 among females ages 20 to 24 years staying in urban areas. The odds of being HIV positive decreased by 0.54 among females ages 20 to 24 years with higher education status. Socioeconomic status did not affect the odds of being HIV positive for all males and females in both years, although a statistically significant association between socioeconomic status and HIV serostatus was observed among females ages 20 to 24 years in 2005/06.

Interpretation of Findings

The findings from this study are in line with the findings from most of the studies conducted worldwide. However, the results in this study are more precise and portray a change in trends of significant predictors of the outcome variables and have further disaggregated the findings among those ages 15 to 19 years (adolescents) and those 20 to 24 years. I present the interpretation of findings from this study and a comparison with existing literature in accordance to the three research questions.

Research Question 1

RQ1 asks the following question: What is the association between sexual behaviors and practices and HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe? The sexual behaviors included age at sexual debut, number of lifetime sexual partners, condom use at last sex, and transactional sex/paid sex.

In 2005/06, HIV serostatus was statistically significantly predicted by total number of lifetime sexual partners among females ages 15 to 19 years and 20 to 24 years, whereas for males, HIV serostatus was predicted by condom use during last sex among those ages 20 to 24 years. Sexual practices were not a statistically significant predictor of HIV serostatus among males ages 15 to 19 years. The odds of being HIV positive was 2.54 times higher in females ages 15 to 19 years who had more than one lifetime sexual partner (OR = 2.54, 95% CI = [1.70, 3.78], p < .001), whereas for females ages 20 to 24 years, the odds of being HIV positive was 1.02 times greater (OR = 1.02, 95% CI = [1.00, 1.04], p < .05) in 2005/06. The odds of being HIV positive for males ages 20 to 24 years reduced by 0.46 times in those who used condoms during the last sexual encounter (*OR* = .464, 95% CI = [.253, .854], p < .05) compared with those that did not use condoms in 2005/06.

This is in line with a secondary analysis conducted in Uganda among young people ages 15 to 24 years which showed that having more than one sexual partner significantly increased the risk of HIV infection [OR = 1.94; 95% CI (1.42-2.65), p = <0.01] while condom use [OR = 0.54; (95% CI: 0.41-0.69)] provided a protective effect against HIV (Chimoyi & Musege, 2014). Kembo (2013) in a multivariate analysis conducted in Zambia also found a statistically significant elevated odds of HIV infection of 1.568 times among young persons ages 15 to 24 years with two or more sex partners in the past 12 months preceding the survey compared to their counterparts with no sex partners in the same period of time. Similarly, Bello et al (2011) found that the proximate factors most consistent with underpinning HIV risk reduction in young people of Malawi included reductions in the proportion of men that had several sexual partners and an increase in condom use. This is consistent with findings from a study in Uganda where having three to five lifetime sexual partners was associated with increased odds (OR adjusted = 2.12, 95% CI 1.50-3.03) of testing positive for HIV among young women (Choudhry et al., 2015).

On the other hand, in 2010/11, sexual practices was a predictor of HIV serostatus only for females 20 to 24 years. The total number of lifetime sexual partners remained a statistically significant predictor of HIV among females 20 to 24 years only and ceased to be a predictor for females 15 to 19 years old. A new statistically significant predictor of HIV serostatus of age at first sex was also observed among females ages 20 to 24 years which was not the case in 2005/06. The odds of being HIV positive was 1.60 times greater (OR = 1.60, 95% CI = [1.31, 1.96], $p < .001$) in females ages 20 to 24 years who had more than one lifetime sexual partner and was .75 times greater in females 20 to 24 years that had first sex below 14 years old (OR = .753, 95% CI = [.596, .952]) compared to those who never had sex. This is in accordance with a secondary analysis of a cross sectional study conducted in Uganda where a young coital debut (below 14 years) increased the risk of HIV among young people by 58% and this risk was seen to decrease as the age at sex debut increased (Chimoyi & Musege, 2014).

This observation is also consistent with findings from a secondary analysis study by Hallet, Lewis and Lopman (2007) in their study in rural Zimbabwe. They observed that females who started sex at earlier ages were more prone to HIV infection than their peers who had their sexual debut at later ages. A multivariate analysis conducted in Zambia by Kembo (2013) also showed that young persons whose age at first sexual intercourse was less than 14 years were significantly associated with 2.696 times more risk of HIV infection relative to their peers whose age at first sexual intercourse was 20 to 24 years ($p = 0.000$).

The increased risk to HIV infection among females who engage in early sexual relationships may likely be due to having more sexual partners than their counterparts whose sexual debut occurs at an older age.

On the contrary, a study conducted in Malawi by Bello et al. (2011) indicated that changes in the timing of starting sex was less likely to play a substantial role in reducing HIV risk overall among young people. Although transactional sex was not a significant predictor of HIV serostatus among young people in Zimbabwe in my study, Bello et al. (2011) indicated that transactional sex was positively associated with increased risk of HIV infection [OR = 4.14; 95%CI (1.31-13.13), $p = 0.02$] among young people in Malawi.

The consistent trend in predictors of HIV infection among females ages 20 to 24 years in 2005/06 and 2010/11 may suggest that no behavioral change was observed regardless of HIV interventions that would have been implemented between the two surveys to influence their reduction in number of sexual partners and yet a change was observed among females ages 15 to 19 years where having more than one lifetime partner ceased to be a significant predictor of HIV infection among them in 2010/11. This indicates that there may be a need for interventions that will empower females 20 to 24 years to reduce their number of sexual partners and increase condom use if HIV prevalence is to be reduced among females ages 20 to 24 years. The proximate factors underpinning reduction in HIV incidence among young people in Malawi was reduction in the proportion of young men with several sexual partners and an increase in condom use (Bello et al., 2011). In addition, the fact that age at first sex became a significant predictor of HIV status among females in 2010/11 may suggest the need to have programs that target the females earlier than the age of 14 years. HIV prevention programs targeted at young persons ages 15 to 24 years should provide invigorated focus on age at sexual debut, number of sexual partners, and condom use so as to mitigate these predisposing factors for HIV infection (Kembo, 2012).

Furthermore, the results showed an upward trend in HIV positive serostatus among all males ages 15 to 19 years from 3.1% in 2005/06 to 3.4% in 2010/11 and yet sexual practices was not a statistically significant predictor of HIV serostatus among this group in both survey years. An increase in HIV prevalence was noted among those 15 to 19 years old males who never had sex from 2.9% in 2005/06 to 3.7% in 2010/11 while a decrease in HIV prevalence was noted among 15 to 19 year males that had sex by age 16 from 4.8% in 2005/06 to 0.9% in 2010/11. The fact that sexual practices was not a statistically significant predictor of HIV status among young males 15 to 19 years in both 2005/06 and 2010/11 suggests the possibility that most of the males in that age group who were HIV positive might have acquired HIV from their mothers at birth and grew to adolescence while HIV positive. This could be linked to the increase in number of children living with HIV initiated on antiretroviral treatment over the past 10 years and have grown to adolescence in Zimbabwe. About half of children born with HIV will die before the age of 2 years and about half will die at a median age of 16 years if they are not given ART (Williams, 2011). These results suggest the need to focus on interventions that will reduce the risk of HIV transmission from mother to child to ensure that children are born HIV free which will eventually contribute to reduced HIV prevalence as the children grow to adolescence. Therefore the results suggest that interventions for adolescent boys and adolescent girls may not be the same since their predictors of HIV serostatus are different.

There may also be need to have a further in-depth study on adolescents (15 to 19 years) living with HIV to determine the extent to which their HIV serostatus is linked to their mothers. These results therefore suggest that programs and interventions to reduce risk to HIV infections should be age and gender disaggregated taking into consideration heterogeneity of young people (Hargreaves et al., 2015). These results further emphasize the importance of delaying sexual debut, hence suggesting that programs should empower young people, especially females, to delay sex or consistently have protected sex. Implementing behavioral interventions to delay sexual debut and improve condom use can help to reduce the transmission of HIV among youth (Scott-Sheldon et al., 2013). Efforts to control the spread of HIV/AIDS among young people should therefore focus on eliminating sexual practices that have shown to propagate HIV risk.

Research Question 2

RQ2 asks the following question: What is the association between socio-demographic determinants and HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe?

In 2005/06, HIV positive serostatus was statistically significantly predicted by being formerly in a union (divorced, widowed, separated) among males and females ages 20 to 24 years and by being in union and previously in a union among females ages 15 to 19 years. The odds of being HIV positive was 3.80 times greater in males ages 20 to 24 years (OR = 3.80, 95% CI = [2.61, 5.52], $p<.001$) and 1.57 times greater among females ages 20 to 24 years (OR = 1.57, 95% CI = [1.25, 1.98], $p<.001$) who were formerly in a union (divorced, widowed, separated) while the odds of being HIV positive decreased by .15 times among females ages 15 to 19 years who were in union (OR = .15, 95% CI = [.07, .30], $p<.001$) and was .45 times less among females ages 15 to 19 years who were previously in a union (OR = .45, 95% CI = [.22, .92], $p<.05$) . However, in 2010/11 marital status was a statistically significant predictor of HIV positive status only in males ages 20 to 24 years and ceased to be a statistically significant predictor for females of same age group. The odds of being HIV positive was 2.54 times greater among males ages 20 to 24 years who were in a union (OR = 2.54, 95% CI = [1.60, 4.05]). On the other hand, marital status was not a statistically significant predictor of HIV positive status among males ages 15 to 19 years in both surveys.

The results for females and males ages 20 to 24 years are in line with findings from a study conducted by Chimoyi & Musege (2014) in Uganda, where young people currently [AOR =3.64; (95%CI; 1.25-10.27)] and previously married [AOR = 5.62; (95%CI: 1.52-20.75)] had significantly higher likelihood of HIV infections relative to those who were never married but contradict these findings for females ages 15 to 19 years. Kembo (2013) in a study conducted in Zambia also reported that young persons ages 15 to 24 years who were divorced, widowed or not living together had significantly increased risk compared to their never-married counterparts, and that marital status was significantly associated with HIV serostatus for the young persons.

Similar findings were reported by Clark, Bruce and Dude (2006) in a study in Africa and Latin America that married young persons ages 15 to 24 years had a higher risk of HIV infection as compared with their sexually active unmarried peers. The increased likelihood of being HIV infected for males and females ages 20 to 24 years previously in marriage (divorced, widowed, separated) or currently in marriage could be that they most probably had entered marriage at younger ages and unprotected sex increased their risks and in some instances their spouses might have died of HIV or being in previously married exposed them to having more sexual partners than single individuals. However, it should be noted that the results from the reported studies generalized the risk associated with marital status to all 15 to 24 years yet this study has shown that these results are different once further age disaggregation separating adolescents is done.

The observed consistent trends in this study on HIV serostatus predictors among females and males 20 to 24 years in previous union in 2005/06 and those in union in 2010/11 suggests the need for interventions that targets couples to reduce risk to HIV transmission in marriage. This study further suggest that programs and interventions to reduce HIV incidence among young people should focus on widowed and divorced young people as a unique group. Young persons ages 15 to 24 years who are divorced, separated and widowed have significantly higher risks of HIV infection than their unmarried peers therefore programs and interventions for the control of HIV and AIDS should also focus on widowed and divorced young persons ages 15 to 24 years and promote appropriate prevention strategies such as condom use (Kembo, 2012).

Furthermore, the fact that the reported studies lumped young people ages 15 to 24 years suggests that the situation is the same for all of them and yet this study has shown that marital status was not a significant predictor on being HIV positive serostatus for males and females ages 15 to 19 years. This might be due to the fact that they may not have stayed in marriage long time and their exposure to HIV is reduced. These results emphasize the need to separate adolescents from young adults (20 to 24 years) and disaggregating females and males when analyzing data and developing interventions since their predictors of HIV differ. With the demographic shifts in the adolescent population (expected to double in 2050) in sub-Saharan Africa, a region where HIV infections are also highest, and adolescents already account for 23% of the current population, it is vital that the post-2015 agenda takes into account age-appropriate HIV related interventions aimed at reducing risk, vulnerability, morbidity, and mortality among them (Idele et al., 2014).

In 2010/11, a new statistically significant sociodemographic predictors (place of residence and education status) of HIV serostatus emerged among females which was not a predictor in 2005/06. The odds of being HIV positive was 1.79 times greater in females ages 15 to 19 years (OR = 1.79, 95% CI = [1.07, 2.97]) and 1.66 times greater among females 20 to 24 years (OR = 1.66, 95% CI = [1.17, 2.35]) staying in urban areas compared to their rural counterparts. These results are consistent with findings from a comparative study by Gonese et al. (2010) in Zimbabwe which showed that HIV prevalence was higher in the urban areas (17.8%, 16.5%–19.1%) and lowest in the rural areas (15.1%, CI 17.0%–18.8%). Although Bello et al, (2011) reported that HIV prevalence dropped from 26% to 15% in urban areas among pregnant women and 40% among those ages 15 to 24 years, compared to no decline among those in rural areas, the HIV prevalence still remained higher among females in urban than those in rural areas (12%). Similarly, Sandoy et al.

(2007) reported that the risk of acquiring HIV infection in 2003 compared to 1995 (AOR) among sexually active young people was higher at 0.35 times [0.28–0.45] for urban females, compared to 0.27 times [95%CI 0.11–0.68] for rural females. Bärnighausen et al. (2007) also reported that urban residence was associated with a 65% increase in the hazard of HIV sero-conversion ($p = 0.012$) among young people in South Africa. There is therefore need to determine risk factors that increase the HIV vulnerability among females in urban compared to their rural counterparts.

In this secondary analysis, education status also became a statistically significant predictor of HIV serostatus among females ages 20 to 24 years in 2010/11. The odds of being HIV positive was .54 times lower among females ages 20 to 24 years with high education status among (OR = .54, 95% CI = [.39,.77] compared to those with no education. These results are consistent with findings from a multivariable survival analysis conducted by Bärnighausen et al. (2007) in South Africa, who reported that one additional year of education reduced the hazard of HIV seroconversion by 7%. ($p = 0.017$). Similar findings were reported by Msuya et al. (2007) in study conducted in Tanzania that decline in the HIV prevalence was significant among those who had completed primary education ($p < 0.005$). Chimoyi & Musege (2014) also reported that higher education (tertiary) was protective against HIV infection by decreasing the likelihood significantly by 68% [OR = 0.34; 95% CI (0.17-0.68), $p = 0.02$] among young people in Uganda. However, Hargreaves et al. (2002) in their secondary analysis of data on socio-demographic factors and HIV infection from 14 nationally representative surveys of young people ages 15 to 24 (seven countries, two surveys each, 4 to 8 years apart) reported varied results from different countries. HIV prevalence among young women was lower in the secondary educated groups than primary educated groups in Lesotho, Kenya and Zimbabwe but HIV prevalence was higher in more educated groups in Malawi and Ethiopia and was lowest among those with primary education in Rwanda (Hargreaves et al., 2002).

The results from this study suggest that education could be a protective factor to HIV infection among young females. This could be attributed to the information received in school that empowers them to abstain or practice safer sex or the fact that they are busy with school, they have less free time to have sex. This therefore suggests that programs that promote retention of females in school should be developed or enhanced to reduce the risk to HIV among females. Results from a study by Bärnighausen et al. (2007) showed that increasing educational attainment in the general population may lower HIV incidence. However, the results of this study should be carefully concluded since the lower likelihood levels observed in this study may suggest that there is no strong evidence that education is a predictor of HIV positive serostatus among females in Zimbabwe. This is also in line with what De Walque et al, (2005) and Bärnighausen et al, (2007) indicated that no significant relationship between schooling and HIV infection existed in South Africa. Although the results show that educational attainment significantly reduces the hazard of becoming infected with HIV the protective effect of education needs to be further determined for both males and females ages 15 to 24 years.

Research Question 3

RQ3 asks the following question: What is the association between socioeconomic determinants and HIV serostatus in males and females ages 15 to 24 years at two different points in time in Zimbabwe?

Social economic status was not a statistically significant predictor of HIV status among both males and females in 2005/06 and 2010/11. This is consistent with findings from Kembo (2013) that the association between the socioeconomic covariates and HIV serostatus for young persons ages 15 to 24 years in Zambia was nonsignificant. However, statistically significant association was observed between socio economic status and HIV serostatus among females ages 20 to 24 years in 2005/06 χ^2 (4, N = 1,629) = 10.39, *p* .03. Being in the middle class *p* .003, richer *p* .02 and poorest *p*.04 categories was statistically significantly associated with being HIV positive among females ages 20 to 24 in 2005/06. These results contradict to some extent findings from a study by Bärnighausen et al, (2007) which showed that members of households that fell into the middle 40% of relative wealth had a 72% higher hazard of HIV acquisition than members of the 40% poorest households (p = 0.012). On the other hand, the association between socioeconomic status and HIV positive serostatus ceased to be a statistically significant in 2010/11 emphasizing the finding that that wealth status does not necessarily influence the hazard of HIV seroconversion in young people in Zimbabwe. As such, while countries like Zimbabwe are linking social protection programs like cash transfers to vulnerable young females to HIV prevention, it should be noted that poverty reduction may not be as effective as anticipated in reducing the spread of HIV (Bärnighausen et al., 2007).

Study Findings in Context of Conceptual Model

For this secondary analysis, Proximate Determinants Model was used as the conceptual Model. The Proximate Determinants Model identifies a set of variables, called underlying determinants and proximate determinants that can be influenced by changes in contextual variables or by interventions and that have a direct effect on biological mechanisms to influence health outcomes (Boerma & Weir, 2005).

Underlying Determinants

For this study, the underlying determinants for HIV serostatus are age, marital status, sex, residential status, education and wealth status. The association between the underlying determinants of HIV infection and HIV serostatus was observed differently between males and female and those ages 15 to 19 years and 20 to 24 years. The association of marital status as an underlying determinants and likelihood of being HIV positive was highest among males and females ages 20 to 24 years who were previously in union (divorced, widowed, separated) in 2005/06 while in 2010/11 the association was high only in males ages 20 to 24 years who were in union. The association of residence as an underlying determinants and the likelihood of being HIV positive was high only in 2010/11 among females ages 15 to 19 years and 20 to 24 years living in urban areas. The association of education status as an underlying determinant and the likelihood of being HIV positive was higher among females ages 20 to 24 years with no education in 2010/11 only. These results suggest that underlying determinates are not the main predictors of HIV serostatus among males 15 to 19 years and that these factors do not remain constant over the years in different gender and age groups hence there is a need to constantly test to determine the predictors of HIV serostatus on an ongoing basis.

Proximate Determinants

For this study, the proximate determinants were age at sexual debut, number of sex partners in life time, multiple sex partners, and condom use. Associations between proximate determinants of HIV infection and risk of being HIV positive was high in females ages 15 to 19 years and females ages 20 to 24 years who had more than one lifetime sexual partner and in males 20 to 24 years who reported not using condoms during last sex in 2005/06. On the other hand, in 2010/11 the associations between proximate determinants of HIV infection and risk of being HIV positive was high only in females 20 to 24 years who had more lifetime sex partners and who had first sex before the age of 14 years. The results show that sexual risk behaviors associated with increased exposure to HIV are more likely to occur among females than among males hence there is a need to have female targeted interventions to reduce HIV prevalence among young women in Zimbabwe. Further analysis to establish if there is any association between the underlying determinants and the proximate determination as predictors of HIV serostatus is recommended to inform development of evidence based targeted programs. Recognizing that the impact of changes in underlying and proximate determinants of risk can be different according to the time frame and different groups of people, continuous studies to establish these impacts is recommended.

Biological Determinants

Biological determinants relate to the transmission of HIV from contacts with susceptible infected persons (Gregson, & Garnett, 2010; & Delany-Moretlwe et al., 2014). The findings from this study show link between proximate determinants and the biological exposure of susceptible females to HIV infection. However, the results may also suggest a link between biological exposure of HIV for males ages 15 to 19 years to their infected mothers since the HIV prevalence rate increased between 2005/06 and 2010/11 and yet proximate determinants did not have a significant association.

Limitations of the Study

Limitations of this study correspond with the limitations of secondary analyses in general. The reliability of the effect size and conclusions of this study depend on the quality, reliability and appropriateness of the methods used by the primary surveys. One limitation of this study was that it utilized secondary data from DHS's that were conducted at different points in time and some of the observed changes in the indicators between the years may be due to bias in the reporting of sexual behavior and practice information among the surveyed young females and males. In addition, as inherent with all cross-sectional studies, this study may neither establish temporality nor causality of the observed associations with the outcome (Chimoyi & Musege, 2014). In addition, cultural factors could have been important determinants of sexual behaviors and HIV serostatus but the DHS does not capture such information creating a gap in this study on establishment of associations related to cultural practices as distal factors.

In the proposal, age of sex partner was included as variables to be analyzed. However, during analysis it was noted that data on age of sex partner was available for females only in one survey of 2010/11 hence the variable was dropped from analysis since it could not add value to the study. During the analysis, it was noted that some variables like marital status had very small numbers in some categories especially when the data was disaggregated by age and gender and this would affect analysis. As such, some of the common groups like divorced, widowed and separated were pooled into one category during the analysis.

Furthermore, the study included data from two ZDHS conducted five years apart and since the enumeration areas may be the same for both surveys, chances that some of the participants interviewed in 2005/06 survey when they were ages 15 to 19 years might have been interviewed again during the 2010/11 ZDH within the age 20 to 24 years. This may mean a repetition of the same individual information in some cases limited to few variables, but for most of the variables of interest, repetition would give different information based on that age group. Lastly, self-reporting of sexual behaviors during the DHS could have introduced recall or social desirability bias which may make generalization of the study findings a challenge.

Recommendations

This study has generated questions for future research beyond the scope of this study. These questions concern five areas: (a) Reasons for high HIV prevalence among females in urban areas compared to rural areas (b) The magnitude with which HIV is acquired from mother to child among adolescents ages 15 to 19 years living with HIV (c)

The need to establish if there is any association between underlying and proximate determinants of HIV serostatus and compare them by gender and ages 15 to 19 years and 20 to 24 years (d) Ongoing research to determine predictors of HIV new infections in young people at various time points in most countries where incidence is high among those ages 15 to 24 years; and (e) a large scale study to compare predictors of HIV serostatus among young people in several countries especially those with similar epidemiology and contexts.

Implications for Social Change

This study has filled a literature gap by providing evidence of a statistically significant association between HIV serostatus and sexual, sociodemographic and socioeconomic determinants that can help in creating positive social change. Information about the strength of association of HIV serostatus with the predictors is helpful in creating awareness about the severity and seriousness of the problem. The findings provide useful information on the existing epidemiological situation of HIV/AIDS in Zimbabwe by highlighting key predictors of HIV among young people by age and gender over a period of time. The results of this study could inform individuals, families and communities to take actions that will reduce the risk of young people getting HIV infected. In addition, the results of this study, once disseminated, could provide insight to policy makers and programmers to develop evidence based intervention strategies for prevention of HIV among young people.

At an individual level, the findings of this study could help to improve the health of Zimbabweans, especially young people who are at risk for HIV. The results of this study could lead to behavioral change in the form of young females reducing the number of sexual partners and increased in condom use among males since by disseminating these results young people could become more knowledgeable about the risks involved in practicing these behaviors. Mahomva et al., (2006) associated a decline in HIV prevalence among young males and females in Zimbabwe with a reduction in number of sexual partners and an increase in condom use. Individuals aware of predictors of HIV infection could inform their peers of the importance of avoiding risky behaviors identified in this study and practice safe behaviors that will protect them from getting infected.

At the family and community level, the results of this study could inform parents to take the role of talking to their children on the need for delaying sexual debut and inform them on risks associated with some practices like multiple sexual partners since they will be knowledgeable of all the risk factors identified in this study. The results from this study could also benefit the community by empowering the community leaders with information on practices that put young people at risk of HIV. This could help the community leaders to review some of the cultural practices like early marriage, early sex initiation and instill cultural norms that prohibit such practices.

At societal level, the findings could help programmers and policy makers to recognize the vulnerability of young people of different age groups and develop programs and interventions that focus on the predictors of HIV serostatus as identified in this study. The findings could help programmers develop programs that target widowed, separated and divorced young persons at high risk of HIV and promote appropriate prevention strategies such as condom use and abstinence from sexual activities in order to prevent contracting HIV. These findings indicate the need for policy makers and programmers to formulate more appropriate age and gender specific strategies that will address issues related to the relevant population if behavioral change is to take place. The findings could also assist government and stakeholders to allocate resources efficiently by having clear target groups with clear interventions hence achieving more results than just generalized interventions. Finally, the findings of this study could inform researchers on strategic areas for research which will contribute to filling other gaps in the literature.

Conclusion

The HIV prevalence among young people in Zimbabwe ages 15 to 19 years was 4.2% for females and 3.4% for males and among those 20 to 24 years, the prevalence was 10.6% for females and 3.8% for males in 2010/11 (ZIMSTAT & ICF International, 2012). However, significant declining trends associated with increase in proportion of young people not yet initiating sex, an increase in the proportion of young females reporting no new sexual partners, a reduction in number of sexual partners and an increase in condom use have been observed over the years (Marsh et al., 2011; Mahomva et al., 2006). The purpose of this study was to fill a gap in the literature by examining the relationship between sexual behaviors and practices and HIV prevalence over a period of time among males and females ages 15 to 24 years in Zimbabwe.

In this study, there was (i) strong evidence of association between sexual practices especially multiple sexual partners and early sexual debut as proximate determinants and HIV serostatus especially among females ages 15 to 24 years and lack of condom use among males ages 15 to 24 years; and (ii) strong evidence of association between HIV serostatus and marital status for both males and females who are widowed, divorced or separated and an association between place of residence especially females in urban areas and HIV serostatus as underlying determinants. The predictor varied between males and females as well as between those ages 15 to 19 years and 20 to 24 years and the significant determinants changed over time. I therefore recommend that programmers develop age and gender specific HIV prevention strategies/interventions that focus on the identified predictors including promoting the delay of sexual debut which contributes to multiple sexual partnerships and increasing the risk to HIV infection. Researchers should also conduct studies on a regular basis to establish actual predictors at each point in time which would ensure that interventions are evidence informed and well targeted. Halting and reversing the HIV prevalence trends among young people requires development of targeted evidence based interventions (Wang et al., 2014). Healthy and HIV free young people are vital for a healthy and productive community, leading to a developed and health world.

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