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Associations of Sociodemographic Characteristics and PMTCT Knowledge among a Sample of Women of Childbearing Age in Zimbabwe by Childbirth Status: A Descriptive Epidemiologic Analysis

Laura Nguyen

Abstract

Title: Associations of Sociodemographic Characteristics and PMTCT Knowledge among a Sample of Women of Childbearing Age in Zimbabwe by Childbirth Status: A Descriptive Epidemiologic Analysis

By: Laura P. Nguyen

Date: June 14, 2018

Introduction: Associations of knowledge and sociodemographic characteristics of individuals for risk of HIV have been documented; however, it remains to be clarified whether these relationships apply to examining women's knowledge regarding vertical transmission risk of HIV on the basis of having delivered a child. The present study explores associations of sociodemographic risk and prevention of mother-to-child transmission (PMTCT) knowledge among a sample of women of childbearing age in Zimbabwe stratified by childbirth status.

Aim: The purpose of this study was to examine differences of sociodemographic characteristics and knowledge of HIV transmission among women of child-bearing age included in the 2015 Zimbabwe Demographic and Health Survey (DHS) based on HIV-blood test result.

Methods: Eligibility criteria for inclusion in the study were: female sex, aged 15-49, with HIV-blood test results. Secondary analyses (Chi-square and logistic regression) were conducted using data from the 2015 Zimbabwe DHS wave of data. Statistical tests between selected sociodemographic variables (age, educational attainment, wealth index, and childbirth status) and knowledge of HIV transmission related to childbirth, breastfeeding, drugs to avoid, and known HIV-blood test result were conducted to compare women with HIV to those without.

Results: 8,433 female sex, aged 15-49, and known HIV-blood test result met the inclusion criteria and were included in the study sample. 18.02% of the sample were HIV+. Results of the analyses found that educational attainment and wealth index were significantly associated with knowledge of HIV transmission during pregnancy; age, wealth index, childbirth status, and HIV-blood test result were significantly associated with knowledge of drugs taken to avoid HIV transmission to baby during pregnancy; and age, educational attainment, childbirth status, and HIV-blood test result were significantly associated with knowledge of HIV transmitted to baby by breastfeeding.

Conclusion: This study revealed that age, educational attainment, wealth index, childbirth status, and HIV-blood test result were associated with knowledge of HIV transmission outcomes of interest among women of childbearing age in Zimbabwe. There is also a need for further research on innovative strategies aimed at increasing HIV knowledge among certain sub-groups of women who lack the knowledge in regards to prevention of mother-to-child transmission of HIV.

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by

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B.S., Texas A&M University

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Approval Page

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Author's Statement Page

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CHAPTER I

Introduction

1a. Background

Nearly 1.4 million people are living with the human immunodeficiency virus (HIV) in Zimbabwe, with an estimated 64,000 new infections in 2015 and a mother-to-child HIV transmission rate of 6.7% (The Elizabeth Glaser Pediatric AIDS Foundation, 2017). With a population of over 13 million, approximately 794,000 women aged 15 and older and children between the ages of 0-14 are living with HIV, and 29,070 deaths are attributed to acquired immunodeficiency virus (AIDS) annually (The Elizabeth Glaser Pediatric AIDS Foundation, 2017). There are many determinants of maternal and child HIV/AIDS in Zimbabwe that impact and affect treatment, diagnosis, and prevention of the disease such as lack of education and cultural barriers which prevent patients from seeking medical care and healthcare workers from educating patients (Avert, 2017).

The key populations most affected by HIV in Zimbabwe are sex workers, with an HIV prevalence of 57.1% and prisoners, with an HIV prevalence of 28% (The Joint United Nations Programme on HIV/AIDS [UNAIDS], 2018). Moreover, among pregnant women living with HIV, 93% were accessing treatment or prophylaxis to prevent transmission of HIV to their children (UNAIDS, 2018). Additionally, a 2016 UNAIDS (2018) reported that women aged 15 to 49 years of age have an HIV prevalence of 16.1% while their male counterparts had an HIV prevalence of 10.7%.

Zimbabwe is one of the sub-Saharan African countries worst affected by the HIV epidemic with a prevalence of 15% among adults aged 15–49 years (Zimbabwe DHS, 2015). Zimbabwe's response to HIV/AIDS include scale-up campaigns which promote HIV testing, screening, and counseling (Kudakwashe et al., 2016). Normalizing routine HIV testing and providing access to such services in the country has been integral to the successful implementation and promotion of other key strategies which include voluntary medical male circumcision, prevention of mother-to-child transmission, HIV care and treatment, and condom programming and behavior change (Kudakwashe et al., 2016). That is why effective and long-term programs and initiatives aimed at reducing HIV among women and children in Zimbabwe are important.

1b. Purpose of Study

The purpose of this study is to understand the knowledge of transmission prevalence of HIV among females, 15-49 years of age, with HIV-blood test results in Zimbabwe and any associations between age, educational attainment, wealth index, HIV-blood test result, childbirth status, knowledge of HIV transmission to baby during pregnancy, knowledge of drugs taken to avoid HIV transmission to baby during pregnancy, and knowledge of transmission of HIV through breastfeeding, using data from the 2015 Zimbabwe Demographic and Health Survey (DHS). The findings of any associations among the variables will indicate statistical significance which are important to identify in order to understand where to prioritize and allocate funding to enhance programs and policies to reduce HIV among women aged 15-49 years of age. This study is important in understanding knowledge of HIV transmission in prevention of mother-to-child transmission (PMTCT) and determining if there are statistically significant associations of sociodemographic characteristics and knowledge/behavioral patterns related to HIV-blood test

result of women based on available data from the 2015 Zimbabwe DHS. Subsequently, these findings can help inform directions for future preventive efforts related to HIV prevention knowledge.

1c. Research Questions

1. Question #1: Is age significantly associated with knowledge of HIV transmission from mother to baby among women aged 15-49 in Zimbabwe??

   Null Hypothesis #1: Age has no association with knowledge of HIV transmission from mother to baby among women, aged 15-49 in Zimbabwe.

   Alternate Hypothesis #1: Age is positively associated with knowledge of HIV transmission from mother to baby among women, aged 15-49 in Zimbabwe.

2. Question #2: Is educational attainment significantly associated with knowledge of HIV transmission from mother to baby among women aged 15-49 in Zimbabwe?

   Null Hypothesis #2: Educational attainment has not association with knowledge of HIV transmission from mother to baby among women aged 15-49 in Zimbabwe.

   Alternate Hypothesis #2: Educational attainment is positively associated with knowledge of HIV transmission from mother to baby among women aged 15-49 in Zimbabwe.

3. Question #3: Is wealth index significantly associated with knowledge of HIV transmission from mother to baby among women aged 15-49 in Zimbabwe?

   Null Hypothesis #3: Wealth index has no association with knowledge of HIV transmission from mother to baby among women aged 15-49 in Zimbabwe.

   Alternate Hypothesis #3: Wealth index is positively associated with knowledge of HIV transmission from mother to baby among women aged 15-49 in Zimbabwe.

4. Question #4: Is childbirth status significantly associated with knowledge of HIV transmission from mother to baby among women aged 15-49 in Zimbabwe??

   Null Hypothesis #4: Childbirth status has no association with knowledge of HIV transmission from mother to baby among women, aged 15-49 in Zimbabwe.

   Alternate Hypothesis #4: Childbirth status is positively associated with knowledge of HIV transmission from mother to baby among women, aged 15-49 in Zimbabwe.

CHAPTER II

Review of Literature

2a. Health Outcome of Interest/Disease

Human immunodeficiency virus or HIV is a disease that weakens an individual's immune system by destroying CD4 cells, commonly known as T cells, which fight disease and infection (Centers for Disease Control and Prevention [CDC], 2017a). There is currently no effective cure for HIV, but with proper medical care and treatment, HIV can be controlled and managed. The medications used to treat HIV are called antiretroviral therapies, or ART, which if taken daily with the oversight of a medical professional, can prolong an individual's life expectancy (by 32.1 years) and reduce transmission of HIV to their partner(s) (CDC, 2017a). Individuals who are at a high risk for HIV include those who engage in risky sexual behavior such as unprotected sex with multiple partners, uncircumcised men, fetuses of HIV-infected mothers, and/or those who share needles and syringes for use of intravenous drugs (Mayo Clinic, 2015). HIV is spread through contact of bodily fluids from an individual with HIV such as blood, semen, vaginal fluids, and breast milk (U.S. Department of Health and Human Services [HHS], 2017). As a result, the CDC (2017a) recommends regular and consistent screening and testing of individuals who are sexually active every 3 to 6 months.

2b. Overview of HIV/AIDS

The first official reporting of what would mark the beginning of the AIDS epidemic was on June 5, 1981 when the CDC published a Morbidity and Mortality Weekly Report (MMWR), describing cases of a rare lung infection, *Pneumocystis carinii* pneumonia (PCP), in five young,

previously healthy, gay men in Los Angeles, California. Within days of the publication, other similar cases across the U.S. were reported. In addition to reports of cases of PCP and other opportunistic infections among gay men, the CDC also received reported cases of Kaposi's sarcoma, among a group of gay men in New York and California (CDC, 2017a). Then in 1985, the U.S. Food and Drug Administration (FDA) licensed the first commercial blood test, ELISA, to detect HIV (HHS, 2016). Following this discovery, further advancements to HIV testing and screening were made to allow for faster and accurate results.

Since the start of the HIV/AIDS epidemic, an estimated 35 million people have died from AIDS-related illnesses. In 2016, the CDC (2017a) reported there were approximately 36.7 million people living with HIV around the world, 1.8 million new cases of HIV, and an estimated 1 million people dying from AIDS-related illnesses. Moreover, sub-Saharan Africa, which bears the heaviest burden of HIV and AIDS worldwide, accounts for 64% of all new HIV infections (CDC, 2017a).

2c. Costs/Burden of HIV/AIDS Globally

A large fraction of the economic burden of HIV/AIDS is the medical costs of treating individuals with HIV (CDC, 2017b). Medical cost estimates are often based on health care utilization by persons with HIV disease with the average annual cost of ART to be an estimated $23,000 and the estimated cost of lifetime HIV treatment to be $379,668 as of 2010 (CDC, 2017b). It is important to note the distribution of HIV/AIDS burden is not equal across demographics and regions with areas such as sub-Saharan Africa carrying the highest burden on an individual level. The costs for treatment, care, management, and drugs associated with HIV/AIDS and their related health outcomes as of those stated previously depend on the

country's political stability, economy, and facilities and resources to tackle the HIV/AIDS epidemic (Bakir & Skarzynski, 2015).

2d. HIV/AIDS in Zimbabwe

Zimbabwe faces multifaceted political and economic crises which have attributed to the collapse of their health system (Munjanja, Nystrom, & Magwali, 2017). This has resulted in food shortages across the country and lack of funding towards HIV/AIDS services and education. As previously stated, nearly 1.4 million people are living with HIV in Zimbabwe, with an estimated 64,000 new infections in 2015 and a mother-to-child HIV transmission rate of 6.7% (The Elizabeth Glaser Pediatric AIDS Foundation, 2017). While the rate of accessing HIV treatment has increased since 2010, children lag disproportionately behind adults in terms of ART coverage—with 43% of all children infected receiving ART in 2015 while adults receive 54% (Avert, 2017). This is due to the limited range of age-appropriate antiretroviral drugs that are available in pediatric formulations. Access and availability of ART for infants can be integral to increasing PMTCT.

One study analyzed the implications of HIV and AIDS prevention, treatment, and care programs on Zimbabwe's healthcare system (Chevo & Bhatasara, 2011). It found that over half a million newborns are infected with HIV in sub-Saharan Africa through mother-to-child transmission and HIV infection rates among pregnant women range from 15-40 percent in countries with the highest overall HIV prevalence, with women of reproductive age comprising over 55 percent of HIV-infected adults. (Kak, Chitsike, Luo, & Rollins, 2009). These findings indicated a need to strengthen HIV and AIDS service delivery and integrate them into the primary health care system in Zimbabwe.

Another study examined HIV related stigma and discrimination as a known barrier for

HIV prevention and care by assessing the relationship between socio-economic status (SES) and HIV related stigma in Zimbabwe (Kudzanai, Singh, Chingono, Sibanda, & Machingura, 2016). A total of 2,522 eligible participants responded to a psychometric assessment tool, which assessed HIV related stigma and discrimination attitudes on 4-point Likert scale. The tool measured three components of HIV-related stigma: shame, blame and social isolation, perceived discrimination, and equity. The results showed that the shame, blame and social isolation component of HIV-related stigma were significantly associated with medium and low SES. This indicates there are more stigmatizing attitudes by participants belonging to medium and low SES in comparison to high SES.

The transmission of HIV from an HIV-positive mother to her child during pregnancy, labor, delivery, or breastfeeding is known as mother-to-child transmission (WHO, 2017b). The highest transmission of HIV from mother-to-child is among breastfeeding with the second highest being HIV-positive women who are not on ART during their pregnancy (McHugh et al., 2017). However, the means of reducing mother-to-child transmission of HIV include early testing/detection of HIV among women of child-bearing age and effective interventions, which involve normalizing HIV education in communities and antiretroviral treatment for mother and child during the periods of pregnancy, labor, delivery, and breastfeeding (WHO, 2017).

A different study evaluated the impact of implementing post-2010 WHO prevention of mother-to-child transmission (PMTCT) guidelines on attainment of PMTCT targets (Gumede-Moyo, Filteau, Munthali, Todd, & Musonda, 2017). Some of the targets were primary prevention of HIV infection among women of childbearing age, preventing unintended pregnancies among women living with HIV, and preventing HIV transmission from a woman living with HIV to her infant. The study used a retrospective and prospective cohort study design to collect data with a

focus on provision and utilization of PMTCT services. The outcomes of the study were the proportion of pregnant women who were tested during their antenatal clinic visits had lower mother-to-child transmission rate. The study found that uptake of antenatal HIV testing was high, but later aspects of PMTCT such as adherence to ART post-antenatal care declined.

One study tested for approaches to improving retention in care among women living with HIV during pregnancy and breastfeeding in six implementation research studies in Malawi, Nigeria, and Zimbabwe (McCarthy et al., 2017). A computer-based state-transition model was developed to estimate the impact of the retention interventions. Among the 5,742 participants, the study found that almost 80% of all infant infections were attributed to the roughly 20% of HIV-positive pregnant and breastfeeding women not retained on antiretroviral therapy (McCarthy et al., 2017).

Potential solutions through funding, research, policy, and programs of HIV/AIDS in Zimbabwe have improved over the last decade but continue to face challenges and obstacles such as resistance to treatment from women and children due to the social stigmas of HIV in the country, access to testing centers, management and adherence to treatment plans, lack of healthcare professionals to provide HIV care, overcrowding of clinics, and facilities that are far from served populations (McHugh et al., 2017). However, studies have found that antenatal care visits serve as a critical gateway to HIV testing and counseling among women which can prevent transmission of the disease to their children (Takarinda et al., 2014; Takarinda et al., 2016).

2e. HIV Prevention Knowledge and Risk Factors

A study examined PMTCT with HIV and antenatal care integrated services and explored the determinants of antenatal HIV testing in Zimbabwe (Gazimbi & Magadi, 2018). The results indicated that antenatal HIV testing was determined by a wide range of factors relating to a

women's economic and demographic status and HIV awareness and stigma within the community. Other factors identified were high socioeconomic status, level of education, and having no observed HIV-related stigma and knowledge of HIV-status based on a previous HIV test. These factors were found to have a significantly higher likelihood of females being tested for HIV during pregnancy than their counterparts of lower socioeconomic status, low levels of educational attainment, and who had observed HIV-related stigma or did not know their HIV-status. The results also showed that community HIV awareness is important for improving antenatal HIV testing especially in school and clinic settings, while stigma is associated with reduced testing uptake.

Another study assessed the impact of routine antenatal HIV testing for PMTCT of HIV in urban Zimbabwe (Chandisarewa et al., 2007). The results of the study indicated that compared to those who opted-in for PMTCT HIV-related services, during routine testing, more HIV-infected women collected results of HIV-status at health facilities resulting in more mother and infant pairs receiving antiretroviral prophylaxis. Additionally, women were satisfied with counselling services and most stated that offering routine testing was helpful. However, the study lacked data as to whether health facilities would develop long-term health plans on educating women on how to properly take their medicines and what the trajectory of their life would be as an HIV-positive individual.

CHAPTER III

Methods and Procedures

3a. Study Population

The eligibility criteria were specified as female sex, aged 15-49 years who voluntarily participated in the questionnaire administration who could be linked to an HIV-blood test result. Any case with missing data were excluded from the final study sample in the 2015 Zimbabwe DHS, which was conducted over a span of 6 months between July 2015 and December 2015.

3b. Data Source

The cross-sectional data for this study was obtained from the DHS program. The DHS program was established in 1984 by the United States Agency for International Development (USAID) to collect, analyze, and disseminate over 260 surveys across 90 countries. These surveys provide comprehensive information on the country's HIV/AIDS, maternal and child health, immunization, fertility, tobacco use, wealth, nutrition, and mortality rates, in addition to numerous other health indicators. All DHS are designed to provide national-level statistics and reliable indicators for various population sub-groups defined by age, sex, educational attainment, urban/rural residence, wealth index, and region of the country. These statistics are released in a standard set of tables included with the country reports on survey completion (Corsi, Neuman, Finlay & Subramanian, 2012).

USAID administer one of two main types of DHS surveys. The first survey type is the "Standard DHS," which has sample sizes between 5,000 to 30,000 households and is conducted every 5 years to allow for comparisons over time. The second survey type is the "Interim DHS"

and typically has a smaller sample size and shorter questionnaire. The Interim DHS is distributed between Standard DHS periods and collects information on key performance monitoring indicators. Each survey consists of three questionnaires: the Household Questionnaire, Men's Questionnaire, and Women's Questionnaire. The Household Questionnaire collects information on the features of the home and identifies eligibility of household members to participate in individual interviews, in addition to measuring the height and weight for women and children in the household (DHS, n.d.). The Men's and Women's Questionnaire identify men and women of reproductive age, 15-59 and 15-49 respectively, to participate in the survey.

While each survey contains the same general questions, certain sections will vary and may not be included in the standard questionnaires, or be relevant to other countries. Permission to download the 2015 Zimbabwe Standard DHS was obtained by DHS, and the use of DHS datasets have been previously approved by the Georgia State University Institutional Review Board, who considers the data not human subjects research and exempt from additional approval requirements (Georgia State University, 2018).

The sample size (n) for the 2015 Zimbabwe DHS was 44,489 household members. The "Women's" and "HIV" datasets were obtained from the DHS website and were merged using SAS 9.4 statistical software package. The sample size (n) of the "Women" dataset was 9,955 whereas the "HIV" dataset was 32,192. An eligibility criterion was applied to this study to allow for only females, aged 15-49 years old that had HIV blood test results to be analyzed. Participants with incomplete or missing responses were excluded from the study. In addition, appropriate weights were calculated and applied to the dataset, as well as cluster and strata variables, to account for the complex survey design. Hence, 8,433 participants met the inclusion criteria for this study.

3c. Variables

The following variables were included in the analyses for this study: age, educational attainment, wealth index, HIV-blood test result, childbirth status, knowledge of HIV transmitted during pregnancy, knowledge of drugs taken to avoid HIV transmission to baby during pregnancy, and knowledge of HIV transmitted by breastfeeding (Zimbabwe Demographic and Health Surveys, 2016). The SAS files in the 2015 Zimbabwe DHS analyzed in this study were the "Women's" and "HIV" datasets. Both datasets were merged using instructions on the DHS website. Common identifiers (identification variables), were determined for both data files, then sorted by the "Case ID" variable.

The predictor variables include respondent's age at the time of survey categorized into 5-year increments (15-49), educational attainment (none, primary, secondary, higher), wealth index (poorest, poorer, middle, richer, richest), HIV-blood test result (HIV-positive, HIV-negative), and childbirth status (yes, no). Educational attainment was a standardized variable and no specific formula or computation were used to generate the categories (USAID, 2013). As for wealth index, a statistical procedure known as a principal component analysis was used to generate quintiles for a composite measure of a household's cumulative living standard based on a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities (USAID, 2013). However, no weights were applied for the wealth index variable during the recoding of the variable in SAS.

The outcome variables are as follows: knowledge of HIV transmitted during pregnancy (yes or no), knowledge of drugs to avoid HIV transmission to baby during pregnancy (yes or no), and knowledge of HIV transmitted by breastfeeding (yes or no).

Table 1. Key Study Variables

Survey Question Number	Survey Question	Variable in SAS	Variable Label in SAS	Type	Response
7	How old is (NAME)?	V013	Age	Independent	15-19
					20-24
					25-29
					30-34
					35-39
					40-44
					45-49
108	What is the highest level of school you attended: primary, secondary, or higher?	V106	Educational Attainment	Independent	No Education
					Primary
					Secondary
					Higher
N/A	N/A	V190	Wealth Index	Independent	Poorest
					Poorer
					Middle
					Richer
					Richest
N/A	N/A	HIV03	HIV-Blood Test Result	Independent	Negative
					Positive
201	Now I would like to ask about all the births you have had during your life. Have you ever given birth?	V201	Childbirth Status	Independent	Yes
					No
1008	Can HIV be transmitted from mother to her baby: during pregnancy?	V774A	(Knowledge of) HIV transmitted to baby during pregnancy	Dependent	No
					Yes
1010	Are there any special medicines that a doctor or a nurse can give to a woman infected with HIV to reduce the risk of transmission to the baby?	V824	(Knowledge of) Drugs taken to avoid HIV transmission to baby during pregnancy	Dependent	No
					Yes
1008	Can HIV be transmitted from a mother to her baby: by breastfeeding?	V774C	(Knowledge of) HIV transmitted to baby by breastfeeding	Dependent	No
					Yes

3d. Statistical Analysis

The SAS software package (version 9.4) was used to merge, organize, and analyze the data for this study. To account for unequal probabilities of selection, over sampling and non-response, appropriate sample weights were utilized for the prevalence estimates. Frequency tables were produced to determine the prevalence of each response for all variables of interest. Chi-squared tables were performed to test for statistically significant associations between predictors (i.e. age, educational attainment, wealth index, HIV-blood test result, and childbirth status) and outcomes of interest (knowledge of HIV transmitted during pregnancy, knowledge of drugs to avoid during pregnancy, and knowledge of HIV transmitted by breastfeeding). Bivariate and multivariate logistic regression models were used to produce odds ratios to determine the influence of the predictor variables on the outcomes of interest, using a reference group for comparison. For all analyses performed, a p-value of 0.05 and confidence interval of 95% were used to determine statistical significance.

CHAPTER IV

Results

Table 1 summarizes the frequency of the variables of interest included in the study. A total of 8,433 female participants, aged 15-49 with HIV-blood test results, met the study eligibility criteria for the study out of 44,489 household members from the 2015 Zimbabwe DHS wave of data collection. The explanatory variables of interest included in the study were age, educational attainment, wealth index, HIV-blood test result, and childbirth status. Additionally, the response variables of interest were knowledge of HIV transmitted during pregnancy, knowledge of drugs to avoid HIV transmission to baby during pregnancy, and knowledge of HIV transmitted by breastfeeding.

Tables 2 presents the results of the bivariate logistic regression analyses, which were used to produce odds ratios for the three main predictors of interest (knowledge of HIV transmitted during pregnancy, knowledge of drugs taken to avoid HIV transmission to baby during pregnancy, and knowledge of HIV transmitted to baby by breastfeeding), using one response category as a reference. All p-values produced by these bivariate analyses were significant at the .05 level, indicating there is a statistically significant difference between the reference and other response categories for the predictors of each knowledge outcome of interest. Among the three outcomes of interest, groups with increased knowledge of HIV transmitted during pregnancy were among those with no education (p-value, 0.0222), primary education (p-value, <.0001), secondary education (p-value, <.0001), and all categories in wealth index. Groups with increased knowledge of drugs taken to avoid HIV transmission to baby during transmission were among

those aged 15-19 (p-value, 0.0020) and with primary education (p-value, 0.0182). Lastly, groups with increased knowledge of HIV transmitted to baby by breastfeeding were among those aged 15-19 (p-value, <.0001), those with a primary (p-value, 0.0020) and secondary education (p-value, 0.0031), and have a HIV-blood test result of positive (p-value, <.0001).

Table 3 is also a bivariate logistic regression analyses that examined the influence of each predictor on the outcomes of interest when stratified by females who ever had a child compared to those who never had a child while controlling for each individual predictor category response option by having age, educational attainment, wealth, and HIV-blood test result constant. The purpose for this stratified analysis is to determine if knowledge of HIV transmission varies among women who have ever had a child compared to those who have never had a child while holding the predictors constant (i.e. not comparing different categories to a reference group, but rather to each response within a predictor based on childbirth status).

The findings showed that compared to those who have never had a child, 20-29 year olds who ever had a child had significantly increased odds of knowledge of transmitting HIV during pregnancy (OR=2.04). The age group, 35-39, had decreased odds (OR=0.61) of knowledge of HIV transmission during pregnancy compared to those who never had a child; however, these findings were not significant. This could be attributed to a low sample of individuals who never had a child and knowledge of HIV transmission during pregnancy. It should be noted that older age groups greater than 30 should be interpreted with caution due to the relatively low number of individuals that may not have a child in that age group.

As for knowledge of transmission of HIV during pregnancy by educational attainment, the findings show that among those who have had a child and had a primary (OR=1.63) and secondary (OR=1.32) education, had a significant increased knowledge of HIV transmission

during pregnancy compared to those who had never had a child. Interestingly, there was no significant difference in knowledge of HIV transmission during pregnancy by child status among those with a higher education. This is somewhat surprising to find those with higher education have less knowledge of transmission of HIV during pregnancy compared to those with a primary and secondary education. Additionally, compared to those with higher educational attainment, all other educational attainment categories have increased knowledge of transmission of HIV during pregnancy. One potential reasoning could be effective targeting or receipt of HIV transmission knowledge elsewhere.

Knowledge of transmission of HIV during pregnancy by wealth indicated that those who have had a child and have a middle wealth index (OR=2.20) are the only ones with a significant increased odds of knowledge of HIV transmission during pregnancy compared to those who never had a child. As for knowledge of drugs taken to avoid HIV transmission during pregnancy, the findings show that all age groups have good knowledge of drugs to avoid HIV transmission during pregnancy despite wider confidence intervals as the age group increases. As for knowledge of drugs taken to avoid HIV transmission to baby during pregnancy, all education groups have increased knowledge of HIV transmission and are significant despite wide confidence intervals.

Additionally, there is no significant difference in knowledge of drugs to avoid HIV transmission to baby among age groups, education levels, and HIV-blood test result compared to the reference groups. However, there is a significantly increased odds (OR=1.59) of knowledge of drugs to avoid among those that are HIV-positive and have ever had a child compared to those without.

In table 4, findings show there was a significant increase in knowledge of HIV transmitted during pregnancy among those with a primary education (p-value, 0.0059), secondary education (p-value, 0.0019), middle wealth (p-value, 0.0010), richer wealth (p-value, 0.0026), and those who had a child (p-value, 0.0024). There was also no significant difference in knowledge of drugs to avoid HIV transmission to baby during pregnancy among age groups, education levels, and HIV-blood test result compared to their reference groups. However, there is a significantly increased odds of knowledge of drugs to avoid among those that have ever had a child compared to those without (p-value, <.0001). Lastly, compared to the reference group for educational attainment (higher), all other educational attainment categories have significantly decreased knowledge of HIV transmission by breastfeeding. This is also similar in the case for those who have had a child (p-value, <.0001).

Table 1. Descriptive Summary of Study Sample

Variable	N	Percent
Age		
15-19	1,736	20.59
20-24	1,520	18.02
25-29	1,451	17.21
30-34	1,362	16.15
35-39	1,044	12.38
40-44	836	9.91
45-49	484	5.74
Missing	0	
Educational Attainment		
No Education	83	0.98
Primary	2,023	23.99
Secondary	5,658	67.09
Higher	669	7.93
Missing	0	
Wealth Index		
Poorest	1,296	15.37
Poorer	1,253	14.86
Middle	1,335	15.83
Richer	2,184	25.90
Richest	2,365	28.04
Missing	0	
HIV-Blood Test Result		
HIV-Negative	6,913	81.98
HIV-Positive	1,520	18.02
Missing	0	
Children Ever Born		
Yes	6,291	74.60
No	2,142	25.40
Missing	0	
Knowledge of HIV Transmitted to Baby During Pregnancy		
Yes	7,596	90.81
No	769	9.19
Missing	68	
Knowledge of Drugs to Avoid HIV Transmission to Baby During Pregnancy		
Yes	8,040	97.85
No	177	2.15
Missing	216	
Knowledge of HIV Transmitted to Baby by Breastfeeding		
Yes	7,326	87.58
No	1,039	12.42
Missing	68	

Table 2. Bivariate Logistic Regression Examining Each Outcome of Interest by Each Predictor

	Knowledge of HIV Transmitted During Pregnancy		Knowledge of Drugs Taken to Avoid HIV Transmission to Baby During Pregnancy		Knowledge of HIV Transmitted to Baby by Breastfeeding	
	OR (CI)	**P-value**	**OR (CI)**	**P-value**	**OR (CI)**	**P-value**
Age						
15-19	0.94 (0.64-1.37)	0.7367	0.30 (0.14-0.64)	0.0020	0.44 (0.32-0.60)	<.0001
20-24	1.14 (0.78-1.68)	0.5046	0.77 (0.34-1.74)	0.5320	1.02 (0.74-1.41)	0.9055
25-29	1.04 (0.72-1.52)	0.8242	0.65 (0.29-1.47)	0.2988	1.27 (0.90-1.80)	0.1809
30-34	1.05 (0.71-1.55)	0.8199	1.66 (0.68-4.06)	0.2664	1.20 (0.86-1.66)	0.2842
35-39	0.89 (0.61-1.31)	0.5464	1.37 (0.51-3.70)	0.5366	1.13 (0.79-1.60)	0.5100
40-44	1.13 (0.73-1.74)	0.5971	1.34 (0.49-3.69)	0.5699	0.85 (0.61-1.19)	0.3362
45-49	REF		REF		REF	
Educational Attainment						
No Education	3.37 (1.19-9.52)	0.0222	0.30 (0.06-1.40)	0.1256	0.52 (0.26-1.06)	0.0721
Primary	2.06 (1.53-2.76)	<.0001	0.41 (0.20-0.86)	0.0182	0.57 (0.39-0.81)	0.0020
Secondary	1.87 (1.44-2.42)	<.0001	0.59 (0.29-1.22)	0.1549	0.59 (0.42-0.84)	0.0031
Higher	REF		REF		REF	
Wealth Index						
Poorest	1.44 (1.13-1.86)	0.0041	0.66 (0.43-1.01)	0.0541	1.07 (0.86-1.34)	0.5266
Poorer	1.51 (1.17-1.96)	0.0019	0.92 (0.56-1.49)	0.7184	0.87 (0.70-1.09)	0.2353
Middle	1.86 (1.44-2.40)	<.0001	1.38 (0.80-2.37)	0.2504	0.89 (0.72-1.09)	0.2568
Richer	1.56 (1.28-1.90)	<.0001	1.35 (0.89-2.07)	0.1583	1.05 (0.86-1.26)	0.6535
Richest	REF		REF		REF	
HIV-blood Test Result						
HIV-positive	1.03 (0.85-1.25)	0.7343	1.36 (0.89-1.11)	0.1404	1.62 (1.33-1.97)	<.0001
HIV-negative	REF		REF		REF	
Ever Have Child						
Yes	1.35 (1.14-1.60)	0.0006	3.45 (2.56-4.65)	<.0001	2.31 (1.99-2.69)	<.0001
No	REF		REF		REF	

Table 3. Bivariate Regression Analyses Examining Sociodemographic Characteristics and HIV Knowledge by Birth History

	Knowledge of HIV Transmitted During Pregnancy			Knowledge of Drugs Taken to Avoid HIV Transmission to Baby During Pregnancy			Knowledge of HIV Transmitted to Baby by Breastfeeding		
	Percent (%)		OR (95% CI)	Percent (%)		OR (95% CI)	Percent (%)		OR (95% CI)
	Yes	No		Yes	No		Yes	No	
Childbirth Status by Age									
Childbirth Status (Yes)									
15-19	92.88	7.12	1.54 (0.96-2.45)	95.97	4.03	1.23 (0.66-2.27)	86.73	13.27	2.03 (1.40-2.93)
20-24	93.23	6.77	1.90 (1.32-2.74)	98.78	1.22	3.02 (1.46-6.26)	90.82	9.18	1.64 (1.17-2.31)
25-29	91.74	8.26	2.04 (1.23-3.40)	98.05	1.95	2.55 (1.09-5.96)	91.82	8.18	1.75 (1.05-2.94)
30-34	91.18	8.82	1.43 (0.62-3.28)	99.14	0.86	1.81 (0.23-14.14)	91.03	8.97	1.60 (0.76-3.38)
35-39	89.48	10.52	0.61 (0.14-2.62)	98.99	1.01	3.38 (0.41-27.92)	90.08	9.92	0.31 (0.04-2.35)
40-44	91.80	8.20	1.87 (0.66-5.31)	99.11	0.89	8.62 (1.74-42.61)	87.45	12.55	0.84 (0.26-2.72)
45-49	90.30	9.70	N/A	98.70	1.30	4.73 (0.53-41.98)	89.01	10.99	0.51 (0.06-3.97)
Childbirth Status (No)									
15-19	89.46	10.54	--	95.10	4.90	--	76.34	23.66	--
20-24	87.85	12.15	--	96.39	3.61	--	85.75	14.25	--
25-29	84.46	15.54	--	95.17	4.83	--	86.49	13.51	--
30-34	87.88	12.12	--	98.46	1.54	--	86.36	13.64	--
35-39	93.33	6.67	--	96.67	3.33	--	96.67	3.33	--
40-44	85.71	14.29	--	92.86	7.14	--	89.29	10.71	--
45-49	100.00	0.00	--	94.12	5.88	--	94.12	5.88	--
Childbirth Status by Educational Attainment									
Childbirth Status (Yes)									
No Education	94.67	5.33	N/A	97.30	2.70	N/A	86.67	13.33	3.25 (0.27-39.38)
Primary	92.44	7.56	1.63 (1.04-2.56)	97.98	2.02	4.46 (2.54-7.83)	88.02	11.98	1.99 (1.41-2.81)
Secondary	91.81	8.19	1.32 (1.08-1.62)	98.83	1.17	3.56 (2.42-5.24)	90.80	9.20	2.61 (2.21-3.09)
Higher	84.79	15.21	1.05 (0.69-1.61)	99.58	0.42	7.88 (1.52-40.80)	93.33	6.67	1.75 (0.99-3.11)
Childbirth Status (No)									
No Education	100.00	0.00	--	66.67	33.33	--	66.67	33.33	--
Primary	88.21	11.79	--	91.57	8.43	--	78.71	21.29	--
Secondary	89.44	10.56	--	95.96	4.04	--	79.06	20.94	--
Higher	84.13	15.87	--	96.81	3.19	--	88.89	11.11	--
Childbirth Status by Wealth									
Childbirth Status (Yes)									
Poorest	91.58	8.42	1.26 (0.74-2.14)	97.25	2.75	2.34 (1.17-4.68)	90.08	9.92	2.23 (1.50-3.31)
Poorer	91.36	8.64	0.84 (0.50-1.41)	98.22	1.78	2.72 (1.37-5.41)	87.76	12.24	1.72 (1.16-2.57)
Middle	94.47	5.53	2.20 (1.42-3.40)	98.50	1.50	1.34 (0.52-3.42)	89.34	10.66	2.47 (1.78-3.43)
Richer	92.18	7.82	1.19 (0.83-1.70)	99.15	0.85	5.11 (2.57-10.14)	91.16	8.84	2.78 (2.10-3.67)
Richest	88.74	11.26	1.26 (0.97-1.62)	99.41	0.59	9.30 (4.78-18.12)	91.28	8.72	2.42 (1.82-3.20)
Childbirth Status (No)									
Poorest	89.66	10.34	--	93.78	6.22	--	80.30	19.70	--
Poorer	92.64	7.36	--	95.29	4.71	--	80.62	19.38	--
Middle	88.61	11.39	--	98.01	1.99	--	77.22	22.78	--
Richer	90.86	9.14	--	95.79	4.21	--	78.79	21.21	--
Richest	86.24	13.76	--	94.74	5.26	--	81.24	18.76	--
Childbirth Status by HIV-blood Test Result									
Childbirth Status (Yes)									
HIV-positive	91.41	8.59	1.52 (0.91-2.53)	98.82	1.18	2.50 (0.79-7.86)	91.77	8.23	1.59 (0.95-2.66)
HIV-negative	91.50	8.50	1.34 (1.12-1.60)	98.59	1.41	3.41 (2.45-4.74)	89.73	10.27	2.28 (1.95-2.66)
Childbirth Status (No)									
HIV-positive	87.50	12.50	--	97.10	2.90	--	87.50	12.50	--
HIV-negative	88.92	11.08	--	95.34	4.66	--	79.32	20.68	--

Table 4. Multivariate Regression Analyses Examining Sociodemographic Characteristics and Birth History by Each HIV Knowledge Outcome of Interest

Variable	Adjusted OR (95% CI)	P-value
Knowledge of HIV Transmitted During Pregnancy		
15-19	1.18 (0.78-1.79)	0.4289
20-14	1.28 (0.86-1.90)	0.2164
25-29	1.12 (0.76-1.64)	0.5697
30-34	1.09 (0.73-1.62)	0.6808
35-39	0.91 (0.62-1.35)	0.6371
40-44	1.15 (0.94-1.79)	0.5322
45-49	REF	
No Education	2.73 (0.94-7.94)	0.0660
Primary	1.63 (1.15-2.31)	0.0059
Secondary	1.58 (1.19-2.11)	0.0019
Higher	REF	
Poorest	1.19 (0.89-1.58)	0.2425
Poorer	1.27 (0.96-1.67)	0.0939
Middle	1.59 (1.21-2.10)	0.0010
Richer	1.38 (1.12-1.69)	0.0026
Richest	REF	
HIV-positive	0.97 (0.79-1.18)	0.7446
HIV-negative	REF	
Childbirth Status (Yes)	1.40 (1.13-1.74)	0.0024
Childbirth Status (No)	REF	
Knowledge of Drugs Taken to Avoid HIV Transmission to Baby During Pregnancy		
15-19	0.58 (0.23-1.47)	0.2533
20-14	0.89 (0.38-2.09)	0.7863
25-29	0.62 (0.27-1.14)	0.2514
30-34	1.47 (0.60-3.62)	0.4011
35-39	1.21 (0.43-3.41)	0.7220
40-44	1.19 (0.43-3.28)	0.7408
45-49	REF	
No Education	0.21 (0.04-1.14)	0.0712
Primary	0.38 (0.17-0.83)	0.0159
Secondary	0.66 (0.31-1.42)	0.2878
Higher	REF	
Poorest	0.72 (0.47-1.11)	0.1338
Poorer	1.02 (0.60-1.74)	0.9304
Middle	1.46 (0.84-2.54)	0.1841
Richer	1.29 (0.85-1.97)	0.2295
Richest	REF	
HIV-positive	1.21 (0.74-1.96)	0.4469
HIV-negative	REF	
Childbirth Status (Yes)	2.77 (1.70-4.51)	<.0001
Childbirth Status (No)	REF	
Knowledge of HIV Transmitted by Breastfeeding		
15-19	0.71 (0.50-1.00)	0.0520
20-14	1.19 (0.86-1.64)	0.3000
25-29	1.29 (0.91-1.82)	0.1597
30-34	1.16 (0.83-1.61)	0.3918
35-39	1.07 (0.75-1.52)	0.7188
40-44	0.81 (0.58-1.14)	0.2209
45-49	REF	
No Education	0.45 (0.22-0.95)	0.0347
Primary	0.54 (0.37-0.80)	0.0020
Secondary	0.68 (0.48-0.97)	0.0353
Higher	REF	
Poorest	1.13 (0.88-1.44)	0.3464
Poorer	0.94 (0.74-1.19)	0.5916
Middle	0.96 (0.77-1.19)	0.6800
Richer	1.02 (0.84-1.23)	0.8530
Richest	REF	
HIV-positive	1.38 (1.13-1.68)	0.0018
HIV-negative	REF	
Childbirth Status (Yes)	1.77 (1.46-2.16)	<.0001
Childbirth Status (No)	REF	

CHAPTER V

Discussion and Conclusion

5a. Discussion

The purpose of this study was to examine data collected from the 2015 Zimbabwe Demographic and Health Survey (DHS) to determine if age, educational attainment, wealth index, HIV-blood test result, and childbirth status were significantly associated with knowledge of HIV-transmission routes from mother to baby among females, aged 15-49 in Zimbabwe. The main HIV transmission knowledge outcomes of interest were knowledge of HIV transmission during pregnancy, knowledge of drugs to avoid HIV transmission to baby during pregnancy, and knowledge of HIV transmitted by breastfeeding.

Results of the analyses found that educational attainment and wealth index were significantly associated with knowledge of HIV transmitted during pregnancy; age, wealth index, and HIV-blood test result were significantly associated with knowledge of drugs taken to avoid HIV transmission to baby during pregnancy; and age, educational attainment, HIV-blood test result, and childbirth status were significantly associated with knowledge of HIV transmitted to baby by breastfeeding.

The findings of this study support those found in previous literature that there are differential risks which affect associations between age, educational attainment, wealth index, HIV-blood test result, and childbirth status depending on the outcome of interest examined—resulting in some factors having greater influence in predicting the outcome. Previous studies have highlighted that individuals of lower socioeconomic status, low educational attainment, and

limited knowledge of HIV prevention have a higher risk of HIV transmission, particularly among at-risk populations, such as women and children. Moreover, the literature review on maternal and child HIV in Zimbabwe and sub-Saharan Africa indicate that consistent ART, regular screening and testing, and education on HIV transmission from mother-to-child during pregnancy and post-partum were the most effective means in reducing HIV transmission rates. Lastly, the findings in the literature review have noted the complex associations between HIV transmission routes from mother-to-child. It was further indicated that HIV-positive mothers who are poorly educated and are living below poverty are more likely to transmit HIV to their baby during their pregnancy and not have the skills or knowledge on how to prevent transmission (e.g. knowledge on what drugs to take to avoid transmission).

Overall, these analyses indicated that women who are pregnant play an integral role in preventing their children from acquiring HIV during pregnancy. Lack of knowledge of transmission routes and/or lack of accessibility to services and education which would provide women with the skills, knowledge, and attitudes to prevent HIV transmission to their baby are important to address when scaling programs and making policy changes. This is a result of women with the lowest wealth index and educational attainment being at a higher risk for HIV transmission.

5b. Limitations and Strengths of the Study

The findings of this study should be considered preliminary and caution should be taken when interpreting the findings. This study cannot be generalized due to the robust nature of the data, missing data (HIV tests were conducted for those who volunteered), use of an unweighted variable (i.e. wealth index), and self-report biases. In addition, despite sample size being relatively large, there were many variables with substantial missing data that may have

inadvertently affected the results of the study. Lastly, the cross-sectional nature of DHS only permits comparison of interest variables at one point in time, preventing an understanding of causality that may exist between HIV transmission among women of child-bearing age and factors that may influence the occurrence. However, despite the limitations, these analyses provided tentative information to guide future research, particularly pertaining to knowledge of HIV transmission as it relates to PMTCT.

5c. Conclusions

Maternal health services such as antenatal care visits, testing, and screening for HIV as well as educational awareness of the disease are an important means of providing prevention and treatment to the most vulnerable—women and children. Given the decreased prevalence of HIV among those with high educational attainment and increased wealth status, policymakers should consider strategies targeted at expanding HIV-testing facilities and treatment/resource centers to ensure a wider population of interest is reached. This also involves increasing the capacity of healthcare staff members to deliver services among those who are of lower-income and have lower-educational attainment levels. However, to reduce HIV transmission among pregnant mothers to their babies specifically, it is crucial to the health of the unborn baby that expectant mothers maintain antiretroviral therapy treatments and understand the resources and tools available to prevent the spread of the disease. Additionally, it is not only about understanding one's disease status but to also receive necessary and long-term support and care to keep viral load low to minimize the risk of HIV transmission.

5d. Future Directions

Future research and intervention efforts need to consider more effective initiatives and strategies in prioritizing HIV education and prevention among women and children in

Zimbabwe, particularly in rural areas. In addition, role of social influences, norms, constructs, and stigmas that contribute to HIV among these population groups should be examined. Other areas of research and funding should also include: implementing support groups for men and women to increase awareness about the negative consequences of engaging in risky sexual behavior and facilitating impactful dialogues about the adverse consequences of living with HIV/AIDS at an earlier age. Lastly, there is currently a lack of research on male involvement in HIV-positive households with children—given that spousal support can greatly influence the decision to seek early medical care. Other identified gaps in research include studying the long-term effects of pregnant women in Zimbabwe who are HIV-positive, children who are born to HIV-positive mothers, and effective interventions and strategies of reducing mother-to-child transmission of HIV.

References

Bakir, A. H., & Skarzynski, M. (2015). Health disparities in the immunoprevention of human papillomavirus infection and associated malignancies. *Frontiers in Public Health, 3*. https://doi.org/10.3389/fpubh.2015.00256

Chandisarewa, W., Stranix-Chibanda, L., Chirapa, E., Miller, A., Simoyi, M., Mahomva, A.,…Shetty, A. K. (2007). Routine offer of antenatal HIV testing ("opt-out" approach) to prevent mother-to-child transmission of HIV in urban Zimbabwe. *Bull World Health Organ, 83*, 843–850. doi:10.2471/BLT.06.035188

Chevo, T., & Bhatasara, S. (2011). HIV and AIDS Programmes in Zimbabwe: Implications for the Health System. *ISRN Immunology*, 11. doi:10.5402/2012/609128

Corsi, D. J., Neuman, M., Finlay, J.E., & Subramanian, S. (2012). Demographic and health surveys: A profile. *International Journal of Epidemiology, 41*(6), 1602–1613.

Gazimbi, M., & Magadi, M. (2018). Individual-and community-level determinants of antenatal HIV testing in Zimbabwe. *Journal of Biosocial Science*, 1-22. https://doi.org/10.1017/S002193201800007X

Gumede-Moyo, S., Filteau, S., Munthali, T., Todd, J., & Musonda, P. (2017). Implementation effectiveness of revised (post-2010) World Health Organization guidelines on prevention of mother-to-child transmission of HIV using routinely collected data in sub-Saharan Africa: A systematic literature review. *Medicine, 96*(40). doi:10.1097/MD.0000000000008055

Kak, Y., Chitsike, I., Luo, C., & Rollins, N. (2009). Prevention of mother-to-child transmission of HIV/AIDS programmes. *Opportunities for Africa's Newborns*, 113. Retrieved from

www.savethechildren.org/publications/technical-resources/saving-newborn-lives/snl-publications/oan-french/section-III-7-r2c.pdf

Kudzanai, M., Singh, B., Chingono, A., Sibanda, E., & Machingura, I. (2016). Is socio-economic status a determinant of HIV-related stigma attitudes in Zimbabwe? Findings from project accept. *Journal of Public Health Africa*, 7(1), 1-12. doi: 10.4081/jphia.2016.533

McCarthy, E., Joseph, J., Foster, G., Mangwiro, A. Z., Mwapasa, V., Oyeledun, B.,…Essajee, S. (2017). Modeling the impact of retention interventions on mother-to-child transmission of HIV: Results from INSPIRE studies in Malawi, Nigeria, and Zimbabwe. *Journal of Acquired Immune Deficiency Syndromes*, *75*(2), S233–S239. doi:10.1097/QAI.0000000000001364

McHugh, G., Simms, V., Dauya, E., Bandason, T., Chonzi, P., Metaxa, D.,…Ferrand, R. A. (2017). Clinical outcomes in children and adolescents initiating antiretroviral therapy in decentralized healthcare settings in Zimbabwe. *Journal of the International AIDS Society, 20*(1). doi:10.7448/IAS.20.1.21843

Munjanja, S., Nystrom, L., Nyandoro, M., & Magwali, T. (2007). Maternal and perinatal mortality study. *Harare, Zimbabwe: Government of Zimbabwe, and Ministry of Health and Child Welfare*. Retrieved from https://www.unicef.org/zimbabwe/ZMPMS_report.pdf

Takarinda, K. C., Madyira, L. K., Mhangara, M., Makaza, V., Maphosa, M., Rusakaniko, S., & Harries, A. D. (2014). Factors associated with HIV testing in the 2010-11 Zimbabwe demographic and health survey. Retrieved from http://dhsprogram.com/publications/publication-WP110-Working-Papers.cfm

Takarinda, K. C., Madyira, L. K., Mhangara, M., Makaza, V., Maphosa-Mutsaka, M.,

Rusakaniko, S., Harries, A. D. (2016). Factors associated with ever being HIV-tested in Zimbabwe: An extended analysis of the Zimbabwe demographic and health survey (2010–2011). *PLOS ONE, 11*(1). https://doi.org/10.1371/journal.pone.0147828

Avert. (2017). Children, HIV and AIDS. Retrieved from https://www.avert.org/professionals/hiv-social-issues/key-affected-populations/children

Centers for Disease Control and Prevention (CDC). (2017a). About HIV/AIDS. Retrieved from https://www.cdc.gov/hiv/basics/whatishiv.html

Centers for Disease Control and Prevention (CDC). (2017b). HIV-cost effectiveness. Retrieved from https://www.cdc.gov/hiv/programresources/guidance/costeffectiveness/index.html

Georgia State University. 2018. Human subjects (IRB) policy for publicly available, archival, and secondary data. Retrieved from https://ursa.research.gsu.edu/human-subjects/policy-for-publicly-available-archival-and-secondary-data/

Mayo Clinic. (2015). HIV/AIDS risk factors. Retrieved from https://www.mayoclinic.org/diseases-conditions/hiv-aids/basics/risk-factors/con-20013732

The DHS Program - Demographic and Health Surveys (DHS). (n.d.). DHS overview. Retrieved from https://dhsprogram.com/What-We-Do/Survey-Types/DHS.cfm

The Elizabeth Glaser Pediatric AIDS Foundation. (2017). Zimbabwe. Retrieved from http://www.pedaids.org//countries/zimbabwe

The Joint United Nations Programme on HIV/AIDS (UNAIDS). (2018). Zimbabwe. Retrieved from http://www.unaids.org/en/regionscountries/countries/zimbabwe

United States Agency for International Development (USAID). (2013). Standard recode manual

for DHS 6, demographic and health surveys methodology. Retrieved from https://www.dhsprogram.com/pubs/pdf/DHSG4/Recode6_DHS_22March2013_DHSG4.pdf

United States Department of Health and Human Services (HHS). (2016). A timeline of HIV and AIDS. Retrieved from https://www.hiv.gov/hiv-basics/overview/history/hiv-and-aids-timeline#year-1982

World Health Organization (WHO). (2017a). Metrics: Disability-adjusted life year (DALY). Retrieved from http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/

World Health Organization (WHO). (2017b). Mother-to-child transmission of HIV. Retrieved from http://www.who.int/hiv/topics/mtct/about/en/

Zimbabwe Demographic and Health Survey. (2016). Zimbabwe demographic and health survey 2015 final report. The DHS Program, 39-40. Retrieved from https://dhsprogram.com/pubs/pdf/FR322/FR322.pdf