THE UNIVERSITY OF HULL

Integrated HIV and maternal/reproductive health service utilization: trajectory for prevention of mother to child transmission of HIV in Zimbabwe

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ABSTRACT

***Background*:** The persistent high mortality related to HIV infection in sub-Saharan Africa has prompted calls for scaling-up access to sexual and reproductive health services including family planning as a trajectory to prevent HIV infection. Thus, HIV prevention programs have been integrated into family planning and reproductive health care services as a means to reach out to men and women who are HIV positive and those who are vulnerable to HIV infection. While the rationale for integration of HIV and reproductive health (RH) services is strong, there is paucity of information on which population groups most utilize these services. Due to the considerable stigma attached to HIV/AIDS, people living with HIV and those who perceive themselves to be at risk of HIV infection may be less likely to use integrated health care services. This thesis aims to inform policy and programs on better integration of HIV testing, maternal health care, and family planning services in order to optimize HIV prevention programs such as prevention of mother to child HIV transmission and condom use with the broader aim to reduce the HIV pandemic.

***Objectives*:** Focusing on individual and community-level predisposing, enabling and perceived need factors (PREP), the specific objectives of the study are to: (i) examine the effects of HIV on reproductive health care services; (ii) identify the determinants of HIV testing, antenatal and delivery care services; (iii) examine contraceptive methods choice among women who know their HIV-sero status; and (iv) establish community-level variation in service utilization.
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Data and Methods: The study applied multilevel binary and multinomial logistic regression models to nationally-representative samples of women and men who participated in the 2005/6 and 2010/11 Zimbabwe Demographic and Health Surveys.

***Results*:** Overall, those who were ever tested for HIV and with low HIV stigma were more likely to use maternal health services than their counterparts who had never been tested or with high HIV stigma. These groups were also more likely to use condoms and long-term

contraceptive methods as a means to prevent both unwanted pregnancies and HIV infection. The results from the analysis of HIV testing showed an evidence of improvement in HIV testing uptake between 2005/6 and 2010/11, especially for women. Most individual level socio-economic and demographic factors associated with HIV testing are largely consistent with patterns in Southern Africa (e.g higher uptake by women and those who are wealthier), but important patterns have also emerged. In particular, results reveal notable gender differences in the determinants of HIV testing: rural residence is associated with lower uptake of HIV testing for women but higher for men; for women, average wealth in a community is a more important factor in enabling HIV testing than household wealth, but the converse is true for men; individual-level, rather than community-level stigma is important for women, while for men, it is community-level stigma that is important.

The analysis of determinants of maternal health care shows that use of antenatal and delivery care services in Zimbabwe are improving and are determined by a wide range of individual-level factors relating to women's economic and demographic status as well as HIV factors relating to stigma, HIV awareness, ever been tested for HIV during pregnancy, knowing someone who died due to HIV, and factors relating to availability and access to health care and media within the community. The individual-level enabling factors that were particularly strong for women included high socio-economic status and not having observed HIV stigmatisation and discrimination. These groups of individuals have an extremely high likelihood of having been ever tested for HIV during pregnancy, or having an early or more than four ANC visits; and have delivered their babies in a health institution with a professional delivery attendant, particularly if they live in richer communities or in communities with low stigma and HIV prevalence.

The analysis of determinants of contraceptive methods choice among women who know their HIV status identified a number of potential pathways of the determinants of this outcome. The analysis revealed that women who know their HIV-positive status were more likely to use condoms and long-term methods than those who know their HIV-negative status. The study also revealed that even though wealth status has no direct effect on the choice of contraceptive methods, it has an indirect impact on the choice of condom versus hormonal methods through intermediate factors such as HIV sero-status.

Conclusions: First, the observed gender disparities in determinants of HIV testing calls for a gender specific response. Couple-oriented HIV counselling and testing services where men accompany their spouses to HIV screening during pregnancy may help increase HIV testing uptake for males and reduce gender disparities. Second, the fact that enabling factors such as socioeconomic status, having been tested for HIV as part of ANC and stigmatization are predictors of maternal health care utilization suggests that being wealthier, having been HIV tested during pregnancy; and having low HIV stigma do translate into expected behavior for pregnant women. Third, knowing own HIV status emerges as a major predictor of condom use and long-term contraceptive methods for women who are HIV positive. These findings have important policy and integrated programme implications for addressing unmet need for HIV and RH services in Zimbabwe.

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Acronyms and abbreviations

AIDS	Acquired immune deficiency syndrome
ABC	Abstinence, Be faithful, Use a condom
ANC	Antenatal care
ART	Antiretroviral therapy
BEAM	Basic Education Assistance Module
CI	Confidence interval
CPR	Contraceptive prevalence rate
DHS	Demographic and Health Ssurvey
DIC	Deviance Information Criterion
FP	Family planning
HIV	Human Immunodeficiency Virus
IEC	Information, education, and communication
ICC	Intra-cluster corrélation
ICF	International Calverton, Maryland, USA
IGLS	Iterative generalised least squares

IUD	Intrauterine Device
MCMC	Markov Chain Monte Carlo
MDG	Millennium Development Goal
MQL	Marginalized Quasi Likelihood
MTCT	Mother-to-child HIV transmission
OR	Odds ratio
PCV	Proportional change in variance
PMTCT	Prevention of mother-to-child HIV transmission
PNC	Postnatal care
PREP	Predisposing, Enabling and perceived /need factors
PQL	Penalized Quasi Likelihood
RR	Relative risk
SDGS	Sustainable Development Goals
SE	Standard error
SES	Socio-economic status
SRH	Sexual and reproductive health

STI	Sexually transmitted infections
TBA	Traditional Birth Attendant
UNAIDS	United Nations Programmes on HIV and AIDS
UNICEF	United Nations Children's Fund
VPC	Variance Partition Coefficient
WHO	World Health Organization
ZDHS	Zimbabwe Demographic and Health Survey

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1 CHAPTER ONE: BACKGROUND AND OBJECTIVES

1.1 Introduction

This thesis focuses on the subject of HIV and sexual and reproductive health (SRH) integrated services, which has emerged as a strong strategy to enhance efforts to reduce the HIV epidemic. The persistent high mortality related to HIV infection has prompted calls for scaling-up access to family planning and reproductive health care services as a trajectory to prevent HIV infection (Druce et al., 2009; Kennedy et al., 2010). Thus, HIV prevention programs have been integrated into family planning and reproductive health care services as a means to reach out to men and women who are HIV positive and those who are vulnerable to HIV infection (Church et al., 2013; Hope et al., 2014). While the rationale for integration of HIV and sexual and reproductive health (SRH) services seems to be strong, there is a paucity of information on which population groups are most likely to use these services. Due to the considerable stigma attached to HIV/AIDS, people living with HIV and those who perceive themselves to be at risk of HIV infection may be less likely to use integrated health care services (Turan et al., 2008). The efficiency of HIV and SRH integrated services has been improved in recent years and most of the improvements have been achieved by removing socio-economic barriers to SRH services, in particular antenatal and delivery care services. Nonetheless, it is possible to further improve the efficiency by increasing uptake of HIV testing services, better timing of maternal health care and family planning choices. This study seeks to inform policy and programs on better integration of HIV testing, maternal health care, and family planning services in order to optimize HIV prevention programs such as HIV testing, prevention of mother to child HIV transmission and condom use with the broader aim to reduce the HIV pandemic. This chapter includes a background of intervention programs followed as pathways to increase uptake of HIV testing. Included in the chapter is also a statement of the problem of HIV burden in Zimbabwe and specific objectives of the thesis are presented in the last section, leading to an outline of thesis chapters.

1.2 General background

By the end of 2013, the total number of people living with HIV was estimated to be 35 million (WHO, 2015). Quite recently, considerable attention has been paid on HIV and sexual and reproductive health integrated services as a pathway to reducing new HIV infection by 90% between 2015 and 2020 (UNAIDS, 2015). Notwithstanding the fact that risk of HIV transmission remains high, the last two decades have seen a remarkable decline by 40% between 2000 and 2015, from an estimated 3.5 million cases to 2.1 million (GARPR, 2016). The percentage reduction in number of new HIV cases does not only reflect better data available and statistical methodologies (Granich et al., 2015), but also reflects effectiveness of HIV intervention programs in some parts of the world (WHO, 2016). Overall, the annual reduction in the number of new HIV infection was estimated at 4% between 2010 and 2015 (USAID, 2016). The current 4% annual reduction in new HIV infection is slower than the 5.5% annual reduction needed to reach the millennium development goal number six (MDG 6)-to reducing new HIV infection. Although the rate of new HIV infection is decreasing in most parts of the world, it is probable that new HIV infection rates will continue to increase in most of the Sub-Saharan African (SSA) countries due to insufficient uptake of HIV intervention programs (Granich et al., 2015; Musheke et al., 2013). As is well known, the proportion of new HIV infection is highest in Sub-Saharan African (SSA) countries and about 66% of global new HIV infection was attributed to countries in SSA by the end of 2015 (USAID, 2016). The majority of these cases come from 20 SSA countries that contributed 69% of all new HIV infection, with Zimbabwe being among the top ten of the countries with the highest number of new infection (Wanga et al., 2016). While the current global agenda to end AIDS within the Sustainable Development Goals (SDGS) is more likely to be achieved in majority of countries in the developed world, this is less likely in most of the countries in SSA unless major efforts are made to increase uptake of HIV intervention programs (Schneider et al., 2016). While lessons learnt from the successes of the MGD 6 at national and global levels can act as a pathfinder for the 2030 agenda for Sustainable Development, it may be difficult for low to middle income countries to overcome social, economic and gender inequalities to promote inclusive societies (Maleche, 2015). In setting out a new approach to end HIV and AIDS, the UNAIDS 2016-2021 strategy firmly acknowledges the need to anchor the HIV response in Agenda 2030, recognising the interdependence between HIV and SDGS, from

ending poverty (SDG 1), to promoting inclusive societies (SDG 16) and strengthening partnerships (SDGS 17) within the countries and at global level (UNAIDS, 2015). It has been argued that the SDGS provide a key opportunity to address the structural drivers that underlie the HIV epidemic. It may be that ending HIV and AIDS is a feminist issue, thus giving women access to sexual and health, education and services and reducing gender inequality and improvement of rights may be integral to a sustainable HIV response (Femnet, 2016)

1.3 Global HIV prevention strategies

To solve the problem of persistent HIV burden, WHO (2015) has set up a 90-90-90 strategic milestones to be achieved by united nation (UN) member states by 2020. The milestones means that by 2020, 90% of all people living with HIV will know their HIV status, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy and 90% of all people receiving antiretroviral therapy will have viral load suppression.To achieve these new ambitious goals,USAID's (2015) strategic plan has called for renewed efforts to increase uptake of sexual and reproductive services (SRH) including family planning services as a trajectory to prevention of new HIV infection around the world (Church et al., 2013;Keogh et al., 2009). Consequently, integration of HIV with SRH services, including family planning, has become a central strategy in an effort to reduce HIV burden. This approach is based on UNAIDS' recognition that reducing HIV infection is closely tied to advancement in addressing maternal health and family planning needs; and in providing comprehensive HIV prevention strategies and SRH care services (Druce et al., 2006; Church et al.,2013; Turan et al., 2012). The HIV and SRH integrated care model links different types of SRH and HIV services by physically locating services in one place or by system referral (Hope et al., 2014). This is important because two or more services can be offered at the same location, during the same opening hours, with the provider actively encouraging clients to consider using other services (Turan et al., 2012). It has been highlighted that integration of HIV services into SRH can increase the pool of people who might not normally be reached through traditional HIV testing clinics e.g. youth, men and commercial sex workers (Turan et al., 2015). There is evidence that individuals who use SRH services often benefit from HIV services and vice versa (Kennedy et al., 2010). For example adding family planning to HIV testing, treatment and care may facilitate the uptake of condom use and long term acting contraceptive methods both of which are crucial for preventing unwanted pregnancies and HIV infection (Mumah et al., 2014). In

the context of prevention of mother to child HIV transmission (PMTCT), the benefits of integrating services includes timely identification of HIV positive mothers, early initiation of antiretroviral (ARV) treatment for both mother and newborn, shorter waiting times, lower transport costs, and reduced stigma and discrimination (Hope et al., 2014).

There is evidence from intervention programs pre-2015 that coordinated HIV and SRH integrated programhas helped galvanise support for HIV response (Druce et al., 2006; Hope et al., 2014; Turan et al., 2015), and that programs post-2015 have seen renewed efforts to improve the efficacy of integrated programs (Schneider et al., 2016). In light of the benefits accrued from offering integrated services, most SRH programmes are being revolutionalised and there is a call for a strong momentum at country level to optimize integration of HIV prevention services into SRH care,including family planning services (UNAIDS, 2014). The United Nation (UN) member states are now being urged to build a vibrant coalition between HIV prevention programmes, maternal health care; and family planning constituencies around the goal of ending HIV by 2030, and to promote greater synergies and the strategic integration of HIV counselling, testing and treatment, prevention of mother to child HIV transmission (PMTCT), maternal health and family planning programmes (Rutaremwa and Kabagenyi, 2016).

Despite the fact that integrated services are critical for increasing uptake of HIV intervention programs, maternal health and family planning literature demonstrates that HIV/AIDS factors such as risk perception, stigma and discrimination are some of the major barriers to access to integrated services in many developing countries (Akwara et al., 2003; Church et al., 2013; Matake and Matake, 2016; Meiberg et al., 2008; Murire et al., 2014; Lemnge et al., 2011). It can thus be reasonably assumed that those who are HIV positive and those who perceive themselves to be at risk of HIV transmission are less likely to use integrated services due to fear of stigma and discrimination (Turan et al., 2012). In the literature, HIV positive people tend to experience stigma and discrimination in the community, family and in health facilities (Jurgensen et al., 2012; Stephenson et al., 2013; Turan et al., 2012; Venkatesh et al., 2011; Yeatman, 2009). Nonetheless, it is worthwhile noting that the changing HIV stigma and discrimination environment, impact of HIV treatment and longevity of many people living with HIV- may alter individual's health seeking behaviour (Magadi, 2016). It is likely that individuals who are HIV positive and those who may perceive themselves to be HIV positive

may have reconsidered their decisions on SRH services as a result of improved HIV intervention programs (Adedimeji et al., 2012; Kennedy et al., 2010; Harrison et al., 2010). The past decade has seen a rapid growth of HIV intervention programs that are targeted at reducing HIV-related stigma and discrimination in the communities (Kalichman et al., 2009), in schools and hospitals (Kevin et al., 2014), and in faith-based organisations (Hartwigg and Kissioki, 2009). While we may know intuitively that reduction in HIV related stigma and discrimination are associated with increased uptake of integrated services, there is much to learn about how specific HIV factors including sero-status, HIV awareness and sexual behaviour affect HIV and sexual and reproductive health integrated services (Kalichman and Simbayi, 2003; Mashuba and Hemalata, 2015; Turan et al., 2008). Many hypotheses regarding the impact of HIV on uptake of integrated services appear to be not well grounded due to lack of data and inappropriate statistical methodologies which do not control for HIV factors.

Besides the effects of HIV on uptake of integrated services, several classical measurements of socio-economic and demographic factors have also been linked to service uptake. These factors include age, gender, marital status, media, education, employment status, religion, place of residence and media exposure (Adamu, 2011; Achia and Mageto, 201; Alam et al., 2015; Ahmed et al., 2010; Golis et al., 2013; Hartwig et al., 2006; Jesmin et al., 2013). A key problem with much of the literature in relation to socio-economic determinants of integrated services relates to its lack of consistency in their findings. There is still considerable ambiguity with regards to the effects of socio-economic and demographic factors on HIV and SRH integrated services. One question that needs to be asked is 'by how much do socio-economic and demographic factors contribute to the variation in service utilisation of integrated services?' after HIV factors are controlled for. Experts contend that the evidence relating to the association of socio-economic and geographic factors with utilisation of integrated services is not conclusive, unless the impact of HIV is controlled for (Magadi and Magadi, 2017; Martin-Herz et al., 2006; Mitchel et al., 2010; Sahlu et al., 2014). Unfortunately, most of the studies neglect to explain the role of HIV in either promoting or inhibiting utilisation of integrated services. Taking advantage of the ever increasing unmet need for sexual and reproductive health services as a means to improve HIV intervention programs, the focus should now be placed on not only addressing socio-economic and structural barriers, but also on targeting people who are vulnerable to HIV infection and those who suffer stigmatisation (Lemnge et al., 2011; Murire et al., 2014) so that no one is left behind (Maleche, 2015).This presents a

challenge to the renewed international efforts to end the HIV epidemic by 2030. Notwithstanding the shortcomings, the HIV and SRH integrated approach is being applied in SSA and in Zimbabwe as a means to reduce HIV new infection by 90 percent between 2015 and 2020.

1.3.1 HIV burden and prevention approaches in Zimbabwe

By 2015, Zimbabwe sought to half new HIV infection as prescribed by the World Health Organisation's strategic plan (USAIDS, 2016). Although it has been a daunting task, adult HIV prevalence in Zimbabwe has almost halved from its peak of nearly 30% around 1997 to around 13.7% in 2011 (ZDHS, 2010/11). HIV related deaths have also been reduced by over 60% as a result of a successful HIV testing, treatment and support programme (ZNASP 2011-2015). However, despite the government's efforts to halt new infections of HIV, Zimbabwe remains one of the countries in Sub-Saharan African countries still burdened with the HIVepidemic (Granich et al., 2015). The current aim in the post-2015 era is to end the AIDS epidemic by 2030. In line with the USAID's goal, the government of Zimbabwe has set up the 90-90-90 strategic milestones to be achieved by 2020 (ZNASP III, 2015-2018). To achieve these goals, HIV services are being made available and accessible through sexual health clinics, maternal and child health care and family planning services as a strategy to reach out to populations who may not otherwise seek HIV services (Wiegert et al., 2014). An example of this integration is where individuals visiting family planning and sexual health clinics for other services are offered HIV counselling and testing (Demisse, 2009; Hope et al., 2014; Obure et al., 2015). In the case of prevention of mother to child HIV transmission, pregnant women who visit maternal health care are screened for HIV and are given treatment, care and support throughout to delivery (Sibanda et al., 2013). At these clinics, sex education is offered such as on risk reduction strategies including practicing safer sex, provision of males and female condoms for both family planning and prophylactic reasons and provision of effective long-term contraceptives to avoid unwanted pregnancies (McCoy et al., 2014; Mumah et al., 2014). The bi-directional integrated services also includes outreach HIV testing and counselling services and referral for special populations such as people living in remote rural areas, vulnerable groups such as prisoners, sex workers and highly mobile populations such as long distance truck drivers (Zimbabwe National HIV and AIDS Strategic Plan 2011-2015).

1.4   Components of HIV and SRH integrated services in Zimbabwe.

In Zimbabwe, the public health system is the largest provider of health-care services, complemented by mission hospitals and health care delivery by non-governmental organisations (NGOS). About 68% of 1589 primary health facilities are providing HIV services i.e HIV testing, counselling and testing, at the same time they provide SRH services (ZNNPS, 2015-2018). The visual depiction representation in figure 1.1 indicates a simulation of four domains of SRH services that are integrated with HIV intervention programs in Zimbabwe. The multiple tiered interventions, HIV testing, comprehensive maternal health care services and family planning are assumed to be the pathways through which the 90-90-90 strategic milestones may be realised in Zimbabwe by 2020. The first domain relates to HIV testing in the general population. This is achieved through an out reach program which is targeted at special populations such as people living in remote areas and the other hard to reach populations. The outreach HIV program is backed by a referral support system to integrated health centres. In addition to the outreach program, HIV testing and counselling targeting the general populationcan also be initiated and recommended by health care providers to all clients attending health care facilities as a standard component of medical care.

The second domain relates to the antenatal care package putting emphasis on early ANC booking, frequent ANC visits and antenatal HIV testing. Zimbabwe National Guidelines on HIV testing and counselling stipulates that all pregnant women be offered routine HIV testing as part of ANC. The framework requires pregnant women to initiate a first ANC visit in the first trimester, and to have at least four more ANC visits as well as having antenatal care HIV testing. Thirdly, institutional delivery and child birth with a trained health professional is an additional intention in prevention of mother to child HIV transmission. Lastly, HIV prevention such as condom promotion and permanent contraceptive methods are also integrated with family planning services. The guidance draws from WHO standards in health care service delivery (WHO, 2012) with specific reference to strategies on increasing HIV testing and prevention of mother to child HIV transmission. It is hoped that identification of determinants of each of the components of HIV and SRH integrated care may help us identify populations that may be targeted in order to optimise the on-going HIV and SRH integrated program.

Figure 1-1: Pathways to achievement of 90-90-90 HIV strategic milestones

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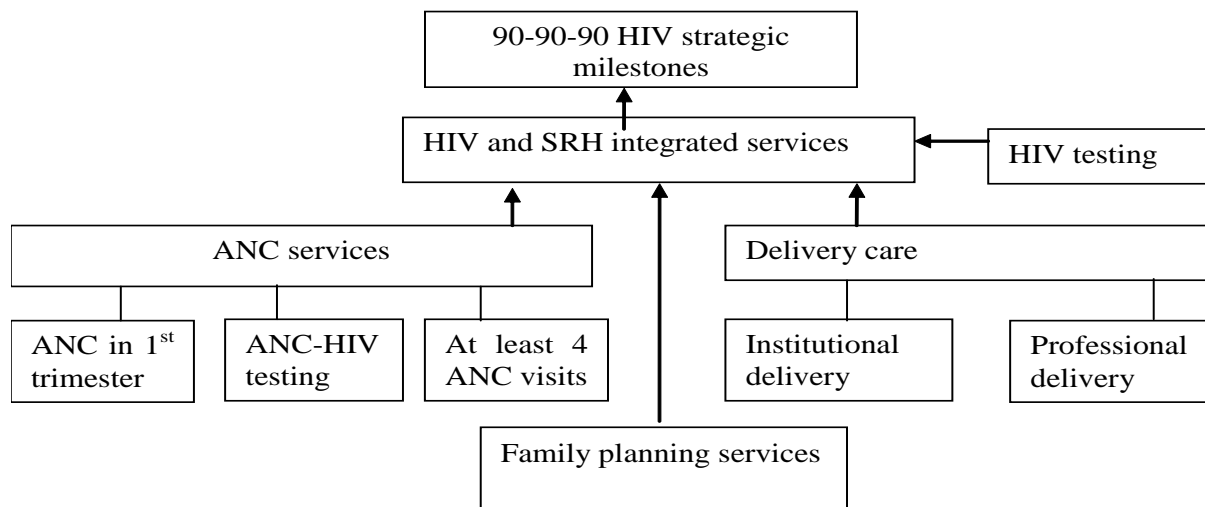
Source: Author's construct

1.4.1 Problem Statement

Zimbabwe is still burdened with an HIV epidemic and the government has an ambitious aim in the post-2015 era to end the AIDS epidemic by 2030. It is a daunting task to increase uptake of HIV and SRH integrated services to meet the government targets of reducing HIV by 90% between 2015 and 2020. Only 36% (men) and 57% (women) aged 15-59 years have ever beeen tested for HIV (ZDHS, 2010/11); suggesting that 64% (men) and 43% (women) in Zimbabwe are not aware of their HIV status. Despite the government efforts in encouraging pregnant women to initiate antenatal care in the first trimester and to have at least four ANC visits as well as to have an HIV test during pregnancy, only 19 % of these women had an ANC visit in the 1ˢᵗ trimester, 67 % had attended the recommended four or more ANC visits and 59 % had received counselling and accepted an HIV test as part of ANC care (ZDHS, 2010/11). In addition, the proportion of pregnant women having institutional and professional delivery falls short of what should be expected in Zimbabwe. By 2010/11 only 67% and 68% of pregnant women had institutional and professional delivery, respectively (ZDHS, 2010/11). While the contraceptive prevalence rate (CPR) is high in Zimbabwe, the use of condoms and long term methods for HIV prevention and unplanned pregnancy is low. According to the (ZNASP 2011-2015) report, the CPR is estimated at 65% and of these 63% are using modern contraception and 2% traditional methods. The contraceptive method commonly used is a pill (48%) and it

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is also estimated that 12% and 37% of births are unplanned and mistimed, respectively. In the absence of prevention of mother to child HIV transmission services, unplanned and mistimed births are risk factors for mother to child HIV transmission among HIV positive mothers (Admachak et al., 2007; Agadjanian and Hayford, 2009).

1.4.2 Rationale for the study

Despite remarkable gains in improvement of integrated services in Zimbabwe over the last few decades, there is a lack of evidence of a corresponding increase in the uptake of HIV prevention programs through sexual and reproductive health services over the years. Testing the link between the efficacy of integrated services and uptake of HIV intervention programs is difficult. Despite the interest in service integration, methodological problems prevent most studies from explicitly testing whether integrated services increase the uptake of HIV intervention or maternal health and family planning programs (Rutaremwa and Kabagenyi, 2016). In the literature, this problem rests on the many determinants of SRH that also impact on decisions on accessing HIV programs (Car et al., 2012; Church et al., 2013). Many program managers and policy makers have recognised these joint determinants when they noticed that some individuals are more receptive to both SRH and HIV services (Fetene and Feleke, 2010). In statistical terms, 'HIV and SRH integrated service' utilisation is an endogeneity variable (Obure et al., 2016). The authors underline that ignoring this endogeneity produces biased and misleading estimates of the impact of SRH utilisation on HIV service receptiveness. Studying the impact of integrated services on HIV prevention programs requires complex statistical models on determinants of each of the individual components of the HIV and SRH integrated service program. However, our knowledge of determinants of HIV and SRH integrated services is largely based on very limited data. Thus, studying the determinants of HIV testing, maternal health and family planning separately becomes at the fore.

I am aware of population based studies on the individual components of HIV and SRH care services in Zimbabwe. For example, Muchabaiwa et al (2012) examined determinants of antenatal, delivery and postnatal care, Maruva et al (2014) studied knowledge of HIV status and antenatal care and utilisation of maternal health care services, Ngobe and Odimegwu (2014) examined the influence of both individual, household and community determinants of adolescence contraceptive use; and (Mumah et al., 2014) also explored the influence of

knowledge of HIV status and contraceptive choice in Zimbabwe. Others such as (Buzdugan et al., 2015; Chandisarewa et al., 2012; Mucheto et al., 2011) have all studied antenatal care HIV testing, facility-based delivery, prevention of mother to child HIV transmission in localised settings respectively.

A key problem with many of the studies on SRH in Zimbabwe relates to methodology. All of them have not taken into account the role of community level factors which may also influence health seeking behaviour (Achia and Mageto, 2015; Adamu, 2011; Aremu et al., 2011; Alam et al., 2015; Magadi and Agwanda,2010). The shortcomings of their methodologies in Zimbabwe have been clearly recognised in literature (Ngome and Odimegwu, 2014). It has been argued that one of the major problems of investigating the effects of HIV and socio-economic factors on a wide range of HIV and SRH integrated outcomes in Southern Africa is the lack of well structured multilevel multivariate techniques to determine the relative importance of various HIV and socio-demographic factors that have an influence on access to SRH outcomes (Chitalu et al., 2013; Stephenson et al., 2013). This study is the first to apply multilevel models to investigate the determinants of HIV and SRH outcomes in Zimbabwe. The study shifts from not only explaining the classical individual level factors but also includes the independent effects of community level factors. The rationale for considering community level factors on service utilization has been well recognized in the social sciences field (Aremu et al., 2011; Delprato, 2016; Diez-Roux, 1998; Magadi and Agwanda and Obare, 2007; Utman, 2010; Vu, 2005). Murire et al (2014) have pointed out that community environment governs our behaviour, thus poverty, HIVprevalence, stigma or awareness in the community also must govern people's SRH behaviour. It has been suggested that many contextual or aggregated variables that have been hypothesized to affect health care service utilization represent properties that vary over geographical and social units (Babalola and Fatusi, 2009; O'meara et al., 2013; Jones, 1991)

The ZDHS (2010/11) estimates of HIV testing and SRH utilisation including contraceptive methods use show wide differences between communities in Zimbabwe. There is considerable literature noting that the explanation of this diversity in service utilisation is numerous-but the closest are the indicators of individual and community level socio-economic and demographic factors (Buzdugan et al., 2015; Makate and Makate, 2016; Kabagenyi et al., 2016). Makate and Makate (2016) recognise that Zimbabwe is a country characterised by huge internal

differences-demography, cultural, economic, cultural and environment. All these factors are therefore likely to have a significant contribution to the service utilisation in Zimbabwe.

Whilst literature on access to SRH indicates low uptake of SRH services is as a result of social and economic disadvantages (Ahmed et al., 2010; Goli et al., 2013; Kevany et al., 2012; Obermeyer et al., 2013), studies on HIV suggests that factors such as HIV awareness and stigma may also lead to low uptake of health care services (Chirawu et al., 2013; Murire et al., 2014; Maruva et al., 2014; Mumah et al., 2014; Sambisa, 2008). These perspectives have rarely been considered and discussed together at a national level in Zimbabwe.

It is important that factors associated with HIV and SRH outcomes are well understood in order to devise appropriate strategies to improve uptake of HIV and SRH services. HIV testing, adequate antenatal and delivery care as well as family planning are all useful in addressing HIV new infections. An investigation of factors associated with HIV and SRH utilisation is necessary for an improved understanding of barriers to effective HIV and SRH integrated services for the development of appropriate interventions. Efforts to increase uptake of HIV and SRH are held back by a lack of comprehensive understanding of the breadth and complexity of factors that influence the use of a wide range of HIV and SRH care services (Piot et al., 2015). This thesis hypothesises that the levels of HIV and SRH care service utilization observed in Zimbabwe are not only as a result of socio-economic and demographic characteristics, but also as a result of the impact of HIV. The overall aim of the thesis, therefore, is to improve understanding of factors associated with utilisation of HIV prevention programmes within the integrated health care service system in Zimbabwe.

Focusing on individual and community-level predisposing, enabling and perceived risk/need factors, the specific objectives of the thesis are:

i.   To identify determinants of HIV testing

ii.   examine determinants of maternal care service utilisation i.e antenatal (antenatal HIV testing, timing and frequency of antenatal care visits) and delivery care (institutional and professional delivery) including the independent effects of HIV on these services

iii.   Explore determinants of contraceptive methods choice among women who know their HIV sero-status

iv.   To establish community variation in service utilisation, and

v.   To synthesise and interpret results to give health policy and planning recommendations.

Research questions

To achieve these objectives the following questions were to be answered:

Question 1: To what extent do individual and community factors influence HIV and SRH integrated service utilisation in Zimbabwe?

Question 2: To what extent do HIV factors independently influence utilisation of HIV and SRH care service including contraceptive methods choices?

Question 3: To what extent do HIV and SRH service utilisation vary across the communities in Zimbabwe?

Community and neighbourhood effects are a matter of practical concern for policy makers and program planners. Thus, the findings of the focused studies also addressed the following question:

Question 4: Is there evidence that would call for policy interventions targeted at the community level in addition to those targeting the individuals?

1.5   Structure of the thesis

The thesis is divided into eight chapters. Chapter two presents a literature review and the conceptual framework. The first part of the literature review focuses on determinants of HIV/AIDS testing in Zimbabwe, the impact of HIV/AIDS on maternal health care services utilization and on contraceptive methods choice. Finally, the limitations of the theoretical framework are presented.

The third chapter on methodology includes a description of the data that will be used and statistical methods to be adopted. The first section describes data, including the statistical methods. The selection of variables is based on the literature and conceptual framework

discussed in chapter two. The last part of the chapter gives model specifications and the estimation procedure.

Chapter four presents findings from a multilevel logistic regression model to identify factors influencing HIV testing. The independent effect of HIV, individual and community factors associated with HIV testing are examined. The chapter concludes with a summary of findings and their implication for policy and program intervention.

Chapter five identifies determinants of HIV and antenatal care (ANC) services. These services include HIV testing during pregnancy, four or more ANC visits and ANC in the first trimester. The analysis of these study outcomes uses a two-level multilevel logistic regression analysis. In addition to the reproductive factors relating and the background socio-economic and HIV perceived risk/need factors; the analysis includes factors relating to the availability and accessibility of health care services within communities.

Chapter 6 relates to delivery care. Factors associated withinstitutional and professional delivery areexamined using two-level multilevel logistic regression models, leading to chapter seven.

Chapter 7 examines determinants of contraceptive choice among women who know their HIV sero-status. The response outcome is an unordered categorical variable that distinguished between different types of methods among users, thus multinomial regression models were applied to contraceptive choices of women who are using contraception who knew their HIV status.

Chapter 8 concludes the analysis part of the thesis by bringing together all of the evidence from the study. It presents a summary of the most interesting and important outcomes from the analyses, along with the conclusions and their implication for HIV and SRH health services. The results are discussed with reference to the conceptual framework perspectives outlined in chapter 2, which attempt to explain the pathways to HIV and SRH care service utilization, as well as with reference to previous work undertaken in this field.

2 CHAPTER TWO: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Introduction

To set out the context of this focused study, chapter two presents a general background of the study of HIV and SRH services. Included in the chapter is the historical overview of HIV testing, and the rationale for integration of HIV with maternal health and family planning services. Various relevant theoretical frameworks are also presented and discussed, and the chapter concludes with a discussion of a general analytical framework that has been adapted to guide the study. Comprehensive literaturerelevant for different chapters are provided in the respective chapters rather than presented here.

2.2 Evolution of HIV Counselling and Testing

HIV testing is considered to be one of the most important components of HIV prevention strategies and is an entry point to treatment and care (Berkman, 2001). The first test for HIV became widely available in developed countries in the mid-1980s, a few years after the virus was discovered to be the cause of AIDS (Bayer, 1991). The initial approach to HIV testing emphasised that it should be client based initiated and to be done voluntarily (Bayer and Fairchild, 2006). In the light of activism which demanded the need for protection of human rights of those infected which was highly stigmatised, counselling was later co-opted as a crucial component of HIV prevention (Bayer, 1991; DeCock, 1998; Heywood, 2005). The chief advantages of post-test counselling is that it provides an opportunity to offer emotional, psychological support and to help clients understand the significance of their test results (whether HIV positive or negative) and to plan for the future (Angotti et al., 2009; Chirawu et al., 2013).

With the introduction of antiretroviral treatment in the mid to late 1990s, policy documents began to emphasize the importance of HIV testing and counselling not only for HIV prevention, but also in linking HIV positive individuals to treatment and care (De Cock, 1998; Bayer and Fairchild, 2006). By the early 2000s, international organisations were examining ways to increase the uptake of HIV counselling and testing services and scale up antiretroviral (ARV) use in SSA (Granich et al., 2015). Debates ensued about 'opt out' and opt in' approaches to testing coming from the human rights health perspective (Bayer and Edington, 2009).

However, in recognition that many opportunities to counselling and to diagnose individuals attending health facilities were being missed in 2007, the WHO and USAIDs published guidelines on HIV counselling and testing to be offered by health care workers within facilities and in the communities (Heywood, 2005). The guidelines recommended opt out as a standard part of medical care. While there has been a dramatic increase in HIV counselling and testing uptake in SSA in recent years, there are considerable regional and community variations in HIV testing. The Demographic and Health Survey (DHS) data from 2004-2010, show that the proportion of women ever tested for HIV ranges from one percent in Chad in 2004 to 76 percent in Rwanda in 2010, and for men ranges from 4 to 69 percent, also in Chad in 2004 and Rwanda in 2010, respectively (Staveteig et al., 2013).

Several facility based HIV intervention programs in SSA countries have reported a substantial increase in HIV testing across SSA (Fetene and Feleke, 2010; Kennedy et al., 2010; Nakanjako et al., 2006,) with much of this being attributed to the testing of pregnant women during antenatal care (Godif et al., 2015; Mitchel et al., 2010).The last few years have also seen a remarkable increase in mobile community-based outreach HIV testing programs (Dugas et al., 2015; Sharma et al., 2017;Underwood et al., 2016; Wheeler et al., 2015). Backed up by an effective referral system, these outreach programs have been found to substantially increase the uptake of HIV testing (Elul et al., 2014; Naik et al., 2015; Sanga et al., 2016). The outreach program helps by reducing logistical costs for individuals who have to travel to a health facility (Muketo et al., 2015).

A number of studies have reported on the general socio-economic advantages that are associated with individuals who reported ever having been tested for HIV (Godif et al., 2015; Musheke. 2013; Moyer and Mustafa, 2013; Venkatesh et al., 2011). Some studies have found the use of HIV testing to be associated with higher risk sexual behaviours (Sambisa, 2008; Rosenberg et al., 2013; Yeatman et al., 2009). Others found HIV factors such as awareness, stigma and risk perception to be major barriers to HIV testing within health facilities and in the community (Martin-Herz et al., 2006; Jurgensen et al., 2012). In spite of the shortcomings of HIV testing programs, there is a general acceptance that increasing uptake of HIV testing may reduce stigma, discourage risky sexual behaviours and may encourage use of other SRH services such as maternal health care and family planning services (Rosenberg et al., 2013; Tedrow et al. 2011). Whilst, HIV testing is broadly directed at specific high-risk populations,

pregnant women have perhaps received the most attention for HIV testing, presumably because mother-to-child transmission is the leading cause of HIV infection among children (Godif et al., 2015). Documents reviewed have shown that mother to child HIV transmission is now a major contributor to new HIV infection in SSA countries (Granich et al., 2015; Heemelaar. 2014). In order to prevent mother to child HIV transmission, antenatal care (ANC) and delivery care became prime locations for HIV screening, treatment and care for pregnant women (WHO 2010). In the last decade, HIV testing, counselling and treatment have been incorporated in the maternal health care system in order to enhance the (PMTCT) program, and the next decade is likely to see a considerable effort to entrench the integration of HIV with other services within the sustainable Development Goals framework.

2.2.1 HIV and maternal health services

In the general population, HIV testing may help by discouraging risky sexual behaviours and individuals can plan for the future, including childbearing of HIV free infants (Wringe et al., 2008), thereby reducing new HIV transmission. Given the importance of HIV testing in prevention of mother to child HIV transmission services, HIV services have also been integrated with maternal health related care (Church et al., 2013; Turan et al., 2015; Washington et al., 2015; Wiegert et al., 2014). While, all pregnant women are encouraged to use maternal health care and to use HIV services to prevent mother to child HIV transmission, there is scant information relating to the sub-groups of pregnant women who are less likely to use HIV and RH integrated services. Whereas there are reports suggesting that integration of HIV and maternal health has been successful in many countries in SSA (Car et al., 2012; Turan et al., 2012), there is evidence that many pregnant women face barriers relating to socio-economic status and HIV in accessing maternal health care services. It has been noted that, due to social stigma, access to HIV and maternal health services is still a crucial issue among pregnant women (Jayleen et al., 2016; Wiegert et al., 2014). Since most people still perceive HIV/AIDS as a disease of bad character (Musheke et al., 2013), few pregnant women are willing to disclose their HIV status to anyone, even to health providers or to the nearest and dearest family members and friends (Daftary et al., 2007; Denison et al., 2008; McCoy et al., 2014; Mushaba and Hemalata, 2015; Mucheto et al., 2011). The considerable stigma attached to HIV/AIDS is reflected in the importance placed on confidentiality (Angotti et al., 2009). Worries about confidentiality and unwillingness to disclose HIV status to health care providers,

families and friends, mean that people who are HIV positive and those who perceive themselves to be at risk of HIV infection are much less likely to present themselves early for maternal health care services that are integrated with HIV services (Mucheto et al., 2011; Rutaremwa and Kabagenyi, 2016).

It has been a consistent finding that individual psychosocial factors such as knowledge of HIV transmission, perception of risk of HIV infection and how confidential HIV status will be maintained are key issues that influence women in seeking maternal health services in a facility (Asefa et al., 2013; Kevin et al., 2014; Orne-Gliemann et al, 2006; Rochat et al., 2006; Sama et al., 2017). Although a heightened risk perception of HIV infection may provide impetus to access HIV services (Oshi et al., 2007), there is also a disjunction between perceived risk of HIV infection and uptake of maternal health care services that involves HIV testing, as those who perceive themselves as being infected already do not see the value of knowing their HIV status during their pregnancies (Martin-Herz et al., 2006). On the other hand, those who are HIV positive and those who perceive themselves to be at risk of HIV infection and have knowledge of HIV transmission and PMTCT services may seek maternal health care services in order to prevent potential danger of HIV transmission to their infants (Turan et al., 2008). As Wiegert et al (2014) postulated, HIV services are often sought when there is clear risk in HIV infection or decline in an individual's health status which necessitates access to health care.

It has also been argued that interpretations of being at low risk of infection, sometimes because of trusting sexual partners may negatively affect uptake of reproductive health care services (Martin-Herz et al., 2006). That type of behaviour has been observed by Morrill and Noland (2006) who pointed out that proxy testing, for example, adopting the status of a sexual partner, is sometimes used as a marker for one's own HIV status. Kalichman and Simbayi (2003) found that people who felt they were at low risk of infection because they trusted their partners or because HIV was mainly perceived as a problem for sex workers were less likely to use maternal health care services than their counterparts.

While HIV factors may directly affect access to maternal health care services, Turan et al (2008) stated that maternal health care problems may manifest through existing root causes of HIV/AIDs and sexual behaviour, such as poverty, gender inequality, stigma and

discrimination, and marginalisation of vulnerable groups. Given this association, and to be able to identify factors associated with maternal health care (Rutaremwa and Kabagenyi, 2016) have argued for a need to understand how predisposing issues such as age, gender inequality, education, marital status, social and economic status interact with HIV factors like risk perception, risky sexual behaviour and HIV awareness to influence utilisation of HIV and maternal health integrated care services. These interactions may lead to an increased risk perception of HIV infection which may in turn decrease the willingness to use or to delay access to HIV and RH integrated services (Manzi et al., 2014; Tedrow et al., 2011; Turan et al., 2006). Studies have shown that underprivileged groups such as young, unmarried (never married, divorced and widowed) women and those who are poor and uneducated are the most vulnerable groups in protecting themselves against HIV infection as a result of engaging in risky sexual behaviour, often due to limited resources, peer pressure, lack of access to condoms or lack of knowledge of HIV (Asefa and Beyene, 2013; Makate and Makate, 2017; Magadi and Agwanda, 2007; Lepine et al., 2014). All of these behaviours may lead to an increased risk perception of HIV infection, leading to low use of maternal health care services.

There is also evidence of an association between HIV knowledge and utilisation of maternal health care services. It was argued that HIV knowledge may be negatively associated with maternal health care services such as HIV testing if knowledge affects risk perception and associated behaviours (Birhane et al., 2015; Byamugisha et al., 2010; Lepine et al., 2014, Sahlu et al., 2014; Weiser et al., 2006). Firstly, because women who have a good understanding of HIV prevention and transmission methods could be less likely to adopt risky behaviour and thus may perceive less need for using any maternal health care services that are linked to HIV as they are at less risk (Birhane et al., 2015). Secondly, pregnant women who overestimate their likelihood of getting infected through their poor health knowledge may have higher odds of using maternal health care thinking they are more at risk (Asefa and Beyene, 2013).

Although extant literature indicates that health care seeking behaviour is an individual responsibility, there is also a body of knowledge arguing that health seeking behaviour may also depend on the social and geographical contexts in which the individuals live (Bond et al., 2005; Chitalu et al., 2013; Fotso et al., 2009; Mumah, 2014). An example of this behaviour can be found in religious community groups, where issues of HIV are seen as a result of promiscuity and sinful acts (Hartwig et al., 2006). These negative community beliefs and norms

may lead to stigmatization and prejudice among those who want to get tested for HIV (Chirawu et al., 2008). In such circumstances researchers such as, Hendriksen et al (2009) have argued that behaviour is influenced by how a person thinks the community views his or her actions, for example, an HIV positive mother would think 'what will the community think of me if I do not breastfeed my baby?', as I am not supposed to breastfeed due to my HIV status. Within communities, gossip and rumours about mothers who are perceived to be HIV positive was found to be common in qualitative studies in South Africa (Sennott and Majola , 2017), Botswana (Dahl, 2012), Zambia (Hazemba et al., 2016) and elsewhere in SSA countries (Liddel et al., 2004). While HIV/AIDS stigma exists within an individual due to how an individual feels and the fear imagined due perceived risk of HIV infection, based on self assessment (Anyait et al., 2012), stigma can also be exerted from the outside world such as from family, community, and friends(Denison, et al, 2008; Gausset et al., 2011). Murire et al (2014) postulated that negative community beliefs that people living with HIV are wayward, coupled with HIV misconceptions and fears of being seen queuing for HIV services have kept away potential candidates for HIV and maternal health care services.

2.2.2 HIV and Family planning

Traditionally, family planning (FP) support for women has been mainly for prevention of unwanted pregnancy in order to reduce fertility and maternal mortality (UNAIDS, 2009) However, with high rates of unmet family planning needs and unplanned pregnancies reported among HIV positive women, HIV and FP services have been integrated in most countries with higher HIV prevalence rates (Haddad et al., 2015; Keogh et al., 2009). The rationale for integrating these services is to increase access to contraceptives, including condoms and long acting methods such as implants and intrauterine device (IUDS) in order to prevent HIV and unwanted pregnancy (Johnson et al., 2009; Keogh et al., 2009). One important thrust for HIV and Family planning integrated services is to encourage the use of condoms with or without other contraceptive methods for protection against unwanted pregnancy and STIs/HIV (Haddad et al., 2015). Upon visiting HIV and FP integrated services women are informed of the fact that non-barrier contraceptives are not effective against STI/HIV transmission and mother-to-child transmission (Agha, 2012; Bogale et al., 2010). Previous studies have highlighted the importance of condom use and long acting contraceptive methods in preventing HIV infection and unwanted pregnancy (Akinyemi et

al., 2013; Church et al., 2014; Haddad et al., 2015; Rosenberg et al., 2010). Extant literature indicates that there are several barriers that service providers face running HIV and FP integrated services, due to problems associated with condom use and long-acting contraceptive methods (Adamchak et al., 2007; Warren et al., 2012). Although condom and long-acting methods have been well promoted for primary prevention of HIV infection and unwanted pregnancies, some studies have indicated that women's choice to use or not use a particular contraceptive is strongly influenced by perceptions of method side effects (Heys et al., 2009), effectiveness (Morrison et al., 2011), availability (Kurewa et al., 2011); and whether or not it will be used for disease prevention of unwanted pregnancy (Mumah et al., 2014)

Another important barrier for HIV and FP integrated services is that, in Sub- Saharan African countries, the scale-up of HIV and FP services has largely focused on availability of contraceptives, and has not comprehensively addressed women's needs based on their HIV serostatus and fertility decisions (WHO, 2010). It was noted that, focusing on increasing access to contraceptives only, without consideration of specific contraceptive needs of women may lead to increased risk of HIV transmission to women, their sexual partners and children (Church et al., 2014). Although, HIV sero-status and fertility desires for women may be only minor considerations among the variety of factors that impact contraceptive use and choice within HIV and FP integrated services (Kurewa et al., 2011), extant literature indicates that these factors are also important determinants of contraceptive choice (Church et al., 2014; Habte and Namasusu. 2015; Johnson et al., 2009; Magadi. 2016; Mayondi et al., 2016; Mumah et al., 2014; Laher et al., 2009). Some scholars such as Snow et al(2012) and Turan et al., (2008) have claimed that women's knowledge of HIV sero-status and an elevated mortality and morbidity known to be attributable to HIV may cause behavioural change in contraceptive methods choice and fertility intentions (Church et al., 2014; Johnson et al., 2009). For example, if an HIV negative woman sees heightened mortality or morbidity that she can reasonably attribute to HIV, she may worry about her own contraction of the virus, and in that sense the threat is also to herself, sexual partners and of any future birth (Mayondi et al., 2016). She may think she may die before her children are old enough to care for themselves (Kakaire et al., 2010; Kaida et al., 2013); or that her ability to bear children may be impacted if she contracts the HIV virus (Habte and Namasasu, 2015).

Another body of scholarship claims that if a woman's community status relies on her fertility, she may perceive contraction of HIV as a threat to her standing if it affects her ability to have children (Snow et al., 2012; Turan et al., 2009). In South Africa, studies have documented societal expectations in relation to childbearing, specifically, pressures to have children, the need to have boys as heirs, and large families (Mantell et al., 2014; Rochat et al., 2006). Similarly, in Malawi, respondents noted the need to have a child in order to strengthen and maintain their relationships and even those who already have children may be forced to have more when they get a new sexual partner (Bisika, 2008). Literature reviewed indicates that, once the threat such as HIV-related mortality and risk of HIV infection has been perceived, it would need to be translated into change in sexual behaviour, such that women who know their HIV negative status and those who know the risks associated with risky sexual behaviours may be more likely to use condoms for HIV prevention, and other methods for FP (Haddad et al., 2015; Kurewa et al., 2011). Studies have found that in addition to condom use, reversible contraception and pill have been well tolerated among HIV negative women (Wagner and Wanyenze, 2013). Whereas several studies show that HIV negative women are more likely to want to have more children, literature also shows that a substantial proportion of women living with HIV desire to have children (Wekesa and Coast, 2014), and thus are less likely to use long-term contraceptive methods such as implants and sterilization than than hormonal methods.

One behavioural model suggests that women respond to their HIV positive status by desiring more children, in order to increase the chance that more will live to adulthood (Wilcher et al., 2009; Yeatman et al., 2009) such that this group of women will choose reversible contraceptive methods because they want to increase their childbearing pace in order to achieve their unmet reproduction goals (McCoy et al., 2014; Mumah et al., 2014). Several studies have shown that after HIV diagnosis, the greater majority of women who had children already expressed a wish to become pregnant again and expressed a stronger wish to use reversible methods, despite the risk of HIV infection and mother to child HIV transmission (Nakayiwa et al., 2006; Wagner and Wanyeze , 2013).

Some studies have also noted that women may not want to have more children when they learn their HIV positive status (Homsy et al., 2009; McCoy et al., 2014), and they have better use of contraception as compared with their HIV negative counters (Johnson et al., 2009). Some

women fear that additional children would accelerate their disease progression (Curtis et al., 2009; Morrison et al., 2011), that they might transmit the virus to their babies (Hoffman et al., 2008), and that they may die and leave their children alone (Muheriwa et al., 2012). Other studies cited ill health as influencing the decision not to have children which may impact on their economic ability to support children (Haddad et al., 2015). However, Elul et al (2009) noted that this may change when they improve after getting into care or starting treatment and when they improve knowledge on HIV prevention methods.

Literature reviewed supports the claim that contraceptive choice among women who know their HIV status can also be altered if they access to information and ARV treatment (Church et al., 2014; Magadi and Magadi, 2016). A change in risk perception may occur through widespread media and education on HIV and its transmission and increased availability of antiretroviral therapy (Bertrand et al., 2006; Magadi, 2016). An increasing number of studies have also found that fertility intentions and contraceptive use are associated with available educational materials on the topic of HIV/AIDS and providers' attitude towards HIV positive women (Duflo et al., 2015; Blackie et al., 2016; Gustav et al., 2014). For example, women who are exposed to correct HIV and reproductive health messages were found to be more likely to use condom and long-term contraceptive methods in Zimbabwe (Mumah et al., 2014) and Kenya (Turan et al ., 2008). In Malawi, providers were reported to have ambivalence about supporting childbearing among their clients with HIV and they lack specific knowledge about safer conception strategies, have a low level of efficacy in relation to PMTCT and the risks of pregnancy for HIV-infected women (Kawale et al., 2015).

As the movement towards integration of HIV and FP progresses, HIV sero-status of women must be considered to maximise the integration of HIV and contraceptive provision. Thus, HIV and FP providers should offer comprehensive support to meet the needs of both HIV positive and negative women who are sexually active and wish to prevent both HIV and unwanted pregnancy (Mayondi et al., 2016). However, this balance is not always achieved for various reasons including lack of knowledge of barriers associated with contraceptive choice after HIV diagnosis (Agadjanian et al., 2009). Thus, examining contraceptive method choice among women who know their HIV serostatus in order to prevent HIV and mother to child HIV transmission becomes at the fore in countries with high HIV prevalence rates such as Zimbabwe.

2.3   Theoretical Frameworks

In this section, a number of theoretical frameworks are considered. Due to the fact that most of the frameworks examined in this thesis have been barely considered from the point of view of the effect of HIV, a development of an overarching analytical framework that takes into account both HIV and the context in which people live has been proposed. The thesis recognises that some variables are very specific to parts of the study outcomes; and do not overlap, for example, some of the determinants of HIV testing and determinants of maternal health services are not the same and cannot crossover, or some of the variables are filtered out depending on the study outcome because of their incompleteness. To solve this problem the proposed framework is modified to suit the requirements of each of the respective chapters of the thesis.

Models that are generally used to explain health behavior are those that focus on individual's characteristics as determinants of services utilisation, thereby, reducing their capacity to explain broader determinants of service utilisation. These models include 'Behavioral Model of Health service use and Social influence model' (Iriyana, 2007), Construct Alone and Trans theoretical Models and AIDS Risk reduction Model (ARRM) developed by (Catania, 1990).

2.3.1   The Health Belief Model

The model posits that health behaviour is a function of an individual's socio-demographic characteristics, knowledge and attitude (Iriyana, 2007). According to this model a person must have the following beliefs in order to change behaviour.

a) Perceived susceptibility to a particular health problem (e.g., am I at risk of HIV)?.

b) Perceived seriousness of the condition (e.g., how serious is HIV/AIDS, how hard would be my life if I get it)?.

c) Belief in effectiveness of the new behavior (e.g., HIV testing is effective in reducing mother to child HIV transmission)?.

d) Cues to action (e.g., witness the death or illness of a close friend or a family member due to HIV)?.

e) Perceived benefits of prevention action (e.g., if I deliver my child in a healthcare facility, can I avoid transmitting HIV infection to my child)?.

Case study for HBM:

'A woman has become aware that her husband has other girl friends **(perceived threat)**. She knows that her auntie became HIV positive as a result of her husband also having multiple sexual partnerships **(perceived severity).** Her health provider tells her that abstaining from sexual intercourse or using condom will decrease the risk of contracting HIV **(perceived benefit)**. Abstaining is difficult because they are married and she is worried about using condom **(perceived barrier).** On talking to people she hears a lady talk about her positive experience with condoms. She begins to use condom and finds success with this routine **(self-efficacy)'.**

In this model, promoting action to change behaviour includes changing individual personal beliefs, e.g through HIV awareness campaigns. Individuals will then weigh the benefits against the perceived costs and barriers to change. For a change to occur benefit must outweigh costs (Catania, 1990). The HBM provides insight on why people make health decisions and it creates a process of encouraging change. It is useful in understanding how to design programs such as health education and to design persuasive messages (Albarracin et al., 2005).

2.3.2   AIDS Risk Reduction Model (ARRM)

Closely related to Health behavioural Model is the AIDS Risk reduction Model (ARRM) developed by (Catania, 1990). The ARRM provides a framework for explaining and predicting the behaviour change efforts of individuals particularly in relationship to the sexual transmission of HIV/AIDS. The model incorporates several variables from other behaviour change theories, including the Health Behaviour Model, 'efficacy' theory, emotional influences, social cognitive theory and diffusion of innovation theories to describe the process individuals (or groups) pass through while changing behaviour regarding HIV risk. The model has three stages involved in reducing risk of HIV. The stages, as well as the hypothesised factors that influence the successful completion of each stage are as follows (Catania, 1990):

Stage 1: Recognition and labelling of one's behaviour as high risk

Hypothesised influences

- Knowledge of sexual activities associated with transmission of HIV

- Believing that one is personally susceptible to contraction of HIV
- Believing that having HIV is undesirable
- Social norms and networking

Stage 2: Making a commitment to reduce high-risk sexual contacts and to increase low-risk activities

Hypothesised influences

- Cost and benefits
- Enjoyment (e.g will the changes affect my enjoyment of sex?)
- Response efficacy (e.g, will the changes successfully reduce my risk of HIV infection?)
- Self efficacy
- Knowledge of health utility, as well as social factors (group norms and social support) are believed to influence individual's cost and benefit and self-efficacy beliefs.

Stage 3: This stage is broken down into three phases: 1) information seeking; 2) obtaining remedies; 3) enacting solutions

Hypothesised influences:

- Social networks and problem-solving choices (self-help, informal and formal help)
- Prior experiences with problems and solutions
- Level of self-esteem
- Resource requirements of acquiring help
- Ability to communicate verbally with sexual partner
- Sexual partner's beliefs and behaviours.

The authors of ARRM further identified other internal and external factors that may motivate individual movement across stages. For example, aversive emotional states, for instance, high levels of distress over HIV/AIDS that blunt emotional states, may facilitate or hinder the label of one's behaviours. External motivators including public campaigns, an image of a person dying from AIDs, or informal support groups may also cause people to examine and potentially change their health seeking behaviour or sexual activities.

The key problem with much of the frameworks discussed above is that they narrowly focus on health seeking decision making of the individuals, neglecting the environmental underpinnings of health and illness (Achia and Mageto, 2015; Bond et al., 2005). Based on the premises that individuals have some kind of interaction with their own communities (Stokols, 1996), Social Ecological Models of Health Promotion and Environment (SEM) are also reviewed for this thesis.

2.3.3 Social Ecological Models of Health Promotion and Structural and Environment

The Sociolecological Model (SEM) was developed under the tree of ecological theory where SEM contributes significantly in explaining the phenonmenon of community participation in various field of development (Stokol, 1996). SEM highlights a premise that 'individuals must have some kind of interaction with their own community and to understand and gain perspectives on factors that shape their behaviours, contextual factors must be considered' (Stokols, 1996). The SEM comprises of several immediate environmental contexts including individual, social, institution and policy (Stokols, 1996). The core principle of SEM as postulated by Stokols is that 'multiple factors influence behaviour, environments are multidimensional and complex, human-environment interactions can be described at varying levels of organisation and the interralationships between people and their environment are dynamic'(Stokols, 1996:282). Based on the SEM model, physical and socio-environmental conditions influence health seeking behaviour at multiple levels (i.e. at both the individual and the community level). This perspective echoes Diez-Roux's (1996) argument that environmental settings, physical, social and cultural dimensions can influence health outcomes. Another interesting framework of understanding how multilevel factors influence individual's health behavior is that of Dahlgren and Whitehead (1991) which demonstrates the relative importance of places (context) and people (composition) as predictors of health behaviour. Dahlgren and Whitehead pointed out that individuals are nested within multiple-spheres of influence and added that contextual factors can be conceptualised as operating at a higher level of the hierarchy, and features of individuals operating at a lower level. Their framework draws together characteristics from individuals' makeup to the socio-economic, cultural and physical environment, living and working conditions, community and social influences.

The social ecological model avoids exclusive focus on individual, community or geographical factors as separate analytical factors, but pays attention to the dynamic interaction of both individual and non-individual factors. This implies that factors influencing individuals' health-seeking behavior are located in the community where they live as well as within the social, economic and physical environments that surround them. Likewise some scholars such as Golden et al (2012) believe that the decision for an individual to use health care services, for example HIV testing or maternal health , must not be viewed as something that exclusively resides in the individual, but rather as a reflection of wider interactive situational processes. Generally the social ecological framework shows how joint factors can influence an individual to decide to go for HIV and sexual and reproductive services. Fig 2.1 provides a basic illustration of how factors relate to service utilisation interaction at different levels in a country.

Figure 2-1: Socio-ecological model
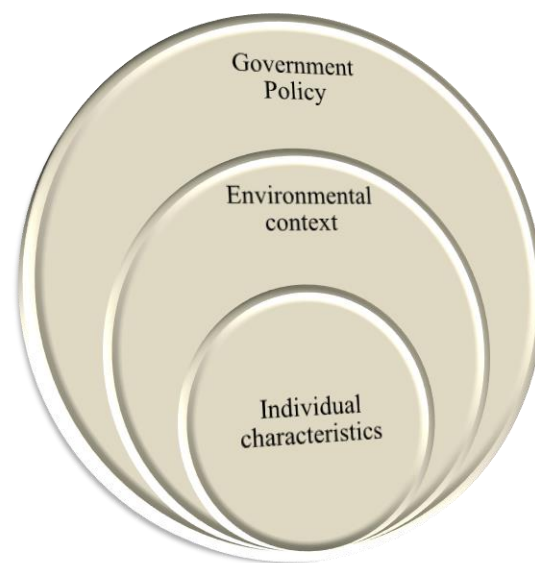
Source: Stokols, 1996

2.3.4   The Behavioural Model of Health Service Use

This model is similar to SEM models in that it integrates contextual factors with individual characteristics for studying health-related behaviours (Golden et al., 2012). However, the main ideology behind the behavioural model of health service utilization is that the use of health care services is a function of environmental, predisposing, enabling or impeding and need factors

(Andersen, 1995). In this view, Andersen offered four sets of individual and contextual characteristics which influence individual's use of health care services. The importance of environmental factors such as regional infrastructure (i.e., hospitals, schools, roads etc); socioeconomic development (i,e., employment creation and poverty) is underscored in literature (Achia et al., 2015; Aremu et al., 2011; Angles et al., 2005; Bond et al., 2005; Magadi and Desta, 2011). Gourly et al (2016) have pointed out that community environment governs our behaviour, thus in the context of HIV and SRH services utilisation in Zimbabwe, HIV prevalence, stigma or awareness in the community also must govern people's SRH behaviour. Extended SEM has also suggested that contextual or environmental factors that may affect health care service utilization may also vary geographically (Babalola and Fatusi, 2009).

The second domain of Andersen's framework relates to predisposing factors. While there may be necessary pre-existing conditions in the area or community where people live that may either facilitate or impede health services utilisation, individual predisposing factors may also play an important role in health seeking behaviour. An individual's access to and use of health services is considered to be a function of socio-cultural characteristics of individuals that exist prior to their illness (Kabagenyi et al., 2016). In the literature social structure including (education, occupation, ethnicity, social networks, social interactions, and culture), health beliefs (i.e attitudes, values, and knowledge that people have concerning and towards the health care system); and demographic factors such as age, marital status, and gender are pre-existing conditions that are associated with health care service utilization (Andersen, 1995;Titaley et al., 2010).

The enabling factors in Andersen's framework represent resources that provide individuals with the means to use health care services. These resources must be available for use at any time they are needed, and can be found at the family and community levels. According to Aremu et al (2011) when the pre-existing conditions of an individual are good, the logistical aspects of obtaining care is the next stage that an individual has to consider. It has been generally acknowledged that factorssuch as income, health insurance, transport, extent and quality of care may impede or enable access to health services (Adamu, 2011; Ahmed et al., 2010; Alam et al., 2015; Golden et al., 2012). It has also been noted that community economic disadvantages such as unavailability of health services, poverty and area development may

also impede access to health care (Achia et al., 2015; Alam et al., 2015; Aremu et al., 2011; Chitalu et al., 2013; Makate and Makate, 2017).

Perceived risk/need based characteristics outlined in Andersen's Behavioural Model refer to health status or illness and its severity as perceived by the individual (Andersen 1995). Although, environment, predisposing and enabling factors contribute to the factors that influence health seeking behaviour, Andersen believes that they may not be enough for the actual use, until an individual sees the benefits of using the services. Based on the author's hypothesis, the perceived risk or need for health services depends on how people view their own general health and functional state, as well as how they experience symptoms of illness, pain, and worries about their health and whether or not they judge their problems to be of sufficient importance and magnitude to seek professional help (Andersen, 1995).This postulation is closely related to the Health Belief model which holds that people act if they perceive they are susceptible to a particular health problem, or if they believe in effectiveness of the new behaviour (Iriyana, 2007).

2.3.5 Limitation of the Theoretical Frameworks

In view of the impact of HIV/AIDs on health care services utilization, the reviewed health behaviour theories have some limitations. The social ecological theory incorporates two or more levels of influence, permitting an examination of health problems at both individual and community levels. But its limitation is that it places more emphasis on environmental factors. On the other hand, the behavioural models of health place more emphasis on individual analysis, not taking in account environments in which these individuals live. Notwithstanding their limitations, all models identified important factors that influence utilisation of health care services. This study argues that, although all the factors identified by these models may be necessary, there is a lack of a conceptual framework that unifies a number of seemingly disparate factors including the effects of HIV on health care service utilisation. Although the decision to seek health is usually influenced by one's socio-economic status and illness characteristics, factors to do with HIV such as awareness and HIV prevalence may also influence service utilisation. In the literature, studies of SRH have not given much consideration to the independent impact of HIV/AIDs on service utilization. In view of the shortcomings of the frameworks reviewed, the following analytical framework is proposed for studying determinants of HIV and sexual and reproductive health care in Zimbabwe.

2.4   General analytical framework

This study advances the theoretical frameworks discussed above in yet another important way by including HIV factors within the determinants of SRH service utilization. Specifically, the conceptual framework incorporates HIV as either an enabling or disabling factor for health care services utilization. The lack of frameworks that emphasise structural and environmental factors, for example the social implication of HIV/AIDS in the community, has resulted in the conceptualisation of a conceptual framework (fig 2.2) that merges Health behavioural, AIDS Risk reduction Model, Social ecological and Heath Belief Models. Whereas, there maybe empical associations between public policy and external factors with health seeking behaviour, these are not addressed in the current study due to data limitations, hence represented with dashed arrows in figure 2.2. However, as can be seen in fig 2.2, predisposing factors (individual and community level) mediate the enabling factors such as access to media, HIV awareness and financial wherewithal to enable access to health care services.

The framework recognises that community variables including, place of residence (urban and rural), community mass media exposure, community poverty, HIV prevalence and HIV stigma have independent effects on health care service utilisation. The community characteristics may also influence the enabling factors. For example, individuals resident in communities with a higher employment rate are more likely to be rich, enabling them to have easier access to financial resources, a major factor that is known to be a key determinant of health services utilisation (Ahmed et al., 2010; Bond et al., 2005) such as access to financial resources and media. Given the paucity of knowledge on how HIV may facililates or impedes service utilisation in Zimbabwe, the conceptual framework has also included HIV awareness and HIV related stigma. HIV awareness has been identified as a key determinant service utilisation, for example individuals with higher HIV awareness were found to be more likely to use a condom (Agha, 2002), initiate antenatal care early (Jayleen et al., 2016); and test for HIV (Godif et al., 2015). Recognising the importance of The Health Belief model (Iriyana, 2007) and the AIDS Risk reduction Model (ARRM) developed by Catania (1990) discussed in section 2.3.1 and 2.3.2, respectively, perceived risk/need factors are also included in the conceptual framework. Based on the above-mentioned models, an individual must have a set of beliefs in order to change behaviour. For example, if individuals believe that they are at risk of HIV infection, they will take action in order to prevention HIV infection (Iriya, 2007). On the other hand,

Catania (1990) suggested that high levels of distress over HIV/AIDS that blunt emotional states may facilitate or hinder the labelling of one's behaviours.

The developed framework enabled this thesis to measure the relative contribution of each of the relevant cluster of variables (i.e individual and community level predisposing, enabling and perceived/need factor) including HIV, that influence access to HIV and SRH integrated services. Based on the literature reviewed, I believe that integrating the Health beliefs (HBM), Socio-ecological (SEM), AIDS Risk Reduction Model (ARRM) and Behavioural model provides a good conceptual model to investigate the complexity of people's health seeking behaviour. It has been suggested that, an interaction with specific context will influence someone's decision either to accept or decline to use health services (Catania, 1990). Therefore, inclusion of SEM perspectives in the final analytical model of the thesis enhances our understanding of every possible context in the system and it helped in giving substantial information towards factors that influence HIV and SRH services utilisation. Figure 2.2 below depicts the overarching conceptual framework for this thesis which will be modified to suit relevant subsequent chapters.

Figure 2-2: Analytical framework for the study of HIV and SRH service utilisation
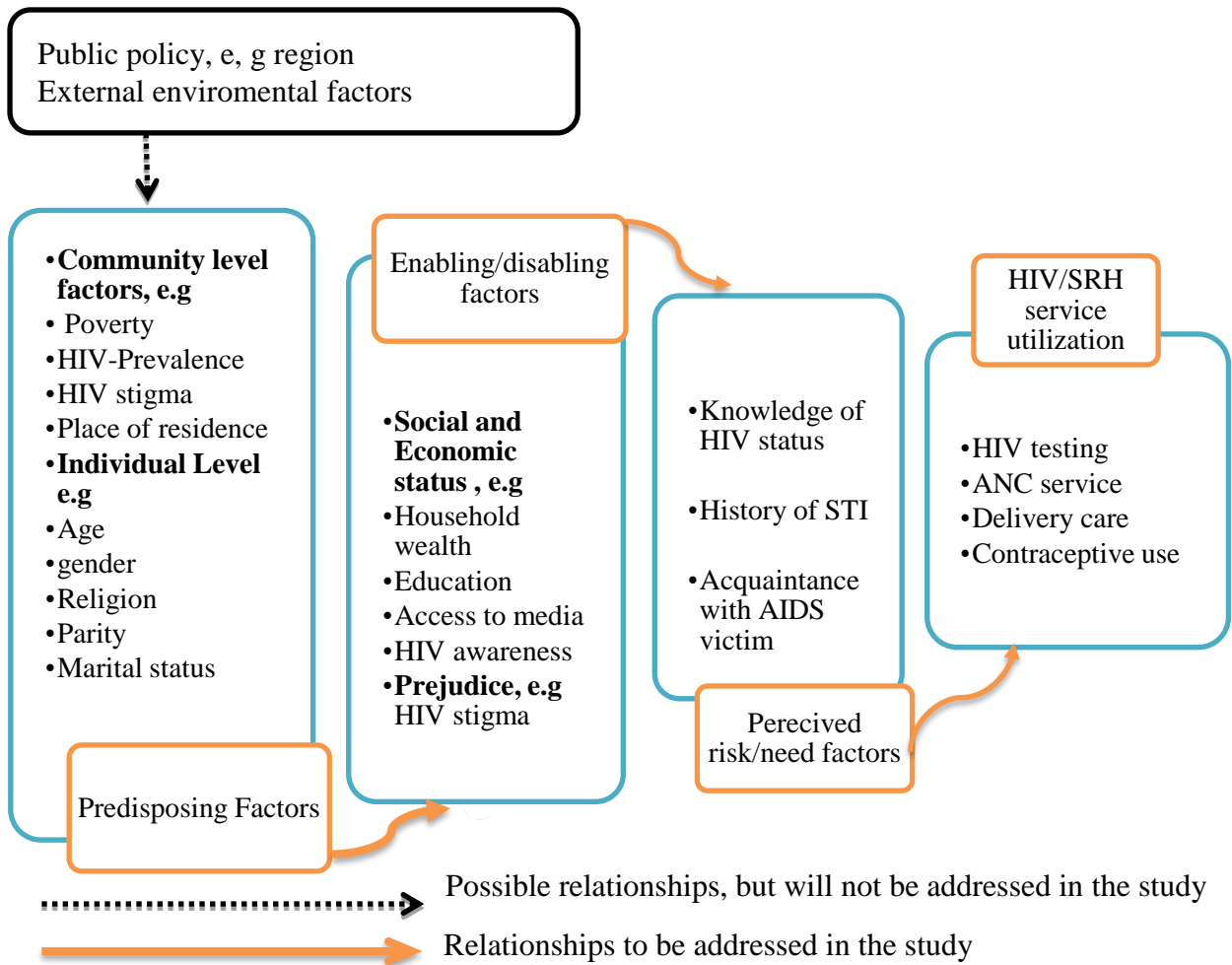
Source: Author's Construct

3 CHAPTER THREE: DATA AND METHODS

This chapter provides a general description of study population, design, data and the analytical methods used in the study. More details about the description and methods for specific outcomes are provided in each relevant chapter. The chapter is divided into three sections. The first section covers general description of study design, data sources and sampling. The second section, introduces study variables (i.e., outcome variables, covariates and HIV variables) as well as an overview of the limitations of data sources on HIV and SRH care services in Zimbabwe. The final section describes the basic statistical methods used i.e multilevel logit models and multilevel multinomial models, as well as modelling specifications and parameter estimations.

3.1 Study area and population

Zimbabwe is a land locked country in Southern Africa that shares borders with Zambia, Mozambique, Botswana and South Africa.By 2015, the country had an estimated population of 13 million people of which 48% are males and 52% being females (ZIMSTA, 2015). The total fertility rate is 3.1 per women and life expectancy at birth is currently estimated at 58 years of age (ZIMSTA, 2015). According to ZNASP (2015-2018), Zimbabwe has one of the highest HIV prevalence at 15.2% among adults aged 15-49 years of age (17.7% among females and 12.3% males). The majority of Zimbabweans have attained some education. Overall, 94% of males and 91% females have ever attended school. About 68% of the population live in rural areas (ZDHS, 2015), and close to 66% of the population live below the poverty line (ZIMSTS, 2012). Zimbabwe has experienced many economic and political problems in recent years and the unemployment rate is estimated to be close to 90% (Duri et al., 2013).

Figure 3-1: Study area and population
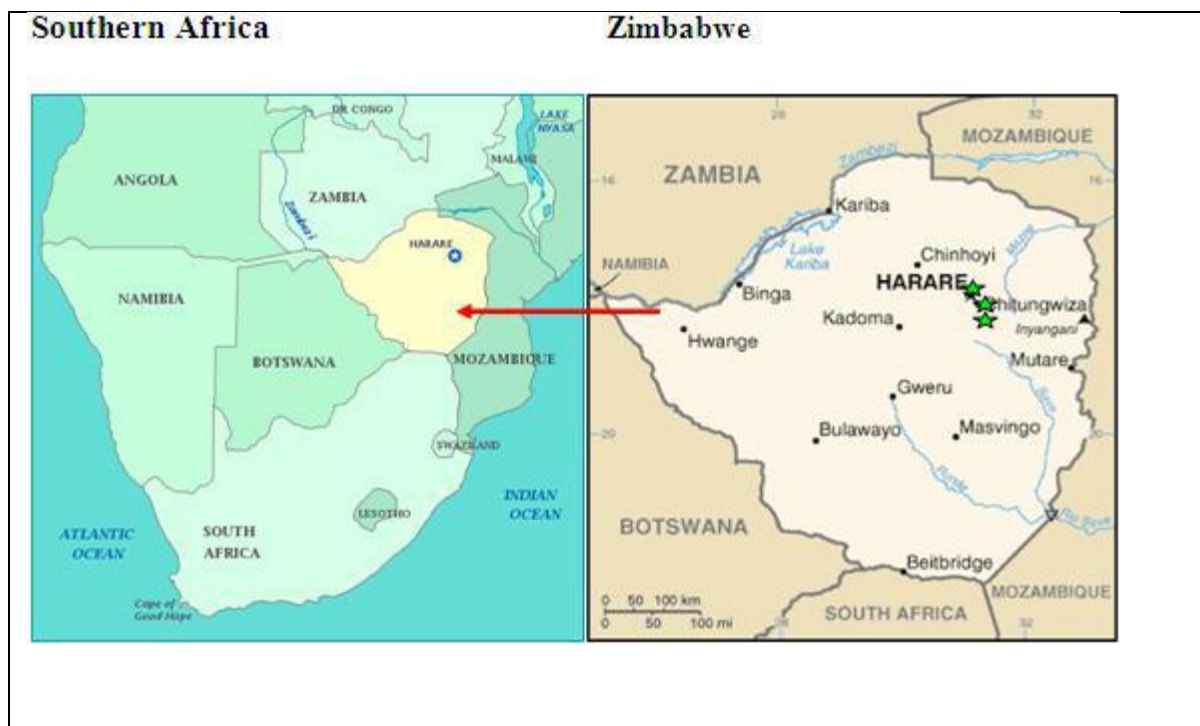
3.2 Study Design

The thesis is based on secondary analysis of cross-sectional data from Zimbabwe Demographic and Health Surveys (ZDHS) conducted in 2005/06 and 2010/11. The datasets were as a result of household based surveys, which in Zimbabwe, have been running every five years since 1988. All eligible women aged 15-49 and men aged 15-54 years resident in each sampled household were included in the surveys. There are three types of data that are collected in the Demography and Health surveys and these are Household, Women's and Men's Questionnaires. These questionnaires solicit information on a range of demographic and health indicators including, history of HIV testing, use of family planning and maternal health services. The 2005/6 and 2010/11 ZDHS, were the first two of a series of on-going surveys to include HIV testing. The repeated nature of DHS surveys, along with the availability of HIV test data that can be linked to individual-level survey data, provides a unique opportunity for a population-based study of factors associated with the HIV/AIDS epidemic in Zimbabwe. The DHS HIV testing protocol undergoes a rigorous ethical review process (ICF Macro, 2010), providing for informed, anonymous, and voluntary testing of women and men of reproductive

age. The protocol allowed for the linking of the HIV results to the background socioeconomic and demographic data collected in the individual questionnaire, ensuring that any information that could potentially identify an individual was destroyed before linking the 2005/6 and 2010/11 ZDHS datasets.

3.3   Sampling Design

The sampling framework used for the 2005-06 and 2010-11 ZDHS was based on the updated 2002 Population Census framework (ZDHS, 2005/6-10/11). Both samples were selected in two stages. The first involved selecting clusters from a nationally representative sample framework. In the second stage, all adults aged 15-49 (women) and 15-59 (men) in the selected households were targeted for household interviews. This resulted in a total of 18078 eligible women aged 15-59 years being interviewed for the two surveys; 8 907 in 2005-06 and 9171 in 2010-11. For men, 7175 were interviewed in 2005-06 and 7480 in the 2010-11. The response rate for individual surveys was 96 percent on average. The data from DHS are in hierarchical form, and Table 2 presents the hierarchical nature of the two ZDHS datasets that were used in the study. The table shows that at the lower level (level 1) are individuals who are nested within units at a higher level (household: level 2) and households are again nested within units at the next level (cluster: level 3). In this study, clusters are described as communities and they are the primary sampling units from which households are selected. Details of the sampling design and data collection procedures for the surveys are available in the individual 2010 DHS reports.

Table 3-1: Samples showing ZDHS Hierarchical pooled datasets

Survey Year	2005-6 ZDHS		2010-11 SDHS	
Clusters	403		406	
Households	9778		9756	
Individuals	Men (n=7175)	Women (n=8907)	Men (n=7480)	Women (n=9171)

Source: Zimbabwe Demography and Health surveys (2005/6-2010/11)

3.3.1   Ethical consideration

Secondary data, mainly the 2005/6 and 2010/11 ZDHS, was used for the data analysis. The DHS had already taken ethical issues into consideration such as the assurance of voluntary participation of respondents, anonymity and confidentiality. Permission for the use of the data in this thesis was obtained from ICF Macro Inc., USA.

3.3.2   Data limitations

The data has advantages and limitations, which may have affected the study results. The main advantages and disadvantages are discussed below. Application of ZDHS data offers several advantages. Firstly, the data included respondent's HIV-test results, which offers a unique opportunity for exploring the association between HIV status and sexual and reproductive health behaviour (Magadi and Magadi, 2017). Before the introduction of voluntary HIV testing during the ZDHS (2005/6) survey, there was a paucity of information about HIV-serostatus available in Zimbabwe to allow researchers to investigate the effect of HIV prevalence and knowledge of HIV status on health care service utilization. Linkage of HIV testing results to DHS surveys was designed to rectify this lack of knowledge (Magadi, 2016).

The data has some limitations too, that readers and policy makers need to consider in this thesis. Both 2005-06 and 2010-11 ZDHS data were collected retrospectively. This method of data collection may have led to recall bias, given that the events in question took place five years preceding each of these surveys (Titaley et al., 2010). Uthman et al (2015) noted that people remember fewer details as time passes.Accordingly, during the interviews, individuals may have forgotten or may have not accurately recalled events, for example, when they first visited antenatal services. They may also have forgotten events such as their date of birth, number of sexual partners or which facility they attended for skilled delivery (Aremu et al., 2011). Furthermore, because of lower level of education in rural areas there may have been misunderstanding of some questions and concepts leading to biased response and misreporting of some concepts (VU, 2005).

Variables such as asset-based wealth index used in the surveys were only proxy indicators, hence it may not produce accurate results similar to those obtained from direct measures of income in other datasets where such data are reliably collected (Aremu et al.,2011). In addition, the surveys did not capture direct questions for HIV stigma, awareness and HIV perceived risk of infection. To get a clear picture of the level of HIV stigma, awareness and perceived risk it would have been better for the survey to ask direct questions such as in the 2007 Malawi Demographic and health surveys in order to minimize information and estimation measurement bias during the imputation of these variables (Sambisa, 2008). Another limitation was the inability to control for the availability and quality of health care services. For example, the

women's questionnaire has exposure questions for maternal health care and Family planning services, but lack useful questions about availability and quality of these services. Previous studies have shown that the presence of quality health facilities and availability of drugs have great impact on utilization of health care services (Gabrysch et al., 2011; Hope et al., 2014). It is therefore possible that the absence of data on the availability of health care services (i.e mainly number of health facilities) and quality of health care services (i.e availability of health care providers and drugs) that are provided in different community settings may have effects on the variations of healthcare service utilisation. In order to achieve a clearer picture of contextual influences on health care service utilization, future surveys should include measures of presence of health care infrastructure, availability of HIV treatment and other HIV intervention programs.

Although it would have been desirable to incorparate geographical data on public policy i.e national and regional policy, this has been hindered by lack of such data in the DHS. This limits the extent to which differences in HIV and SRH service utilisatiion across the regions would be attributed to the characteristics of the region themselves or differences between the types of individuals living in different regions in Zimbabwe. Oseni et al (2018) found striking variations in health service utilisation acorss different provinces in Zimbabwe and have suggested that response/policies should vary at the regional level to ensure that the often diverse needs of populations acrocc the country are met and incorporated into planning the HIV and SRH response. Future studies on HIV and SRH integrateed services need to provide insights into spatial and regional variation in HIV and SRH service utilisation.

On the question on HIV testing in various regions, there were reasonably high response rates and no clear systematic patterns that can cause bias. However, we must be cautious when interpreting the results for specific subgroups (for example condom users and those with multiple sexual partners that have some degree of non-response rates in the surveys). This may have the effect of under-representing condom users and those who have multiple sexual partners.

Another interesting bias is that poorer HIV positive individuals die quicker than those who are better off because they lack financial wherewithal needed for health care services and treatment (MacPhail et al., 2007). As a result, HIV positive respondents may have over- represented

subgroups of population who are better off economically (Magadi and Desta, 2011). Given that the surveys excluded people who lived in army barracks, hospitals, police camps, boarding schools and other institutional arrangements, there could have been some under sampling of employed people who are generally knowledgeable about health issues and healthier than unemployed people (Carneiro and Howard, 2011). Fourthly, there are a number of variables relating to health facilities such as distance, staffing, facilities and equipment and cultural beliefs and practices that could confound the results obtained in the analysis as the data set used did not collect them. Another important limitation is that because of the cross-sectional nature of the data, the relationship between outcomes and community factors could work in the other direction where constraints of health care supply maybe due to lack of incentive of providers to enter deprived areas rather than the constraints of demand driven by for example, community wealth, HIV awareness or stigma (Delprato, 2016). Indeed, strong arguments for causality effects on determinants of health care service utilisation would require a panel data structure. Notwithstanding the limitations above, I believe that since the questionnaire used has already been validated internationally, limitations discussed above have no significant bearing on the results of the study outcomes.

3.3.3   Missing data

The 'exclude case pairwise' option was used to exclude cases only if they had truly missing data that was required for specific analysis. However, the cases were included in the analysis for which they had relevant information.

3.4 Introduction to multilevel modelling analytical methods

The thesis adopts a multilevel modelling analytical method. For several years, great efforts have been devoted to the study of public health focussing on relationships between characteristics of community where people live and health outcomes. Based on sociological theories and literature, there seems to be an agreement that individuals' health and behaviour is shaped not only by individual risk factors but also by the structure of the social environment in which they live, creating widespread acceptance that health varies across places and communities (Ngome and Odimegwu, 2014; Magadi, 2011; Uthman, 2008). In the history of public health and places, the focus on community variation in health outcomes has always been there. Fundamentally, in the mid 1940s, public health and epidemiological investigations of diseases were ecological (Diez-Roux, 1998, 2002) being interested in the association between health outcomes with environmental and community characteristics. A chief example of ecological investigation is that of John Snow's study of cholera in London in which he concluded that the geographical setting was the key to spread of cholera (Diez-Roux, 1998).

In contrast with ecological investigations, modern research on health outcomes has also focused more on individual level factors rather than environmental factors (Achi and Matero, 2015; Angles et al., 2005; Aremu et al., 2011; Bond et al., 2005; Magadi and Desta, 2011). One reason for the shift is the increased prominence of chronic diseases, with research focusing mainly on behaviour and biological factors responsible for chronic diseases (Leyland et al., 2003). Another reason for the shift concerns the 'ecological fallacy' which occurs when the associations found at the group level are inferred to the individual level when in truth, such association may not be existing (Golden et al., 2012). Considering the 'ecological fallacy, there has been a renewed interest in investigating the effects of context on health outcomes, which seeks to bring public health research back towards structural and environmental influence on health outcomes (Diez-Roux, 2002). Many experts have always been content that health outcomes may be affected by contextual effects associated with community characteristics (e.g Angles et al., 2005; Aremu et al., 2011; Bond et al., 2005; Magadi and desta, 2011). Furthermore, it has been suggested that variations in health outcomes may be because of compositional effects whereby, for example, particular types of individuals, who are more

ssusceptible to poor health outcomes due to their individual characteristics, are clustered in the same community (Goldstein and Rasbash, 1996).

Instinctively, individuals within the same area tend to be more similar in health status than individuals from different areas (Aremu, 2011). It has been argued that the clustering of individuals within communities may lead to a correlation of health outcomes for individuals within the same community, which demonstrates the shared experiences of individuals in the same area (Delprato, 2016). This correlation may lead to violation of the assumption of independence required for regression techniques, which in turn leads to underestimation of standard errors (Magadi et al., 2007). In addition, the finding of differences and relationships when they do not exist may be more likely to happen (Jones, 1991). Most statistical methods assume that observations in the dataset are independent of each other, but when groups of observations share some common features or have information at different levels (e.g., individual and community); they are no longer independent of each other (Vu. 2005).

Data that fall into hierarchies can be analysed using multilevel models, which account for the dependence of outcomes of individuals within the same community (Chitalu et al., 2013). The DHS dataset has a hierarchical structure with individuals living in households and households clustering within communities, thus such kind of data violates the assumption of independence of ordinary (linear) or logistic regression models (Diez-Roux, 2002). In this thesis, a multi-level modelling technique is used to account for the hierarchical nature of the data, and to be able to estimate community level effects on the outcome variables. In addition, the technique was used to remove the effect of clustering in order to obtain valid point estimates for the parameters and standard errors for point estimates: and also, to study the effects of variables that operate at different levels of the hierarchy and how the variability in the outcome variable is distributed across the levels of the hierarchy (Vu, 2005). Multilevel models employed in this thesis allowed the total variation in the response, which is measured at the individual level, to be partitioned into variation attributable to the individual level and variation that is attributable to differences between communities (Goldstein and Rasbash, 1996). According to VU (2005), the advantage of this model is that the researcher simultaneously estimates the individual and community level effects on the outcome variable. It has been argued that not only do multilevel models overcome the ecological fallacy, but they also overcome the individualistic fallacy

when the association found between, for example maternal health outcomes and individual characteristics are inferred to the community level, when it is not true (Golden et al., 2012).

3.4.1 Multilevel Logistic Model

A two-level logistic regression model for binary data and a multinomial logistic regression model for data with unordered responses were employed in the study. These consist of two sub-models at level 1, and level 2, with individuals (level 1) nested within communities (level 2). In this study, individual and household variables were considered as individual level variables. The reason for this was that the average number of individuals in a household as contained in the dataset was small, thus the household could not be considered as a separate level of analysis. Here we are interested in identifying the factors associated with HIV testing, antenatal HIV testing, timing and number of ANC visits; place of delivery and delivery with a professional birth attendant as outcomes. The analysis further examined the extent of between community variations in care service use of these outcomes.

Single-level logistic regression
A general single-level model for binary (1, 0) response data can be represented as follows:

$$f(\pi_i) = \beta_0 + \beta_{1i} x_{1i} + \ldots\ldots + \beta_{m\,i} x_{m\,i}$$

Where $f(\pi_i)$ is some transformation of the probability π_i, namely the *link function*
For the logit link,

$$f(\pi_i) = \text{Log}\,[\pi_i/(1-\pi_i)]$$

where the quantity $\pi_i/(1-\pi_i)$ is the odds of event occurring for the individual, $_i$. We use the logit link $f(\pi_i)$, which is a function that models the odds that an individual uses HIV and SRH outcomes in Zimbabwe.

B_0 is the constant; $\beta_{1\ to}\ \beta_m$ represent coefficients of the explanatory variables x_1 to x_m for individuals as subscripted with $_i$. In this case, x_1 to x_m are variables such as individual's age, sex, marital status etc.

The individual-level model may be extended to a two-level random intercept model, for individual $_1$ within the community $_j$. This allows for inclusion of community effects on the odds of using health care services.

41

$$Logit\ (\pi_{ij}) = \beta_{0j} + \beta_1 x_{ij}$$

$$\beta_{0j} = \beta_0 + u_{0j}, \quad u_{0j} \sim N\ (0,\ \sigma^2_{u\ 0})$$

Here the intercept consists of two terms: a fixed component β_0 and a community-specific component, the random effect u_{0j}. The random effects represent the variation of HIV and SRH service utilization for individuals from different communities. *Xij* is the matrix of fixed (observed) covariates corresponding to i^{th} level-1 unit in the jth level-2 unit. Given that the study has two levels, where level 1 is individual and household, level 2 is community.

3.4.2 Multilevel Multinomial logistic regression Model

Chapter 7 adopted multinomial regression model for analysis of contraceptive methods choice among women who know their HIV status. The multinomial model can be built in stages as follows:

Stage 1-Unordered multinomial model

Using a logit link, the unordered single-level multinomial model for contraceptive methods choice (categorical response variable with four categories) can be written succinctly as follows:

$$\log\left[\frac{\pi_i^{(s)}}{\pi_i^{(t)}}\right] = \beta_0^{(s)} + \beta_1^{(s)} x_i + \cdots, s = 1, \dots t-1$$

Where, s superscript (s=1, …, t-1) denotes each response with response specific intercepts and slopes. In the model, the same explanatory variable appears in each of the t-1 contrasts. From the above equation, the probability for choosing a particular contraceptive methods $\pi_i^{(s)}$ (s=1,...., t-1) can be obtained as follows:

$$\pi_i^{(s)} = \frac{\exp(\beta_0^{(s)} + \beta_1^{(s)} x_i)}{1 + \sum_{k=1}^{t-1} \exp(\beta_0^{(k)} + \beta_1^{(k)} x_i)}$$

The probability of being in the reference category $_t$ is the remainder from 1 minus the summed probability of all other categories:

$$\pi_i^{(t)} = 1 - \sum_{k=1}^{t-1} \pi_i^{(k)}$$

Stage 2: a model with hierarchical structure for women nested in communities

The second model sees individual women as being nested within communities. The general equation of the random intercepts two-level multinomial Logistic regression model used for analysis of determinants of contraceptive methods choice therefore takes the form:

$$log \left[\frac{\pi_{ij}^{(s)}}{\pi_{ij}^{(t)}} \right] = \beta_0^{(s)} + \beta_1^{(s)} X_{1ij} + \beta_2^{(s)} X_{2ij} + \ldots + \beta_k^{(s)} X_{kij} + u_j^{(s)}, \quad s=2,3.$$

where: $\pi_{ij}^{(s)}$ denotes the probability of using a particular contraceptive method (s) (i.e. long-term methods=2, condom=3 or other=4) for woman, i, in the jth community ; $\pi_{ij}^{(t)}$ is the probability of using hormonal methods (t=1 for hormonal methods used as reference category) for woman i, in community j; $\beta_0^{(s)}$ are the regression intercepts/constant for contraceptive methods s; $X_{(1-k)ij}$ are 1-k explanatory variables defined at woman or community level; $\beta_{(1-k)}^{(s)}$ are the associated usual regression parameter estimates for contraceptive methods choice (s); and $u_j^{(s)}$ are the community-level residuals for contraceptive methods choice (s). These are assumed to be normally distributed with mean zero and variance $\sigma^{2(s)}_u$. The community random effects may be correlated across contraceptive methods choice categories: covariance $(u_j^{(s2)}, u_j^{(s3)}) = \sigma^{(s2, s3)}_u$, (s2=long-term, s3=condom; and s4=other methods). (Rasbash et al, 2016).

3.5   Fixed and Random Effects

The models were estimated initially by IGLS and then by Markov chain Monte Carlo (MCMC) estimation with an initial burn-in of 500 simulations followed by 5k simulations. Fixed effects are the level-1 and level-2 covariates, expressed as odd ratio (OR) for binary outcomes and as relative risk (RR) for the multinomial outcome, both at 95% confident interval (95% CI). The random effects are the measures of variances in health services utilization and contraceptive methods choice across communities (level-2). The ratio of the variance at the community level to the total variance is called inter-class correlation coefficient (ICC), which is a tool of measuring the degree of homogeneity within units such as households or communities. According to Field (2009) the ICC measurements are used to gauge whether contextual variables have any effect on the outcome. The results of random effects are expressed as variance partition coefficient (VPC), which is in this study are equal to ICC. The models were

estimated in MLwin 2.32 (Rasbaschet al.2015); by bayesian methods using Markov chain Monte Carlo (MCMC) estimation (Browne. 2014).

3.5.1   Inter –class correlations

For binary outcome, the partition of variance between different levels is not interpreted the same way as in the case of a linear model. Therefore the, VPC analysis will be calculated based on the linear threshold model which converts the individual level variance from the probability scale to the logistic scale, on which the community variance will be expressed (Chitalu et al, 2013). This means that by using the linear threshold model, the unobserved individual outcome variance follows the logistic distribution with individual level variance σ_e^2 equal to $\pi^2 / 3$ (equal to 3.29). In this case, the VPC corresponds to the ICC, which is a measure of general clustering of the individual outcome of interest in the community.

The ICC is calculated as follows:

$$P = \sigma_U^2 / (\sigma_U^2 + \sigma_\varepsilon^2)$$

Where:

P is the intra-class correlation coefficient *(ICC)*. σ_U^2 in the variance at the community level. $\sigma_\varepsilon^2 = 3.29$ represents the fixed individual variance(Goldstein, 2003).

3.5.2   Proportional change in Variance (PCV)

Community differences in health service utilisation may be attributed to contextual influences or differences in the individual composition of the communities (including unobserved community characteristics) (Field. 2009). Thus, while adjusting for the individual characteristics in the multilevel models, some part of the compositional differences will be taken into account to explain some differences in communities as observed in the empty model. The equation for the proportional change in the community variance is:

$$PCV_1 = (V_{n-1} - V_{n-2}) / V_{n-1}$$

Where V_{n-1} is the community variance in the empty model and V_{n-2} is the community variance in the models including individual characteristics or community characteristics.

3.5.3 Parameter estimation

Before fitting the models, we have to specify details about estimation procedure to be used. For both binary and multinomial response models, different procedures have been implemented in *MLwiN* for the estimation of multilevel models that have categorical responses: quasi-likelihood methods (MQL) (Goldstein, 1991; Goldstein and Rasbash, 1996) and Penalized Quasi Likelihood (PQL) (Breslow and Clayton, 1993, Laird, 1978), 1st or 2nd order) For most of the analysis I shall used the quasi-likelihood methods, starting with the default procedure 1st order MQL and extending to 2nd order PQL on convergence. Both orders can be used; however, 2nd order is preferred because it is an improved approximation procedure (Rasbash et al., 2005). For the analysis the quasi-likelihood methods was used, starting with the default procedure 1st order quasi-likelihood methods (MQL) (Goldstein, 1991; Goldstein and Rasbash, 1996) extending to Penalized Quasi Likelihood (PQL) (Breslow and Clayton, 1993, Laird, 1978), 1st or 2nd order on conversion.

3.6 Summary

Chapter three introduced methods and data to be used, and this was followed by analytical methods including binary and multinomial logistic regression models. Chapter four, five, six and seven began the analysis of data and chapter seven and eight presented findings and conclusion of the study.

4 CHAPTER FOUR: FACTORS ASSOCIATED WITH HIV TESTING IN ZIMBABWE

4.1 Introduction

4.1.1 Background context

A national HIV testing program was implemented a decade ago in Zimbabwe, providing HIV treatment to millions` of HIV-positive individuals, many of whom previously struggled with the illness due to unknown HIV status. By 2015, Zimbabwe sought to half new HIV infection prescribed by the World Health Organisation's strategic plan (WHO, 2016). Although it has been a daunting task, adult HIV prevalence in Zimbabwe has almost halved from its peak of nearly 30% around 1997 to around 13.7% in 2011 (ZIMSTAT, 2012). HIV related deaths have also been reduced by over 60% as a result of a successful HIV testing, treatment and support programme (ZIMSTA, 2012). However, despite government's efforts to stem the HIV scourge, Zimbabwe remains one of the countries in Sub-Saharan African still burdened with HIV epidemic (WHO, UNICEF, 2014). The current aim in the post-2015 era is to end the AIDS epidemic by 2030. To achieve this, the government, in collaboration with its partners have set up the 90-90-90 strategic milestones to be achieved by 2020. The milestones means that by 2020, 90% of all people living with HIV will know their HIV status, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy and 90% of all people receiving antiretroviral therapy will have viral load suppression (UNAIDS 2014). HIV testing has been used as an entry point for both HIV prevention and treatment; and an early detection of HIV can add 15 years to a person's life span (Wringe et al., 2008). People have to get tested and know their HIV status to enable them to seek treatment and to choose preventative strategies. For this reason HIV testing services need to be available and accessible to all people to enable easy utilisation (Kayeyi et al., 2014).

To ensure targets are met, Zimbabwe needs to improve HIV testing coverage, but scaling up HIV testing coverage; currently estimated at 56% can be daunting, given that HIV testing is voluntary. The success of the HIV self-testing programme will require a better understanding of the factors that influence people's HIV testing behaviour, which this study seeks to achieve.

4.1.2   Factors associated with HIV testing

Existing studies have identified a range of factors to be associated with HIV testing, including: place of residence, gender, marital status, and socio-economic status (Mitchel at al., 2010; Stephenson et al., 2013). Extant literature from Sub-Saharan African countries indicates that gender has been an important determinant of HIV testing behaviour. Specifically the studies found that females were more likely to get tested for HIV than males (Godif et al., 2015; Mwangi et al., 2014), due to reasons such as frequent access to health care services through maternal care (Peltzer et al., 2009).

Besides gender, marital status has been found to be strongly associated with HIV testing and findings have been consistent across gender. Individuals who are divorced, widowed and married tend to have higher odds of HIV testing than never married individuals (Lepine et al et al., 2014; Obermeyer et al., 2013; Weiser et al., 2006). For example, married individuals were found to be 2.54 times more likely to be tested for HIV than never married individuals in South Africa (Venkatesh et al., 2011). Similarly, a study in Ivory Coast (Jean et al., 2013) found that never married individuals were 66% less likely to be tested than married people.

HIV testing is also influenced by enabling factors such as wealth status, education, HIV awareness and media exposure. Several studies have found that poorer individuals were less likely to test for HIV than those from wealthy households (Mwangi et al., 2014; Weiser et al., 2006; Jean et al., 2013). It has been noted that poverty is likely to be associated with lack of education, and lack of education implies that messages regarding HIV testing are often inaccessible (Hendriksen et al., 2009; Mitchel at al., 2010). Education is a key indicator of socioeconomic status and more educated individuals are more likely to have better healthdue to their ability to have better access to health information and to understand and respond to such information. Socioeconomic challenges may also decrease the likelihood of HIV testing, due to lack of financial resources that would enable individuals to have access to health care services (Bond et al., 2005; Musheke et al., 2013; Obermeyer et al., 2013; Staveteig et al., 2013).

The effect of HIV/AIDS factors (e.g stigma and discrimination, risk perception of HIV infection, risky behaviour, HIV awareness, or knowing someone who died of HIV/AIDS) on

HIV testing may depend on an individual's predisposing factors such as age, education, marital status, social and economic status (Murire et al., 2014; Jacobi et al., 2013; Wringe et al., 2008). These interactions may lead to an increased risk perception of HIV infection which may in turn decrease the willingness to utilise health care services that are linked to HIV (Chirawu et al., 2010; Oshi et al., 2007). The risk perception of contracting HIV may either increases or decreases the likelihood of using health care services (Akwara et al., 2003; Kayiki and Forster, 2011; Muchini et al., 2010). An example of this phenomenon could be that, since HIV prevalence is reported to be positively associated with higher socio-economic status and education (Magadi and Desta, 2011) individuals with higher educational attainment and those who are wealthier may perceive themselves to be at risk of HIV infection, and therefore have recourse for HIV testing, compared to those who are less well-off (Jean et al., 2012; Obermeye et al., 2013).

There is also evidence of a positive association between HIV awareness and HIV testing (Weiser et al., 2006) and awareness and education are highly correlated (Sambisa.2008). However, Lepine et al (2014) have argued that HIV awareness may be negatively associated with HIV testing if the awareness affects risk perception and associated behaviours. Firstly, because individuals who have a good understanding of HIV prevention and transmission methods could be less likely to adopt risky behaviour and thus may perceive themselves to have less need for HIV testing as they think they are less at risk (Izugbara et al., 2009). Secondly, people who overestimate their likelihood of getting infected through their poor health knowledge could have higher odds of HIV testing thinking they are more at risk. This notion resonates with Musheke et al (2013) who assert that the effect of HIV knowledge on HIV testing may be heterogeneous in the population. For instance education may determine access and exposure to HIV information and will affect the way this information is used to modify attitudes towards HIV testing (Mwangi et al., 2014).

Also, many studies have linked HIV infection with risky sexual behaviours, including multiple sexual partners and limited ability to negotiate safer sex, which may lead to lower rates of condom use and disclosure of HIV status (Agha, 2012; Akinyemi et al., 2010; Rosenberg et al., 2013). All of these may lead to an increased risk perception of HIV infection, leading to lower or higher uptake of HIV testing. In line with the effects of risk perception on healthcare utilisation, studies have shown that perceived susceptibility as a result of risky sexual behaviour

exacerbates risk perception of HIV infection, in turn leading to underutilisation of health care services (Kayiki and Forster, 2011; Martin-Herzet al., 2006). On the other hand, existing literature also suggests that perception of being at risk of a disease is a prerequisite for behaviour change (Turan et al., 2008), and that perceived high risk of infection causes people to take precautionary measures including HIV testing and knowing the results in order to reduce the risk of getting the virus (Lepine et al., 2014; Jean et al., 2012). According to Health Behavioural models (Iriya et al., 2007) perceived susceptibility to a particular health problem (e.g., am I at risk of HIV?), perceived seriousness of the condition (e.g., how serious is HIV/AIDS?, how hard would my life be if I get it?), and cues to action (e.g., witnessing the death or illness of a close friend or a family member due to HIV) may move an individual to take necessary action or change their behaviour (Iriyana et al., 2007). Therefore, knowing someone who died because of HIV is also a significant cue to action to an individual to test for HIV (Meiberg et al., 2008).

At the community level, the likelihood of HIV testing may increase for individuals who reside in communities with higher HIV prevalence, high poverty, high risk perception of HIV infection, or within easy access of HIV intervention programmes, compared to individuals living in other communities (Bond et al., 2005; Mitchel et al., 2010; Murire et al., 2014; Uthman et al., 2010). While HIV/AIDS stigma may exist within an individual as a result of imagined fear due to perceived risk of HIV infection based on self-assessment (Nyblade et al., 2001), stigma can also be observed and exerted from the outside world (health care providers, family, community, and friends). Either form of stigma may lead to more people underutilising health care services (Sambisa, 2008).

Since risky sexual behaviour may be linked to poverty in the community, people living in poor communities may perceive themselves to be at a high risk of HIV infection, and this may reduce the likelihood of uptake of HIV testing services in such communities (Hendriksen et al., 2009). Furthermore, availability and quality of health care services, for example availability of family planning and HIV testing services in the community, may motive individuals to seek help (Stephensen et al., 2013).

The determinants of HIV testing have received considerable research attention. However, different studies have come up with different positions and it is challenging to reconcile existing findings and use them to inform our knowledge about HIV testing in Zimbabwe. Most

available literature has focused on the association between HIV testing and individual-level factors (Jean et al., 2012; Stephensen et al., 2013; Sambisa, 2008; Takarinda et al., 2014). However, implications regarding community influences on HIV testing has received limited attention.Also, most studies have tended to analyse the association of predisposing factors such as age, gender, marital status etc, without taking into account the enabling factors such as resources and enabling environment that facilitate individual's behaviour. Working from the premises that community inequalities in access to health care services is as significant as individual level factors, it is essential and worthwhile to investigate and understand the effects of both individual and community-level determinants of HIV testing in the context of Zimbabwe.

4.2   Conceptual framework

The trajectories to HIV testing first need to be explained before undertaking the analysis. In this regard, Andersen (1995) provided a useful analytical framework for examining determinants of HIV testing. This theoretical framework is grounded in the notion that utilization of health care services is dependent upon contextual situations, which in turn influences individual circumstances. The framework is conceptualised based on the predisposition, enablement and need for health care use (Andersen, 1995). What is vital in this approach is its emphasis on the joint effects of community and individual level factors that influence health care service utilisation. First, the level of HIV testing uptake is affected by predisposing factors which usually includes personal attributes of an individual such as demographic characteristics (i.e age, gender, marital status, religion, ethnicity and others). Secondly, predisposing factors are assumed to operate through enabling and perceived need factors and these comprise of contextual and sometimes personal circumstances, representing the ability to use health care services. In this study, enabling factors are composed of an individual's income, access to media, and awareness of HIV, observed HIV stigma, HIV disclosure and confidentiality concerns (Angotti et al., 2009; Mashuba et al., 2015; Lepine et al., 2014). Thirdly, enabling factors are assumed to facilitate or inhibit individuals from accessing HIV testing services. However, whether or not an individual has a means ofaccess to health care services, there must be a need for them taking that action (Iriyana et al., 2007). The need factors pertain to the perceived and evaluated assessment of one's health status which may compel the need for seeking health care services (Bond et al., 2005). For that reason, perceived/need factors such as whether an individual had engaged in risky behaviour such as

having multiple sex partners, or had history of sexually transmitted diseases and whether one knew someone who had died of HIV were also considered in the framework. The conceptual framework in Figure 4.1 provides a schematic display of the perceived determinants of HIV testing in Zimbabwe.

Figure 4-1 Conceptual framework for the analysis of determinants of HIV testing
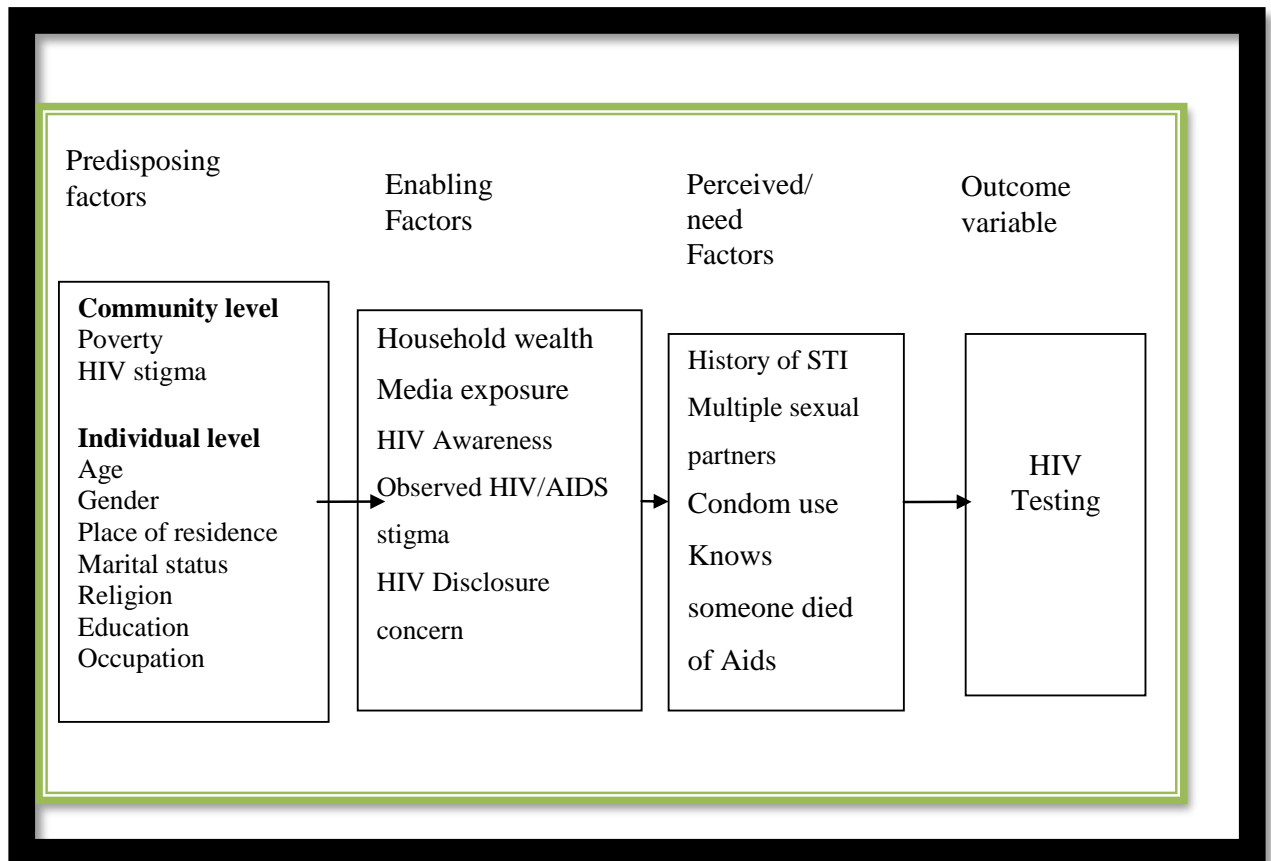
Source: Authors' construct.

The accumulated effects of predisposing, enabling and need factors govern one's trajectory to HIV testing behaviour. Given the background of growing inequality in access to health care services in Zimbabwe, issues of community influence on HIV testing comes at the fore. A growing need exists for information on the implication of both individual and community level effects on HIV testing. Such information will help the HIV prevention programs identify communities with high concentrations of individuals who are likely to have been ever tested for HIV, as well as sub-populations that are not likely to be tested (Mwangi et al., 2014). Guided by this conceptual framework, this chapter aims to understand individual and

community-level factors associated with HIV testing. Specifically, the study aims to identify the predisposing, enabling and perceived risk or need factors associated with HIV testing with particular focus on gender differences

4.3 Data and Methods

4.3.1 The Data

This is a secondary data analysis study based on the 2005-6 and 2010-11 Zimbabwe Demographic and Health surveys (ZDHS), the first two nationally representative surveys to include HIV testing. The surveys were designed to provide national estimates of HIV in the population, including HIV testing coverage. The analysis is based on respondents aged between 15-59 years residing in 402 clusters,and the sample size was 32384 of which 27.8% of males (n=14587) and 43.7% of females (n=17797) were ever tested for HIV. Overall, about 93% of those who tested for HIV received their test results. The individuals responded to a questionnaire survey asking questions related to their HIV testing history, socio-economic and demographic background and health indicators such as the individual's sexual behaviour, HIV related knowledge, attitude and behaviour and media exposure. The sample excluded the institutional population, which includes individuals living in hospitals, prisons and other institutions.

4.3.2 Outcome variables

The key outcome variables of interest were whether the respondent was ever tested for HIV and received results. For each outcome variable, possible responses were 'yes' or 'no' if an individual had ever been tested for HIV or have received results or not.

4.3.3 Explanatory Variables

We identified a range of independent variables based on the conceptual framework described above, their presence in existing empirical literature and the sample distribution in the ZDHS datasets. The explanatory variables were clustered into specific categories; individual and community-level predisposing, enabling and perceived/need factors.These categories were considered to give the best representation of community and individual characteristics that are associated with HIV testing behaviour. Community-level factors such as poverty, HIV

awareness, and stigma and media exposure were imputed from relevant individual -level factors.

4.3.4 Individual-level socio-economic and demographic predisposing variables

While inclusion of wealth, occupation, education and media exposure may indicate the manifestation of economic position of an individual (Obermeye et al., 2013; Uthman et al., 2010) demographic factors such as gender, parity, religion, marital status and age are considered important because they may capture behavioural factors such as the perception of risk, acceptance of testing and sexual practice (Kayeyi et al., 2014).The following are factors which were included at the individual level.

(a) Gender: gender plays a key role in health seeking behaviour and there is evidence from existing literature suggesting that women, due to reasons such as frequent access to health care services through antenatal care (ANC), are more likely to test and receive HIV test results than men (Peltzer et al., 2009; Lepine et al., 2014). The variable was used to compare utilisation of HIV testing services between males and females. This is a binary measure coded 1 if female and 0 if males.

(b) Age: The ZDHS sample included females (aged 15-49) and males (aged 15-59) of reproductive age. Age was recorded into five categories: 15-24; 25-29; 30-34; 35-39; 40+. The variable wasused to compare HIV testing behaviour between different age groups.

(c) Marital status: This variable captures differentials in HIV testing behaviour between marital status categorises. It was recoded into four categories: never-married, married, widowed and divorced.

*(d)*Type of place of residence: This variable captures HIV testing behaviour of individuals by urban / rural residence.

*(e)*Level of education: This was one of the key variables, which captured socio-economic characteristics of individuals. The variable was recoded into three categories: primary, secondary and higher educational attainment.

(f) Religion: Catholic and Protestant followers tend to have higher odds of health care service utilisation.This behaviour has been interpreted as a consequence of greater social diversity within mainstream religious groups that facilitates change of behaviour towards health care services utilisation (Hartwig et al., 2006; Mashuba and Hemalata, 2015;Luginaah et al., 2005). A categorical variable based on religious affiliation classified into: Catholic, Protestant, Pentecostal and Apostolic categories is included in the analysis

(g) Occupation: Economic dependency has been one of the major barriers to women's control over their health behaviour in developing countries. However, studies have shown that a woman's occupation is an important factor that influences her access to health care services. This is due to the fact that women who are working and earning money will have greater autonomy and control over financial resources, and thus they are more able to pay for health care services (Jean et al., 2012). A categorical variable based on occupation is also included in the analysis

4.3.5   Enabling factors

Another explanatory domain in the conceptual framework relates to enabling factors. These are factors which promote or inhibit use of HIV testing services and they include enabling resources and environmental factors.

(a) Household wealth: This variable was used as a measure of economic wellbeing. The index was constructed by DHS using principal component analysis to assign indicator weights based on household ownership of assets (Rutstein, 2008). This was a key variable of interest, and five wealth quintiles (poorest, poorer, middle, richer, and richest) were used in analysing the relationship between wealth and HIV testing behaviours.

(b) Media exposure: This variable captures how individuals' exposure to media was associated with their HIV testing behaviour. Exposure to HIV/AIDS information through mass media may lead to high levels of awareness, which may in turn influence self-assessed risk of HIV infection and the need to test for HIV (Weiser et al., 2006).This variable was measured by three

items relating to frequency of watching television, reading newspapers and listening to radio. An additive scale was imputed and classified into three categories: 'low, medium and high.

(c) AIDS awareness index: This variable was derived from eight HIV related questions which consist of prevention and misconceptions about transmission. Aids awareness index, was classified into three categories: low: if participants answered three or less questions correctly; medium: if answered up to five questions correctly; and high: if answered 6-8 questions correctly.

(d) HIV related stigma: This referred to the respondent's attitude towards HIV developed from four questions of HIV related stigma, namely; if the respondent' would buy vegetables from a vendor with HIV', 'can care for a relative with HIV', 'would want an HIV-positive teacher to continue teaching', and 'would want others to know if a family member became infected with HIV'. The variable was classified into three categories: low: if not experienced any of the stigma indicators, medium: if experienced 1-2 of the stigma indicators and high stigma: if experienced 3-4 stigma indicators.

(e) Observed stigma: Like in Sambisa (2008), this study uses this variable to assess individual's attitude towards people living with HIV. People act upon what they see happening around them (Chirawu et al., 2010). People may have been discouraged from being tested for HIV if they observed people living with HIV being discriminated against in their communities or families. In a study by the Government of Zimbabwe (ZNASP, 2011-2015), a significantly number of people living with HIV reported that they had been forced to change residency or denied accommodation. We therefore, constructed observed an'stigma variable' from the following set of prompt items; whether participant knows someone suspected to have HIV/AIDS who has been denied health services, knows someone suspected to have HIV/AIDS who has been denied involvement in social events and knows someone suspected to have HIV who has been verbally abused. For the observed stigma variable, the additive scale was split into two categories: yes (1 or more) or no (0)

(f) Disclosure and Confidentiality: Not much attention has been given to HIV status disclosure and confidentiality dynamics within private and public places. People do not worry about how to disclose their HIV sero-status only, but they also worry about how their health information

is shared (Kalichman et al., 2003). Mashuba and Hemalata (2015) pointed out that people living with HIV may have to disclose their HIV status to their family members, health care workers, employers, religious leaders, counsellors and community members. The disclosure and issues with how health information is going to be shared if results come out positive can act as a barrier to access to HIV testing services. Disclosure and confidentiality concern was a variable measured by a single item; 'would want others to know if a family member became infected with HIV and coded 'yes'if someone reported that they would want others to know if a family member became infected, and 'no' if they didn't want others to know.

4.3.6 HIV and risky sexual behaviour variables

Finally the perceived need factors were considered. The conceptual framework suggests that for someone to take an action on his/her health there must be a perceived risk and a need to do so (Iriyana et al., 2007). Here the perceived need factors are operationalized by whether someone feels he/she is at risk of HIV infection because of their history of sexually transmitted diseases (STI), multiple sex practice or knowing someone who died of HIV. Literature suggests that people get tested for HIV following the Illness or death of people they know (Kalichman et al., 2003). Each perceived need variable was coded 'yes or no'

(a) Condom used in the last sex encounter. This is a binary variable. Those who had not used condom takes the value of 0, and those who have used take the value of 1.

(b) Multiple sex partnership: This also is a binary variable, which takes the value of zero if an individual did not have sex or had sex with only one partner and takes the value of one if an individual had sex with more than one sex partner in the last 12 months preceding the survey.

(c) History of STI: This is a binary variable. Those who have never had STI take the value of 0, and those who have ever had STI takes the value of 1.

4.3.7 Methods of analysis

A two-level logistic regression model for binary response was employed. Individuals who responded to the questionnaire were considered as level-1. Other studies which investigated

multilevel determinants of HIV testing behavior considered household (Mitchel et al., 2010) and couples (Lepine et al., 2014), as levels of analysis. This study did not consider household as a level of analysis because the average number of individuals in a household who have been ever tested for HIV as contained in the dataset was too small to be considered as a level of analysis. The study did not also consider couples; this was premised on the fact that never married people are less likely to be tested for HIV than married, divorced or widowed people (Agha, 2012; Weiser et al., 2006). Therefore, in this study of the determinants of HIV testing, level-2 of analysis was represented by a cluster, which is defined as a community.

4.3.7.1 **Multilevel logistic models**

We recognize that communities may share similar socio-economic and demographic characteristics, resources and experiences (Mitchel et al., 2010) and it is therefore, reasonable to assume that residents of one community maybe more similar to each other with respect of their HIV testing behaviour. With such background knowledge, it can be argued that variations in HIV testing in Zimbabwe may not have been as a result of individual characteristics alone, but of the effects of community effects in which they live as whole (Godif et al., 2015; Uthman et al., 2017). For that reason, this study used two level logistic regression models to investigate the community and individual level factors that influence HIV testing behaviour. The basic form of two-level random intercepts logistic regression model used can be expressed as:

$$\text{Logit}\,(\pi_{ij}) = \text{Log}\,[\pi_{ij}/\,(1-\pi_{ij})] = \beta_0 + \beta X'_{ij} + u_{0j}$$

$$\text{Var}_{(u_{0ij})} = \sigma^2_{u0}$$

Where (π_{ij}) is the probability of having ever been tested for HIV for an individual i, in the jth community. β_0 is the regression intercept, X'_{ij} is the vector of covariates defined at individual or community level; β is the associated vector of usual regression parameter estimates, and is shared by all communities, while the random effect u_{0j} is specific to community $_j$.

Before including any explanatory variables in the models, it was crucial to know how much between community variations was there in the propensity to test for HIV. To assess this, we look at the estimated value of σ^2_{u0}, which is the variance of the u_{0j} terms. We use a threshold model approach which measures proportions at group level:

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$\rho = \sigma_U{}^2 / (\sigma_U{}^2 + \sigma_\varepsilon{}^2)$

Where $\sigma_U{}^2$ is the total variance at the community level, and $\sigma_\varepsilon{}^2$ is the total variance at the individual level. For the multilevel logistic regression model, the level-1 residuals are assumed to have a standard logistic distribution with mean zero and variance $\sigma_\varepsilon{}^2 = \pi^2 / 3$ where π is the constant 3.14159. Thus, $\rho = \sigma_U{}^2 / \sigma_U{}^2 + 3.29$ (Goldstein, 2003).

4.3.7.2 **Modelling Approaches**

Since our analysis is based on hierarchical data given the ZDHS multi-stage sampling design, it is necessary to use techniques that consider the possible dependence of individuals clustered in the community (Goldstein, 2003). Conventional regression analysis techniques assume that individual observations are independent from one another (Magadi and Desta, 2011). If this assumption is violated, estimates of the regression coefficients can be biased and standard errors may be underestimated. Multilevel regression techniques make it possible to take into account the possible dependence of the outcome variable between people in the same community (Goldstein, 2003). Four models were fitted in the analysis. Model 0 was an empty model with year of survey as the only co-variate. This was fitted to decompose the total variance between individual and community level. Background demographic and socio-economic factors were then added in Model 1. The next model (Model 2) was composed of background demographic/socio-economic factors and HIV and risky sexual behaviour; enabling and need factors. The final model (Model 3) took account of community factors.

Measures of fixed effects, that is the effects of individual-level and community-level determinants of HIV testing were reported in terms of odds ratios, whilst the measures of variation (random effects) were expressed in terms of intra-class correlation coefficient (ICC). The estimation procedure was based on quasi-likelihood methods, starting with the default procedure 1st order Quasi-likelihood Methods (MQL) and extending to 2nd order Penalized Quasi Likelihood (PQL).The 2nd order estimation was preferred because it is an improved approximation procedure (Rasbash et al., 2005).

4.4 Results

4.4.1 Descriptive and bivariate analysis

Cross-tabulation analysis, including chi-square tests were undertaken to assess the distribution of individuals who were ever tested for HIV by predisposing, enabling and need factors. Relevant means or proportions were imputed for community-level variables. The proportions of individuals who were ever tested for HIV and received their results are presented in table 4.1, based on the 2005/6 and 2010/11 ZDHS.

4.4.1.1 Percentage distribution of individuals ever tested for HIV and those who received the results

Table 4.1 presents the proportion of individuals who ever tested for HIV and the proportion that received results among those who were ever tested for HIV in the 2005-6and 2010-11 surveys. The coverage of HIV testing was significantly higher for females (26%) versus males: (18 %), $p<0.005$) in the 2005-6 survey. By 2010-2011 the coverage of HIV testing increased for both males and females to 62 % for females: versus males: 38% ($p<0.005$). Among those who ever tested for HIV, 89 % of males and 85% of females received results in the 2005/6 survey; these percentages increased to 93% for males and 96% for females in the 2010-11 survey.

Table 4-1: Trends in HIV testing coverage and receipt of results, 2005/6-2010/11 ZDHS

Survey year	Proportion who have ever been tested for HIV			
	Males		Females	
	%[a]	n[b]	%[a]	n[b]
2005-6	17.7	7107	25.7	8849
2010-11	37.6	7480	61.5	8948
All	27.9	14587	43.7	17797
Proportion who received results among those who have ever been tested for HIV				
Survey year	Males		Females	
	%[a]	n[b]	%[a]	n[b]
2005-6	88.6	1258	85.1	2274
2010-11	92.8	2812	96.4	5503
All	91.5	4070	93.1	7777

[a]Weighted; [b]unweighted cases

4.4.1.2 **Distribution of HIV testing by background characteristics**

A bivariate analysis was used to assess the association between each independent variable set out in the framework and the study outcomes. The Chi-square tests showed association between key variables and HIV testing, but not with receipt of HIV test results. The sample size of those who did not receive results after an HIV test was too low to allow for a meaningful multivariate multilevel logistic regression analysis. Therefore, the determinants of receipts of HIV test results were excluded from further analysis. Given that over 90% of those who tested for HIV collected their results (ZDHS, 2010/11), policies needs to focus mainly at increasing uptake of HIV testing in Zimbabwe.

The results in Table 4.2 indicated that there was an association between HIV testing and the following factors: age, place of residence, marital status, educational attainment, occupation, household wealth, exposure to media, and HIV awareness. The highest proportion (58%) was observed among females in the age group (25-29); compared to males (38%) in the same age group. For both males and females, HIV testing coverage was lowest among individuals below the age of 20 years, followed by those aged 40 years and above. Because of disparities in social and economic development between urban and rural areas, place of residence was also a key factor in determining access to HIV testing services.

A higher proportion of people who ever tested for HIV were from urban than rural areas for both males and females. With respect to marital status, for females, the highest coverage of HIV testing was observed among those who were married (52%), whilst for men; it was among those who were widowed (41%). As would be expected, HIV testing uptake has increased by educational attainment for both males and females. For example only 19% of males and 36% of females with primary education were ever tested for HIV, compared to 53% and 65% males and females with higher educational attainment, respectively.

Table 4-2: Distribution of HIV testing by background socio-economic and demographic characteristics

| Background characteristics | Proportion ever been tested for HIV by background characteristics | | | | | | All Cases[a] |
| | Males | | | Females | | | |
	%[a]	n[b]	P-value	%[a]	n[b]	P-value	
Age groups*			<0.001			<0.001	
15-24	16.7	6533		35.4	7717		14250
25-29	37.7	2218		57.9	3089		5307
30-34	36.3	1838		51.6	2470		4308
35-39	37.1	1462		48.0	1859		5321
40+	34.6	2536		36.5	2660		5196
Residence*			<0.001			<0.001	
Urban	34.6	4992		47.9	6571		11563
Rural	24.4	9595		41.3	11224		20819
Marital status*			<0.001			<0.001	
Never married	17.7	6724		22.9	4695		11419
Married	36.7	7154		51.9	10529		17683
Widowed	41.1	180		46.5	1231		1411
Divorced	34.2	529		49.1	1340		1869
Education level *			<0.001			<0.001	
Primary	18.8	4176		35.5	6065		10241
Secondary	29.6	9523		46.9	11083		20606
Higher	52.8	888		64.5	647		1535
Religion*			<0.001			<0.001	
Roman catholic	26.9	6837		42.2	4754		11591
Protestant	29.4	2202		41.3	3734		5936
Pentecostal	33.6	1944		47.2	3343		5287
Apostolic sect	25.8	3604		44.4	5964		9568
Occupation*			<0.001			<0.001	
Unemployed	18.5	4634		40.7	10278		14912
Professional	52.1	1056		72.6	1796		2852
Manual work	46.0	2121		70.8	729		2850
Agriculture	36.4	1842		58.6	1218		3060

[a]Weighted; [b]unweighted cases

4.4.1.3 Distribution of HIV testing by enabling and need Factors

Table 4.3 shows differentials in HIV testing based on enabling and need factors, including household wealth, media exposure, HIV/AIDS awareness, observed stigma, and HIV test results disclosure concern. The proportion of individuals who were ever tested for HIV was higher among those from wealthier households. For example, 21% of males from poorest households versus 39% from richest household reported ever being tested for HIV. Whilst, HIV testing was higher among individuals who reported having higher media exposure or HIV awareness, it was lower among those who reported having observed HIV stigma and those with HIV disclosure concerns.

Table 4-3: Distribution of testing by enabling and need factors

Variable	Proportion ever been tested for HIV by enabling and need factors						
	Males			Females			
	%[a]	n[b]	*P*-value	%[a]	n[b]	*P*-value	All Cases
Wealth *			<0.001			<0.001	
Poorest	20.7	2513		38.1	3227		5740
Poorer	21.3	2638		39.6	3143		5781
Middle	24.3	2712		42.9	3165		5877
Richer	30.1	3475		48.6	3925		7400
Richest	39.1	3249		46.9	4335		7584
Media exposure*			<0.001			<0.001	
Low	24.3	9446		44.1	12396		22742
Medium	37.8	3245		48.2	2662		5907
High	28.7	1877		34.4	1804		3681
HIV awareness*			<0.001			<0.01	
Low	19.2	661		23.8	1117		1778
Medium	33.8	7694		51.6	10174		17868
High	21.6	6232		34.7	6504		12736
Observed stigma*			<0.01			<0.01	
No	16.5	5148		47.3	14782		19930
Yes	22.4	9439		30.6	3013		12452
Disclosure concern*			<0.001			<0.001	
No	28.7	8226		44.3	9982		18208
Yes	26.9	6361		42.9	7813		14174

Continued

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Table 4-3 continued

Need/risk perception factors							
History of STI*			<0.001			<0.001	
No	27.7	14204		43.3	17248		31452
Yes	35.2	383		57.2	547		930
Condom use*			<0.001			<0.001	
No	36.0	12057		42.1	16374		28431
Yes	37.1	2530		62.4	1421		3951
Multiple sexual partners*			<0.001			<0.001	
No	31.2	7501		47.4	11698		19199
Yes	24.5	6576		36.7	5931		12507
Know living with HIV*			<0.001			<0.001	
No	29.9	11089		47.3	14313		25402
Yes	21.7	3490		30.7	3261		6751

[a]Weighted; [b]unweighted cases .

Based on the Health belief and Aids Risk Reduction models (Catania, 1990, Iriyana, 2007) individuals who engage in multiple sexual partnerships, have history of (STI), and do use condoms or those who knew someone who had died of HIV may consider themselvesto be at a high risk of HIV infection. Therefore, they may perceive themselves as having a need to test for HIV (Lepine et al., 2014). In our sample, a higher proportion of individuals (35% of males and 57% of females) who mentioned that they have a history of STI had been tested for HIV than those who did not have a history of STI (28% of males and 43% of females). Furthermore, a higher proportion of individuals who reported having used condoms in their last sexual intercourse encounter had been tested for HIV compared with individuals who did not use condoms (e.g. 62% versus 42% for females). For both males and females, those who reported having multiple sexual partners and those who knew someone who died of HIV were less likely to report having been tested for HIV than their counterparts without multiple partners or who did not know anyone who had died of HIV/AIDS, contrary to expectation.

The results from bivariate analysis suggested a significant association between variables considered in the framework. However, given that bivariate associations can be influenced by confounding factors, a multivariate analysis that simultaneously takes into account these effects was used to accurately establish the independent predictors of HIV testing behaviour (Snijders and Bosker, 1999).

4.4.2　Multivariate multilevel Analyses

Multivariate analyses here start with combining the data for males and females across the two surveys to assess gender differences. Although the association patterns observed in bivariate analysis were relatively consistent with gender, it is reasonable to recognise that the determinants of HIV testing among males and females are likely to be different (Godif et al., 2015). For this reason, multivariateanalysis is presented separately for males and females to explore the differences in predictors of HIV testing by gender. Results for the combined sample are given in Annex (4.1), while tables 4.4 and 4.5 present estimates for females and males respectively. There is evidence of a significant gender disparity in HIV testing, with females being about twice as likely to be tested (average OR=1.8) as compared to males of similar characteristics (See Annex 4.1).

4.4.2.1　The Determinants of HIV testing among females

Table 4.4 presents the odds ratios (ORs) associated with HIV testing for females. With all variables excluded, the results show females were 5.4 times more likely to have been HIV tested in 2010/11 than in 2005/6 survey. When all predisposing variables were included in Model 1, the odds of HIV testing substantially increased to 6.9. Females from rural areas were 36% less likely to test for HIV than those from urban areas. As females grow older, they have a tendency to avoid HIV testing. For example, females aged between 30-34 years and those who were 40 years and above were 31% and 65 % less likely than young individuals aged 15-24 years to test for HIV, respectively. Married females were 2.1 times while those who were widowed and divorced were 2.4 and 1.8 times more likely, respectively, to test for HIV compared with those who never married. Also females who were professionals and those with manual jobs had 1.4 times higher odds of HIV testing than those who were unemployed. Again, the likelihood of HIV uptake increased significantly with birth order. For instance, birth order 2 was associated with 5.4 times higher odds of HIV testing than birth order 0. Furthermore, individuals with secondary or higher educational attainment were found to be 1.8 and 3.6 times more likely to have been tested for HIV compared with those with primary or no educational attainment. Compared with the empty model 0, the inclusion of individual level variables in Model 1 increased the intra-community correlation to 6.8%, with approximately 21.4% of proportional change in variance unexplained.

Table 4-4: Average odds of HIV testing from multilevel logistic regression models (95% confidence intervals are given in square brackets)-females

Parameters	Model 1		Model 2		Model 3	
	AOR	95%CI	AOR	95% CI	AOR	95% CI
Survey (2005-6)						
2010-11	5.39	[4.83-6.02]*	6.89	[6.08-7.79]*	6.91	[6.11-7.82]*
Residence (urban)						
Rural	0.74	[0.67-0.83]*	0.96	[0.82-1.11]	1.08	[0.91-1.29]
Age groups (15-24)						
25-29	1.02	[0.91-1.14]	0.93	[0.83-1.05]	0.93	[0.30-1.05]
30-34	0.69	[0.61-0.79]*	0.62	[0.54-0.71]*	0.62	[0.54-0.71]*
35-39	0.51	[0.44-0.59]*	0.46	[0.39-0.53]*	0.46	[0.39-0.53]*
40+	0.35	[0.30-0.40]*	0.31	[0.27-0.36]*	0.31	[0.26-0.36]*
Marital status (never married)						
Married	2.12	[1.85-2.43]*	2.23	[1.94-2.57]*	2.23	[1.94-2.57]*
Widowed	2.43	[2.00-2.95]*	2.40	[1.97-2.92]*	2.39	[1.97-2.91]*
Divorced	1.76	[1.47-2.11]*	1.71	[1.45-2.10]*	1.74	[1.45-2.09]*
Occupation(unemployed)						
Professional	1.41	[1.24-1.63]*	1.34	[1.17-1.54]*	1.34	[1.17-1.54]*
Manual work	1.41	[1.17-1.70]*	1.36	[1.12-1.64]*	1.34	[1.11-1.63]*
Agriculture	1.03	[0.88-1.19]	0.98	[0.84-1.15]	0.98	[0.84-1.14]
Religion (Catholic)						
Protestant	1.10	[0.99-1.22]	1.05	[0.94-1.17]	1.04	[0.94-1.17]
Pentecostal	1.08	[0.97-1.21]	1.05	[0.94-1.17]	1.04	[0.93-1.17]
Apostolic	0.93	[0.85-1.02]	0.96	[0.87-1.06]	0.96	[0.87-1.05]
Education (primary)						
Secondary	1.78[	1.63-1.94]*	1.56	[1.43-1.71]*	1.55	[1.42-1.70]*
Higher	3.60	[2.91-4.44]*	2.79	[2.24-3.47]*	2.78	[2.24-3.46]*
Enabling and perceived/need factors						
Wealth (poorest)						
Poorer			1.05	[0.93-1.19]	1.03	[0.91-1.17]
Middle			1.20	[1.06-1.37]*	1.14	[0.99-1.31]
Richer			1.24	[1.07-1.45]*	1.15	[0.97-1.36]
Richest			1.27	[1.05-1.53]*	1.16	[0.95-1.42]
Media exposure (low)						
Medium			1.21	[1.09-1.35]*	1.21	[1.09-1.34]*
High			1.67	[1.42-1.97]*	1.67	[1.42-1.97]*
HIV/AIDS Awareness(low)						
Medium			1.59	[1.31-1.93]*	1.59	1.31-1.93]*
High			2.04	[1.72-2.43]*	2.04	[1.71-2.43]*

Table 4-4 Continued

Observed AIDS stigma(no)						
Yes			1.07	[0.90-1.27]	1.06	[0.90-1.26]
HIV disclosure concern(no)						
Yes			0.82	[0.74-0.90]*	0.81	[0.74-0.89]*
Knows someone died with Aids(no)						
Yes			1.23	[1.08-1.41]*	1.23	[1.08-1.41]*
History of STI (no)						
Yes			1.55	[1.27-1.89]*	1.55	[1.27-1.90]*
Community factors						
Poverty –gm					0.73	[0.56-0.94]*
Random Variance (SE)	0.23(0.025)*			0.22 (0.024)*		0.218(0.024)*
(VPC)=ICC (%)		6.8		6.3		6.2

VPC=Variance Partition Coefficient, ICC=intra-cluster correlation, *Statistical significance at 5% level p<0.05

Model 2 controlled for the enabling, perceived and need factors. The results showed that, although slightly reduced, the background characteristic factors remained significantly associated with HIV testing when enabling, perceived and need factors were controlled for. However, controlling for model 2 factors substantially explained the effect of place of residence such that place of residence was no longer significantly associated with HIV testing for females. Enabling factors such as wealth, media exposure and HIV awareness were found to be associated with HIV testing for females. Being wealthier was associated with increased odds of HIV testing. For instance, females in the richest quintile households were 1.3 times more likely to test for HIV than those from the poorest households. Similarly, those with higher levels of media exposure and HIV awareness had higher odds of HIV testing compared with their counterparts with lower levels of media exposure or HIVAIDS awareness. The results relating to perceived and need factors suggest that having disclosure concerns was associated with reduced odds of being tested for HIV by 18% compared with females with no disclosure concerns. On the other hand, having a history of STIs and knowing someone who died of HIV was associated with increased odds of HIV testing. The results provide no evidence of a relationship between HIV testing and observed stigma among females.

In the final model (Model 3), poverty in the community was the only community-level variable found to be significantly associated with HIV testing for females. Living in a community with

a high proportion of individuals living in poverty was associated with reduced odds of HIV testing.The estimates for household wealth diminished after we controlled for community poverty such that household wealth was no longer significantly associated with HIV testing.

The results of the variance components model (i.e the empty model) and other models in Table 4.4 suggest that most of the variation in HIV testing for females was at the individual level. However, there was also some variation at the community level as indicated by the significant random variance in reporting of ever being tested for HIV across communities. As shown by the variance partition coefficient (VPC), the intra-class correlation coefficient (ICC) was estimated at about 6-7%, even after controlling for individual and community level factors in Table 4.4. Thus, about 6% of the total unexplained variation in HIV testing could be attributed to unobserved community-level effects with the remaining 94% of unexplained variation attributable to individual –level factors.

4.4.2.2 The Determinants of HIV testing among males

The results for males (Table 4.5) slightly differed from those for females. As with females, the odds of HIV testing for males were higher in 2010/11 than in 2005/06, but the odds of HIV testing for males were lower by 3.03 points compared with the odds for females between the same periods (OR=5.60 females versus OR=2.57 males). This suggests that the increase in uptake of HIV testing was greater for women than men. In comparison with female's estimates, some results for males also differ when we controlled for background characteristics. It is noticeable that males residing in rural areas were about 1.2 times more likely than those from urban areas to have ever been tested for HIV. This finding differs with those of females which suggested that rural residence was associated with lower odds of HIV testing than urban residence. Results also revealed that being older is associated with lower odds of HIV testing for females, but not for males. Being married was associated with reduced odds of HIV testing by 32% for males, while being widowed was associated with increased odds by 47% compared to being never married. Unlike females, being a manual worker or working in agricultural sector was associated with increased odds of HIV testing for males.

Table 4-5: Average odds of HIV testing from multilevel logistic regression models (95% confidence intervals are given in square brackets)-males

Parameters	Model 1		Model 2		Model 3	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
Survey (2005-6)						
2010-11	2.57	[2.28-2.91]*	2.92	[2.53-3.37]*	3.04	[2.63-3.53]*
Individual level factors						
Residence (urban)						
Rural	1.16	[1.01-1.33]*	1.17	[1.02-1.34]*	1.13	[0.99-1.30]
Age groups (15-24)						
25-29	0.30	[0.24-0.38]*	0.37	[0.29-0.48]*	0.37	[0.29-0.48]*
30-34	1.04	[0.85-1.27]	1.04	[0.85-1.27]	1.04	[0.85-1.27]
35-39	0.93	[0.76-1.14]	0.93	[0.76-1.14]	0.93	[0.76-1.14]
40+	0.94	[0.76-1.15]	0.94	[0.76-1.16]	0.94	[0.76-1.15]
Marital status (never married)						
Married	0.68	[0.59-0.77]*	0.68	[0.59-0.77]*	0.57	[0.49-0.68]*
Widowed	1.47	[1.06-2.03]*	1.47	[1.06-2.03]*	1.23	[0.87-1.74]
Divorced	1.00	[0.82-1.22]	1.00	[0.82-1.22]	0.77	[0.62-0.96]*
Occupation(unemployed)						
Professional	1.18	[1.00-1.39]	1.17	[0.98-1.38]	1.16	[0.98-1.38]
Manual work	1.37	[1.20-1.58]*	1.35	[1.17-1.55]*	1.35	[1.18-1.55]*
Agriculture	1.20	[1.03-1.39]*	1.18	[1.02-1.37]*	1.20	[1.03-1.40]*
Religion (Catholic)						
Protestant	1.21	[1.05-1.40]*	1.25	[1.09-1.45]*	1.26	[1.09-1.45]*
Pentecostal	0.96	[0.84-1.09]	0.99	[0.87-1.12]	0.99	[0.87-1.13]
Apostolic	0.84	[0.74-0.95]*	0.85	[0.75-0.96]*	0.85	[0.75-0.96]*
Education (primary)						
Secondary	1.89	[1.29-2.76]*	1.82	[1.24-2.66]*	1.88	[1.28-2.75]*
Higher	3.03	[2.01-4.57]*	2.90	[1.92-4.37]*	3.00	[1.98-4.54]*
Enabling and perceived/need factors						
Wealth (poorest)						
Poorer			1.01	[0.88-1.18]	1.02	[0.88-1.19]
Middle			1.16	[1.01-1.35]*	1.18	[1.02-1.36]*
Richer			1.25	[1.06-1.47]*	1.26	[1.07-1.49]*
Richest			1.62	[1.34-1.96]*	1.65	[1.36-2.00]*
Media exposure (low)						
Medium			1.12	[1.01-1.25]*	1.12	[1.01-1.25]*
High			1.53	[1.35-1.73]*	1.54	[1.36-1.74]*

Table 4-5 continued

Condom used (no)						
Yes			1.63	[1.43-1.86]*	1.63	[143-1.86]*
Knows someone died of Aids(no)						
Yes			1.26	[1.11-1.43]*	1.26	[1.11-1.44]*
History of STI (no)						
Yes			1.46	[1.15-1.85]*	1.45	[1.14-1.84]*
Community level factors						
Stigma –gm					0.55	[0.34-0.87]*
Random effects						
Variance (SE)		0.082 (0.019)*		0.08(0.019)*		0.08 (0.019)*
(VPC)=ICC (%)		2.4		2.5		2.5

VPC=Variance Partition Coefficient, ICC=intra-cluster correlation, *Statistical significance
at 5% level p<0.05

Also differing from females, the odds of being tested for HIV was 21% higher for individuals belonging to the Pentecostal church and 16% lower for those belonging to the Apostolic faith, compared with those from Roman catholic church for males, but not for females. Education was found to be positively associated with HIV testing, with those with higher educational attainment exhibiting increased odds of HIV testing for both males and females.

Model 2 controlled for enabling, perceived and need factors. Comparing females and males, both wealth and media exposure were found to be associated with HIV testing. Like for females, being wealthier and having exposure to media were associated with increased odds of HIV testing for males. Similarly, males exposed to media messages were more likely than their counterparts with less media exposure to have tested for HIV. Among perceived and need factors that were associated with HIV testing were condom use, knowing someone who died of HIV and history of STI. The results suggest that those who did use condoms in their last sex encounter were 1.6 times more likely to have been tested for HIV than those who did not use condoms. Meanwhile, those who reported knowing someone who died of AIDS and those with a history of sexually transmitted diseases (STI) were 1.3 and 1.7 times more likely to test for HIV than their counterparts who did not know of anyone who had died of AIDS or had no history of STI. Circumcised males were about1.3 times more likely to have been tested than those not circumcised. In the final model 3, the results showed that living in a community with a high proportion of individuals with stigma was associated with reduced odds of HIV testing. Other community level factors such as poverty and media exposure were not associated with

HIV testing for males. Controlling for community-level stigma in Model 3 considerably reduced the estimates for place of residence such that rural residence was no longer significant for males.

The results for different models in (Table 4.5) shows that most of the variation in HIV testing for males was at the individual level, but there were also some variation at community level as indicated by significant community-level random variance. The variance partition coefficient (VPC) (i.e. the intra-cluster correlation coefficient (ICC) was estimated at about 2.5%, which was the proportion of total unexplained variability in HIV testing that could be attributed to unobserved community level effects. This implies that most (i.e. about 97.5%) of the unexplained variation in HIV testing was attributable to unobserved individual-level factors.

4.5 Discussion, conclusion and recommendation

4.5.1 Key findings

The main objectives of this study were to identity individual and community-level factors associated with HIV testing in Zimbabwe, and establish gender disparities. Overall the results show that, HIV testing is improving as indicated by higher odds in the 2010/11 than in 2005/6 surveys. This finding applies to both males and females, but the main difference lies in the degree females were more influenced to test for HIV in the 2010/11 survey. This may be that more females have been responding to calls for HIV testing during maternal health care services than males. Although, males have not been a focal target for HIV testing during antenatal care, recent initiatives have encouraged men to accompany their partners to the health facility for HIV testing during pregnancy.

The two objectives were addressed by applying multilevel logistic regression models to separate samples by gender to identify and compare individual and community-level determinants of HIV testing among women and men. Measures of individual-level predisposing factors (i.e gender, age, educational attainment, marital status, household wealth, media exposure) showed significant associations with HIV testing. As expected, higher odds of having been tested for HIV were observed among females than males. Several studies conducted outside Zimbabwe, reported similar results to those found here with reference to differences in HIV testing between sexes. For example, a study conducted by Weiser et al

(2006) in Botswana and Mitchel et al(2010) in ten Southern African countries are comparable to the results found here, showing a significantly higher uptake of HIV testing for females than males. This may be explained as follows: First, it is possible that women with little control over their sexual activities of their partner's and more vulnerable to infection by their partners may have perceived themselves to be at a high risk of HIV infection and consequently this may have acted as a cue for HIV testing (Martin-Herz, 2006). The secondexplanation could be the fact that females are more likely to be exposed than males to attend health care services through maternal health care (Jean et al., 2012; MacPhail et al., 2009). As such, the disparity may have been as a result of success of the increased testing uptake during antenatal care.

The person's age was found to be a significant predictor of health care service utilisation. The effect of age on HIV testing behaviour observed was consistent with other studies; although the study by Weiser et al (2006) suggested that coverage of HIV testing begins to increase after 40 years. This study found lower odds of HIV testing among individuals over 30 years for females and those between the ages of 25-29 for males. This could be that older adults may have already experienced feeling of isolation due to illness or loss of someone they know who died of HIV (Takarinda et al., 2014). Having an HIV diagnosis may increase that sense of isolation. Older people may also face unique issues such as being widowed or divorced and are dating again, but they may have less knowledge of HIV and are less likely to protect themselves than younger people. Although studies have shown that older people visit health care services more frequently than younger people, they are less likely than younger people to discuss their sexual health with the doctors, who in turn may be less likely to ask older people about these issues. Older women who are less worried about getting pregnant may have less of a perceived need for HIV testing since they will not pass on HIV to unborn babies (Elul et al., 2009; Wekesa et al., 2014;Nakayiwa et al., 2006). We did not find evidence of lower uptake of HIV testing among males over 30 years of age. Further studies are needed to examine why being older for males was not associated with HIV testing.

We found that being married, divorced and widowed were associated with higher odds of HIV testing than being never married for females, but not for males. The finding that these females are more likely to test for HIV than those who never married has also been noted in previous studies (Mwangi et al., 2014; Jean et al., 2012; weiser et al., 2006).This pattern is likely to relate to the fact that never married females perceive themselves to be at lower risk of HIV;

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and thus see no need to test for HIV (Chirawu et al., 2010; Taegtmeyer et al., 2006). It may also be that those married ordivorced may have had an opportunity for HIV testing during marriage and with partner involvement during ANC visits (Theuring et al., 2009). This study did not come to the same conclusion with other studies in regards to HIV testing for males based on marital status (Jean et al., 2012; Stephenson et al., 2013). The study found that married and divorced males were less likely to have been tested compared to those who were never married. This could indicate that married and divorced males may be relying on proxy testing if their partners were evertested for HIV during antenatal care (Morrill and Noland, 2006).

Several studies have found significantly higher odds of HIV testing among individuals with higher educational attainment than those with primary education (Jean et al., 2012; Stephenson et al., 2013; Weiser et al., 2006). The results presented here further confirm that the odds of having been tested for HIV were significantly higher among individuals with secondary or higher educational attainment. This finding applies to both males and females, but the main difference lies in the degree to which males were influenced by education. Disparities in HIV testing by education may be caused by differences in awareness of the importance of testing, access to testing centres and riskier sexual behaviour (Mlay et al., 2008). People with higher education may have better access to health care services generally, and particularly more uptake of antenatal care among females with higher education (Sherr et al., 2007).

Wealth may make it easy to afford payment of transport to go to testing centres consultation fees since health care services are paid for in Zimbabwe (Loewenson et al., 2012). The results observed here show increased odds of having been tested for HIV among the wealthier than the poorer for males, and no association between wealth and HIV testing for females after controlling for community wealth/poverty. This finding is consistent with previous studies from similar settings in Sub-Saharan African countries (Jean et al., 2012; Lepine et al., 2014) which found levels of HIV testing increasing with wealth for males. Several hypotheses may explain this outcome. Firstly HIV prevalence has been found to be positively correlated with socio-economic status in many sub-Saharan African countries (Magadi and Desta, 2011).Thus, individuals (particularly males) who are wealthy may perceive themselves more at risk, and therefore have a higher recourse to HIV testing compared to the poor (Jean et al., 2012). Another explanation could be that HIV testing promotion and programmes are failing to reach the most deprived populations (Chirawu et al., 2010). Thirdly, the adverse living conditions

associated with low socio-economic status may itself constitute a barrier to access to HIV testing (Wringe et al., 2008) and that the wealthier may have the opportunity to access health service easily and to choose a health service which they are comfortable with. The fact that household wealth is more important for males, while community wealth is more important for females may suggest that most males are economically empowered and have more resources enabling them to access healthcare services than females, while females rely on public health care which is cheaper or free in Zimbabwe.

Exposure to messages about HIV testing and counselling or campaigns about condom use or abstinence can be an important factor in motivating individuals to adopt HIV testing (Weiser et al., 2006). Several studies have found positive associations between HIV testing and higher media exposure (Mitchel et al., 2010; Mwangi et al., 2014; Peltzer et al., 2009). This study found similar results and suggests that being exposed to media (i.e listening to radio daily, watching and reading newspapers frequently) increased the odds of having been tested for HIV for both males and females. This might reflect the fact that individuals who are exposed to mass media may have the opportunity to learn the benefits of HIV testing, where and how HIV counselling and testing is given, and this subsequently improves their awareness towards HIV related knowledge and stigma.

Females who were exposed to HIV stigma and HIV awareness were also more likely to have been tested than those who were not. The possible reason could be those who had better knowledge or comprehensive knowledge about HIV/AIDS are more likely to know how HIV/AIDS is transmitted, the prevention mechanism and the benefit of HIV testing (Kayiki et al., 2011). The positive association between exposures to stigma could be as a result of success of HIV awareness programs aimed at reducing stigma in the communities. There is no evidence suggesting an association between HIV testing and HIV stigma and awareness for males.

The association between most of the sexual behaviour factors and HIV testing conform to what might be expected. For both males and females, the odds of having been tested for HIV were higher among individuals, who used condom during their last sexual contact, and those who had multiple sex partners. Several studies have found that people are more likely to be tested if they have risky sexual behaviours, such as having multiple sex partners and inconsistent condom use (Martin-Herz et al., 2006; Sherr et al., 2007). In regards to HIV knowledge and

awareness, the highest estimates for HIV testing coverage are observed among individuals with medium to higher HIV/AIDs awareness, echoing the results found in the previous studies (Mitchel et al., 2010; Obermeyer et al., 2013).

At the community level, community poverty, HIV-related stigma and media exposure were found to be associated with HIV testing. Community level risky sexual behaviour and HIV awareness were not associated with HIV testing, consistent with findings from previous studies (Agha, 2012; Bond et al., 2005; Lepine et al., 2014). In the general population, it was living in the communities with higher proportions of individuals with HIV-related stigma and media exposure that were associated with HIV testing. Living in a community with higher levels of media exposure was positively associated with HIV testing. Meanwhile, the results suggest that living in communities with higher proportion of individuals with HIV-related stigma was negatively associated with HIV testing in the general population. Similarly, the results showed that males living in communities with higher levels of stigmatisation were less likely to have reported ever testing for HIV. An explanation of this behaviour could be that men may be reluctant to know their HIV status if they feel that by doing so they become defined in the community as ill or weak, or feel that they can be denied opportunities such as employment (Jurgensen et al., 2012). Living in a community with high levels of poverty was associated with reduced HIV testing for females, but not for males. Overall, there is no evidence of an association between HIV testing and other community level factors (i.e community education and risky sexual behaviour).

Finally, the analysis focused on ascertaining the intra-community correlation to obtain a clear picture of between-community variation in HIV testing. The study found significant community variations in HIV testing, partly attributed to the individual level factors. As shown in tables 4 and 5, the random part showed that about 6-7% of the total variation in HIV testing among females (and 2-3% for males) in Zimbabwe was attributed to differences across the communities. The results were fairly consistent with the literature where the proportion of total variation in HIV testing attributed to community level factors ranged from 4 to 15 percent (Lepine et al., 2014; Stepheson et al., 2013). As in other countries, the community level variation obtained supports the theory that some differences in health outcomes are attributed to the community characteristics in which the individuals live (Stephenson et al., 2013; Uthman

et al., 2017). The study sheds light beyond the contribution of individual characteristics to the determinants of HIV testing in Zimbabwe.

4.5.2 Study limitations

The data used in this study came from two nationally representative surveys with household and individual response rates of 98% and 97% respectively.The missing data was lower than 5%, thus not likely to have affected the estimates in the study. However, the data had some weakness which might have affected the results. Firstly, the study did not control for the availability of HIV health care services at the community level. The ZDHS does not provide data to distinguish whether the number of people having an HIV test is limited by the availability of testing services or whether the testing services were underutilised and why. There is a possibility that inclusion of factors regarding health care services would have helped to explain some of the variance in the model. While knowing one's own HIV status is a proxy for a person having received counselling, the indicator does not provide information on the quality of the counselling services. In countries like Zimbabwe, where scaling up of HIV testing services is happening; population-based surveys conducted every few years will not capture annual progress. The information in the survey was self-reported, so to some extent under-reporting of socially unacceptable behaviours and attitudes (such as stigma) and over reporting of socially desirable behaviours were likely. In Zimbabwe, HIV testing has been heavily promoted as a responsible thing to do, so it is possible that some people may say they have been tested when in fact they were not. Another limitation was that the HIV testing and risk measures did not include assessments of time since the behaviours occurred, not allowing this study to examine whether people who were recently tested or who recently engaged in risky sexual behaviour differed from practising these behaviours less or more recently. Although, variables for the females such as 'problems of getting money, permission and transport to go to a health care centre are related to HIV testing behaviour, it would be a mistake to use them to make a general claim about their relative importance using variables available in ZDHS because most of these questions were not completed by the respondents. Otherwise the representation of the whole country is a major strength of this study as it allows generalization of findings for the country as a whole, for both genders.

4.5.3 Conclusion and way forward

Overall the multilevel results showed little variations in HIV testing across communities in Zimbabwe. The variations were mainly explained by individual level variables such as background characteristics rather than enabling, perceived need factors that were included in the models for both sexes. At the community level, variables found to be contributing to the variations in HIV testing differed by gender. It was found that community poverty was negatively associated with HIV testing for females, while community stigma was important for males. Controlling for community level factors did not have much effect on community variation in HIV testing. Therefore policies should focus on predisposing and enabling factors in order to improve HIV testing in Zimbabwe. For males' household wealth and HIV factors such as risky sexual behaviour are critical for improvements in HIV testing. Given that household wealth was a significant predictor of HIV testing for males, the introduction of financial incentives may stimulate males to access HIV testing services by providing compensation for transport cost and opportunity cost of time associated with accessing HIV testing services. Monetary incentives could reduce barriers and stigma as it may provide a broader reason for going to testing centres. More importantly perhaps for both sexes, awareness creation on HIV counselling and testing service utilization should focus on avoiding stigmatizing and discriminatory behaviours, so that clients can develop positive attitudes towards people living with HIV/AIDS. Furthermore, introducing couple-oriented HIV counselling and testing services where men accompany their spouses to HIV screening during pregnancy may help increase the HIV testing uptake for males. While offering HIV testing to everyone normalises HIV testing to everyone, raising awareness amongst several populations about the risk of HIV infection, it is believed that a substantial reduction of HIV burden is contingent upon increasing uptake of prevention of mother to child HIV transmission through improvement of key dimensions of HIV and SRH integrated services (Druce et al., 2006). The subsequent chapters focus on determinants of maternal health and family planning services, the global aim of these services being to contribute to the reduction of HIV burden by increasing uptake of (PMTC) programs.

5 CHAPTER FIVE: DETERMINANTS OF HIV AND ANC SERVICES UTILISATION.

5.1 Introduction

In the previous chapter, factors which could potentially increase uptake of HIV testing in the general population were investigated and tested using data from both males and females. As females are disapprortionately affected with HIV, including hgher risk of transmitting HIV to infants if they are HIV positive, it is of interest to understand factors associated with uptake of HIV and antental care (ANC) services among pregnant women. The current chapter contributes to the dialogue on prevention of mother to child HIV transmission through the use of antenatal HIV testing, timing and frequency of ANC visits. Included in the first sections of the chapter are literature on the magnitude of mother to child HIV transmission, determinants of intervention programs and conceptual framework relating to utilisation of HIV and ANC services. In the later sections, data, methods and results from the analysis of each indicator are presented. It concludes with a discussion on the results, including the effects of HIV on these services.

5.2 Background

In Sub-Saharan African (SSA) countries, new HIV infection in infants persist unabated notwithstanding the fact that antenatal HIV testing and prevention of mother-to child-transmission (PMTCT) interventions are available with a potential to reduce MCTC to as low as 1–2% (Ganich et al., 2015).There are approximately 3.2 million children aged 0-14 living with HIV in Sub-Saharan African countries (WHO, UNAIDS, UNICEF, 2011). Although declining from 390000 in 2009 an estimated 200000 children in SSA were newly infected with HIV in 2013 (UNAIDS, 2014). It has been estimated that, in the absence of antenatal HIV testing, the likelihood of HIV passing from mother-to-child is as high as 30% to 45% (Moodley et al., 2011; USAIDS, 2014). Approximately 90% of new HIV infected cases in infants in Sub-Saharan Africa countries are attributable to mother to child HIV transmission (MTCT) during pregnancy, labour, delivery or breastfeeding (Wangaet al., 2016), and MTCT is becoming a major contributor to HIV burden in SSA countries (Jayleen et al., 2016). UNAIDS (2014) reported that about 9 million new HIV infections in infants have been averted as a result of

PMTCT intervention in SSA countries since 2010. PMTCT services are designed for maternal health HIV diagnosis, treatment, information and education on maternal health and delivery care and breastfeeding among pregnant women in order to reduce new HIV infection in infants (Townsen et al., 2008), and the importance of antenatal HIV testing is more apparent in SSA given that the region is characterised by high mother to child HIV infection.

In spite of the benefits accrued from PMTCT intervention in reducing HIV infection in infants, SSA remained the region with the largest proportion of MTCT (UNAIDS, 2014). Lack of and access to ANC (Alam et al., 2015; Fotso et al., 2009), low uptake of HIV testing among pregnant women (Murugugi et al., 2008; Jayleen et al., 2016) HIV related stigma (Church et al., 2013; Gausset et al., 2012; Turan et al., 2012), late ANC booking (Adekanle and Isawuni, 2008; Munjoma et al., 2010) inadequate ANC visits (Rutaremwa and Kabagenyi.,2016), compounded by low socio-economic status (Ahmed et al., 2010; Car et al., 2012) have all contributed to the slow pace of PMTCT coverage and increased HIV new infection in infants.

It has been argued that ANC has a potential to increase antenatal HIV uptake and other PMCT services (Car et al., 2012). When PMTCT programs were first introduced, they were provided in stand-alone clinic programs (Church et al., 2013). However, a number of studies reported the inadequacies of this model (Kalichman and Simbayi, 2003) leading to integration of HIV and ANC services in late 2000. The rationale for integration of HIV and ANC services is to increase the coverage of PMTCT services as pregnant women who use maternal health care services can also benefit from PMTCT services and vice-versa (Obure et al., 2015; Sweeney et al., 2012). Against this backdrop, the WHO guidelines recommend routine HIV testing for all pregnancy related visits (WHO, 2014). Studies have shown that integration of HIV and ANC has the potential to reduce missed opportunities for key intervention including HIV testing, provision of ART, education in breasfeeding and adherence to treatment (Druce et al., 2006; Wiegert et al., 2014). Indeed, studies have reported an association between service integration and an increased uptake of antental HIV testing (Car et al., 2012; Hope et al., 2014). Furthermore, implementation of PMTCT as a part of ANC may help reduce stigma among HIV positive women during their routine visits to ANC (Turan et al., 2015). It is generally recommended that prenatal visits start early in the first trimester and continue at regular intervals throughout the pregnancy; as well as having antenatal HIV testing to mitigate potential mother to child HIV transmission (Asefa and Beyene, 2013).It has been argued that

women who start ANC early and those who frequently attend maternal health care are more likely to have been HIV tested compared to those who initiate late or attend few visits (Sahlu et al., 2014).

While available evidence tends to support integrated services as critical in response to MTCT, there is surprisingly little evidence of increased uptake of ANC services and antenatal HIV testing. In most SSA countries uptake of ANC services including an ANC visit in the first trimester and the proportion of women who accumulate a recommended four visits to allow for HIV routine testing are still very low (UNAIDS, 2014). There is urgent need to identify HIV positive women within integrated services and enrol them in the PMTCT intervention program for treatment, disease monitoring and education on breastfeeding (Johnson et al., 2012). While uptake of ANC care has increased in the past decade, only 38% of pregnant women in SSA countries received antenatal HIV counselling and testing and the majority have late booking or infrequent ANC (WHO, UNICEF et al., 2013). Although ANC services have been visited by the majority of pregnant women at least once during pregnancy in 2015, only about 37% pregnant women attended at least four ANC visits and half of them in the second trimester in SSA (Jayleen et al., 2016). This is worrisome given that integration of HIV and RH care services has been promoted as the panacea for increasing uptake of PMCT (Kennedy et al., 2010), yet there is scant evidence in regards to increased uptake of HIV testing during pregnancy. In the literature, there is very limited and non-genelizable evidence of improved uptake of ANC in the first trimester (Alam et al., 2015; Golis et al., 2013; Houweling et al., 2007); four or more ANC visits (Asefa and Beyene, 2013); and antenatal HIV testing in SSA countries (Staveteig et al., 2013).

While it is difficult to measure the efficacy of integrated services on health outcomes, stand-alone studies on ANC HIV testing, timing and frequency of ANC visits have been able to shed light on the influence of predisposing socio-demographic factors. Late booking of ANC and infrequent ANC visits have been consistently linked to predisposing and enabling factors such as place of residence, age, marital status, unwanted pregnancy, religion, parity, economic status, education and access to media (Ahmed et al., 2010;Bertrand et al., 2006; Golis et al., 2013; Jayleen et al., 2016). It has been a constant finding that pregnant women living in urban areas are more likely to have antenatal HIV testing, early ANC initiation and frequent ANC services than those from rural areas (Ochako et al., 2016; Rutaremwa and Kabagenyi,

2016;Titaley et al., 2010). Due to geographical inequalities in SSA countries, Alam et al (2015) reached the conclusion that pregnant women from urban areas enjoy easier access to health care service, including information, education on HIV and resources, enabling them easier access to health care services than women from rural areas. Alam et al's assumption that low economic status is associated with low use of health care services seem to be well-founded because women with low economic status tend to reside in rural areas where access to resources, employment, economic activities, health information and education on HIV are low (Gross et al., 2012).

5.3 Factors associated with HIV and maternal healthcare: evidence from available literature

Studies investigating the influence of women's age on antenatal HIV testing, timing and frequency of ANC visit consistently found out that older women are more likely to have an antenatal HIV test (Jayleen et al., 2016; Rutaremwa and Kabagenyi, 2016), initiate ANC in the first trimester and to have at least four or more ANC visits (Achia and Mageto, 2015; Beauclair et al., 2014; Gupta et al., 2014; Magadi, Madise and Rodriques, 2001). This is natural because young women can generallybe expected to have less knowledge and experience about child birth, while older mothers may have accumulated knowledge of risks associated with child birth (Ngome and Odimegwu, 2014). Other studies have noted that older women's ANC seeking behaviour is shaped by awareness of dangers associated with HIV/AIDS; particularly that HIV can be transmitted to a child during pregnancy as well as their knowledge of existence of PMTCT (Asefa et al., 2013; Birhane et al., 2015; Byamugisha et al., 2010 ; Sama et al., 2017). Older women may also have better resources enabling them access to health care services (Aremu et al., 2011; Tarekegn et al., 2014). An article by Kayeyi et al (2014) reported that young and never married pregnant women are either less likely to attend ANC or to attend late and infrequently due to lack of knowledge, lack of power to take decisions, lack of money, or societal norms which may forbid teenage pregnancy. Another critical issue surrounding maternal health care among young pregnant women in SSA countries is pregnancy wantedness and acceptance by the community (Magadi et al., 2007). Studies in Zambia and Uganda showed that pregnant teenagers were more likely to experience violence from parents, be expelled from school, and to be stigmatised (Denison et al., 2008; Kabagenyi et al., 2016). The fact that antenatal care services in SSA are not often oriented to the needs of teenagers makes the health risks associated with their pregnancies and childbearing more pronounced than those of older

women (Matthews et al., 2009; Renju et al., 2010). Unintended pregnancies have also been shown to be associated with low use of maternal health care such as not having ANC in the first trimester because of delay in recognising or acknowledging pregnancy (Magadi et al., 2000). There is on-going debate on the relative importance of parity as opposed to maternal age in access to HIV and ANC services. Higher order parity has been found to be strongly associated with uptake of ANC services (Ochako et al., 2011; Jayleen et al., 2016). Beaclair el at (2014) found that pregnant women were more likely to present themselves late for prenatal care and make fewer ANC visits in their second than first pregnancies.

Marital status of pregnant women is also an important factor in both HIV testing and ANC seeking behaviour. Heemelar et al (2014) have noted that married women are more likely to use ANC and HIV testing services during pregnancy if they make more decisions in the household, if they were educated and if they regularly watch television or read newspapers. This postulation agrees with Woldemicael and Tenkorang (2009) who suggested that married women may have improved risk perception and better decision-making power. It was also postulated that married women may have a lower perception of the risks of acquiring HIV infection, and thus are more likely to have adequate HIV and maternal health care, assuming that their partners would be mutually faithful (Keogh et al., 2009).

Besides background demographic factors such as parity, marital status and age, individual socio-economic characteristics such as household wealth, mother's education, religion, mass media and social status have also been found to be associated with use of HIV and ANC services in SSA countries (Ahmed et al., 2010; Gustav et al., 2014; Jayleen et al., 2016; Jesmin et al., 2013; Kevany et al., 2012). In particular, it has been argued that education and media offer women an expanded role in family decision making and control over resources (Makate and Makate, 2017).

While low economic status may be associated with rural residence, an increasing number of studies have found that pregnant women with low economic status, in general, are significantly more likely to receive poor ANC (no visit in the first trimester, antenatal HIV testing; and make less than four ANC visits), compared with pregnant women with higher economic status (Adamu, 2011; Fotso et al., 2009; Gabrysch et al., 2011). In the literature, pregnant women from wealthier households are more likely to initiate early and have more frequent ANC visits.

Several theories have been proposed to explain this association. Ahmed et al (2010) suggested that this may be due to the fact that pregnant women from wealthier households have financial ability to afford cost of health care services. A related hypothesis holds that pregnant women from wealthier households are more likely to be educated and women who are educated are more likely to have access to information and enjoy greater freedom to seek health care without seeking permission of their husbands even in situations of HIV epidemic (Fotso et al., 2009; Houweling et al., 2007). Although, not apparent, it has also been suggested that pregnant women who have low socio-economic status do not perceive many dangers to pregnancy itself, but they perceive risk happens during labour and delivery (Asefa et al., 2013). This claim seems to be supported by a qualitative study from South Africa which found that pregnant women from poor households did not perceive many hazards to pregnancy; rather they perceive risk happened during labour and child birth (Birhane et al., 2015).

Mass media is another important determinant of HIV and ANC services and it can reach a wide range of audience. Several authors have documented the role of mass media in disseminating information on health related issues through radio, television, newspapers and magazines (Gustav et al., 2014; Jesmin et al., 2013). In recent years, HIV prevention and SRH promotion information has been disseminated through posters, mobile phones and the internet (Underwood et al., 2014). Employment status has also been linked to HIV and ANC service utilisation. Studies have also noted that employment status was associated with timing of and frequency of ANC visits (Maruva et al., 2014; Kevany et al., 2012). They have noted that non-working mothers were more likely to have antenatal HIV testing; or initiate ANC early and frequent ANC more than those in employment. It has been hypothesised that employed women do not accept HIV tests because they view positive tests as devastating, and this may lead to a number of consequences including loss of job, stigma and discrimination and difficulties in getting an insurance policy at work (Chevo and Bhatasara, 2012).

In the literature, a number of perceived risk/need factors relating to HIV sero-status, knowing someone who died of HIV, perceived risk of infection, perceived lack of confidentiality, HIV awareness and stigma were also found to be associated with HIV and ANC services (Asefa et al. 2013; Church et al., 2013; Killam et al., 2010; Sahlu et al., 2014; Sama et al., 2017, Tenthani et al., 2015; Turan et al., 2015). Some studies seem to suggest that being personally affected by HIV, especially having seen a close person die of HIV, may be associated with higher

perceived risk of HIV infection and perception of personal vulnerability leads to adopting protective behaviour (Yeatman et al., 2009; Sahlu et al., 204). Therefore, being HIV positive or knowing someone who died of AIDS is expected to influence utilisation of HIV and maternal health services as a protective measure against mother to child HIV transmission (Maruva et al., 2014). As Kalembo et al (2014) alluded, depending on the past sexual behaviour and knowledge of how HIV is transmitted, individuals construct their own probabilities of being infected-affecting their health seeking behaviour.

Although it is expected that integration of HIV and maternal health will potentially reduce HIV-related stigma and discrimination, there is considerable literature showing that pregnant women are still vulnerable to HIV-related stigma and discrimination at home, in the health care centres and communities after diagnosis (Theuring et al., 2016). It has been suggested that fears and experiences of stigma or discrimination are potential reasons why some pregnant women avoid HIV and maternity health care services altogether i.e refusal of antenatal HIV testing, delay and infrequent ANC visits (Buzdugan et al., 2015). It has been shown in multiple studies from SSA that men can positively influence female health decision-making and utilization of HIV and ANC services, for example the uptake of HIV testing and PMTCT measures (Farquhar et al., 2004). One of the drawbacks to HIV and ANC service utilisation relates to low couple attendance in ANC and HIV testing services (Byamugisha et al., 2011; Kalembo et al., 2013; Mohlala et al., 2011; Theuring et al., 2016).Fewer males are involved in maternal health care in most SSA countries, and a pregnant woman is usually the first family member to be tested for HIV and Yargawa and Bee (2015) have noted that she may be blamed for bringing HIV if she discloses her HIV-positive status to her partner.

Antenatal HIV testing requirements may also increase the potential for involuntary unwanted disclosure of HIV status, heightening fears of experiencing stigma and discrimination in health facilities (Turan et al., 2009). Multiple studies from various countries report that perceived lack of confidentiality decreases the likelihood of HIV and maternal health care service utilisation (Angotti et al., 2009; Hardon et al.,2012; Mashuba and Hemalata, 2015; Mucheto et al., 2011; Sahlu et al., 2014). This is because, in most SSA countries, hospital records and information are recorded in hand-held notes, and the notes may be seen by friends and family members, thereby inadvertently discouraging pregnant women from utilising HIV and maternal health integrated services (Demisse et al., 2009; Washington et al., 2015). While it has yet to be fully

recognised, unmitigated HIV-related stigma and discrimination present a missed opportunity to identify HIV positive women and enrol them into PMTCT.

5.4   HIV and maternal healthcare in Zimbabwe

Zimbabwe with its high maternal mortality ratio (MMR) of 960 deaths per 100,000 live births, is among the top 40 countries in the world with the highest maternal mortality (ZIMSTAT and ICFI, 2015); and child morbidity as a result of mother to child HIV transmission (WHO et al 2012). An estimated 790,000 women are living with HIV in Zimbabwe, and mother-to-child transmission accounts for 28% of all new HIV infections in children aged 0-14 years (ZIMSTAT, 2015). Although, the number of new infections in this age group has fallen from 12,000 in 2010 to 4,900 in 2015, mother to child HIV transmission is still unacceptably high (ZIMSTAT, 2015).To avert new infections in infants, detection of maternal infection early in pregnancy through HIV testing and access to antiretroviral prophylaxis is crucial (Buzdugan el a., 2015).To ensure the prevention of mother to child HIV transmission (PMTCT), Zimbabwe is scaling up integration of HIV programs into existing family planning, maternal and child health care services, through the Focussed Antenatal Care (FAC) program (ZNASP 2011-2015). The rationale is to increase the availability and access to HIV testing services among pregnant women through antenatal care services (Wiegert et al., 2014). The FAC framework stipulates that; pregnant women should have at least four ANC visits , with the first visit being in the first trimister (WHO, 2014, Titaley et al 2010). The purpose of an ANC visit in the first trimister includes early screening of infectious dieseaes such as HIV/AIDS for the positive mothers to begin treatment to prevent mother to child HIV transmission during pregnancy or delivery (Heemelar et al 2014). As discussed in chapter one, stand alone models of health care services are insufficient in increasing uptake of HIV testing coverage and PMCT services (Fetene et al., 2010). This inadequacy led the WHO to establish guidelines recommending routine HIV testing among all pregnant women visiting health facilities for all pregnancy related care in SSA. As a result of this initiative, HIV diagnosis is often offered to pregnant women during their first ANC visit, which is usually part of an integrated maternal and child health service (Maruva et al., 2014) in Zimbabwe.

Although, the 2010/11 ZDHS has reported that 90% of pregnant women in Zimbabwe had at least one antenatal care (ANC) visit, only 59 % had both received counselling and accepted an HIV test as part of ANC care. In addition, 67 % had attended the recommended four or more

ANC visits, and 19 % had an ANC visit in the 1ˢᵗ trimester. The reported rates for maternal health care service utilisation in Zimbabwe remain far too short of the 90% targets adopted in the country (ZIMSTAT, 2015). In addition, the attainment of the United Nations global plan to reduce the mother to child HIV transmission rate to 5%, and decreasing the paediatric HIV infection by 90%, as well as increasing ANC coverage to 90% by 2020 (ZIMSTAT, 2015), can be hard to obtain. Despite the overall increase in ANC coverage and uptake, antenatal HIV testing remains low and unevenly distributed and MCTC of infants remains unacceptably high in Zimbabwe. The low uptake of PMCT greatly undermines the aim of reducing the MTCT rate to 5% by 2020 in Zimbabwe. It is therefore imperative to identify the factors responsible for delay in ANC visits, use and non-use of HIV testing offered as part of antenatal care and frequency of ANC visits in order to fast track the attainment of future targets such the 90-90-90 targets by 2020 and 95-95-95 targets by 2030, each of the 90s representing the anticipated coverage on HIV testing, treatment of the positive cases and viral suppression respectively (UNAIDS, 2014). Knowledge of enabling and inhibiting factors may help to inform the Zimbabwean government and other concerned local and international stakeholders to devise programmes and policies that will help to scale up the antenatal service utilization and thereby enhance the PMTCT programmes in the country. However, without sufficient information on which population groups are less likely to use the services, the broader aim to increase coverage of HIV testing and enrolling pregnant women who are found to be HIV position in PMTCT program will remain elusive and new HIV infections in infants will continue in Zimbabwe. Therefore, understanding and addressing barriers against ANC and HIV testing could significantly contribute to the main goal of increasing uptake of PMCT services.

Previous population studies on HIV and maternal health services have largely focused on individual level predisposing factors in specific components of integrated care services in Zimbabwe (Makate and Makate, 2016; Maruva et al., 2014;Muchabaiwa et al., 2012). Others are community-based studies-for example, (Kevany et al., 2012) have evaluated influence of household income on demand for maternal health care in rural areas; and (Chirwa et al., 2013) have focused on the impact of user fees on access to maternal health care services. The overall drawback of these studies has been the use of single level analytical techniques that ignore clustering and the hierarchical structure of data for individuals living in different communities (Aremu et al., 2011). There is evidence showing that women's access to HIV and maternal health is not only related to individual choice, but it is also to a large extent depends on social

contexts that influence individual's HIV and maternal health seeking behaviour (Olalekan and Uthman, 2010; Lugalla et al., 2012). The context within which individuals live matters because the broader environment not only provides opportunities to learn and reassurance, but also generates general norms regarding activities within the community (O'Meara et al., 2013). Quantitative studies have shown that HIV factors such as awareness and stigma can be influenced by social grouping in the community (Chiu et al., 2008; Lugalla et al., 2012; Olalekan et al., 2010). Thus, multilevel modelling can be used to account for factors at the individual and community levels simultaneously and provide a more robust understanding of the factors associated with HIV and maternal health service utilisation in Zimbabwe (Rasbash, 2004).A better understanding of community level factors that influence HIV and ANC service utilisation would contribute to the large effort to design multilevel, effective and sustainable interventions (Underwood et al., 2014). This study therefore aims to address this evidence gap by explicitly examining both individual and contextual level determinants of HIV and ANC services, by implementing a multilevel methodological approach (Magadi and Desta, 2011). As more women become infected, mother-to-child transmission (MTCT) of HIV continues to be a major challenge in Zimbabwe underscoring the need to understand the correlates of each of the components of HIV and ANC integrated services from truly nationally representative data.

Using the adapted Andersen's framework discussed in chapter 2 and in section 5.1 this chapter seeks to explore predisposing, enabling and perceived risk/need factors that may influence uptake of HIV and ANC services within the integrated model of care. The objectives of the study are:

- To identify individual and community socio-economic, demographic and HIV factors associated with use of HIV and ANC integrated services i.e (a) timing of first ANC visit, (b) antenatal HIV testing; and (c) four or more ANC visits among pregnant women in Zimbabwe.

- To examine national variations in HIV and ANC services utilisation.

The study aims to provide an overall picture of the determinants of HIV and ANC integrated services, which is useful for informing the design of multilevel HIV intervention programs.

5.5   Analytical framework

The framework of Andersen discussed in chapter 2 guides selection of factors that could affect utilisation of both HIV and maternal health care services. The model is conceptualized based on the predisposition, enablement and need for health care use (Andersen, 1995). Fig 5.1 and Table 5.2 present the modified framework and selected variables for this chapter. Based on literature reviewed, a number of predisposing factors have been selected, ranging from individual demographic factors (e.g age. marital status, religion, place of residence, year of survey, parity, education, media exposure) to community HIV factors that predispose pregnant women (i.e HIV awareness, stigma and prevalence). The enabling factors include the logistic and resource aspects of obtaining care which comprise of household income, woman's bargaining power, employment status, availability and accessibility of health care facilities. The HIV and psychological aspects of enabling factors include (HIV stigma, awareness, disclosure and confidential concern). The need factors relate to both the perceived and evaluated assessment of one's health status which may inform the need for seeking health care (Lepine et al., 2014). In line with other studies, the need factors in this chapter are conceptualized as the need for HIV testing (Demisse et al., 2009; Lepine et al., 2014). HIV status and knowing someone who died of HIV are considered as a proxy for the perceived risk need. Based on the literature reviewed, no previous study has applied this conceptual framework to examine the determinants of HIV and maternal health integrated services in Zimbabwe. However, the framework has been widely applied on survey data and in various settings elsewhere (Rutaremwa and Kabagenyi, 2016). The conceptual framework in figure 5.1 below shows three sets of factors that are linked to the outcomes of this study.

Figure 5-1: Analytical framework on determinants of HIV and maternal health integrated service utilization
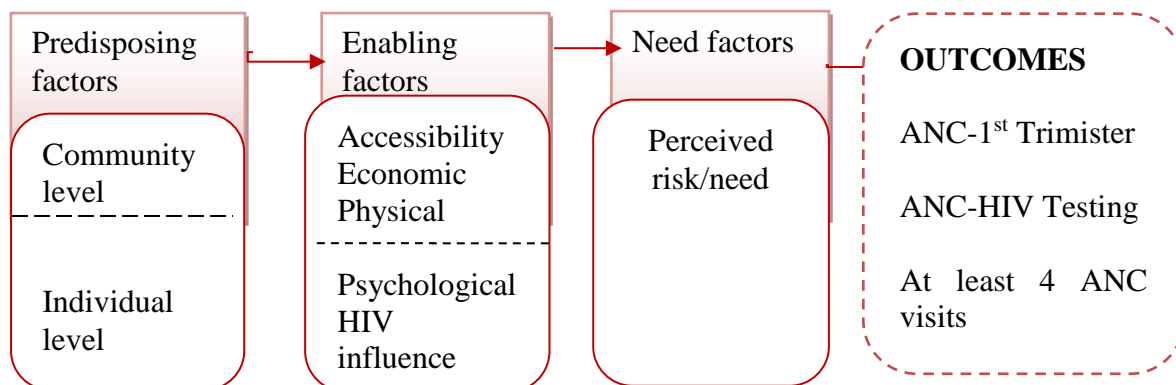
Table 5-1: List of variables related to each set of variables shown in Figure 5.1 above

Predisposing factors	Enabling factors	Need/percived risk factors
Individual factors	**Resources and autonomy**	Ever been tested for HIV
Year of survey	Household wealth	Knows someone died of HIV
Place of residence	Employment status	HIV status
Women's age	Accessibility problems	
Marital status	Women decision making	
Religion	**HIV and Psychological influence**	
Parity	Confidentiality concern	
Media exposure	HIV awareness	
Mother's education	HIV stigma	
Wanted Child		
Community influence		
HIV prevalence		
HIV related stigma		
HIV awareness		

5.6   Methods and data

5.6.1   Data source

The chapter is based on secondary analysis of existing data (ZDHS 2005/6 and 2010/11) surveys. The availability of HIV test data that can be linked to individual-level survey data provides a unique opportunity for a population based study of factors associated with the HIV/AIDS epidemic in Zimbabwe. For the purpose of analysis of this chapter, data from males are excluded. A total number of 18078 women were interviewed in the two surveys. To construct the sample for analysis from merged ZDHS datasets, the selection was initially restricted to all women who had given birth during the past five years (DHS code; V208>0) preceding the surveys. This way of selection excluded women who did not give birth within the specified period and it generated an unweighted sample of 8471 women who gave birth to a total of 10620 children. This selection procedure was adopted in order to ensure compatibility with other related studies (Achia and Mageto, 2015; Ochako et al., 2011). To avoid clustering of multiple births and to reduce the likelihood of recall bias on sensitive questions (Uthman et al., 2015), the sample was further limited to the last birth in the five years preceding the surveys (DHS code; BIDX\$01 = 1). This restriction gave a final sample size of 8471 women with at least one live birth in the five years preceding the surveys for the analysis. Of these, (92.4%, n=7879) had at least one antenatal care visit, whilst (7.6%, n=648) did not have, representing near universal access to antenatal care service (table of percentages not shown). From this sample, dependent and independent variables of interest were extracted. The following section deals with the study outcomes of this chapter.

5.6.2   Measures of outcome variables

Based on literature reviewed, there are three problematic maternal health care indicators within integrated HIV and health services in Zimbabwe (Maruva et al., 2014; Mashumba and Hemalata 2015; Muchabaiwa et al., 2012; Mucheto et al., 2009). These are whether the pregnant woman had; i) late ANC booking; ii) lack of antenatal HIV testing; and, iii) infrequent ANC visits.

Timing of antenatal care

The first measure of outcome relates to whether or not the pregnant woman had her first ANC visit in the first trimester during the last pregnancy. The measure was based on a recode of DHS variable M13$M. Definition of first trimester ANC visit (All mothers who had an ANC visit between 1 to 13 weeks of pregnancy were coded '1'and having no ANC visit or having a first ANC visit during the second or third trimester of pregnancy were coded '0'. The coding categorisation adopted is consistent with a previous study (Manzi et al., 2014) which defined 'delayed ANC' as having no ANC visit or having the first ANC visit during the second trimester. The standard definition of 'first trimester' is first three months in pregnancy, which is up to week 12 or 13 based on the recommended maternal and perinatal health care guidelines (WHO, 2012).

HIV testing during ANC

The second outcome variable is Antenatal HIV testing. In the DHS, pregnant women who attended ANC for the most recent birth responded to these questions; (a) were you tested for AIDS virus during any of the ANC visits?, if yes,(b)did you get results of the AIDS test?. Women who answered 'yes'to both questions and those who answered 'yes' to question (a) are classified as having been tested for HIV during ANC. Women who were not tested answered 'no' to both questions (Staveteg et al., 2013). The measure was based on a (DHS code; V840-1) and women who were tested for HIV are coded '1' and those who were not are coded '0', indicating a dichotomous response variable.

Number of antenatal care visits

The third outcome measure was constructed based on whether or not the mother had at least 4 or more ANC visits during the last pregnancy. The number of antenatal care visits a woman attends as shown in previous studies is important for allowing routine HIV testing and monitoring viral load in the blood among HIV positive pregnant women. The lack of retesting during pregnancy represents a missed opportunity to identify women who have recently acquired HIV infection and have an increased risk of MTCT (Sama et al., 2017).The measure of frequency of ANC visits was based on a recode of variable M14, in which women who had

at least 4 ANC visits are coded '1', and women who had less than 4ANC visits and those who reported not having ANC visit coded as '0'.The ZDHS asked the respondents: How many times did you receive antenatal care during this pregnancy? The responses enabled a classification of the number of times antenatal care was attended. Manzi et al (2014) have argued that a total number of visits may better reflect coverage rather than quality of services, which is the goal of this chapter.

5.6.3 Key independent variables

Based on the conceptual framework, literature reviewed and data available, a range of independent variables were selected for this chapter. The variables are classified into individual and community-level predisposing, enabling and perceived/need factors. All variables included in the models are from the previous chapter except for HIV related factors. However, categories of some variables in the individual and enabling categories had fewer cases; and to ease comparison, these were collapsed and re-coded. The recoded variables were educational attainment, women's age, marital status, religion, media exposure and household wealth. The coding categories were consistent with the categorisation of the same variables in previous studies on HIV and maternal health care in Zimbabwe (Makate and Makate, 2017; Maruva et al., 2011; Muchabaiwa et al., 2012; Ngome and Odimegwu, 2014). For the original coding refer to ZDHS questionnaires (ICF International 2011). Individual predisposing and enabling factors such as parity, wanted child, and women's autonomy were not included in chapter 4, but were controlled for in this chapter. The additional factors were defined as follows:

(a) Parity

The variable parity V201 (total number of children ever born) was recoded into three categories with 1 equals to lowest birth order and 3 plus as the highest birth order. Birth order is expected to have a u-shaped association with HIV and maternal service utilisation since the first births and higher birth orders have an increased risk of death during pregnancy (Fotso et al., 2009).

(b) Wanted child

The variable (V367) provides information on whether or not the woman wanted the last child. The wanted last child variable was recoded into three categories: a) wanted child then -1, b) wanted later -2, and c) not wanted -0.

(c)Women's autonomy

Also, consistent with other studies (Matthews and Gubhaju, 2004), the women's decision making variable was derived from five questions (V743A-V743E) asking about decision making. The five questions were; final say on health care (V743A)' final say on large purchases (C743B), final say on daily needs (C742C), final say on visitors (V743D); and final say on food to be cooked (V743E). The mother was coded as 1 - (makes decision alone), if they were the sole decision maker; 2 - (jointly) if made the decision jointly with a partner or another person; or 0 - (husband only) if they did not contribute to decision. A single variable problem of access was created from a combination of five questions (V467A through to V467E) asking about the problems women face when seeking health care services. The variable was coded '0' for no perceived problems and '1' for perceived problems.

5.6.4 HIV factors

The HIV variables were selected carefully based on previous literature (Sambisa, 2010; Lepine et al., 2014; Mashumba and Hemalata 2015)**.** The HIV-related stigma and comprehensive HIV awareness variables are not available in the ZDHS dataset. The literature reviewed which used the HIV related stigma and comprehensive awareness has used an additive procedure to generate a single variable from a set of questions from the survey (Magadi, 2016).

(i) Comprehensive HIV awareness: Comprehensive HIV awareness about transmission of HIV was measured based on the following: If a pregnant woman correctly identified the four main modes of transmission of HIV (sexually, blood transfusion, infected sharps and MTCT), if she rejects common local misconceptions (i.e. HIV/AIDS can be transmitted through mosquito bites, supernatural means, and by physical contact e.g. hugging, handshakes); and if she is aware that a healthy looking person can have HIV. Each correct response to the above questions was scored 1 point, otherwise 0. In total, the maximum obtainable score is 8 points. Participants with 0-4 correct responses were considered to have a low HIV awareness; 5-6 medium knowledge on transmission of HIV; and 7-8 were considered to have high level of comprehensive HIV awareness. Therefore, the variable was classified into three categories: low, medium and high.

(ii) HIV related stigma: This referred to the respondent's attitude towards HIV developed from five questions of HIV related stigma, namely; if the respondent' would buy vegetables from a vendor with HIV', 'can care for relative with HIV', 'would want an HIV-positive teacher to continue teaching', and 'would want others to know if a family member became infected with HIV'. The variable was classified into three categories: low: if not experienced to any of the stigma indicators, medium: if experienced 1-2 of the stigma indicators and high stigma: if experienced 3-4 stigma indicators.

Other HIV variables like 'HIV status, knowing someone who died of HIV, disclosure concern and previous HIV testing' adopted the original coding from the DHS survey. The previous HIV test variable was not used among the determinants of the antenatal HIV testing outcome because of high multicolinearity between the two variables; however, it was among the determinants of number of ANC and timing of visits. The binary previous HIV test variable relates to whether the woman had ever been tested for HIV before. The variable was coded '1' if ever been tested and '0' for otherwise. The 'disclosure and confidential concern' was derived directly from the question 'would you want others to know if a family member became infected with HIV'. Similarly, the 'knowing someone with HIV/AIDS variable was also derived directly from the DHS question. Knowing someone who died of AIDS is hypothesized to be positively associated with HIV testing uptake, since women would be aware of the potential risks of HIV transmission and benefits of testing (Godif et al., 2015). At the community level, variables relating to HIV related stigma, HIV prevalence and HIV awareness were derived from relevant individual level data and were created and grand mean centred during the multivariate modelling.

5.6.5 Methods of analysis

Like in chapter 4, this chapter adopts a multivariate binary logistic regression analysis, with community at level 2 and last birth in the last 5 years at level 1 for all three outcomes.

The logit of the probability of outcome can be modelled as follows:

$$f(\pi_{ij}) = \text{Log}\left[\pi_{ij}/(1-\pi_{ij})\right] = \beta_0 + \beta_1 X_{1ij} + \beta_2 C_{2ij} + \mu_{0j}$$

$$\text{Var}(u_{0j}) = \sigma^2_{u0}$$

Where (π_{ij}) is the probability of an outcome for a pregnant women in the j_{th} community. The intercept β_0 is shared by all communities; βs denoted the fixed coefficients, where X and C are a vector of covariates at the individual and community levels variables, respectively; while μ_{0j} ~N(0, σ^2 j) shows the random effects for the j_{th} community. The random intercept is shared by all individuals from the same community (defined by primary sampling unit) and serves as an indirect control for community factors not included in the models that may affect the HIV and maternal health integrated service utilisation.

Before allowing for any explanatory variables in the models, it was crucial to know how much between community variation was there in the propensity for utilisation of HIV and maternal health services in the study. To assess this, we look at the estimated value of $\sigma^2_{u\,0}$, which is the variance of the u_{0j} terms. We use a threshold model approach which measures proportions at group level:

$P = \sigma_U^2 / (\sigma_U^2 + \sigma_\varepsilon^2)$

Where σ_U^2 is the total variance at community level, and σ_ε^2 *is* the total variance at individual level. For the multilevel logistic regression model, the level-1 residuals are assumed to have a standard logistic distribution with mean zero and variance $\sigma_\varepsilon^2 = \pi^2 / 3$ where π is the constant 3.14…, Thus: $\sigma_U^2 / \sigma_U^2 + 3.29$ (Goldstein, 2003).

Proportional change in variance was derived from:

$PCV = V_A - V_B / V_A * 100$

Where: V_A=variance of the initial model, V_B=variance of the succeeding model.

The Deviance information criterion (DIC) was used as measure of the goodness fit of the models. A lower DIC value in subsequent models indicates a best fit of the model (Aremu et al., 2011).

5.7   Results

The results are presented based on univarite, bivariate and multivariate logistic regression analysis. To gain an initial sense of the structure of variables, a univariate description of the study respondents was done followed by bivariate analysis. Then, the parameter estimates were determined by a multilevel multivariate logistic regression analysis. The percentage distribution and proportions in outcomes found here cannot be directly compared with the estimates in the ZDHS final reports. This is because the denominators which were used to produce estimates in the ZDHS reports included multiple births within the 5 years preceding the surveys rather than the last birth in the ZDHS used here. As stated earlier, factors that determine the utilization of HIV and maternal health integrated services in this chapter are organized into three categories as predisposing, enabling and perceived need factors.

5.7.1   Proportions of mothers who gave birth in the last 5 years preceding the surveys

Table 5.2 shows the proportions of mothers who gave birth within the last five years preceding the ZDHS 2005/6 and 2010/11 surveys used in this chapter. The number of respondents totalled 4074 in 2005/6 and 4397 in 2010/11. Of these, on average 75% gave birth to one child in both years. About a quarter of mothers gave birth to two of more children within the same periods.

Table 5-2: Percentages of mothers who gave births in the last 5 years preceding the surveys, 2005-6; 2010-11 ZDHS

| | Proportions of births in the last 5 years (n=8471) | | | |
| | ZDHS 2005-6 | | ZDHS 2010-11 | |
No. of births	%[a]	n[b]	%[a]	n[b]
1	74.8	3007	75.6	3315
2+	25.2	1067	24.4	1082
Total	100	4074	100	4397

[a]Weighted; [b]unweighted cases.

5.7.2   Description of Study Population by Background predisposing factors

This section describes the general characteristics of women who gave birth to their last child in the two samples. As shown in table 5.3, about 69% of births occurred in rural areas, compared to 31% in urban areas for both surveys. Across the age groups, most of the women who gave birth were within the age range of 25 to 34 years of age. Over 80% and 60% were

married or had secondary education respectively. Fewer births occurred among single women i.e never married, divorced or widowed. The majority were HIV negative, made household decisions jointly with their partners, unemployed, had wanted a child then, and were from poorer households, with multi- parity and low media exposure. There was a slight increase in the proportion of HIV positive women who gave birth from 12.9% in 2005/6 to 14.3% in 2010/11. Almost two thirds of women perceived that money is a big problem in accessing medical care, while more than one quarter perceived that transport and distance were big problems. Less than half of the women (45%) were in the two poorest wealth quintiles, while the lowest proportion was in the richest wealth quintile. More than two thirds (71%) of women in the sample were from large households, while more than three quarters (89%) were from male headed households.

Table 5-3: Proportion of last birth in the last 5 years by selected socio-demographic factors

Variable	ZDHS 2005-6		ZDHS 2010-11	
	% [a]	n [b]	% [a]	n [b]
Residence				
Urban	31.3	1136	31.2	1339
Rural	68.7	2938	68.8	3058
Age groups				
15-24	39.2	154	36.6	1592
25-34	45.0	1813	46.5	2073
35+	15.8	672	16.9	732
Marital status				
Never married	5	217	4.1	247
Married	81.4	3334	85.1	3669
Widowed	4.9	19	2.7	130
Divorced	8.7	332	8.1	351
Women's education				
No/Primary	39.3	1648	32.8	1480
Secondary/Higher	60.7	2426	67.2	2917
Husband's education				
No/Primary	66.1	2653	74.2	3123
Secondary/Higher	33.9	1421	25.8	1274

Continued

Table 5.3 Continued

Religion				
Catholic/others	28.0	1179	23.0	1107
Protestant	20.7	830	13.7	597
Pentecoastal	16.6	646	19.2	799
Apostolic	34.7	1419	44.1	1894
Employment status				
No	63.5	2559	68	2889
Yes	36.5	1515	36	1508
Household Wealth				
Poor	63.5	2584	63.2	2692
Rich	20.3	842	20.9	965
Richest	16.2	648	15.9	740
Wanted child				
Then	63.2	2623	66.7	2921
Later	20.2	879	20.6	1134
Not Wanted	16.6	564	12.6	340
Parity				
1	30.1	1202	29.5	1301
2	25.6	1033	27.9	1225
3+	44.0	1839	42.6	1871
Decision-making				
Huband alone	23.7	966	30.9	1359
Women alone	29.9	1219	11.1	490
Jointly	46.4	1889	57.9	2548
Media exposure				
Low	37.1	1567	31.9	1431
Medium	29.4	1192	49.7	2138
High	33.4	1315	18.8	828
HIV sero-status				
Negative	87.1	3549	85.7	3767
Positive	12.9	525	14.3	630

[a]Weighted; [b]unweighted cases.

5.7.3 Percentage distribution of women who had HIV test, had 4 ANC visits and ANC in the first trimester

Delivery of integrated HIV and maternal health services in Zimbabwe has resulted in a substantial increase in antenatal HIV testing uptake and greater improvement in frequency of ANC visits, but not for appropriate timing of ANC. As shown in table 5.4 and figure 5.2, from the 2005/6 to 2010/11 survey periods, ANC HIV testing uptake increased dramatically

(percentage differences, 26.5%); and those who had four or more ANC visits (percentage difference 4.2%) compared with their counterparts. Regrettably, there was a marked decrease in the timing of ANC visits, with percentage differences of -10.6% of proportion of women reporting not having ANC in the first trimester between the two surveys. Although about 56% of women were reported to have had antenatal HIV testing in 2010/11, four or more ANC visits (44.5%) and ANC in the first trimester (37.5%) were relatively lower.

Table 5-4: Percentage distribution of HIV and reproductive health care outcomes in the samples, 2005/6 and 2010/11 ZDHS

Outcome variable	ZDHS 2005-6		ZDHS 2010-11	
	%[a]	n[b]	%[a]	n[b]
ANC HIV TEST				
Yes	29.4	1195	55.9	2494
No	70.6	2879	44.1	1903
Had 4+ ANC visits				
Yes	40.3	1721	44.5	1993
No	59.7	2353	55.5	2344
Timing of ANC visits				
1st trimester	48.1	1878	37.5	1610
Late or no visit	51.9	2196	62.5	2727
Total	100	4074	100	4337

[a]Weighted;[b]unweighted cases.

Figure 5-2 : Percentage distribution of HIV and reproductive health care outcomes in the study population by survey year
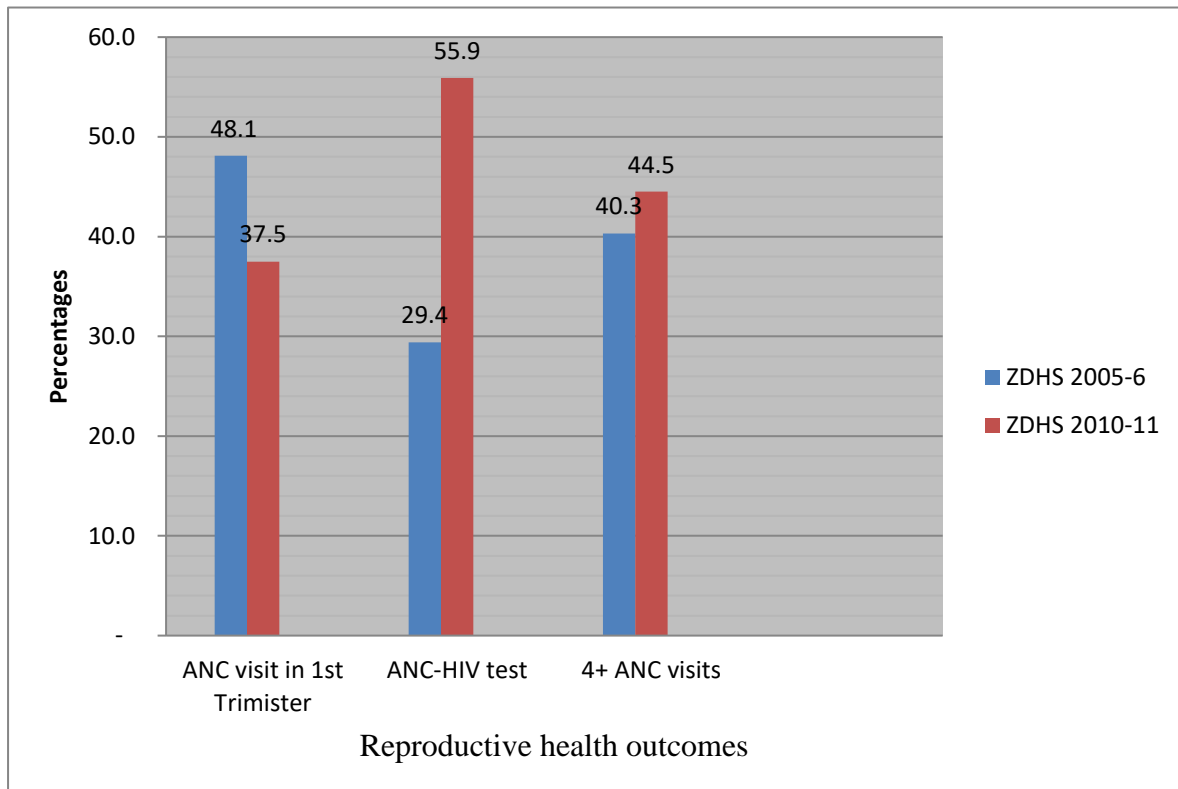
Source: Zimbabwe Demography and Health Surveys (2005-6; 2010-11)

5.7.3.1 **Bivariate analysis of timing of ANC, antenatal HIV testing and frequency of ANC visits by predisposing factors**

Table 5.5 presents the bivariate association between selected individual predisposing factors and HIV and maternal health care indicators (antenatal HIV testing; timing of; and number of ANC visits). The results show that pregnant women in rural areas have better timing of; and have an increased number of ANC visits than urban pregnant women. About 43.5% (p<0.000) of pregnant women in the rural areas had their first ANC visit in the first trimester and 44.4% had at least four ANC visits, significantly higher proportions compared with 40.1% and 38.2% in urban areas, respectively. While, urban women were late initiators of ANC visits and infrequent visitors, they were more likely to be acceptors of antenatal HIV testing. About 50% (p<0.000) of urban women were offered and accepted HIV testing compared with 40.2% in rural areas. Given that HIV testing during pregnancy is low in rural areas, it means that a number of new babies were exposed to HIV during pregnancy in these areas. Although the proportions of access to maternal health care are lower than 50% across all age groups, women

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under the age of 24 years are late attendees of ANC, but have higher proportions having four or more ANC visits and acceptance of HIV testing during pregnancy than women in other age groups. Antenatal HIV testing was much lower among pregnant women over 35 years. The proportions with antenatal HIV testing and that of women who had at least four ANC visits were higher among married and never married women. Never married pregnant women exhibited the lowest proportions having an ANC visit in the first trimester, whilst those who are widowed are the earliest in initiators of ANC care. The formerly married i.e widowed and divorcee women are also the least acceptors of antenatal HIV testing.

The majority of women who had antenatal HIV testing and those who initiated ANC in the first trimester had secondary or higher educational attainment, while this was not the same for number of ANC visits. A significant proportion of pregnant women with primary and lower educational attainment were more likely to have four or more ANC visits than those with secondary or higher educational attainment (46.5% versus 40.2%). Regarding religious affiliation, the differences were not statistically significant for ANC timing and antenatal HIV testing, but women affiliated with apostolic faith groups are late attendees to antenatal care. Observed also is a higher level of ANC visits in the first trimester among pregnant women who reported that they wanted the child then, compared to later or not wanted. The results suggest no statistical difference in antenatal HIV testing and number of ANC visits among women who reported wanting the child then, later or not wanted. HIV and maternal health care service utilisation, increases with an increase in media access for antenatal HIV testing and timing of ANC, but this observation was not so for the number of ANC visits. The majority of women who had four and more ANC visits are in a category of women who have low access to media. Birth order parity is not associated with timing and number of ANC visits, but antenatal HIV testing was found to be more common among women with low birth order parity of one pregnancy.

Table 5-5: Bivariate analysis of timing of ANC, antenatal HIV testing and frequency of ANCvisits by predisposing factors, 2005/6 and 2010/11 ZDHS

Variables	% ANC 1st trimister[a]	P-value	% HIV-ANC tests[a]	P-value	% 4+ ANC visits[a]	P-value	All cases[b]
Residence		.001		.001		.001	
Urban	40.6		49.6		38.2		2475
Rural	43.5		40.2		44.4		5996
Age groups		.002		.001		.003	
15-24	39.2		48.3		46.9		3176
25-29	44.2		42.6		43.2		2338
30-34	45.7		43.3		40.8		1548
35+	41.4		32.3		41.6		1409
Marital status		.002		.004		.001	
Never married	34.2		44.8		48.8		464
Married	42.7		44.1		42.6		7003
Widowed	48		30		40.4		321
Divorced	43.7		39		39.5		683
Women's education		.001		.000		.001	
No/Primary	40.8		33.3		46.5		3128
Secondary/Higher	43.6		48.7		40.2		5343
Religion		.021		.011		.029	
Catholic/others*	43.1		40.2		45.4		2286
Protestant	43.9		44.8		43.2		1427
Pentecoastal	45.0		45.7		40.2		1445
Apostolic	39.3		43.6		44.7		3313
Wanted child		.001		.332		.011	
Then	44.6		43.6		42.7		5544
Later	37.3		43.4		45.6		2013
Not Wanted	37.8		40.6		47.8		914
Parity		.248		.001		.723	
1	43.6		48.0		43.2		2503
2	41.4		47.0		44.4		2258
3+	41.5		37.7		44.1		3710
Media exposure		.001		.001		.001	
Low	38.2		35.9		49.2		2998
Mediun	42.0		48.6		42.7		3330
High	47.4		45.1		38.6		2143

[a]Weighted; [b]unweighted cases .

5.7.3.2   **Bivariate analysis of the use of antenatal HIV testing, timing and number of ANC visits by enabling and need factors**

The first part of Table 5.6 describes bivariate analysis of the use of antenatal HIV testing services, timing and number of ANC visits by enabling and need factors (HIV and Socio-economic factors). The results show that previous HIV testing was associated with timing of ANC and HIV testing during ANC care, but not with number of visits. About 44.5% (p<0.000) of women who had been previous tested for HIV had their first ANC visit in the first trimester, compared with 38.9% of their counterparts. Over three quarters 75.5% (p<0.000) of women who had a previous HIV test were also tested for HIV during pregnancy, compared with only 24.5% of their counterparts. HIV sero-status was significantly associated with antenatal HIV testing, whereas, this was not so for timing and frequency of ANC. Although not so pronounced, four or more ANC visits were common among pregnant women with low HIV awareness, while HIV testing during pregnancy was more popular among women with medium HIV awareness.

HIV stigma was significantly associated with four or more ANC visits and antenatal HIV testing, but not with timing of ANC visits. Paradoxically, the majority of pregnant women who had antenatal HIV testing were in a category of individuals with high stigma 74.8% (p>.000), while four or more ANC visits was more pronounced among women with low to medium stigma. It is also noted that knowing someone who died due to HIV was an important factor of timing of ANC and having a subsequent antenatal HIV test. Fewer pregnant women who reported knowing someone who died of HIV had an ANC visit in the first trimester (40.8% versus 44.9%, p<0.000), compared with those who reported not knowing someone who died due to HIV. A large proportion of those who reported knowing someone who died due to HIV, 72.2% (p<0.000) were tested for HIV during antenatal care visits, compared with their counterparts.

The second part of Table 5.6, describes bivariate analysis of the use of antenatal HIV testing services, timing and number of ANC visits by socio and economic enabling factors. The results show that employment status was significantly associated with HIV and maternal care service utilisation. Employed women have a higher proportion of initiating ANC in the first trimester (45.2% versus 40.2%), but are less likely to have antenatal HIV test (40.6% versus 44.7%,

p<0.000) and four or more ANC visits (42.7% versus 44.6%, p<0.000) than unemployed women. The majority of pregnant women who had antenatal HIV testing and those who initiated ANC in the first trimester were from wealthier households. However, four or more ANC visits were more common among women from poorer households compared with their counterparts. The results also show that decision-making in the household only matters in respect of HIV testing during ANC. HIV testing was more among pregnant women who jointly make decisions with their husbands/partners or when their husbands make decision alone. Women who reported having no big problem on physical access to health care facility were more likely to have their ANC visit in the first trimester or have an antenatal HIV test. Surprisingly, the majority of the women who reported having a big problem in accessing health care were more likely to have four or more ANC visits.

Table 5-6: Bivariate analysis of timing of ANC, antenatal HIV testing and frequency of ANC visits by enabling and need factors, 2005/6 and 2010/11 ZDHS

Variables	% ANC-1st trimister[a]	P-value	% HIV-ANC tests[a]	P-value	% 4+ ANC visits[a]	P-value	All cases[b]
HIV and enabling and perceived risk/need factors							
Previous HIV test		.001		.001		.410	
No	38.9		24.5		43.7		3550
Yes	44.5		75.5		44.0		4921
HIV sero-status		.015		.003		.450	
Negative	41.5		42.5		43.9		7316
Positive	45.1		47.0		43.7		1155
HIV awareness		.447		.001		.003	
Low	44.4		57.2		46.3		2180
Medium	43.0		64.4		44.3		3765
Hgh	47.7		55.1		39.6		2526
Knowsome with HIV		.000		.001		.240	
Yes	40.8		72.2		44.2		2476
No	44.9		36.5		43.2		5995

Table 5-7 Continued

HIV Stigma		038		.001		.001	
Low	44.0		36.5		44.2		1459
Medium	40.8		44.0		47.9		1566
High	44.9		74.8		39.6		5446
Resources and access to health care service (enabling factors)							
Employment Status		.001		005		.001	
No	40.2		61.3		44.6		5448
Yes	45.5		57.5		42.7		3023
House wealth		.001		.001		.001	
Poor	41.2		54.9		47.0		5276
Rich	40.3		67.0		43.1		1807
Richest	48.9		70.7		32.9		1388
Accessibility problems		.001		.001			
No	44.9		69.1		38.8		2585
Yes	40.8		55.9		46.1		5886

[a]Weighted; [b]unweighted cases .

5.7.4 Multilevel logistic regression analysis

In the previous sections, bivariate analysis shows that the majority of the selected predisposing, enabling and need factors are associated with HIV and ANC service uptake. However, HIV factors such as previous HIV testing, knowing someone who died of HIV, and HIV-sero status were found not be associated with the number of ANC visits. In addition, HIV sero-status, awareness and stigma were also associated with antenatal HIV testing. Following important findings in the bivariate analysis, multivariate multilevel logistic regression analysis was used to estimate the factors that influence ANC HIV testing, timing and number of ANC visits. Separate analysis was done for each of the HIV and ANC service integrated outcomes. A total of four models were estimated for each outcome. The first model (model 0) was an intercept only model, so called empty model, with year of survey, as a covariate. This empty model is useful in showing if there is sufficient variance at the community level. All the individual predisposing factors were entered simultaneously in model 1. In model 2, enabling, need/perceived factors are added and adjusted for. The community level factors were then

included in model 3. All the fixed effects are expressed as odds ratio (OR) in the multivariate models. A 95% confidence interval is used (95%CI). The random effects were expressed as variance partition coefficient (VPC), also known as intra-class correlation coefficient (ICC) and proportional change in variance (PCV). The multilevel fitness was tested using deviance information criterion (DIC). The multilevel multivariate analysis was performed in MLwin statistical software.

5.7.4.1 Multilevel logistic regression parameter estimates for ANC timing visit

As previously noted in table 5.2, only 37.7% of pregnant women reported having an ANC visit in the first trimester during the 5 years period preceding the 2010/11 ZDHS, down from 48% in the previous survey. Table 5.7 presents the parameter estimates for timing of ANC in Zimbabwe. The results in the empty model show that most of the variation in ANC visit in the first trimester was at the individual level (96%). However, there was also some variation at the community level as indicated by significant variance in the log odds of reporting being ever tested for HIV across communities (estimated= 0.144, S.E= 0.026, i.e Z-value of 5.5>2.58 at 1% sig, level). Based on the estimated variance partition coefficient (VPC) also known as the intra-class correlation coefficient (ICC), the intra-community correlations was estimated at about 4.2%. This indicates the extent of the variability in early ANC visits that that could be attributed to community level factors. Confirming the results from bivariate analysis, the results from an empty model suggests that women in 2010/11 were 44% less likely to have ANC in the first trimester than in 2005/6.

In comparison with model 0, the variation in ANC visit in the first trimester remained significant across the communities in model 1 (estimated= 0.137, S.E= 0.026, i.e Z-value of 5.3>2.58 at 1% sig, level).The ICC remained stable at 4%. This showed that the inclusion of individual level predisposing factors did not help explain much of the between community variance in ANC visits in the first trimester. However, the proportional change in variances (PCV) in the odds of ANC visit in the first trimester of 4.8% across the communities was explained by individual level predisposing factors considered. This therefore, means that part of the clustering of ANC visit in the first trimester in the communities, albeit small, was as a result of the composition of the communities by individual predisposing factors.

The variables found to be associated with ANC in the first trimester in model 1 included place of residence, women's age, marital status, wanted child, parity and media exposure. As would be expected, women who reside in urban areas were 1.39 times (OR=1.39, 95% CI=1.23-1.58) more likely to have an ANC visit in the first trimester than rural women. Also, women above 25 years of age had higher likelihood of having an ANC visit in the first trimester, compared to young women in the age group 15-24. Similarly, women who were married, divorced or widowed were more likely to have an ANC visit in the first trimester, and this was more pronounced among those who were divorced (OR=1.70, 95% CI= 1.51-2.34), compared to never married pregnant women. However, the estimates indicated an inverse relationship between wanting the child with the timing of ANC visit. Women who reported that they wanted the child later (OR=0.78, 95% CI=0.69-0.87) and the child not wanted (OR=0.68, 95% CI=0.60-0.79) had lower odds of an ANC visit in the first trimester compared to those who wanted the child now. In the same vein, women with higher order parity, 2nd birth (OR=0.75, 95% CI=0.75-0.86); and 3rd plus birth (OR=0.66, 95% CI=0.59-0.77) were also less likely to have their initial ANC visit in the first semester. When other individual predisposing factors were controlled for in model 1, there was no evidence of an association between women's education and religious affiliation with timing of ANC in Zimbabwe.

Model 2 added enabling and needs factors. After adjusting for factors in model 2, the variation in ANC visit in the first trimester remained significant and stable across the communities. Also, the estimates for predisposing factors remained almost the same as in model 1, except for women affiliated with the protestant religious group. The results show that this group of women have 1.22 times the odds of initiating ANC in the first trimester compared with women who are affiliated with a catholic religious group. The estimates for enabling and need factors show that richer women (OR=1.38, 95% CI=1.23-1.69); and the richest (OR=1.23, 95% CI=1.09-1.39) were more likely to have an ANC visit in the first trimester, compared to poor women. Being in employment increased the odds of having an ANC visit in the first trimester by 1.20 times. The likelihood of having an ANC visit in the first trimester was also found to be positively associated with media exposure. It was found that pregnant women who had low (OR=1.28, 95% CI=1.14-1.44) and high (OR=1.34, 95% CI=1.19-1.53) media exposure were more likely to have had their initial ANC visit in their first trimester compared to those who were not exposed to media at all. Women's autonomy and access to health care have not been found to be associated with ANC in the first trimester.

There is no evidence of an association between HIV factors (i.e sero-status, awareness, and stigma) with timing of ANC. However, those who reported not having confidentiality concern and knowing someone who died due to HIV were 1.10 and 1.61 times more likely to have an ANC visit in the first trimester than their counterparts. Similarly, those who reported having previous HIV test before pregnancy were 1.50 (times (OR=1.50, 95% CI=1.33-1.69) more likely than those who had a test to have an ANC visit in the first trimester. Again, after adjusting for model 2 factors, the variation in timing of an ANC visit in the first trimester remained stable.

Finally, model 3 introduced community level factors. In model 3, the community level variation in ANC visits in the first trimester was attenuated, but became significantly lower than in models 0-2. The variance partition coefficient indicated that intra-community correlations were 3.6%. The proportional change in variance in the odds of an ANC visit in the first trimester across communities (10%) was explained by the community factors, indicating that part of the clustering of ANC visit in the first trimester within communities is due to contextual factors. The ICC of 3.6% indicate that there was a slight difference in timing of ANC for mothers at the community level

Women who lived in communities with higher HIV prevalence were 1.84 times (OR=1.84, 95% CI=1.64-2.74) more likely to have visited antenatal care service in the first trimester than those from communities with low HIV prevalence. Other community level factors considered were not associated with timing of ANC. Lower values of the deviance information criterion (DIC) in successive models were indicative of the fit of the multilevel model in explaining the variation in the odds of ANC visit in the first trimester by individual and community predisposing factors, and enabling and need factors.

Table 5-8: Average odds ratios of ANC visit in the 1st trimester from multilevel logistic regression models (95% confidence intervals are given in square brackets)

Parameters	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95%CI
Predisposing factors						
Survey 2010	0.56	[0.50-0.64]*	0.59	[0.52-0.68]*	0.68	[0.60-0.79]*
Place of residence (rural)						
Urban	1.39	[1.23-1.58]*	1.61	[1.43-1.91]*	1.61	[1.44-1.91]*
Age groups(15-24)						
25-29	1.36	[1.21-1.55]*	1.33	[1.18-1.51]*	1.32	[1.17-1.50]*
30-34	1.53	[1.36-1.80]*	1.47	[1.31-1.73]*	1.47	[1.30-1.73]*
35+	1.47	[1.31-1.75]*	1.41	[1.26-1.69]*	1.39	[1.24-1.67]*
Marital status(never married						
Married	1.47	[1.30-1.83]*	1.44	[1.28-1.80]*	1.45	[1.29-1.81]*
Widowed	1.70	[1.51-2.34]*	1.66	[1.46-2.26]*	1.68	[1.49-2.31]*
Divorced	1.58	[1.40-2.05]*	1.53	[1.36-1.99]*	1.54	[1.37-2.01]*
Women's education (primary)						
Secondary	1.19	[1.07-1.32]	1.03	[0.92-0.78]	1.03	[0.91-1.16]
Religion(Catholic)						
Protestant	1.19	[1.06-1.44]	1.22	[1.08-1.47]*	1.21	[1.08-1.46]*
Pentecoastal	1.13	[1.01-1.36]	1.12	[1.00-1.35]	1.11	[0.99-1.34]
Apostolic	0.98	[0.87-1.16]	1.01	[0.89-1.19]	0.99	[0.88-1.31]
Wanted child (now)						
Later	0.78	[0.69-0.87]*	0.79	[0.70-0.88]*	0.78	[0.69-0.87]*
Not wanted	0.68	[0.60-0.79]*	0.69	[0.61-0.80]*	0.67	[0.60-0.79]*
Parity						
2	0.75	[0.75-0.86]*	0.76	[0.67-0.86]*	0.76	[0.68-0.87]*
3+	0.66	[0.59-0.77]*	0.67	[0.60-0.79]*	0.68	[0.60-0.79]*
Wealth (poor)						
Medium			1.38	[1.23-1.69]*	1.39	[1.24-1.70]*
Rich			1.23	[1.09-1.39]*	1.22	[1.08-1.38]*
Employment status(No)						
Yes			1.20	[1.08-1.33]*	1.19	[1.07-1.33]*
Media exposure (Low)						
Medium			1.28	[1.14-1.44]*	1.28	[1.14-1.44]*
High			1.34	[1.19-1.53]*	1.35	[1.20-1.54]*

Continued

Table 5-7 continued

Decision making (husband)						
Women alone			0.96	[0.80-1.16]	0.96	[0.80-1.16]
Jointly			0.95	[0.80-1.12]	0.94	[0.80-1.11]
Physical access to a health facility problem (no)						
Yes			0.93	[0.82-1.04]	0.91	[0.81-1.03]
Pre-HIV test (no)						
Yes			1.50	[1.3-1.69]*	1.50	[1.34-1.69]*
HIV sero-status (negative)						
Positive			1.13	[0.98-1.29]	1.06	[0.92-1.22]
HIV awareness (low)						
Medium			1.13	[0.99-1.28]	1.12	[0.99-1.27]
High			0.98	[0.86-1.13]	0.99	[0.86-1.13]
HIV stigma(low)						
Medium			0.97	[0.82-1.14]	0.97	[0.82-1.15]
High			1.17	[0.97-1.40]	1.15	[0.96-1.38]
Confidential concern (yes)						
No			1.10	[0.98-1.2]*	1.09	[0.98-1.20]*
Knows someone living with HIV (no)						
Yes			1.61	[1.43-2.]*	1.62	[1.44-2.22]*
Contextual Factors						
HIV prevalence in community					1.84	[1.64-2.74]*
HIV Awareness in community					0.81	[0.53-1.25]
HIV Stigma in community					1.07	[0.71-1.61]
Random effects parameters						
Community-level						
Variance (SE)	0.14	[0.03]*	0.13	[0.03]*	0.123	[0.026]*
(VPC)=ICC (%)		4				
(PCV)(%)		4.8		4		3.6
Model fit statistics				0		10
Cluster		679		679		675
DIC		8293		8293		8255

*Statistical significance at 5% level *P*< 0.05.

5.7.4.2 **Multilevel logistic regression parameter estimates of antenatal HIV testing uptake**

The results in the empty model 0 in (Table 5.8) showed that most of the variation in antenatal HIV testing was at the individual level. However, there was also some variation at the community level as indicated by significant variance in the log odds of reporting ever being

tested for HIV across communities (estimated= 0.291, S.E= 0.037, i.e Z-value of 7.9>2.58 at 1% sig, level). Based on the estimated variance partition coefficient (VPC), the intra-community correlation was estimated at about 8%. This indicates the extent of the variability in antenatal HIV testing that could be attributed to community level factors. Like in Table 5.7 above, the likelihood of having antenatal HIV testing was 3.77 times (OR=3.77, 95% CI=3.32-4.29) higher in the 2010/11 ZDHS than in 2005/6 ZDHS.

All the individual predisposing individual level factors are included in model 1. The variables found to be associated with antenatal HIV testing in model 1 included place of residence, women's age, marital status, women's educational attainment and parity. While, the odds of having an antenatal HIV test were increasing in the general population, pregnant women from urban areas were 48% less (OR=0.52, 95% CI=0.43-0.63) likely to be tested for HIV, compared with their rural counterparts. The results also show that age of women, marital status and parity were inversely correlated with antenatal HIV testing. The estimates suggest antenatal HIV testing decreases with age, such that women from age groups, 25-29, 30-34 and over 35 years of age were less likely to have been tested for HIV during ANC by 29% (OR= 0.71, 95%CI=0.62-0.81]; 31% (OR=0.69, 95% CI=0.56-0.70); and 57% (OR=0.43, 95% CI=0.36-0.52), compared with young women in the age group 15-24, respectively. Within marital status categories, divorced women were 26% less likely to have an antenatal HIV test (OR=0.74, 95% CI= 0.57-0.96), compared with never married pregnant women. Other marital status categories i.e being currently married and widowed were not found to be significantly associated with antenatal HIV testing. Similarly, women in their 2nd order parity were 28% less (OR=0.72, 95% CI=0.58-0.90) likely to have antenatal HIV testing. It was only having secondary or higher educational attainment that was found to be increasing the odds of antenatal HIV testing by 1.43 times (OR=1.43, 95% CI=1.28-1.61), compared with women with primary or no education. The estimates suggest no evidence of an association between religious affiliation and wanted child with antenatal HIV testing in model 1.

In comparison with model 0, the variation in antenatal HIV testing remained significant across the communities (estimated-0.266, S.E= 0.036, i.e Z-value of 7.4>2.58 at 1% sig, level). As judged by the variance partition coefficient, the ICC was 7%. The proportional change in variances (PCV) in the odds of HIV testing during ANC of 12.5% across the communities was attributed to individual level predisposing factors. This therefore, means that the composition

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of individual characteristics did explain part of the nesting of HIV testing during an ANC visit within the communities.

Model 2, added enabling resources and HIV need factors to model 1. When model 2 factors were controlled for, pregnant women in the 2010/11 ZDHS continued to have antenatal HIV tests more than in the 2005/6 survey. There was no suggestive evidence of an association between place of residence and antenatal HIV testing in model 2 and 3. As in model 1, the likelihood of antenatal HIV testing decreased by an increase in age in model 2. A similar pattern was also observed regarding women's marital status. Being wealthier was found to be associated with increased odds of HIV testing during ANC visit in model 2. The estimates suggest that women in the rich and richest quintiles were 1.45 (OR=1.45, 95% CI=1.11-1.91) and 1.67 (OR=1.67, 95% CI=1.16-2.41) times more likely to have an antenatal HIV test, compared with poor women. This behaviour regarding the association between antenatal HIV testing with household income continued into model 3. The likelihood of antenatal HIV testing was also found to be significantly associated with media exposure. It was found that pregnant women who have medium to high media exposure were more likely to have antenatal HIV testing than those with low media exposure. For example, women who had high media exposure were 1.30 times (OR=1.30, 95% CI=1.06-1.61) more likely to have an antenatal HIV test, compared to those with low media exposure. Likewise the association between wealth and antenatal HIV testing, women with higher media exposure continued to have an antenatal HIV test even after community level factors were controlled for. It was found that the odds of HIV testing during ANC were on average 14% lower among women reported as having problems in accessing a health care centre in model 2 and 3, compared to those said it was not their main problem. Employment status and decision-making in the household were not significantly associated with antenatal HIV testing.

To explore the effects of HIV on antenatal HIV testing, model 2 also controlled for HIV factors.The estimates show that HIV factors such as sero-status, awareness and confidentiality concern were not associated with antenatal HIV testing across the models. However, knowing someone who died due to HIV increased odds of antenatal HIV testing. The estimates suggest that women who knew someone who died of HIV were on average 1.24 times more likely to have an antenatal HIV test compared with their counterparts. Compared to model 1, the variation in HIV testing during an ANC visit remained significant across the communities

(estimated= 0.25, S.E= 0.035, i.e Z-value of 7.14>2.58 at 1% sig, level). The inclusion of resources and HIV enabling and need factors appear to have no effect on community variation in antenatal testing as evidenced by 0% proportional change in variance.

Community level variables including in model 3, were HIV stigma, HIV awareness, and HIV prevalence. The outputs of the fixed effects from model 3 are approximately the same as the previous models 1 and 2. There was no evidence of association between HIV prevalence and stigma in the community with antenatal HIV testing, but women residing in communities with high HIV awareness were 2.08 times (2.08, 95% CI=1.05-4.11) likely to have been tested for HIV compared with their peers who lived in communities with low HIV awareness. Compared to model 2, the final ICC remained at 7% across the communities, with 0% proportional change in variance observed. The successive reduction in Deviance Information Criterion (DIC) from Model 0-3 demonstrates a better fit model over every previous one in table 5.7.

Table 5-9: Average odds ratios of ANC- HIV testing from multilevel logistic regression models (95% confidence intervals are given in square brackets)

Parameters	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Survey 2010	3.77	[3.32-4.29]*	3.10	[2.66-3.62]*	1.87	[1.58-2.21]*
Place of residence (rural)						
Urban	0.52	[0.43-0.63]*	0.83	[0.60-1.13]	0.97	[0.68-1.39]
Age groups(15-24)						
25-29	0.71	[0.62-0.81]*	0.70	[0.61-0.80]*	0.68	[0.60-0.75]*
20-34	0.69	[0..56-0.7]*	0.65	[0.55-0.78]*	0.65	[0.55-0.77]*
35+	0.43	[0.36-0.52]*	0.43	[0.35-0.52]*	0.42	[0.35-0.51]*
Marital status(never married						
Married	1.10	[0.85-1.32]	1.03	[0.83-1.29]	1.02	[0.82-1.28]
Widowed	0.75	[0.54-1.06]	0.73	[0.52-1.02]	0.47	[0.47-0.93*]
Divorced	0.74	[0.57-0.96]*	0.73	[0.56-0.95]*	0.73	[0.56-0.95]*
Women's education (primary)						
Secondary	1.43	[1.28-1.61]*	1.38	[1.23-1.55]*	1.32	[1.17-1.48]*
Religion(Catholic)						
Protestant	1.17	[0.96-1.43]	1.13	[0.90-1.42]	1.13	[0.90-1.41]
Pentecoastal	1.13	[0.91-1.38]	1.03	[0.81-1.30]	1.01	[0.80-1.28]
Apostolic	1.15	[0.97-1.36]	1.23	[1.02-1.49]*	1.23	[1.02-1.49]*

Table 5-8 continued

Wanted child (now)						
Later	0.88	[0.75-1.04]	0.81	[0.68-0.98]*	0.81	[0.67-0.98]*
Not wanted	1.15	[0.93-1.43]	1.16	[0.90-1.49]	1.16	[0.90-1.49]
Parity						
2	0.72	[0.58-0.90]*	0.90	[0.73-1.11]	0.90	[0.73-1.11]
3+	0.88	[0.75-1.04]	0.78	[0.61-0.99]*	0.78	[0.61-1.00]
Wealth (poor)						
Rich			1.45	[1.11-1.91]*	1.35	[1.02-1.78]*
Richest			1.67	[1.16-2.41]*	1.53	[1.05-2.24]*
Employment status(No)						
Yes			0.86	[0.73-1.01]	0.85	[0.72-1.00]
Media exposure (Low)						
Medium			1.35	[1.12-1.63]*	1.34	[1.10-1.64]*
High			1.30	[1.05-1.61]*	1.28	[1.03-1.60]*
Distance to health facility problem (no)						
Yes			0.86	[0.75-0.98]*	0.85	[0.75-0.97]*
HIV sero-status (negative)						
Positive			1.08	[0.88-1.31]	1.10	[0.89-1.35]
HIV awareness (low)						
Medium			0.96	[0.80-1.15]	0.91	[0.76-1.10]
High			0.83	[0.68-1.02]	0.79	[0.64-0.98]
HIV stigma(low)						
Medium			1.41	[1.14-1.73]*	1.36	[1.10-1.68]*
High			1.11	[0.87-1.42]	1.07	[0.3-1.38]
Confidential concern (no)						
Yes			0.94	[0.81-1.10]	0.94	[0.81-1.09]
Knows someone with AIDS (no)						
Yes			1.23	[1.02-1.49]*	1.24	[1.02-1.51]*
Contextual Factors						
HIV Awareness in community					2.08	[1.05-4.11]*
Random effects parameters						
Community-level						
Variance (SE)	0.266	[0.036]*	0.25	[0.035]*	0.241	[0.034]*
(VPC)=ICC (%)		8		7		7
(PCV)(%)		12.5		0		0
Model fit statistics						
Cluster		679		679		679
DIC		8461		8461		8461

*Statistical significance at 5% level P < 0.05.

5.7.4.3 **Multilevel logistic regression parameter estimates of at least four ANC visits**

At 67%, the rate at which women use antenatal defined as making at four and more visits-is moderately high in Zimbabwe. However, bivariate analysis indicates that there are variances in ANC visits within populations. In the multivariate logistic regression analysis, based on the result in the empty model 0, the variance in the odds of having four or more ANC visits was significant across the communities (estimated= 0.144, S.E= 0.026, i.e Z-value of 5.5>2.58 at 1% sig, level). Based on the estimated variance partition coefficient, the ICC was estimated at 4.2%. This suggests that about 96% of the variability in having four or more ANC visit was attributed to individual level factors. Pregnant women were 1.19 times (OR=1.19, 95% CI=1.08-1.32) more likely to have four or more ANC visits in ZDHS 2010/11 than in the ZDHS 2005/6.

Adjusting for individual predisposing factors in model 1, the estimates suggests that place of residence, women's age, marital status, educational attainment, parity and wanted child were associated with four or more ANC visits in integrated HIV and RH services. The estimates show that number of ANC visits is largely dependent on the place of residence. The positive slope means that women in urban areas are 1.24 times (OR=1.24, 95% CI=1.10-1.40) more likely to have four or more visits than their rural counterparts. The negative slopes for age mean that middle aged women (25-29) were 22% less likely to attend four or more ANC visits than those of younger age (15-24). Meanwhile, those aged (30-34) years are 29% less likely to have four or more ANC visits. Similarly, older women above 35 years were 37% less likely to have four or more ANC visits. Across marital categories, married people, those who were widowed and divorced were 29%, 33% and 39% less likely, respectively to attend four or more ANC compared with those never married women. Educational attainment is another important factor that works alone in predicting the number of ANC visits. Unexpectedly, women with secondary or higher educational attainment are comparatively less likely to have four or more ANC visits by 25%, compared to those with no education. Whether pregnant women will attend four or more ANC visits or not also is dependent extensively on whether the current pregnancy was wanted then or later. Women who reported wanting the child later or not wanted were 1.15 and 1.24 times more likely than those who wanted the child now to have four or more ANC visits. There is also a considerable amount of effect of birth order parity over number of ANC visits in Zimbabwe. Women with in parity 2 and 3 groups are 1.21 and 1.33 times more likely

than those in parity (0-1) to have attended ANC four or more times. In comparison with an empty model, the variation in having four or more ANC visits across the communities was small as indicated by a 3.4% intra-community correlation and the proportional change in variance of 0%.

Model 2 included resources and HIV enabling factors. The inclusion of enabling factors made the effects of place of residence redundant throughout the models. However, similar patterns regarding other predisposing factors in model 1 are also observed in model 2. The estimates show that household wealth, media exposure, women's autonomy and confidentiality concerns are important inhibiting factors for decreasing number of ANC visits. Quite interestingly, it has been found that women from the richer households and those with higher exposure to media were on average 23% less likely to have four or more ANC visits. Confidentiality concern about personal HIV related issues is also a vital factor in decreasing the odds of four or more ANC visits. Women who reported that they have issues with confidentiality regarding HIV are 11% less likely to have four or more ANC visits than those who reported they were not concerned. Women's autonomy, physical access to a health facility and antenatal HIV testing successfully increased the odds of four or more ANC visits. Women who made decisions regarding household purchases and their own health care alone or jointly with their husbands were 1.26 and 1.23 times more likely to have four or more ANC visits compared with women whose decisions are made by their husbands alone. Also women who had been offered and accepted antental HIV testing were 1.33 times more likely to have attended ANC four or more times. Likewise, women who reported having no problems with physical access to health care services were 1.20 times more likely to have ANC visits compared with their counterparts. There is no suggestive evidence of an association between four or more ANC visits with employment status and HIV factors (i.e sero-status, awareness, stigma and knowing someone who died due to HIV). The pattern observed in model 1 and 2 remained the same in model 3 when community level factors were adjusted for, except for household wealth which does not have any effects anymore. At the community level, HIV awareness, stigma and HIV prevalence in the community are not important factors for the number of ANC visits. Across the three models the ICC remained low at 3%, suggesting that all individual factors included in the models accounted for about 97% of the variability in four or more ANC visits in HIV and RH integrated services in Zimbabwe.

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Table 5-10: Average odds ratios of at least four ANC visits from multilevel logistic regression models (95% confidence intervals are given in square brackets)

Parameters	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Predisposing factors						
Survey 2010	1.19	[1.08-1.32]*	1.83	[1.48-2.26]*	1.82	[1.45-2.29]*
Place of residence (rural)						
Urban	1.24	[1.10-1.40]*	0.82	[0.67-1.00]	0.82	[0.67-1.00]
Age groups(15-24)						
25-29	0.78	[0.69-0.89]*	0.78	[0.67-0.89]*	0.78	[0.68-0.90]*
20-34	0.71	[0.61-0.84]*	0.73	[0.61-0.87]*	0.74	[0.62-0.88]*
35+	0.63	[0.53-0.75]*	0.64	[0.53-0.78]*	0.65	[0.53-0.79]*
Marital status(never married						
Married	0.71	[0.58-0.87]*	0.62	[0.47-0.81]*	0.62	[0.47-0.81]*
Widowed	0.67	[0.50-0.92]*	0.76	[0.54-1.07]	0.76	[0.54-1.07]
Divorced	0.61	[0.48-0.79]*	0.66	[0.50-0.87]*	0.66	[0.50-0.87]*
Women's education (primary)						
Secondary	0.85	[0.76-0.94]*	0.89	[0.79-1.01]	0.90	[0.80-1.02]
Religion(Catholic)						
Protestant	0.20	[0.86-1.14]	1.07	[0.91-1.26]	1.07	[0.91-1.27]
Pentecoastal	0.94	[0.81-1.08]	0.99	[0.84-1.17]	0.100	[0.84-1.18]
Apostolic	0.98	[0.87-1.09]	1.09	[0.95-1.24]	1.09	[0.95-1.25]
Wanted child (now)						
Later	1.15	[1.04-1.29]*	1.18	[1.05-1.33]*	1.19	[1.05-1.34]*
Not wanted	1.24	[1.07-1.45]*	1.30	[1.09-1.54]*	1.29	[1.09-1.53]*
Parity (0-1)						
2	1.21	[1.06-1.37]*	1.22	[1.06-1.40]*	1.21	[1.05-1.39]*
3+	1.3	[1.14-1.6]*	1.34	[1.13-1.59]*	1.34	[1.13-1.58]*
Wealth (poor)						
Medium			1.03	[0.89-1.19]	1.09	[0.92-1.29]
Rich			0.77	[0.64-0.91]*	0.82	[0.66-1.02]
Employment status(No)						
Yes			0.96	[0.86-1.08]	0.96	[0.86-1.07]
Media exposure (Lowl)						
Medium			0.82	[0.72-0.93]*	0.82	[0.72-0.93]*
High			0.78	[0.67-0.90]*	0.77	[0.67-0.89]*
Decision making (husband)						
Women alone			1.26	[1.04-1.54]*	1.27	[1.04-1.55]*
Jointly			1.23	[1.02-1.45]*	1.22	[1.02-1.45]*

Continued

Table 5-9 continued

Distance to health facility problem (yes)						
No			1.20	[1.06-1.36]*	1.20	[1.06-1.36]*
ANC-HIV test (no)						
Yes			1.33	[1.21-1.46]*	1.32	[1.20-1.45]*
HIV sero-status (negative)						
Positive			1.01	[0.87-1.18]	1.03	[0.88-1.21]
HIV awareness (low)						
Medium			0.90	[0.79-1.03]	0.92	[0.80-1.05]
High			0.97	[0.84-1.12]	0.98	[0.85-1.14]
HIV stigma(low)						
Medium			0.10	[0.84-1.18]	0.99	[0.3-1.18]
High			0.96	[0.79-1.17]	0.96	[0.78-1.17]
Confidential concern (no)						
Yes			0.89	[0.80-0.99]*	0.89	[0.80-0.99]*
Knows someone with AIDS (no)						
Yes			0.94	[0.80-1.10]	0.94	[0.80-1.09]
Contextual Factors						
HIV awareness in community					0.81	[0.53-1.25]
HIV stigma in community					1.07	[0.71-1.61]
HIV prevalence in community					0.75	[0.42-1.35]
Random effects parameters						
Community-level						
Variance (SE)	0.116	[0.024]*	0.11	[0.028]*	0.113	[0.028]*
(VPC)=ICC (%)		3.4		3.4		3.3
(PCV)(%)		0		0		0
Model fit statistics						
Cluster		679		679		675
DIC		8461		6841		6808

*Statistical significance at 5% level P < 0.05.

5.8   Discussion

The main aim of this chapter was to provide an overall picture of the determinants of HIV and maternal health integrated services as measured by three indicators i.e antenatal HIV testing, timing and frequency of ANC visits. It examined the individual and community level predisposing, enabling and need factors, including the effects of HIV-related factors such as HIV sero-status, previous test, awareness, stigma, confidentiality concerns and knowing someone who died due to HIV/AIDS. Overall, the results of the analysis showed a low level of uptake of HIV and maternal health integrated care, only 37% of pregnant women had antenatal care in the first trimester; 44% were not HIV tested during pregnancy; and 45% had

less than four ANC visits. The results also indicated that utilization of HIV and maternal health integrated services was clustered within and across communities, although the variability was small. As one would expect, individuals from the same community were homogeneous (Diez Roux, 2002). This was expected in this study given the tribal, cultural and religious diversities in Zimbabwe, which to some extent; serve as markers of attitudinal identities, socio-economic status and health beliefs (Kayeyi et al., 2009). After controlling for all variables selected in the study, the variation in ANC timing, antenatal HIV testing and number of ANC visits across the communities were 3.6%, 7% and 3.3% respectively. This suggests that over 90% of the total unexplained variation in utilisation of HIV and maternal health integrated services was as a result of unobserved individual level factors. Less than 10% of the total unexplained Variation could be attributed to unobserved community level factors. This finding was consistent with other studies which indicated that over 90% of the factors that influence utilisation of HIV and maternal health care services are attributed to individual rather than community level characteristics in southern Africa (Gabrysch et al., 2008; Ngome and Odimegwu, 2014).

The analysis shows that uptake of ANC visits in the first trimester was decreasing, whilst antenatal HIV testing and frequency of ANC visits increased significantly between 2005/6 and 2010/11. The individual predisposing and enabling factors relating to socio-economic status appear to be more important than community level factors for HIV and maternal health integrated services, although the results reveal mixed patterns across the three outcomes. Most individual predisposing factors associated with timing of ANC, antenatal HIV testing and number of visits are largely consistent with patterns observed in other SSA countries (e.g., place of residence, age, marital status, education, parity, wanted child and religion). However, unique patterns have emerged regarding uptake of each outcome. In particular, the results show that urban residence is a key predictor for timing of ANC, but not for antenatal HIV testing and number of ANC visits. Urban residence was found to be positively associated with timing of ANC care and the results resonate with the situation in SSA countries including in Zimbabwe. This is mainly due to inequalities in access to health care services between urban and rural residence (Gross et al., 2012). Women resident in urban areas may have been enjoying easier access to health care services, information and education on timing of ANC visits through media (Takarinda et al., 2016) than those residing in rural areas. Although access to HIV and maternal health services is free in Zimbabwe, there are several challenges that women face in these services in rural areas. These challenges include staff shortages, drug stock-out, poor

infrastructure, low access to media and poverty (Chirwa et al., 2013; Kevany et al., 2012). In fact, WHO (2012) reported that 98% of drugs and health care provider's salary were donor funded in rural areas and due to poor salaries and working conditions (Maruva et al., 2014) have noted high staff turnover, negligence and uncaring attitude among health care staff working in rural hospitals. The finding that urban residence is positively associated with timing of ANC visits is therefore plausible and directly relates to poor health services delivery in rural areas. This is consistent with most of the literature which suggests that women are more likely to have trust in health care system due to the increased quality of care (Achia and Mageto, 2015; Alam et al., 2015; Adam, 2011; Jean et al., 2012; Ochako et al 2011; Titaley et al., 2010). Although, the findings in this study seem to be reliable, the relationship between place of residence and maternal health service utilisation needs further investigation in future studies, taking into account the different nature of deprivation within urban areas (Matthews et al., 2010). It has been suggested that the urban poor have very similar or even less progress in terms of access to health care than in rural areas due to urbanisation (Usman, 2016). More recent evidence (Usman, 2016) reveals that health and social services in urban areas have not kept pace with urban population growth. Over the past few years, large-scale migration from rural to urban areas in Zimbabwe has led to a proliferation of slums and informal settlements in many urban areas (Chatiza and Mlalazi, 2009). As noted by Gwauya (2013) high fertility in urban areas, especially among poorer groups, has further boosted city populations. The author stated that, cities are not only becoming larger, but they are becoming more inequitable, with large impoverished and marginalised settlements springing up often in close proximity to relatively wealthy existing communities.

Some studies have suggested that urbanisation is changing the face of poverty and marginalisation (Fotso et al., 2008; Matthews et al., 2005; Shah et al., 2009); and that poor and marginalised urban populations compare unfavourably within urban dwellers, particularly migrants from rural areas and slum dwellers, who may have low rates of service utilisation as low as rural populations. Matthews et al (2005) have pointed out that urban population dynamics are changing rapidly in many countries-leading to the possibility of an erosion of the urban health advantage. In countries like Ghana, Ethiopia, Kenya, Liberia and others, Matthews et al (2010) have reported that a facility birth rate of over 80% for urban rich coexists with a rate of around 20% for women in the poorest quintile. A scoping study in Ghana, byAdongo et al (2014) found that women living in informal settlements and slum areas are faced with limited

health services from the public sector and in such circumstance, small and unregulated for-profit making clinics fill that gap. The authors noted that health care services from profit making clinics are often unreliable, relatively very expensive and do not provide full and quality care. However, much of the existing literature has tended to ignore the inequities among and within urban dwellers and has focused instead on simple average differences between urban and rural areas, indicating that most nations experience substantially better health care services in urban than in rural areas (Fotso et al., 2008; Matthews et al., 2005).

The results also revealed mixed effects of women's age on timing of ANC, antenatal HIV testing and number of ANC visits. It was found that being over 25 years was positively associated with timing of antenatal care, but inversely associated with antenatal HIV and number of ANC visits. These general patterns were consistent with those observed in previous studies based on DHS data from sub-samples related to timing of ANC (Ochako and Gichuh,2016), antenatal HIV testing (Semali et al 2014); and number of ANC visits (Gupta et al 2014). It was noted in the literature that maternal age is often presented as a proxy for accumulation of experience and knowledge, including the knowledge about HIV and the complications following late ANC booking (Weizer et al., 2006; Peltzer et al., 2009; Jean et al., 2012). This hypothesis agrees with the findings in this study. One explanation of this phenomenon could be that older women's sense of urgency regarding timing of ANC visit is shaped by awareness of the dangers associated with pregnant complications or negative experience resulting from previous pregnancies (Ngome and Odimegwu, 2014). It may also be that younger mothers may be less experienced in child birth or may lack economical resources and maybe cared by families, which may make it difficult for them to report early pregnancy (Jean et al., 2012). Another potential explanation could be that younger pregnant women do not know the gestation period at which they should initiate ANC. This postulation was supported by Ochako and Gichuh (2016) who stated that not knowing the right gestation age among young pregnant women partly explains why women initiate late their first ANC visit. Aside, due to culture, religious and health care provider attitude which stigmatise teenage pregnancies, young people may not want to be seen at a health facility seeking maternal health care services, which is usually tailored to cater for older and married women in Zimbabwe (Murire et al, 2014). Other studies reported that young and never married pregnant women are either less likely to attend or attend late or infrequently due to lack of power to make decisions

and they are also likely to experience violence from parents or stigmatised in the community (Kabagenyi et al., 2016).

The findings that older women are less likely to have antenatal HIV testing do not lend credence to the previous findings that indicate that acceptance of an antenatal HIV test increases with a woman's age. Previous studies have noted that older women have higher odds of accepting antenatal HIV testing due to accumulated knowledge on HIV (especially that HIV can be transmitted to a child during pregnancy as well as their knowledge of existence of prevention of mother to child HIV transmission (PMTCT) programmes (Semali et al., 2014). Although, the knowledge of need for PMCT has increased remarkedly over the years among older women in Zimbabwe (Murire et al 2014), the results in this current study could not find solace with older women's behaviour. The finding is unclear and perhaps requires a qualitative investigation. However, a simpler explanation could be that, older women may have previously given birth to presumably healthy children and thus see no reason for HIV testing in their future pregnancies. This is consistent with (Ochako and Gichuh, 2016)'s finding that pregnant women who had previously given birth to presumably healthy children were less likely to opt-in to voluntary HIV testing in the subsequent pregnancy. Another possible hypothesis is that, the low levels of antenatal HIV testing among older women shows that the campaigns to promote PMTCT programmes have not been effective among this group (Mtumbuka et al, 2012). There is a need to develop new methods of communication in order to encourage antenatal HIV testing among older women. Similarly, older women were less likely to have at least four ANC visits in this study. This finding supports (Mason et al., 2015)'s observation that HIV screening and being given a registration card was the main motivation for women to attend ANC so that they could receive medication and delivery in hospital in case of emergency. Once a woman is registered she stops visiting health facilities for fear of associated costs and time (Moindi et al 2015). Some women dislike frequent hospital examination during pregnancy, especially examination by use of fingers (Shiferaw et al., 2013). These reasons were similarly important in this study, and the hypothesis is that most pregnant women relied on traditional birth attendant (TBA) for their subsequent ANC after an initial registration and presumably HIV testing (Maruva et al., 2014).

Women's marital status has also seemingly shown paradoxical associations with HIV and maternal health care service utilisation. However, in line with the findings of many studies (for

example Semali et al, 2014) this study found positive associations between being married and better timing of antenatal care. The findings particularly that never married women -usually young teenagers were less likely to have an ANC visit in the first trimester have important implications for prevention of mother to child HIV transmission (PMCT) programs. This can certainly increase mother to child HIV transmission, given that about 70% of teenagers in Zimbabwe are not aware of their HIV status (ZIMSTAT, 2012). This result might reflect the fact that maternal health care in Zimbabwe is geared towards older and married women; and it is important to provide information and raise awareness of PMCT programs to prevent further mother to child HIV infection among single young mothers in Zimbabwe. The relationship between marital status and antenatal HIV testing and number of ANC visits does not conform to what might be expected. For both outcomes, the levels of HIV testing during pregnancy and number of ANC visits were lower among previously married women (widowed and divorced), compared with never married and married women.

The study results reveal that educational attainment is a key factor for antenatal HIV testing, but not for timing and frequency of ANC visits somehow makes sense in the context of HIV, and supports the notion that educated women are more likely to realise the benefits of antenatal HIV testing. Extant literature reported multiple potential pathways that can explain why maternal education is associated with antenatal HIV testing. These include an increased knowledge of the benefits of preventative health care and awareness of risk (e.g PMCT), higher receptivity to new health care information, and socialisation with formal services outside the home, access to financial resources, and better communication with a partner, increased self-worth and confidence (Asefa et al., 2013; Birhane et al., 2015; Byamugisha et al., 2010; Maruva et al., 2014; Sama C-B et al., 2017).

In regards to parity, women with higher order parity tend to have reduced odds of maternal health care services utilisation (Ochako, 2016). This study found decreased odds of an ANC visit in the first trimester and an increased likelihood of having four or more ANC visits among women with a higher birth order. The fact that pregnant women with a higher order birth were less likely to initiate ANC in the first trimester maybe a reflection of lack of time, limited resources in the household, constraints related to their other responsibilities for their other children; and negative perceptions resulting from a previous pregnancy, if the woman was in her second or higher order pregnancy (Jayleen et al., 2016; Tarekegn et al., 2014). Higher order

parity may also be a reflection of a lack of access to family planning, traditional attitudes and lower economic status, which apparently maybe associated with lack of access to maternal health care services (Achia and Mageto, 2015, Beauclair et al., 2014). The results revealed that women were more likely to increase ANC visits with each additional child. This may be that women who have had more children may be in a more stable relationship and may be more confident of the processes of antenatal care and are more prepared to increase frequency of ANC visits (Bbaale, 2011).

Enabling and perceived need factors were also found to be major determinants of HIV and maternal health integrated health care in Zimbabwe. In particular, household wealth was found to be associated with timing of ANC visits and antenatal HIV testing. Extant literature has shown that being wealthier is associated with an increase in the likelihood of maternal health care utilisation (Babalola and Fatuisi 2009; Tarekegn et al., 2014). The finding is expected, women from wealthier households are more likely to be able to afford `health care services and their associated costs such as transport (Moindi et al., 2015; Semali et al 2014, Lepine et al 2014). Another possible explanation is the fact that since higher household wealth could beindicative of a higher number of educated household members; women from such households may have higher access to information and education on HIV and its implications (Ahmed et al., 2010). Employment status was found to be associated antenatal HIV testing, while there was no evidence of an association between employment and timing and number of ANC visits. The lower HIV testing during pregnancy among employed women raises issues of accessibility of HIV testing services and time. One potential explanation could be that, although Zimbabwe Employment policy protects people living with HIV against abuse and discrimination at the workplace, employed women do not accept HIV testing because they still view a positive test as devastating, and may lead to a number of negative consequences including loss of job, stigma and discrimination and difficulties in getting insurance (Sambisa, 2008). The reason for the absence of an association between employment and timing and number of ANC visits may be explained by the factor that even if women were employed, the decision on her health care may be made by her husband (Woldemicael and Tenkorang, 2009). However, decision-making for women was found not to be associated with either of the outcomes in this study.

The results show mixed patterns regarding enabling and perceived need factors relating to HIV/AIDS. There is no evidence of a significant association between HIV awareness and HIV sero-status with the three outcomes, once important background socio-economic and demographic as well as other HIV/AIDS factors are controlled for. This confirms earlier findings based on bivariate analysis in Table 5.6 suggesting HIV awareness and sero-status are not associated with timing and number of ANC visits. In addition, the results in the bivariate analysis suggesting an association between HIV awareness and sero-status maybe explained by differences in the background characteristics. However, the finding that higher HIV awareness at a community level is associated with increased odds of antenatal HIV testing resonates with the findings of Buzdugan et al(2015), which are suggestive of a stronger and wider campaign on PMCT programs in the communities (Ngome and odimegwu, 2014)

There is evidence of an association between HIV stigma and antenatal HIV testing, but not with timing and number of ANC visits. The result that pregnant women with medium to high levels of stigma are more likely to have antenatal HIV testing is unexpected. The logical explanation for this situation may suggest acceptance of HIV/AIDS and that pregnant women want to protect their infants from HIV, never mind their experience with stigmatisation. The results also indicate that confidentiality concern is a key factor for timing and number of ANC visits, whilst it is not for antenatal HIV testing. Pregnant women with no confidentiality concerns were more likely to initiate ANC early and to have four or more ANC visits. This may be that pregnant women who have had ANC in the first trimester may have been tested for HIV and are more confident of their HIV status enabling them to frequent ANC. The fact that antenatal HIV testing is not associated with confidentiality concern may be that women are given private individual counselling and space to make a private decision without staff and group interference in Zimbabwe (Perez et al., 2004). Actually, a study by Shetty et al (2010) suggests that the quality of care including confidentiality concerns shapes the women's decision to use health care services. The findings from this study suggest that the content of ANC is an important determinant of antenatal HIV testing and that improving health care service delivery through training and retention of qualified staff can encourage the overall use of maternal health services (Schnippel et al., 2015). This study found strong associations between timing and number of ANC visits and previous-HIV testing and counselling. The pre-test HIV counselling which included information on prevention of mother to child HIV

transmission in the DHS could be argued to be an enabling factor for early ANC attendance, in view of the fact women may be aware of their test results (Asefa and Beyene, 2013).

Knowing someone living or who died of AIDS was associated with an increased likelihood of ANC in the first trimester and antenatal HIV testing. The results also revealed that pregnant women living in communities with high HIV prevalence rates are more likely to initiate ANC in the first trimester. This may suggest that personal acquaintance with AIDS may be a pointer to behavioural change to avoid mother to child HIV transmission and knowing someone who died of HIV is common in communities with higher HIV prevalence rates (Magadi and Desta 2011).

5.9   Recommendations and way forward

Overall the multilevel results showed little variations in HIV and maternal health care integrated services across communities in Zimbabwe. The variations were mainly explained by individual level variables such as background characteristics and enabling/ perceived need factors that were included in the models for all outcomes. At the community level, variables found to be contributing to the variations in HIV testing differed by HIV prevalence and awareness. It was found that community HIV prevalence was positively associated with timing of ANC visits, while community HIV awareness was important for antenatal HIV testing. Controlling for community level factors did not have much effect on community variation in HIV testing. Therefore, policies should focus on predisposing and enabling factors in order to improve HIV and maternal health care in Zimbabwe. For timing of ANC visits and antenatal - HIV testing, household wealth, access to media, employment status and HIV factors such as confidentiality concern, knowing someone who died as a result of HIV are critical, whilst women's decision making role, previous HIV test and confidentiality concern were more important for number of ANC visits. More importantly perhaps for both antenatal HIV testing and number of ANC visits, the introduction of financial incentives may stimulate pregnant women to access HIV and maternal services by providing compensation for transport cost and opportunity cost of time associated with accessing HIV testing services.

6 CHAPTER SIX: HIV AND DELIVERY CARE

6.1 Introduction

This chapter places particular interest on women's utilisation of delivery care, especially since professional delivery care is essential for prevention of mother to child HIV transmission which is a major contributor to HIV new infections. The aims of the chapter are twofold: first and primarily to identify individual and community level determinants of institutional and professional delivery care; and this includes hitherto unnoticed independent effects of HIV. Firstly, literature on the impact of HIV on delivery care is presented. This is followed by data and methods used in the analysis, while the last part presents the results and discussion of the findings.

6.1.1 Background

While antenatal care is an important strategy to reduce mother to child HIV transmission, child birth with a medically-trained health professional, which is most likely to be available if a pregnant woman gives birth in an institution is an additional strategy in prevention of mother to child HIV transmission (Buzdugan et al., 2015; Turan et al., 2008). Institutional delivery presents an opportunity for a repeat HIV test and for education on PMTCT if the mother is found to be HIV positive during labour and delivery (Buzdugan et al. 2015). HIV testing at labour and delivery may also present an opportunity to identify HIV positive mothers who may have had false HIV negative results and those who were not tested during antenatal care (Heemelaar et al., 2014). One study has reported that pregnant women who test HIV negative during antenatal care may feel reassured that neither they nor their infants are at risk of HIV infection (Moodley et al, 2009). However, HIV can be acquired during pregnancy and postpartum and women who sero-converted would not be detected unless a repeat testing is conducted throughout child and maternal care processes (Johnson et al., 2012; Weiser et al., 2006). The lack of professional delivery care can represent a missed opportunity for retesting and identification of pregnant women who have recently acquired HIV infection (Moodley et al., 2011). It has also been noted that the intrapartum events such as duration of membrane rupture, preterm births, invasive procedures during labour and delivery are crucial factors that

may increase mother to child HIV transmission since this is period where the risk is highest (Heemelar et al., 2014), thus it is important for pregnant women to deliver in an institution and with a professional delivery attendant. There is evidence that professional delivery assistance enhances the effectiveness of PMTCT intervention as women who give birth with a professional health care attendant have additional benefit of using ARVs meant to be taken around the time of delivery (Nkonki et al., 2007; Sibanda et al., 2013; Washington et al., 2015).

While, the need for increasing PMTCT uptake through delivery care continues, mounting evidence demonstrates an urgent need to examine barriers to institutional and professional delivery care. There is evidence indicating that uptake of delivery care still lags behind other HIV and maternal integrated health care indicators, and skilled care at birth remains elusive for many pregnant women in many SSA countries (Buzdugan et al. 2015). Against a backdrop of a frail health care system (characterised by a shortage of skilled professional attendants, increasing costs of care, poverty and inaccessibility of health care among other factors), home care delivery and child birth administered by traditional birth attendants and family members remain a lifeline for most pregnant women in many Sub-Saharan African countries (Zere et al.,2011). Studies have shown that factors such as culture, rural residence and low socio-economic status of pregnant women constraint the effectiveness of PMTCT programs (Ahmed et al., 2010; Aremu et al., 2011; Arthur, 2012; Makate and Makate, 2017) as these factors force pregnant women to stay away from health facilities when they are due to give birth. In particular, access to delivery care is severely compromised for many low income pregnant women in SSA countries who sometimes have to travel a long distance to arrive at the nearest health care centre (Gabrysch et al., 2011).

Perhaps, some of the key barriers relate to how HIV factors such as HIV-related stigma, discrimination and lack of comprehensive knowledge of HIV among pregnant women (Turan et al., 2011) impact on delivery care. Regardless of economic status, often pregnant women are placed in an untenable position in which they have to choose between immediate threats to their social, economic and physical well being if their HIV status is disclosed and the future health benefits for themselves and their child in accessing delivery care (Rochat et al., 2006). Researchers such as Hardon et al (2012) pointed out that due to lack of attention to privacy and confidentiality in most SSA countries, HIV pregnant women may experience stigma and discrimination during delivery care. In particular, literature reviewed reveal that high levels of

fear, experience of HIV-related stigma and discrimination in the community and health facilities may negatively affect all women, not just those who know they are HIV positive (Turan et al., 2008).

Studies of HIV and antenatal care revealed that HIV related stigma could be inhibiting the effectiveness of delivery care as women who test positive want to keep such information from relatives and others who play an active role during child birth (Mucheto et al., 2011). Culturally, in most SSA countries, husbands, friends and relatives tend to be present during delivery (Bisika, 2008), and for women who desire to keep their status secret, the tendency is to avoid returning to the facility where they were diagnosed, preferring a home delivery or somewhere their status is not known (Turan et al., 2012). A qualitative study in Ethiopia reported that most HIV positive women do not give birth where their status in known, so that relatives will not become suspicious when they and their infants are given special medication shortly after birth (Shiferawet al., 2013). The authors reported that fewer pregnant women returned to deliver their babies in facilities they were diagnosed with HIV and that the majority of those who gave birth were not enrolled for antenatal HIV testing in the same facilities. In Tanzania, Theilgaard et al. (2011) reported that pregnant women recognised the importance of PMTCT and most were accepting antenatal HIV testing, but they were desperate to conceal their positive status from close family members, compelling them to stay away from health facilities where they were diagnosed and to give birth at home. A study in Kenya revealed that pregnant women who held negative stigma views about people living with HIV were less likely to deliver in a health facility (Turan et al., 2012). In another study, HIV positive women who had disclosed their HIV status to anyone were more likely to deliver in a facility than HIV positive women who did not disclose to anyone (Buzdugan et al., 2015).

6.1.2 Rationale for the study of HIV and delivery care in Zimbabwe

The primary health care clinics in Zimbabwe provide both HIV and maternal health care services to pregnant women. However, safe assisted delivery and essential HIV care cannot be provided for women opting for home deliveries (Maruva et al., 2014). Proper obstetric care during labour and delivery constitutes important prerequisites for reducing mother to child HIV transmission (Rutaremwa and Kabagenyi. 2016). This is particularly serious in Zimbabwe where about 93% of pregnant women attended ANC clinics, but the institutional delivery

averaged 77% according to the latest ZDHS (2014/15). The question that may require an answer is why more women attend ANC clinics and yet they continue to deliver at home?. This may be important in explaining the disparities between the number of ANC bookings and institutional delivery in Zimbabwe. In rural areas, a number of initiatives to improve uptake of delivery care have been implemented, including construction of more health facilities closer to the communities, setting up maternal waiting home shelters where pregnant who might not get to the hospital in time for delivery can be accommodated at the clinic during their final stages of their pregnancy (Makate and Makate, 2016). During their stay, pregnant women are offered an HIV test and are given information about HIV and pregnancy, as well as breastfeeding for those who are HIV positive (Maruva et al., 2014). Partly, due to the effects of HIV-related stigma and discrimination, and lack of comprehensive knowledge of HIV, many pregnant women in rural Zimbabwe prefer home delivery with help from family members or traditional birth attendants (Buzdugan et al., 2015). This is worrisome because over 90% of women in Zimbabwe are aware that HIV can be transmitted during labour and delivery and that PMTCT can prevent HIV in infants (ZDHS, 2014/15). Given that delivery care may help reduce mother to child HIV transmission, it is imperative for this chapter to identify factors influencing women's preference for home delivery rather than institutional delivery in Zimbabwe. Based on the research results, recommendations will address the question why delivery care is lagging behind ANC uptake. The results will also address women's preference so that the number of home deliveries could decrease. This may help enhance PMTCT programs in Zimbabwe. Given that an increased uptake of delivery care enhances effective utilisation of HIV and maternal health integrated services, the main objective of this study is to identify individual and community predisposing, enabling and need factors that influence institutional and professional delivery.

To achieve this aim the specific objectives are:
- Identify individual and community level determinants of delivery care; this includes hitherto unnoticed independent effects of HIV factors, and to investigate their relative contribution in explaining the disparities between institutional and professional delivery; and to

- To compare factors associated with institutional and professional delivery care

6.2 Methods and data

The chapter applies multilevel logistic regression models to data from the 2005/6 and 2010/11 Zimbabwe Demographic and Health Surveys. The sampling and procedures for data collection and methods of analysis are discussed in chapter 2-6. In this chapter, the sample size was first restricted to all women who tested for HIV. To avoid clustering of multiple birth and reduce recall bias (Lepine et al., 2014; Mumah et al., 2014), the sample was further restricted to the last birth in the five years preceding the surveys. This yielded a sample size of 8471 women with at least one live birth. In order to see the changes that occurred between the survey years, the data was further restricted by year of survey resulting in a split sample size of 4074 and 4397 for the 2005/6 and 2010/11 ZDHS, respectively. Measures of fixed effects, that is the effects of individual-level and community-level determinants of HIV testing were reported in terms of odds ratios (OR), whilst the measures of community variation (random effects) were expressed in terms of intra-class correlation coefficient(ICC).The estimation procedure was based on quasi-likelihood methods, starting with the default procedure 1st order Quasi-likelihood Methods (MQL) and extending to 2nd order Penalized Quasi Likelihood (PQL).The 2nd order estimation was preferred because it is an improved approximation procedure (Rasbash et al., 2005).

6.2.1 Outcome variables

There were two main outcome variables in this chapter. These were whether or not a pregnant woman had delivered in a health institution and whether they were attended by a professional birth attendant. In addition, the study also examined two composite indicators, which combines attendant and place of delivery. There are questions of relevance to delivery care that women are asked during the DHS survey. Women aged between 19-49 years in selected households were asked a series of questions on delivery care for each live birth they reported occurred in the past 5 or 3 years. The specific questions on delivery care (ORC Macro, 2010) are:

Who assisted with the delivery of [NAME OF CHILD]? Anyone else?

Where did you give birth to [NAME OF CHILD]?

The DHS questions allowed for multiple responses to be recorded for the place of delivery and the person who attended to delivery.

6.2.1.1 **Institutional delivery care variable outcome**

The binary outcome measure was constructed based on whether or not the mother had delivered in a health facility. All the facilities were included in this indicator-hospitals, clinics, health centres and maternal homes. The measure was based on a recode of DHS variable (M15$1), where those mothers who delivered at any form of health institution eg. Government or private hospitals were coded 1 and those who delivered elsewhere were coded '0'

6.2.1.2 **Professional delivery**

This is a standard international indicator of delivery care. The term 'health professional' rather than skilled attendant was used because the surveys recorded the professional label used by the women to identify their attendants and provide no indication of the individual's level of practical skills. As noted above, DHS recorded the attendants named by the women, but for the purpose of this analysis the indicator is defined by the most qualified attendant reported. For example, if a woman mentioned a midwife and a doctor in attendance, the delivery will be classified as attended by a doctor. Therefore, in this study a health professional is defined as midwife, doctor and a nurse. Given this working definition, the binary outcome measure for 'health professional' was constructed based on whether or not the mother had delivery attended by a doctor (M3A$1), a midwife (M3B$1), or a nurse (M3C$1). An additive index with scores ranging from 0-3 was coded '0' no 'professional delivery', and '1-3', coded 'profession delivery'. This way of coding was important because providing skilled attendants for delivery care, along with the equipment, drugs and supplies necessary for effective management of obstetric complications has been advocated as the single most important factor in preventing maternal deaths (WHO, 2010).

6.2.2 **Explanatory variables**

The explanatory variables used in this chapter were adapted fromAndersen (1995) framework and are contained in figure 6.1 below. As noted in the previous chapters, the main ideology behind the framework is that the use of health care services is a function of contextual, predisposing, enabling or impeding and need factors. Based on the reviewed literature, theory and data availability, variables were selected and thereby operationalized as shown in Table 5.1 in the previous chapter. Some of the variables were re-coded for the purpose of this study.

The original coding of the data is shown in the 2005/6 and 2010/11 ZDHS questionnaire. Consistent with other studies (Magadi and Desta, 2011; Takarinda et al, 2016) variables such as media exposure, HIV knowledge and AIDS stigma related variables were constructed from a set of correlated indicators using a principal component analysis (PCA).The PCA is a statistical technique that is used to condense a number of variable dimensions without significant loss of relevant information (Lepine et al., 2014). At community level, apart from HIV prevalence, two variables describing the community were newly imputed and added to the dataset. The variables were average HIV awareness and stigma in the cluster. In the analysis, the later variables were represented by a two-category variable split at the median across all communities, indicating high or low levels of the characteristic. The variables were coded '1' for communities with a high level; and '0' for low level of characteristics.

In addition to other factors as are operationalised in Table 6.1, three more enabling factors were added in this chapter. These were (i) timing of ANC visit and (ii) HIV testing during pregnancy. These variables were exploratory were a proxy for use of HIV and maternal health integrated services. However, the rationale for including these variables stems from literature reviewed which suggested a high correlation between antenatal and delivery care without adjusting for the effects of HIV (Jayleen et al., 2016). Utilisation of antenatal care is expected to reflect several things including the pregnant women's access to information about HIV, knowledge of mother to child HIV transmission, attitude towards ANC and potential awareness of pregnancy complications (Kevin et al., 2014; Muruva et al., 2014;Orne-Gliemann et al., 2006). Often, pregnant women who get in contact with maternal health care services are given information about pregnancy complications, mother to child HIV transmission and HIV prevention programs; and they are also encouraged to test for HIV, delivery in a hospital and with a professional birth attendant (Tenthanet al., 2015). It is therefore expected that women who do have access to ANC and those who are offered and accept an HIV test during pregnancy are more likely to use delivery care than their counterparts. The three variables are described below:

a) Timing of first ANC visit
Proxy for timing of prevention of mother to child HIV transmission program
This variable is a proxy for a need for an early HIV test during pregnancy. There is evidence indicating vertical HIV transmission can occur during pregnancy (Mugurungi et al., 2008;

Townsen et al., 2008). In the 2005-11 ZDHS, women were asked about methods of HIV transmission from mother to child and prevention methods. About 91% of respondents reported knowing that HIV can be transmitted from mother to child during pregnancy, delivery and breastfeeding (ZDHS, 2014/15), 90% knew that drugs can prevent mother to child HIV transmission. This reflects a high level of (MTCT) awareness in Zimbabwe and pregnant women are expected to initiate ANC earlier in order to get an HIV test with subsequent enrolment into PMCT programmes if a woman is found to be HIV positive. This variable therefore can be used to predict timing of an enrolment into prevention of mother to child HIV transmission programme. The variable is coded '1' if the women initiated ANC care in the first trimester and '0' for all others; including those who did not attend any ANC.

b) Number of ANC visits

The study included number of ANC visits since adequate utilization of ANC is a strong predictor of health institutional delivery in the literature (Gupta et al., 2014). In addition, the number of antenatal care visits a woman attends is important for allowing routine HIV testing and monitoring viral load in the blood among HIV positive pregnant women (Maruva et al., 2014). The lack of retesting during pregnancy represents a missed opportunity to identify women who have recently acquired HIV infection and have an increased risk of MTCT (Samaet al., 2017). In addition, pregnant women who do not frequent ANC have fewer opportunities to learn about PMCT programs (Buzdugan et al., 2015). The measure of frequency of ANC visits was based on a recode of variable M14, in which women who had at least 4 ANC visits are code '1', and women who had less than 3 ANC visits coded as '0'.The ZDHS asked the respondents: How many times did you receive antenatal care during this pregnancy? The responses enabled a classification of the number of times antenatal care was attended.

c) Antenatal HIV testing

This variable represents the actual need to prevent mother to child HIV transmission and to start taking drugs if a women was HIV positive. In the ZDHS, pregnant women who attended ANC for their last birth and were offered an HIV test responded to the question, I don't know the results, but (a) were you tested for HIV virus during any of the antenatal visits? If yes, (b) did you get the results of HIV test? Respondents who reported 'yes' to these two questions were classified as having been tested for HIV and know their results during ANC (Staveteig et

al., 2013; ICF international, 2014). Women who were tested and know their results were coded '1' and those who were not tested coded '0' indicating a binary response variable.

Figure 6-1: Analytical framework for the analysis of determinants of delivery in Zimbabwe
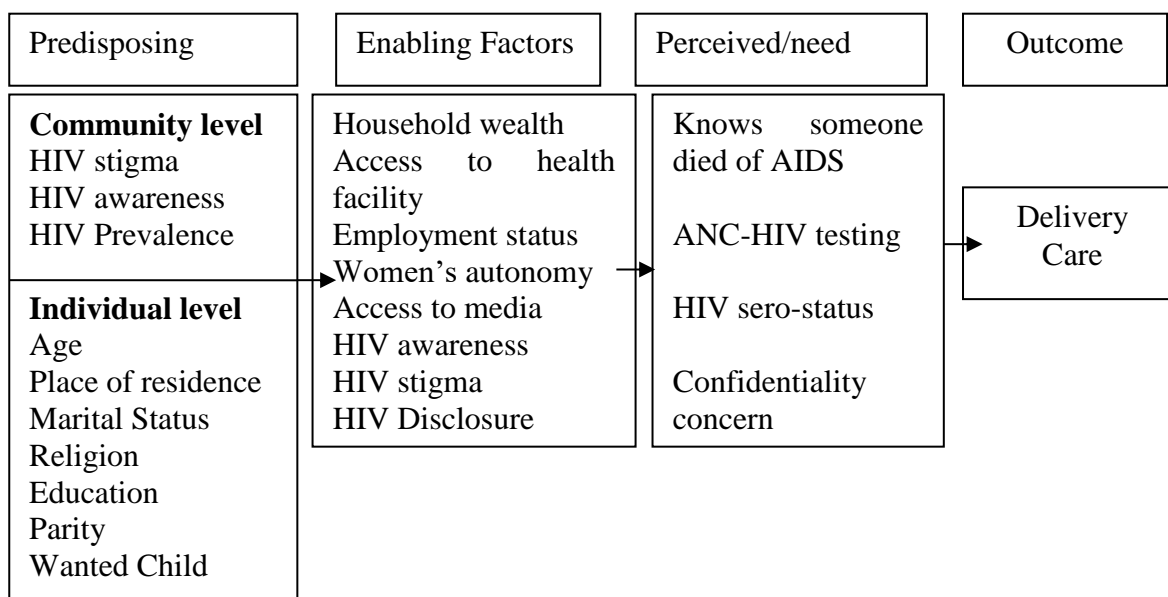
Source: Authors' construct

Table 6-1: Summary description of study variables

Variable	Operation Definition
Institutional delivery	Deliveries that occurred in a health facility: coded '1' if delivery occurred in any form of health institution eg. Government or private hospitals and' 0' for deliveries that occurred elsewhere.
Professional Delivery	Deliveries that were attended by a (doctor, midwife or nurse): coded '0' for no 'professional delivery', and '1' for 'profession delivery'
Individual predisposing factors	
Residence	Women's residence, coded as 1=rural, and 0=urban
Women's age	Categorised into three age-groups: 15-24, 25-34 and 35+
Women's education	Educational attainment classified into: No education and primary coded '0', and secondary and higher '1'
Marital status	Classified into four groups: never married, currently married, widowed and divorced/separated
Religion	Religious affiliation, classified into: Catholic/Traditional, protestant, Pentecoastal, apostolic
Wanted last child	Three categories: wanted then, later and not wanted
Parity	Total number of children ever born, classified into three groups: 1, 2 and 3+

Continued

Table 6-1 continued

Enabling and perceived risk/need factors	
Media exposure	A composite summary index derived from information on frequency of reading newspapers, listening to radio and watching TV by respondents. The additive scoresranging from 0-1 were coded '0'-'low', '2-3' was '1' 'medium' and 4-5 was '2' 'higher'
Household wealth	DHS composite wealth index (Rustein et al 2004), based on household possessions and amenities, reclassified into three groups , poor, rich and richest, based on ODHI (2013) classification of poverty in Zimbabwe
Perceived distance to health facility to get medical help	The survey question asked women if distance was a problem for them to get any medical help from health institutions. The responses were coded as: '1'=yes big problem, '0'=not big problem
Employment status	Coded 1=if respondent is employed; 0=otherwise
Woman's autonomy	The relevant DHS questions (mv739 to mv743b)on who makes the final decision on own health care elicited categorical responses, 1=Wife alone 2=jointly, 3=Husband alone/ Others
Frequency of ANC visits	The measure of frequency of ANV visits was based on a recode of variable M14, in which women who had at least 4 ANC visits are code '1', and women who had less than 3 ANC visits and those who reported not having ANC visit coded as '0'
ANC-HIV testing	The binary variable was constructed based on whether or not the pregnant women had been offered and accepted HIV test for the last birth during their ANC visits. The measure was based on a recode of variable V840, in which a woman who had been tested for HIV as part of ANC was coded '1' and '0' otherwise.
HIV sero-status	Coded as 1=if respondent is HIV-positive;0=otherwise
HIV stigma	A composite index derived from a set of four DHS questions on HIV/AIDS stigma. The resulting score is classified as '0' low, '1-2' medium and '3-4' high
HIV awareness	A composite index derived from a series of questions on knowledge of how HIV is transmitted and ways to avoid infection. The resulting index is classified into quartiles and the higher the index, the higher the knowledge.
Knows someone with HIV	Coded as 1 =if respondent personally knows someone who died of HIV/AIDS; 0=otherwise
Confidentiality concern	Coded 1=if the respondent want HIV in the family to remain secret; 0=otherwise
Contextual community/cluster HIV factors	
HIV prevalence	Proportion of individual in cluster who are HIV-positive
HIV/AIDS awareness	Average HIV awareness in the cluster
HIV/AIDS stigma	Average HIV/AIDS stigma in the cluster

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6.3 Results

6.3.1 General trends in institutional and professional delivery care

Table 6.2 shows the extent of changes in delivery care between the two surveys. The bivariate analysis for deliveries that were attended by a health professional by place of delivery and professional deliveries by place of birth are presented in tables 6.3 and 6.4 below. The results indicate that institutional delivery care remained low, and have declined between 2005/6 and 2010/11. About 68% of pregnant women had institutional delivery in 2010/11, down from about 71% in 2005-6, a decrease of about 3%. Equally, professional delivery decreased slightly from about 68% in 2005/6 to 67% in 2010/11. Although table 6.2 suggests that the proportion of health facility deliveries in 2010-11 (67.6%) is about similar to health professional delivery (67.4%), the two are not identical. For example, about half of the home deliveries (49.4%) were attended to by a health professional and almost (18.6%) of professional deliveries occurred outside a health facility (Tables 6.3 and 6.4). Thus it is important to examine factors associated with institutional delivery separately from factors associated with a professional delivery attendant.

Table 6-2: Percentage Distribution of institutional and professional care delivery in Zimbabwe, 2005/6 and 2010/11 ZDHS

Outcome variable	ZDHS 2005-6		ZDHS 2010-11	
Place of delivery	**%[a]**	**n[b]**	**%[a]**	**n[b]**
Home	29.5	1251	32.4	1411
Institution	70.5	2823	67.6	2986
Professional				
Yes	68	2803	67.4	2985
No	31.2	1271	32.6	1412
Total	100	4074	100	4397

[a]Weighted; n[b]:unweighted cases

6.3.2 Delivery attended by a professional delivery attendant and institutional delivery

While women's use of a professional birth attendant and delivery in an institution are expected to take place together, use of professional birth attendant can also occur in the community or at home (Gabrysch et al., 2009; Mutumbuka et al., 2012). Similarly, a delivery in an institution can occur without a professional health delivery attendant. Results in figures 6.3 and 6.4 are

presented in order to identify births that were attended by a health professional (doctor, midwife or nurse) and place of delivery. The bivariate results in table 6.3 indicated that about 2662 births occurred at home, of which about 49% (n=1316) were attended by a professional health attendant, suggesting that about 51% of births that occurred at home were attended by traditional birth attendants, family members or friends. While about half of the women who gave birth at home were attended by a professional health attendant, almost all (99%; n=5809) of those who gave birth in an institution were attended to by a professional health attendant. The results also showed that 95% (n=1346) of deliveries that occurred outside a facility were not attended to by a health professional, while only 5% of institutional deliveries were not attended by a health professional. About 19% of births delivered by a health professional occurred at home.

Figure 6-2: Percentages of birth deliveries that were attended by a health professional by institutional delivery
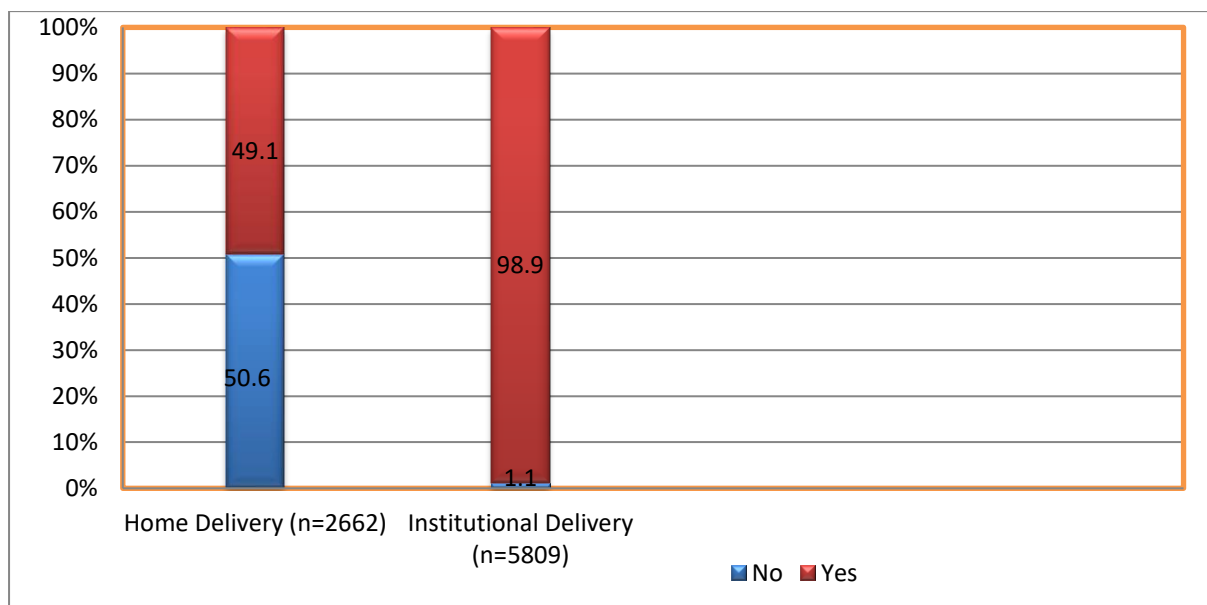
Source: Derived from Zimbabwe Demographic and Health Surveys (2005-6; 2010-11)

Figure 6-3: Percentages of health professional birth deliveries by institutional delivery
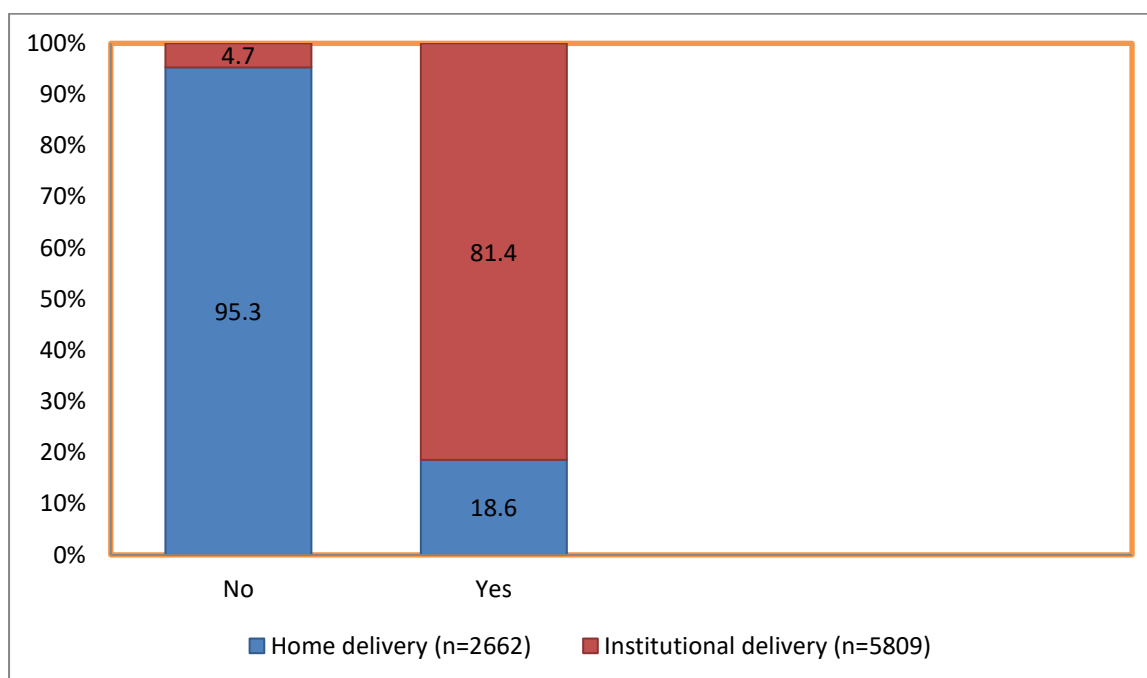
Source: Derived from Zimbabwe Demographic and Health Surveys (2005-6; 2010-11)

6.3.3 Bivariate association between institutional and professional delivery by individual level predisposing factors

Table 6.5 presents the proportion of women who gave birth in an institution and those who were attended by a professional health care provider (doctor, nurse, and midwife) according to their background predisposing factors. There are clear similarities between institutional and professional delivery and the trends for both outcomes match each other across the key factors as expected. This pattern was expected because births delivered at home are usually more likely to be delivered without assistance from a professional provider, whereas births delivered at an institution are more likely to be attended by a trained health professional. There was a strong association between institutional and professional delivery and background predisposing factors, with the exception of marital status. According to the results about, 91% of pregnant women gave birth in an institution and were also attended by a health professional in urban areas. Fewer women in rural than urban areas gave birth in an institution (57.7%) and only (53.3%) of these were attended by a professional health provider, suggesting that 4.4% of births that occurred in an institution in rural areas were not attended by a professional health provider.

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This number may be as a result of pregnant women arriving at the institution very late and in labour, however this will be discussed further in the chapter. Age is significantly associated with both outcomes. Across the age groups, the lowest coverage of institutional and professional delivery was observed among older women aged 35 and above, which was averaging 60% for both outcomes, followed by those in the age group 15-24 years. The highest proportion of institutional and professional care uptake was observed among women aged 25-34 years and was averaging 70% for both outcomes. As expected, institutional and professional delivery were more common among women with secondary or higher educational attainment 77% (p<0.000) than those with primary or low educational attainment which was about 50% for both outcomes. Pregnant women affiliated with the apostolic faith group were less likely than others to have institutional and professional delivery, whilst a considerable majority of the women who had institutional and professional delivery were belonging to pentecoastal and protestant faith groups. The proportions of women who had institutional and professional delivery were higher among women who reported wanting the current pregnancy compared with those who reported wanting the child later or not wanted. Meanwhile, parity had a negative association with institutional and professional delivery. The negative association is shown by constant decrease in the proportion of institutional and professional delivery with an increase in the number of children ever born. For example, for women with one pregnancy about 77% gave birth in an institution compared to women with higher order birth of 3 or more pregnancies (59%). Meanwhile, the majority of women who reported having fewer than four ANC visits (71%) gave birth in an institution and were attended by a professional health provider compared with those who reported having four or more visits (66%) on average for both outcomes.

Table 6-3: Bivariate analysis of institutional and professional delivery by predisposing individual factors

Variables	% Hospital delivery %[a]	P-Value	% Skilled attendant %[a]	P-value	All cases[b]
Residence		.001		.001	
Urban	91.3		91.3		2475
Rural	57.7		53.3		5996
Age groups		.001		001	
15-24	66.4		66.5		3176
25-34	70.1		69.8		3886
35+	60.9		59.8		1409
Marital status		.510		.247	
Never married	69.7		70.0		464
Married	67.2		67.0		7003
Widowed	68.6		66.7		321
Divorced	65.2		63.7		683
Women's education		.001		.001	
No/Primary	49.9		50.0		3128
Secondary/Higher	77.7		77.0		5343
Religion		.001		.001	
Catholic/others*	63.4		63.3		2286
Protestant	79.4		79.6		1427
Pentecoastal	80.4		80.1		1445
Apostolic	58.8		58.1		3313
Wanted child		.001		.001	
Then	69.3		69.4		5554
Later	62.0		62.3		2013
Not Wanted	65.9		61.7		904
Parity		.001		.001	
1	76.7		76.7		2503
2	70.1		70.4		2258
3+	59.0		58.0		3710
No.of ANC visits		.001		.001	
4 plus	65.5		65.7		4757
No	71.0		71.4		3714

[a]Weighted; [b]unweighted cases

6.3.4   Bivariate association between institutional and professional delivery by enabling factors

Table 6.6 presents the association between institutional and professional delivery by different enabling and perceived risk/need factors. The factors in the table are classified into two groups. The first group relates to employment status, household wealth, women's autonomy, media exposure and access to a health facility as key enabling factors for institutional and professional delivery care. The second group relates to the association between a range of HIV factors with institutional and professional delivery. In the first group, only three variables relating to household wealth, physical access and media were significantly associated with delivery care. The highest proportion of women who had institutional and professional delivery were from the richest households (about 94%), followed by those from middle income households and the least were from poor households. Similarly, institutional and professional delivery care was more common among women who reported having higher media exposure and those with no problem accessing a health care facility.   Meanwhile, the bivariate results indicate that women's autonomy and employment status are not important factors for delivery care. With respect to HIV enabling and perceived risk/need factors, the results show that institutional and professional delivery care were highest amongst women who reported having had antenatal HIV testing, those who were not concerned about confidentiality issues, with medium HIV awareness and stigma and those who did not know someone who died of HIV.

Table 6-4: Bivariate association between institutional and professional delivery by enabling and perceived risk/need factors

Variables	% hospital delivery %[a]	P-Value	% Skilled delivery %[a]	P-value	All cases[b]
Resources, access, autonomy (enabling factors)					
Employment status		.032		.016	
No	66.4		65.9		5448
Yes	68.7		68.5		3023
House Wealth		.001		.001	
Poor	55.3		54.7		5276
Rich	83.3		83.3		1807
Richest	93.6		93.8		1388
Media exposure		.001		.001	
Low	53.4		52.7		2998
Mediun	72.7		72.7		3330
High	77.5		77.2		2143
Distance to a health facility problem		.001		.001	
No	80.3		79.9		2585
Yes	61.6		61.2		5886
HIV and enabling and perceived risk/need factors					
ANC- HIV test		.001		.001	
No	55.6		55.0		3550
Yes	75.9		75.7		4921
HIV sero-status		.128		.070	
Negative	66.9		66.3		7316
Positive	68.7		68.8		1155
HIV awareness		.001		.001	
Low	67.0		67.1		2180
Medium	73.7		73.1		3765
High	57.9		57.5		2526
Knowsome who died of HIV		.009		.008	
Yes	65.1		64.8		2476
No	68.1		67.8		5995
Confidential concern		.001		.001	
Yes	64.7		59.4		4388
No	69.9		76.5		4083
HIV related Stigma		.001		.001	
Low	65.0		65.8		1459
Medium	74.9		73.5		1566
High	65.5		65.1		5446

[a]Weighted; [b]unweighted cases

6.3.5   Multivariate multilevel analysis

A series of multilevel logistic regression models were estimated to investigate the determinants of delivery care and to estimate how much variation in institutional and professional delivery existed between communities. An empty model was initially specified to assess the baseline variation in the dependent variable including establishing a benchmark value for Deviance Information Criterion (DIC). In the second stage of analysis, three models assessed whether institutional and professional delivery care were associated with predisposing factors (model 1); enabling factors (model 2); and community factors (model 1). In the final stage of analysis, separate models were built for each year. This was in order to evaluate the trends and to identify factors that may have been attributable to change in the probability of having institutional and professional delivery care between the surveys. The analytical strategy of specifying sequential models (Valpine, 2012) employed here allowed for an evaluation of relative contribution of each model in explaining variance in delivery care utilisation as well as allowing an evaluation of DIC-value comparison of the predisposing individual level, enabling, need and community level models.

6.3.5.1   **Multilevel logistic regression parameter estimates for institutional delivery**

Results presented in table 6.7 uneartheddisparities in the use of institutional and professional delivery among pregnant women in Zimbabwe. Results in the empty model show that women were 21% less likely (OR=0.79, 95% CI=0.69-0.91) to have delivered in an institution in ZDHS 2010/11 than in 2005/6. The results also show that there is variation in the likelihood of giving birth in an institution across the communities, and this variation was significant as indicated by significant variance in the log odds of reporting giving birth in an institute across communities (estimated= 1.199, S.E= 0.097, i.e Z-value of 12.36>2.58 at 1% sig, level). Based on the estimated variance partition coefficient (VPC), the intra-community correlation was estimated at about 27%. This significant variation indicates the extent of variability in institutional delivery which is attributed to unobserved community factors. This means that 73% of the variability in institutional delivery was as a result of the composition of individual level characteristics.

Regarding individual predisposing factors in model 1, the results show that place of residence, maternal age; marital status, educational attainment, religion, wanted child and parity are significantly associated with institutional delivery. Women in rural areas are 82% less likely (OR=0.18, 95% CI=0.15-0.22) than in urban areas to have an institutional delivery. Significantly, more women aged 25-29 years (OR=1.71, 95% CI=1.46-2.00) and those over 35 years (OR=1.67, 95% CI=1.36-2.05) were more likely than young women aged between 15-24 years to have an institutional delivery. Marital status was also found to be positively associated with place of delivery. Being married or widowed increased the odds of institutional delivery by 1.38 and 1.88 points respectively. The greatest odds of likelihood of institutional were observed among women with secondary or higher educational attainment. The estimates in this group indicated that women were 2.07 times (OR=2.07, 95% CI=1.84-2.32) more likely to have institutional delivered, compared with women with primary or no education. Being a member of Protestant and Pentecostal religious groups increased the odds of delivering in hospital by 1.67 and 1.45 times than women of catholic religion affiliation. Higher order birth decreases the odds of giving birth in a facility. For example, when a pregnancy is third or higher order, women were 64% less likely to give birth in facility than the zero or first pregnancy. Meanwhile, women who reported wanting a child later or not wanted were 23% and 20% less likely to give birth in a facility compared with those who reported wanting the child now. The inclusion of individual level predisposing factors decreased the community variance to 17% with the proportional change in the odds of delivering in hospital of 37% across communities explained by individual level predisposing factors.

Model 2 included enabling and HIV perceived risk/need factors. All enabling factors included in this model were found to be associated with institutional delivery. The results indicated a high correlation between institutional delivery and household wealth and the likelihood of giving birth in an institution increasing by the increase in household income. Women in the rich wealth quintile were 2.66 times (OR=2.66, 95% CI =1.94-3.66) more likely to give birth in an institute compared with women from the poorest households. Similarly, a woman from the medium wealth quintile was 1.65 times (OR=1.65, 95% CI=1.36-2.01) more likely than poorer women to have institutional delivery. Also women with medium to high levels of media exposure were 1.23 and 1.26 times more likely than women with low media exposure to have delivered in hospital. Women who reported having problems in accessing a health facility were 21% less likely to have institutional delivery than their counterparts. Perhaps, one of the

influential enabling factors relates to frequency of ANC visits. Significantly, women who reported having four or more ANC visits were 4.03 times (OR=4.03, 95% CI=3.22-5.04) more likely than those who reported they have four or less ANC visits to deliver in an institution.

Fewer HIV factors in model 2 appear to have influence an institutional delivery, antenatal HIV testing, confidentiality concern and knowing someone who died of HIV/AIDS in particular. The odds of institutional delivery were 2.78 times (OR=2.78, 95% CI=2.43-3.17) higher for women who were offered and accepted an HIV test during antenatal care, compared with their counterparts. Women who have confidentiality concerns and those who knew someone who died due to HIV were 1.19 and 1.25 times more likely than their counterparts to have institutional delivery. Having higher HIV stigma minimally decreased likelihood of giving birth in an institution by 3%. In model 2, employment status, women's autonomy, HIV status, and HIV awareness are not associated with institutional delivery care. After adjusting for all enabling and perceived risk/need factors, the odds of institutional delivery decreased substantially to 57% (OR=0.43, 95% CI=0.34-0.54) in the 2010/11 compared with ZDHS 2005/6. The model 2 variables reduced community level variation to 12%, with about 29% of proportional change in variation explained by enabling and HIV perceived risk/need factors.

At the community level, there is no evidence of an association between HIV stigma, awareness and prevalence in the community and delivery care. The pattern of an association between institutional deliveries observed in model 1 is also observed in model 2 and 3. After adjusting for all the independent factors individual predisposing factors (i.e place of residence, age, marital status, education, wanted child, religion) were significant explanatory variables for disparities in institutional delivery. These independent contributions of individual predisposing factors to institutional delivery were preserved after inclusion of all other factors. Enabling factors including household wealth, media exposure, access to health care and timing of ANC visits appear to be key determinants of institutional delivery, while on the other hand HIV factors including not having antenatal HIV testing, having confidentiality concern constraints and knowing someone who died because of HIV drive women to deliver in an institution. The final ICC remained 12%, suggesting that 88% of unexplained variation in institutional delivery is at individual level factors. The successive reduction in Deviance Information Criterion (DIC) from Model 0-3 demonstrates a better fit model over every previous one.

Table 6-5: Average odds ratios of institutional delivery from multilevel logistic regression models (95% confidence intervals are given in square brackets)

Parameters	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Predisposing factors						
Survey 2010	0.79	[0.69-0.91]*	0.43	[0.34-0.54]*	0.41	[0.32-0.53]*
Place of residence (urban)						
Rural	0.18	[0.15-0.22]*	0.39	[0.30-0.50]*	0.39	[0.30-0.50]*
Age groups(15-24)						
25-29	1.71	[1.46-2.00]*	1.68	[1.43-1.97]*	1.68	[1.43-1.97]*
35+	1.67	[1.36-2.05]*	1.77	[1.43-2.19]*	1.77	[1.44-2.19]*
Marital status(never married						
Married	1.38	[1.07-1.79]*	1.39	[1.03-1.88]*	1.39	[1.03-1.88]*
Widowed	1.88	[1.29-2.74]*	1.75	[1.19-2.57]*	1.75	[1.19-2.57]*
Divorced	1.10	[0.81-1.49]	1.11	[0.81-1.52]	1.11	[0.81-1.52]
Women's education (primary)						
Secondary	2.07	[1.84-2.32]*	1.69	[1.50-1.91]*	1.69	[1.50-1.91]*
Religion(Catholic)						
Protestant	1.67	[1.39-2.01]*	1.52	[1.26-1.84]*	1.53	[1.26-1.84]*
Pentecoastal	1.45	[1.20-1.74]*	1.30	[1.08-1.57]*	1.30	[1.07-1.57]*
Apostolic	0.92	[0.81-1.05]	0.94	[0.82-1.07]*	0.94	[0.82-1.07]
Wanted child (now)						
Later	0.77	[0.68-0.88]*	0.78	[0.68-0.89]*	0.78	[0.68-0.89]*
Not wanted	0.80	[0.66-0.95]*	0.77	[0.64-0.92]*	0.77	[0.67-0.92]*
Parity						
2	0.59	[0.50-0.70]*	0.60	[0.50-0.71]*	0.60	[0.50-0.70]*
3+	0.36	[0.30-0.44]*	0.38	[0.32-0.47]*	0.38	[0.32-0.47]*
Wealth (poor)						
Medium			1.65	[1.36-2.01]*	1.64	[1.35-2.00]*
Rich			2.66	[1.94-3.66]*	2.66	[1.94-3.65]*
Employment status(No)						
Yes			0.93	[0.83-1.06]	0.94	[0.83-1.07]
Media exposure (Low)						
Medium			1.23	[1.07-1.40]*	1.23	[1.07-1.40]*
High			1.29	[1.11-1.51]*	1.29	[1.10-1.51]*

Continued

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Table 6-5: continued

Decision making (husband)						
Women alone			0.98	[0.80-1.20]	0.98	[0.80-1.20]
Jointly			0.95	[0.80-1.14]	0.95	[0.80-1.13]
Perceived distance problem (no)						
Yes			0.79	[0.69-0.91]*	0.79	[0.69-0.91]*
Timing of ANC visits (no)						
1st trimester			3.85	[3.05-4.85]*	3.83	[3.14-4.67*
No. of ANC visits (no)						
4 plus			4.03	[3.22-5.04]*	4.14	[3.28-5.21]*
ANC-HIV test (no)						
Yes			2.78	[2.43-3.17]*	2.77	[2.43-3.16]*
HIV sero-status (negative)						
Positive			0.99	[0.85-1.17]	1.01	[0.86-1.19]
HIV awareness (low)						
Medium			1.15	[1.00-1.32]	1.14	[0.99-1.31]
High			0.85	[0.74-0.99]	0.84	[0.72-0.98]
HIV stigma(low)						
Medium			1.06	[0.87-1.28]	1.04	[0.86-1.27]
High			0.97	[0.79-1.19]*	0.95	[0.77-1.17]*
Confidential concern (yes)						
No			1.18	[1.05-1.32]*	1.18	[1.05-1.32]*
Knows someone with AIDS (no)						
Yes			1.25	[1.05-1.49]*	1.25	[1.05-1.49]*
Contextual Factors						
HIV awareness-gm					1.22	[0.73-2.04]
HIV stigma-gm					1.26	[0.71-2.24]
HIV prevalence-gm					0.68	[0.31-1.46]
Random effects parameters						
Community-level						
Variance (SE)	0.663	[0.074]*	0.465	[0.062]*	0.447	[0.061]*
(VPC)=ICC (%)		17		12		12
(PCV)(%)		37		29		0
Model fit statistics						
Cluster		679		679		675
DIC		6882		6882		6882

Model 0: empty model (survey year only included), ICC=27%

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6.3.5.2 **Multilevel logistic regression parameter estimates for professional delivery**

Table (6.8) presents the odds ratios (ORs) for professional delivery. The results in the empty model show that there is a variation in the likelihood of having a health professional delivery across communities. The variation was significant (estimated= 1.219, S.E= 0.131, i.e Z-value of 9.3>2.58 at 1% sig, level). Based on the estimated variance partition coefficient (VPC), the intra-community correlation was estimated at about 27%. This significant variation indicates the extent of variability in professional delivery attributed to unobserved community factors. This means that 73% of the variability in professional delivery was as a result of the composition of predisposing individual level characteristics. Similar patterns observed in institutional delivery are also observed in professional delivery. With all variables excluded, the results show that pregnant women were 20% less likely to have been attended by a professional in 2010/2011 than in 2005/2006 survey.

When all individual predisposing factors were included in model 1, the results show that pregnant women from rural areas were 83% less likely to have professional delivery than those from urban areas. Part of the rural disadvantage is explained by enabling factors, but even after controlling for enabling factors, rural residence is still associated with 62% lower odds of institutional delivery than urban residence. Significantly, older women aged 25-29 and 35 and above were 1.77 and 1.86 times more likely than young women aged 15-24 years to have a health professional delivery, respectively. Women with secondary or higher educational attainment were found to be 2.05 times more likely to have a professional health delivery compared with those with primary or no educational attainment. Furthermore, widowed women were 1.48 times more likely than never married to have a professional delivery. Women affiliated to the Pentecostal religious group were 1.48 times more likely than women in other groups to have professional health care delivery. Conversely, women who reported wanting the child later or not wanted were on average 24% less likely to have professional delivery than those who wanted the child now. Higher order birth decreased the odds of professional birth delivery. For example when a pregnancy is third or higher order parity, women were 66% less likely to have a professional health delivery than the first pregnancy. In comparison to model 0, the ICC decreased to 14 from 27% and the PCV was 26%, suggesting that the clustering of health professional delivery across communities was not as a result of the composition of the community by individual predisposing factors.

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Enabling factors such as household wealth, employment status, women's decision making, media exposure, and accessibility to a health care facility, timingof ANC visits and HIV perceived risk/need factors including antenatal HIV testing, HIV sero-status, HIV-related stigma, awareness, confidentiality concern and knowing someone who died because of AIDS/HIV were all added in model 2. The results suggest a high correlation between household wealth and professional delivery. Relative to women from poor households, the odds of having professional delivery were 1.70 and 2.76 times higher for women from medium to rich households, respectively. Similarly, having four or more ANC visits increases significantly the odds of professional delivery. The results reveal that women who had four or more ANC visits were 5.90 times more likely than those who did not to have professional delivery. However, women who reported having a big problem accessing health care were 19% less likely to have professional delivery compared with those who have easier access to health facilities. While individual predisposing and enabling factors appear to have greater influence in professional delivery, HIV perceived risk/need factors including antenatal HIV testing, awareness, confidentiality concern and knowing someone who died of AIDS/HIV are also key determinants of delivery care. Unlike in institutional delivery, HIV awareness is found to be associated with professional delivery, but not with HIV stigma. The results suggest that pregnant women with higher HIV awareness were 16% less likely than those with low awareness to have professional delivery. The effects of other HIV factors on professional delivery are comparable with institutional delivery. Antenatal HIV testing is significantly associated with professional delivery, such that those who were offered and accepted HIV testing were 2.75 times more likely than those who did not to have a professional delivery. Meanwhile, those who reported knowing someone who died of AIDS/HIV and those with no confidentiality concern about their personal HIV-related issues were 1.19 and 1.23 times more likely to have professional delivery compared with their counterparts. Compared to ICC in model 0 and 1, the ICC in model 2 decreased further to 12% and PCV from 30% to 26%. This suggests that 12% of variance in professional health delivery across the communities is explained by unobserved factors at the community level and 88% is explained by variance as a result of unobserved individual level factors. There is no evidence of an association between community level factors included in model 3 with professional delivery. This suggests that HIV awareness, stigma and prevalence in the communities where these pregnant women reside

do not influence their utilisation of professional delivery. The inclusion of model 3 factors did not have much effect on the ICC which remained stable at 12%.

Table 6-6: Average odds ratios of professional delivery from multilevel logistic regression models (95% confidence intervals are given in square brackets)

Parameters	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Predisposing factors						
Survey 2010	0.80	[0.69-0.92]*	0.46	[0.36-0.57]*	0.44	[0.34-0.56]*
Place of residence (urban)						
Rural	0.17	[0.14-0.21]*	0.38	[0.29-0.49]*	0.38	[0.29-0.49]*
Age groups(15-24)						
25-29	1.77	[1.52-2.07]*	1.74	[1.49-2.04]*	1.74	[1.49-2.04]*
35+	1.86	[1.51-2.28]*	1.98	[1.60-2.45]*	1.99	[1.61-2.45]*
Marital status(never married						
Married	1.28	[0.98-1.66]	1.27	[0.94-1.72]	1.27	[0.94-1.72]
Widowed	1.56	[1.06-2.26]*	1.43	[0.97-2.10]	1.42	[0.97-2.09]
Divorced	0.94	[0.69-1.28]	0.95	[0.69-1.30]	0.95	[0.69-1.30]
Women's education (primary)						
Secondary	2.05	[1.82-2.31]*	1.68	[1.48-1.89]*	1.67	[1.48-1.89]*
Religion(Catholic)						
Protestant	1.74	[1.45-2.09]8	1.59	[1.32-1.92]*	1.59	[1.32-1.92]*
Pentecoastal	1.48	[1.23-1.79]*	1.33	[1.10-1.61]*	1.33	[1.10-1.61]*
Apostolic	0.93	[0.81-1.06]	0.94	[0.82-1.08]	0.94	[0.82-1.08]
Wanted child (now)						
Later	0.75	[0.66-0.85]*	0.76	[0.66-0.87]*	0.76	[0.66-0.87]*
Not wanted	0.74	[0.61-0.88]*	0.71	[0.59-0.85]*	0.71	[0.59-0.85]*
Parity						
2	0.59	[0.50-0.69]*	0.59	[0.50-0.70]*	0.59	[0.50-0.70]*
3+	0.34	[0.29-0.41]*	0.36	[0.30-0.44]*	0.36	[0.30-0.44]*
Wealth (poor)						
Medium			1.70	[1.40-2.07]*	1.70	[1.40-2.07*
Rich			2.76	[2.00-3.80]*	2.76	[2.00-3.80]*
Employment status(No)						
Yes			0.96	[0.51-1.09]	0.97	[0.85-1.10]

Table 6-6 continued

Media exposure (Lowl)						
Medium			1.21	[1.06-1.39]*	1.21	[1.06-1.39]*
High			1.28	[1.09-1.50]*	1.28	[1.09-1.50]*
Decision making (husband)						
Women alone			0.95	[0.78-1.17]	0.96	[0.78-1.17]
Jointly			0.98	[0.82-1.17]	0.98	[0.82-1.17]
Perceived distance problem (no)						
Yes			0.83	[0.72-0.95]*	0.83	[0.72-0.95]*
Timing of ANC visits (no)						
1st trimester			4.03	[3.22-5.04]*	4.14	[3.28-5.21]*
No.of ANC visits (no)						
4 plus			5.89	[4.68-7.46]*	5.90	[4.82-7.24]*
ANC-HIV test (no)						
Yes			2.73	[2.37-3.10]*	2.75	[2.41-3.13]*
HIV sero-status (negative)						
Positive			0.99	[0.84-1.16]	0.10	[0.85-1.18]
HIV awareness (low)						
Medium			1.13	[0.98-1.30]	1.13	[0.98-1.30]
High			0.84	[0.72-0.97]*	0.84	[0.72-0.97]*
HIV stigma(low)						
Medium			1.03	[0.85-1.25]	1.01	[0.3-1.23]
High			0.91	[0.74-1.11]	0.89	[0.73-1.10]
Confidential concern (Yes)						
No			1.19	[1.06-1.33]*	1.19	[1.06-1.33]*
Knows someone with AIDS (no)						
Yes			1.23	[1.02-1.45]*	1.21	[1.02-1.45]*
Contextual Factors						
HIV awareness-gm					0.73	[0.33-1.51]
HIV stigma-gm					1.07	[0.60-1.92]
HIV prevalence-gm					1.06	[0.75-2.13]
Random effects parameters						
Community-level						
Variance (SE)	0.758	[0.097]*	0.544	[0.084]*	0.526	[0.083]*
(VPC)=ICC (%)		19		14		14
(PCV)(%)		30		26		0
Model fit statistics						
Cluster		406		406		406
DIC		4395		4276		4276

Model 0: empty model (survey year only included), ICC=27%

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6.4 Discussion

The main objectives of the chapter were to identify individual predisposing and community level determinants of institutional and professional delivery care focusing on predisposing, enabling and perceived risk/need factors (including the effects of HIV); and to compare factors associated with institutional and professional delivery care. Firstly, while interpreting the findings, the reader should bear in mind the potential limitation of the data used in the analysis. This relates to the problem of causality since the cross-sectional nature of the data makes it impossible to determine the time sequence of key events of interest, that is, whether the use of institutional and professional delivery preceded various risk factors. The cautionary note that correlation does not equal causation applies here. Overall the results show that institutional and professional delivery are not improving as indicated by lower odds in the 2010/2011 than in 2005/2006 surveys. This may be due to a number of factors relating to general decline in health care systems over the past two decades as a result of dollarization, lack of financial/human capital and material resources (Loewenson et al., 2012). Dollarisation was the shift from using the Zimbabwe dollar, whose value had collapsed due to hyper-inflation, to the US dollar as the national currency in 2009 (Makate and Makate, 2017). Dollarisation resulted in a multifaceted health care crisis due to a shortage of hard currency and these included a health care staff exodus, high hospital fees, shortage of drugs, and closure of important health care institutions and health promotion programs, including key maternal health waiting shelters for pregnant women which forms part of the maternal health care delivery in rural areas (Chirwa et al. 2015, Zimsta, 2011).

While the general decline observed in institutional and professional delivery care utilisation maybe associated with a general collapse of the economy and the health care system, results from this study have revealed variations in institutional and professional delivery among different populations. Measures of individual predisposing factors (i.e place of residence, age, marital status, religion, education, wanted child and parity) showed significant association with institutional and professional delivery care. The results suggest that on average the odds of women having institutional delivery were higher in urban than rural areas. This observation applies to professional delivery too. This relationship does not change when enabling and perceived risk/need factors are controlled for, suggesting that institutional and professional

delivery care are on average 61% lower for pregnant women in rural areas than those from urban areas. The evidence presented here supports the view that geographical accessibility might influence delivery care by predicting how fast and easily maternal health can be reached for primary delivery care or in the case of obstetric complications (Claudia, 2013). Almost all studies that investigated place of residence have reported lower delivery care in rural areas and among women with longer distances to a health facility (Faye and Niane, 2011; Moyer and Mustafa, 2013; Rockers et al., 2009; Sanga et al.,2017 ; Sharma et al., 2015). Place of residence might also be a proxy of socio-economic status as the urban population is often wealthier and better educated (Gregson et al., 2011). However, there is a suggestion that even when controlling for poverty and education, health in urban areas is better than in rural areas (Matthews et al., 2010). It was hypothesised that a proximity to affluence neighbourhood, which is more evident in urban than rural areas, may help to sustain neighbourhood social organization which in turn positively affects health (Golden et al., 2012). The authors have stated that the presence of affluent members of society may attract the attention of politicians, and government agencies, and help to win development in the community including maternal health services for delivery care. This may also provide a strong base for civic and other community-based activities such as HIV/AIDS campaign encouraging facility delivery (Bertrand et al., 2006). Thus, socioeconomic heterogeneity, one of the hallmarks of urbanisation, may bring benefits such as health care and education within the reach of everyone including the more disadvantaged urban residents (Shetty et al., 2010). The picture of an urban health advantage in Zimbabwe becomes more relevant when considering that pregnant women in rural areas must walk a substantial distance for delivery care, requiring significantly longer travel times to reach care than their counterparts in urban areas (Buzdugan et al., 2015). It was reported that, even if the women can afford to pay for delivery care in rural areas in Zimbabwe, they cannot always get to thefacility for delivery care, because distance makes it difficult to get to the facility when they need health services (Loewenson et al., 2012).

The age of pregnant women is another key individual predisposing factor that has been found to be associated with both institutional and professional delivery. The disparity by age groups resonates with other previous studies (Ahmed et al., 2010; Buzdugan et al., 2015; Gustav et al., 2014; Jayleen et al., 2016), confirming that being young is associated with low odds of institutional and professional delivery compared to older women. Such disparity has been attributed to older women having greater autonomy in accessing maternal health care than

young women (Moyer and Mustafa, 2013). Higher odds of institutional and professional delivery for older women may also mean that older women have benefited enormously from information and education campaigns as well as community mobilization efforts aiming to increase utilization of HIV and maternal health care services (Loewenson et al., 2012). As a result of stigma and discrimination against adolescent pregnancy, young mothers may fail to attend ANC care, which benefits pregnant women by receiving healthinformation such as pregnancy complications, mother to child HIV transmission, breastfeeding and the need for facility delivery (Murire et al., 2014). While health education has a tendency of improving health outcomes (Kevany et al., 2012), health education in Zimbabwe has tended to emphasize certain sexual and maternal health practices, including no sexual engagement at an early age (McCoy et al., 2014), and the emphasis on 'no early sex' campaign may have inadvertently prevented teenage mothers from accessing delivery care (Maruva et al. 2014). Generally, access to maternal care for young women can be difficult because they are despised and stigmatised and thus some prefer to deliver at home because they anticipate a negative provider attitude (Renjuet al., 2010).

The results show that being married and widowed were associated with higher odds of institutional delivery than never married women, but not for professional delivery. The finding that these women are more likely to have institutional delivery has been noted in other studies (Aremu et al., 2011; Buzduganet al., 2015;Eijik et al., 2006) This finding is likely to relate to stigma and discrimination that never married (usually teenagers) experience when they access maternal health care services (Ngome and Odimegwu, 2014). Researchers such as McCoy et al. (2015) and Perez et al. (2008) have pointed out that the health care system in Zimbabwe is tailor-made to suit married and older women and adolescentpregnancy is associated with wayward behaviour and is frowned upon even in health facilities in Zimbabwe, and this can act as a barrier to institutional delivery. Some studies have indicated that being married improves socio-economic status of a woman (Mucheto et al., 2011; Sibanda et al., 2013), making it easier for this group of women to pay for costs associated with institutional delivery care. Therefore, the finding that married women were more likely than never married women to have institutional delivery may relate to their improved household income (Jayleen et al., 2016). Being widowed was also found to be more influential for institutional delivery, probably via its influence on female autonomy and status (Kohler et al., 2014). Although widowed mothers are more likely to be living in female-headed households and may be in an

unfavourable economic position, they may enjoy greater autonomy than those who are married (Magadi, 2011). The finding that widowed women were more likely to have institutional delivery may mean that widowed women in Zimbabwe enjoy freedom of choice and have greater autonomy than never married women, who usually live under the control of their parents (Houweling et al.2007). The results suggestthat while marital status was associated with institutional delivery, there was no evidence of an association between marital status and professional delivery once other individual and community predisposing, enabling and perceived/need factors are controlled for. This may relate to poor quality of health care services delivery and this supports evidence presented in Table 6.1 indicating that 5% institutional delivery was not attended by a professional birth attendant in Zimbabwe. Muchabaiwa et al (2012) reported that pregnant women deliver their babies in a facility with no help of a professional assistant because of a lack of staff and equipment or they arrive very late in labour due to distance or problems of getting transport to health centres.

Education builds awareness of HIV and prevention methods (Chiu et al., 2008). There is evidence of better utilisation of health care services among individuals with higher educational attainment than those with primary or no education (Kayeyi et al., 2014; McCoy et al., 2014; Mitchel et al., 2010). The observed higher odds of institutional and professional delivery among women with secondary or higher educational attainment presented here corroborates with previous studies. This may be as a result of differences relating to higher income, better exposure to media and urban residence among women with higher educational attainment than those with no education , all of which are associated with institutional and professional delivery (Aremu et al., 2011; Babalola et al. 2009; Mopembeni et al., 2007; Wanjira et al., 2011). Women with higher educational attainment may also have better knowledge of HIV transmission modes and are more likely to deliver in an institution to protect their infants against mother to child HIV transmission if they know their HIV positive status or if they perceive themselves to be at risk of HIV transmission (Stephensen et al., 2013).

Religion is often considered as a cultural predisposing background factor and is thought to influence beliefs, norms and values in relation to access to health care service. Traditional religious groups including Catholics and the apostolic faith may avoid institutional and professional delivery due to cultural requirements of privacy; or because of specific requirements around delivery position or having to undergo health screening including HIV

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(Sahlu et al., 2014). Therefore the findings that women who are affiliated to protestant and Pentecostal faith groups were more likely to use delivery care services maybe credible, because they are more liberal and receptive to modern health care service, including antenatal HIV testing (Luginah et al., 2005).

Consistent with other studies (Fotso et al., 2009; Mrisho et al., 2007) the results show that women with lower birth order were more likely than women with higher birth order to have institutional and professional delivery care. This could be as a result of the fact that women with high parity relied on their experience from a previous pregnancy and therefore feel no need for care-seeking (Ngome and Odimegwu, 2014). Alternatively, some might have experienced difficulties in accessing delivery care due to constraints related to their other responsibilities for their other children and financial resources (Anyait et al., 2012).

This study found remarkable influence of enabling and HIV perceived risk/need factors on both institutional and professional delivery. Enabling factors relating to household wealth, media exposure, frequency of ANC visits and antenatal HIV testing are largely associated with higher odds of institutional delivery. These findings persisted even after taking into account HIV perceived risk/need and community level factors. This observed behaviour also applies to professional delivery. Significantly, household wealth was found to be one of the major enabling factors in institutional and professional delivery when all other factors are controlled for. For example, women from the richest households were 2.66 and 2.76 times more likely to have institutional and professional delivery, respectively. This result is expected since pregnant women are required to pay user fee and additional out of pocket payments for transport and medical supplies in Zimbabwe (Takarinda et al, 2016), inhibiting women from poor households from institutional delivery (Ahmed and Mukanga et al., 2010). The fact that the odds of home delivery are higher for women from poor households may also suggest that women of low socioeconomic status fear bad treatment at health facilities. Makate and Makate (2016) have pointed out that health workers often treat impoverished patients harshly compared with the treatment they give to richer and educated women. This finding means that better socioeconomic status enables pregnant women to overcome their socioeconomic barriers to institutional and professional delivery care such as transport, distance, lack of education and media exposure (Ahmed et al., 2010; Magadi et al., 2000), all of which are key factors that enable women to have access to health care services.

Not having access to media also impedes institutional and professional delivery (Tarekegn et al., 2014). Frequently, listening to radio, reading newspapers and watching television enables women to learn more about delivery risks, including mother to child HIV transmission during delivery as well as the availability of PMTCT programmes (Kevany et al., 2012; Sibanda et al., 2013). The result that women with higher levels of access to media were more likely to use delivery care could probably be due to high levels of access to information on importance of giving birth in a facility, location of such facilities, HIV awareness and the availability of PMTCT programmes among pregnant women in Zimbabwe, particularly those in urban areas. The study also found a negative association between delivery care and access to health facilities. Previous studies have suggested accessibility problems (distance, time and cost of transport to the nearest facility) influence delivery care (Faye et al., 2011; Fotso et al., 2009) and ability to pay for transport costs may be related to household wealth and decision-making (Titaley, 2010). The fact that problem of access to delivery care continued after household wealth and decision-making are controlled for suggests women's socio-economic vulnerability could result in home-based delivery. It could also be a result of impromptu labour, as some women do not know the actual date of delivery, especially among young mothers, and this along with money, distance and transport problems may act as a barrier to delivery care (Gabrysch et al., 2011).

Perhaps the most important finding in this chapter relates to the impact of antenatal care on delivery care. The results that those women who had four or more ANC visits and those who were tested for HIV during pregnancy were more likely to have institutional and professional delivery than their counterparts indicate that an integration of HIV and antenatal care maybe a critical pathways institutional and professional delivery uptake. The study findings show that ANC in the first trimester, four or more ANC visits and antenatal HIV testing were important factors enabling a women access to institutional and professional delivery, probably due to HIV information and education on pregnancy they receive during ANC visits (Ahmed et al., 2010). A study in Ghana found that women who frequent ANC were more likely to deliver in a facility than those who do not present at all or have infrequent visits as a result of their accumulation of knowledge of prevention of mother to child HIV transmission. In other words, access to antenatal care enables expecting mothers to learn more about delivery care, MTCT

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and associated programmes. The findings did support the hypothesis that HIV and ANC services can enhance delivery care.

The study had postulated, from the existing Health Belief Model (Iriyana, 2007), that measures of individual- level HIV perceived risk and need factors relating to HIV sero-status, awareness, stigma, confidentiality concern and knowing someone who died of HIV would affect women's behaviour in seeking institutional and professional delivery. Although, one might expect the odds of institutional and professional delivery care to differ by HIV-sero status, since previous studies have suggested that HIV positive women are more likely to be more aware of PMTCT due to frequent contact with health providers (Buzdugan et al., 2015), the results provided evidence that HIV-sero status does not have an effect on institutional and professional deliver care, once important individual-predisposing and enabling factors, as well as other HIV factors are controlled for. Given the widespread campaign advising HIV positive mothers to deliver in a health facility, one would expect HIV positive mothers to give birth in a facility at least if they know their HIV status (Uwakwe et al., 2016). However, in addition to their economic disadvantages, HIV positive pregnant women face further barriers to delivery care relating to stigma and discrimination (Jayleen et al., 2016; Turan et al., 2012). If they have not yet disclosed their HIV positive status to the community, HIV positive women may be reluctant to deliver in an institution to avoid involuntary disclosure, stigma and discrimination (Mucheto et al., 2011). The results found here that pregnant women with HIV's confidentiality concerns are less likely to have delivery care corroborates with the assertion that non-disclosure of HIV status is a key barrier to institutional and professional delivery (Gourlay et al., 2016; Turan et al.,2012). However, the result that HIV sero-status is not significantly associated with delivery care is not surprising given that significantly about 44% of pregnant women were not tested for HIV during antenatal care and were not aware of their HIV-sero-status.

There is no evidence of a significant association between HIV/AIDS stigma and professional delivery, but pregnant women with higher HIV/AIDS stigma are less likely to have an institutional delivery. Conversely, HIV/AIDS awareness is not an important factor for institutional delivery, but pregnant women with high levels of HIV/AIDs awareness are less likely to have a professional delivery. The results that higher HIV stigma is associated with low uptake of institutional delivery is consistent with previous studies (Buzdugan et al., 2015; Turan et al., 2012). Assuming that HIV-stigma is consistent with women's HIV-sero status,

pregnant women who find they are HIV negative during ANC or if they hold negative attitudes about people living with HIV, may not want to deliver in a facility in order to avoid the assumption that they are HIV positive or they can simply consider themselves at low risk of HIV transmission during labour and delivery (Martin-Herz et al., 2006). The results that pregnant women who hold higher perceptions of HIV-related stigma are delivering at home in Zimbabwe is not good news because pregnant women remain at risk of HIV-infection throughout pregnancy (Heemelar et al., 2014), thus more efforts should be focused on reducing HIV-related stigma among women who test HIV-negative during ANC. For those who test HIV-positive during ANC, other considerations, including her perceptions of the risk of mother-to child transmission of HIV or whether or not she has disclosed her HIV status to her husband and family, may be at the fore (Mlay et al., 2008; Turan et al., 2015). The importance of avoiding unwanted disclosure of HIV status in HIV-positive women's decisions about where to give birth has been reported in other studies (Manzi et al., 2014; Rochat et al., 2006). Other studies suggested that some HIV positive women prefer a home delivery or somewhere their status is not known to avoid involuntary disclosure (Mucheto et al., 2011). The fact that pregnant women who personally know someone who died of AIDS were more likely to have institutional and professional delivery than their counterparts of similar background who had no personal acquaintance with AIDS victims suggests that personal acquaintance with AIDS may have led to taking appropriate action to prevent mother to child HIV transmission (Magadi and Desta, 2011). Despite considerable random variation at the community level, the three community-level factors included in the models were not significantly associated with both institutional and professional delivery, possibly due to the fact that the majority of people in the communities are now aware of HIV and that HIV is now a treatable disease (Kayeyi et al., 2009). A qualitative study by Musheke et al (2013) found that pregnant women who have received information about HIV during antenatal care have reduced negative attitudes towards people living with HIV and need to prevent HIV transmission to their infants outweighs their perceptions of discrimination against HIV positive women in the community (Mason et al., 2015).

One of the specific objectives of this study was to compare the determinants of institutional and professional delivery care. A comparison of determinants of institutional and professional delivery suggests that overall risks factors among women who had institutional delivery are more or less similar, but with some exceptions (see appendix 6.1). One of the notable

differences pertains to the odds of professional delivery which are much greater among older women compared with institutional delivery. For example, pregnant women who are over 35 years of age are 1.77 times more likely to have institutional delivery than younger women below the age of 24 years, women above 35 years of age have 1.99 times higher odds for institutional delivery. More telling than other factors was the fact that marital status (i.e being married or widowed) was positively associated with institutional delivery, but not with professional delivery. Besides age and marital status, the biggest variation between institutional and professional delivery is observed among women who had four or more ANC visits. Although, pregnant women who have four or more ANC visits are more likely to have both institutional and professional delivery, the results show that more pregnant women in this group gave births with a professional assistant than have institutional delivery. Women who had four or more ANC visits were 5.90 and 4.14 times more likely to have professional and institutional delivery, respectively, with 1.76 points differences in favour of professional delivery. HIV stigma is associated with low uptake of institutional delivery, but not with professional delivery. The observed disparities underscore the need for program specific response in order to increase uptake of both institutional and professional delivery, given that the data indicates that professional delivery uptake is lagging behind institutional delivery care.

6.5   Conclusion

The multilevel results show significant variations in institutional and professional delivery care across the communities in Zimbabwe. About 12% and 14% of the total variation in institutional and professional delivery are attributed to community-level factors. These variations are partly explained by individual and community characteristics. Controlling for community HIV prevalence, awareness and stigma, the effect of individual predisposing, enabling and perceived risk factors remain the same for both institutional and professional delivery care. This may suggest that HIV factors relating to community prevalence, stigma and awareness do not explain the differences in delivery care that are observed. The models suggest that predisposing individual level factors (i.e place of residence, age, marital status, education, religion, parity and age at marriage) were the superior and important factors for predicting the institutional and professional delivery and did explain most of the variance, whilenthere was also a reasonable amount of variance explained by enabling factors (household wealth, media exposure, access to health care, HIV testing during pregnancy, timing of ANC, HIV stigma, AIDS awareness).The results provide further evidence that uptake of antenatal care services i.e

ANC in the first trimester, ANC HIV testing and four or more ANC visit are key important factors for delivery care. Given that having ANC anvisit in the first trimester, four or more visits and having ANC HIV testing were significantly associated with institutional and professional delivery, encouraging women to initiate ANC care and HIV testing during pregnancy may enable pregnant women to have institutional and professional delivery. More importantly perhaps, focus should be on reducing involuntary HIV status disclosure to families and friends who accompany pregnant women during labour and delivery. Asking permission from pregnant women to allow families and friends during delivery care may reduce stigma associated with involuntary disclosure. Finally, the study found little evidence of the impact of integrating HIV with delivery care, except the negative effectof HIV stiga on institutional delivery which may be as a result of pregnant women being concerned with how their information relating to HIV is held.

7 CHAPTER SEVEN: KNOWLEDGE OF HIV STATUS AND CONTRACEPTIVE METHODS CHOICE AMONG WOMEN IN ZIMBABWE

7.1 Introduction

Having argued in the previous chapters that HIV has an impact on maternal health care services; it is also possible to make a link between this chapter and the whole argument that HIV has an impact on contraceptive methods choice. This chapter thereforeexamineswhether knowledge of HIVserostatus has an impact on contraceptive methods choice among women. This is crucial for policy and may help by improving access to effective family planning for women who know their HIV status and do not wish to become pregnant; and to promote long-acting reversible and dual contraceptive method use strategies among women who require condoms for HIV/STI prevention. The chapter begins with background and literature review on contraceptive methods choice, and then moves on to explain the methodology that has been used, arguing that multinomial regression analysis is the most suitable approach to provide answers to the question of contraceptive method choice among women who know their HIV sero-status in Zimbabwe. The last part of the chapter presents results, discussion and conclusion.

7.2 Background and Objectives

The impact of knowledge of HIV sero-status on pregnancy intention and contraceptive choice is attracting considerable research interest in high-HIV burden SSA settings in this era of widespread antiretroviral treatment availability. The high rates of reported unplanned pregnancy and poor contraceptive choice in Zimbabwe underscores an urgent need for better access to effective contraceptive methods for women who know their HIV sero-status (ZNFPC, 2016). While there is suggestive evidence that knowledge of HIV sero-status in some parts of SSA countries is associated with more frequent condom use for disease prevention and effective contraceptive methods for unplanned pregnancy, little is known about contraceptive choice among women who know their HIV status in Zimbabwe. With an increasing rate of HIV testing and receipt of test results, it is possible to examine whether knowledge of HIV serostatus has an impact on contraceptive method choice among women, and this may help by

improving access to effective family planning for women who know their HIV status and do not wish to become pregnant; and to promote long-acting reversible and dual contraceptive method use strategies among women who require condoms for HIV/STI prevention in Zimbabwe.

The Zimbabwe Demography and Health survey (2010) indicated that 38% of women were ever tested for HIV and of this 96% received their HIV test results. Women who know their HIV status have better contraceptive decision-making regarding safe sex and choice of birth control methods that prevent both HIV transmission and unplanned pregnancies (Church et al., 2014, Johnson et al., 2009). Thus, the decision on contraceptive methods choice is paramount, particularly in countries with higher HIV prevalence rates such as Zimbabwe. Women who choose not to use effective contraceptive methods are at risk of unplanned pregnancies and HIV transmission (Habte and Namasasu, 2015). While a woman's socio-economic situation may influence desire to have more or fewer children (Askew and Berer, 2003), HIV may have a role in the reproductive preferences in countries with high HIV prevalence. Magadi and Agwanda (2010) have stated that HIV may have a role in the reversal of reproductive preference for women who perceive themselves to be at risk of HIV infection because they anticipate giving birth to a child who may be at risk of mother to child HIV transmission. Such women, including those who have personal acquaintance with HIV victims, particularly if they witnessed death of a child as a result of perceived HIV are more likely to adopt more permanent contraceptive methods to avoid unintended pregnancy (Laher et al., 2009). They may also use condoms if they think they are at risk of HIV transmission themselves (Magadi and Magadi, 2017). However, behaviours may also be dependent on whether or not a woman knows her HIV sero-status (Taulo et al., 2009). While extant literature has shown a positive relationship between women's knowledge of their HIV positive status and increased contraceptive use (Elul et al., 2009, Mayondi et al., 2016, Johnson et al., 2009, Keogh et al., 2012), it is not yet clear to what extent women who know their HIV positive status may have contraceptive needs that differ from those who are HIV negative in the Zimbabwean context. There is also a lack of information regarding groups of women after HIV diagnoses which are more likely to use effective contraceptive methods to prevent unplanned pregnancy or condoms to prevent HIV transmission. Literature reviewed showed that knowing your HIV status after diagnosis may temporarily alter women's fertility intention in favour of delaying or limiting birth (Hoffman et al., 2008; Heys et al., 2009). Johnson et al. (2009) analysed data from eight countries in Sub-

Saharan Africa (SSA) and found that women who knew their HIV positive status were more likely to limit childbearing by increasing contraceptive use. Similar to Johnson et al. (2009) studies by Elul et al. (2009) and Heys et al. (2009) found that HIV positive women were less likely to desire for more children than HIV negative women; hence, the odds of using long-term methods was higher among HIV positive women. However, in Rwanda, contraception use among both HIV positive and HIV negative women desiring to avoid pregnancy was low (Elul et al., 2009) suggesting that future needs for family planning for both HIV positive and HIV negative women is high. In Zimbabwe, where 13% of women are infected with HIV (ZDHS, 2010/11) and antiretroviral treatment (ART) coverage is high (77%) (UNAIDS, 2014), access to a variety of contraceptive options is important because HIV positive women may change their childbearing plans in response to learning their HIV status (Habte and Namasasu, 2015) and in response to HIV treatment (Farahani et al., 2014). In fact, from a reproductive health-based and rights-based perspective, all women should have access to their methods of choices for avoiding unwanted pregnancies, particularly for HIV positive women who have particular needs for contraception to avoid unintended pregnancy, prevent the transmission of the infection to their partners and to eliminate the risk of mother-to-child HIV transmission (McCoy et al., 2014). Despite the protective effect of contraception against adverse sexual and reproductive health outcomes among HIV positive women, HIV negative women are also expected to prevent unwanted pregnancies and HIV infection (Mumah et al., 2014). Prevention strategies among HIV negative women include condom use, sexual abstinence, and the use of most effective methods including long-term methods (Mumah et al., 2014). However, to sum it up, all women are simultaneously at risk of both unintended pregnancy and HIV infections (Reynolds et al., 2013). Therefore, all contraceptive methods should be made available to all women such that they make appropriate choices and align their choices with their reproductive intentions (Mayondi et al., 2016).

Typically, the rationale for choosing a particular contraceptive method is dependent upon its motivation, effectiveness, availability and whether or not it will be used for disease prevention such as HIV and STIs (Mumah et al., 2014). The choice of these methods may also vary by stage of a woman's reproductive life course (Warren et al., 2013) and it is postulated that women use more effective methods such as permanent methods if they have completed their fertility desires (Reynolds et al., 2008). A study by McCoy et al (2014) found out that women who had not reached their fertility intention and were sterilised regretted doing so. Due to the

varying effectiveness of different contraceptive methods, contraceptive decision-making is a critical health behaviour that directly affects an individual's risk of unplanned pregnancy and HIV infection (Yeatman, 2009). Ideally in the context of high levels of HIV infection, a dual methods approach (i.e combining condoms with highly effective contraceptive methods) should be promoted (UNAIDS, 2012). Using a condom alone may pose a challenge due to high failure rate for pregnancy and HIV prevention (Bogale et al., 2010) and this may be due to low levels of correct and consistent use (Elul et al., 2009). Like condoms, the contraceptive pill method was found not to be reliable due to poor adherence (Church et al., 2014). Several longitudinal studies of HIV positive women found higher use of short-acting methods (Hoffman et al., 2008; Nanda et al., 2011), but their contraceptive use was not sustained (Hoffman et al., 2008). Hence, unintended pregnancy could be high in Zimbabwe, where the available methods are mainly short-acting requiring daily adherence (Moyandi et al., 2016).

Long-term methods such as implants and sterilisation are credited for eliminating the need for daily or pre-act intercourse adherence that is normally associated with the use of pill and condoms (McCoy et al., 2014; Warren et al., 2013) but may not be appropriate for HIV positive women who may change their fertility intention due to improved antiretroviral treatment after they have HIV post-test counselling (Hoffman et al., 2008). On the contrary, long-acting reversible contraceptives are highly effective in the long-term and useful for women who want to limit childbearing (Kaida et al., 2011). Examples of long-term methods are the intrauterine device (IUD) and the birth control implant. Such long-term methods offer women some form of reproductive control that does not require sexual negotiation that is required with condom use (Matthews et al., 2013). However, long-term methods are less accessible than condoms and other less effective methods (abstinence, withdrawal) which do not require a prescription from a health provider (Church et al., 2014). Also, in the context of HIV, hormonal methods such as IUD are not frequently provided in the public health sector due to safety concerns, but Curtis et al (2009) and Stringer et al (2007) concluded that hormonal contraceptive methods are not associated with disease progression and HIV transmission to uninfected partners. Another problem that is associated with the use of long-term methods relates to provider skills in the administration of implants and other permanent contraceptive methods. Previous studies found that long-term methods are sometimes not recommended by healthcare providers or accessible to women with HIV due to limited knowledge and skills of health care providing HIV services and lack of operational guidelines (Moodley and Cooper, 2014).

Literature reviewed suggests that the woman's knowledge of her own HIV status plays a significant part in the choice of contraceptive methods (Church et al., 2014; Johnson et al., 2009; Mumah et al., 2014). Although some studies found no difference in family planning unmet needs for both HIV positive women and HIV negative women, the decision for contraceptive choice among HIV positive women may be complex and can be affected by many factors. While some studies find no difference in methods choices between HIV positive and HIV negative women (Elul et al., 2009), others suggest high condom use among women who know their HIV positive status following a diagnosis (Mayondi et al., 2016; Johnson et al., 2009; Heys et al., 2009), suggesting a desire to prevent HIV transmission to their partners (Mayondi et al., 2016). Mumah et al. (2014) analysed data from 13 countries in SSA countries and found that hormonal method use was high among women who knew their HIV positive status. Condom use was found to be three times higher among HIV positive women than HIV negative women in Zambia (Elul et al., 2009), while injectables were more popular among HIV positive women in Tanzania (Keogh et al., 2012).

In Zimbabwe, mitigating the HIV epidemic through the family planning programme has been one of the government's long-term goals (UNAIDS, 2012). Specifically, there is an increasing funding and scaling up of the HIV and family planning integrated program at the health centres across the country. The outreach efforts target hard to reach women who may be at risk of HIV and unintended pregnancies (Washington et al., 2015). Women who visit family planning health care centres are offered options from which they choose their most appropriate contraceptive methods. Other programmes such as Prevention of Mother-to-Child Transmission Programmes (PMTCT); National Behaviour Change Programme (i.e Abstinence, Be faithful, and Condom use (ABC); and Voluntary Counselling and Testing Services programs were also implemented with the aim to reducing HIV infection. These programs run health campaigns promoting condom use and encouraging HIV testing. They also promote the use of more effective contraceptive methods such as long-acting contraceptives.

Figure 7-1: Percentage distribution of method choice among women who ever used any contraceptive methods (N=13698)
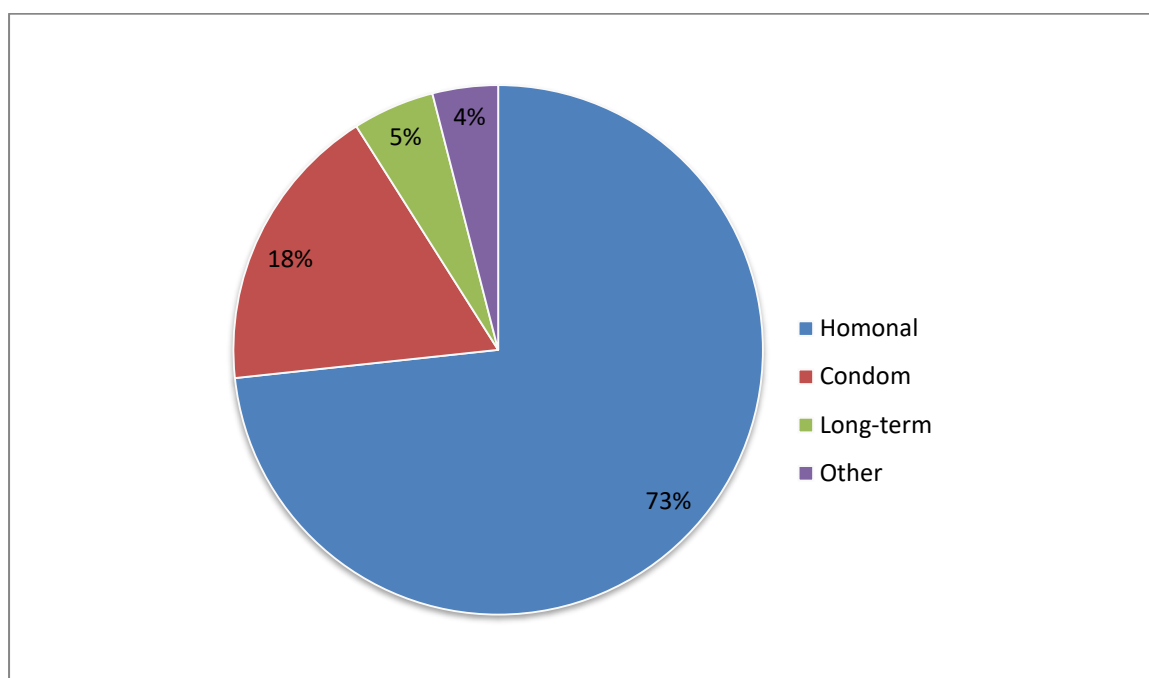
Source: Zimbabwe Demography and Health Surveys (2005/6; 2010/11)

Despite the government's effort in promoting the use of family planning services, the use of long-term contraceptive methods and condoms is very low in Zimbabwe. As shown in fig 7.1 above, it is estimated that 73% of women using contraceptives in Zimbabwe are currently using hormonal contraceptive methods (pill and injectables), 18% are using condoms (male and female condom), 5% using long-term methods (mainly implant/norplant and sterilisation); and other methods (4%). This is worrisome, because in the context of HIV, women are encouraged to use condoms concurrently with other effective methods for dual protection i.e prevention of HIV and unwanted pregnancy (Mumah et al., 2014). The low use of condoms and use of less effective contraceptive methods has been identified as an important factor for high rates of unplanned pregnancy and HIV in Sub-Saharan African countries (Church et al., 2014, Johnson et al., 2009, Mumah et al., 2014). Relative to hormonal and long-term methods, studies have noted low typical condom use, perhaps due to the fact that it must be worn at every sexual encounter and requires male cooperation (Cleland and Ali, 2009). Despite the benefits of long-term methods and condom use, these methods are less frequently used in Zimbabwe.

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Studies have argued that choice of contraceptive methods is dependent on socioeconomic status or community environment depending on the level of analysis. On the role of social and economic development, studies have shown that women from more affluent communities will adopt smaller family sizes and seek out permanent contraceptive methods when they achieve their fertility desires (Kakaire et al., 2010; Heys et al., 2009; Laher et al., 2009). On the contrary, women from poor communities may react slowly to societal changes that govern fertility behaviour (Nattabi et al., 2009). Given that HIV prevalence is said to be higher among richerpeople than poorer people, it may be that some factors that influence contraceptive methods choice among HIV positive women may differ from HIV negative women (Mumah et al., 2014).

While several studies investigating the behaviour of women who know their HIV status towards choosing contraceptive methods have been conducted in Sub-Saharan African countries (Magadi, 2016; Habte and Namasasu, 2015), they have not broken down the methods into clusters according to their relative strength in preventing HIV infection and unintended pregnancy. To gain more in-depth knowledge of the determinants of contraceptive choices among women who know their HIV status, this study assumes the decision-making processes of family planning choices is a two-way process. A woman who knows her HIV serostatus is confronted with choice between pregnancy prevention and HIV prevention, hence the choice of four contraceptive clusters in fig 7.1. The limitation of previous studies addressed here is the assumption that contraception choice can be a yes or no answer, without taking into account the possibility of parallel branches of contraceptive methods available (Johnson et al., 2009). The strength of the current study is that it assumes that the choices of parallel contraceptive methods might be influenced by different determinants. Conditionally on choosing contraceptive methods, the study assumes that if a woman opts for hormonal methods, her second options consist of either long-term, condom or other methods (Mayondi et al., 2016). This way it is possible to compare the differences in the profiles of women who make different contraceptive methods choices. To shed more detailed light on what is happening in Zimbabwe regarding contraceptive methods choice after HIV diagnosis, the study used multilevel multinomial logistic regression and by using this technique, the study was expected to separate individual from community determinants of each particular contraceptive methods choice in Zimbabwe.

The study fits in with the research on contraceptive choices among HIV positive women which has been expanding since its beginning in the 2000s, for example (Magadi, 2016, Mayondi et al., 2016, Johnson et al., 2009). This study therefore investigates:

- The association between knowledge of HIV sero-status and contraceptive method choice
- Other (individual and community level) determinants of contraceptive method choice

7.3 Data and Methods

7.3.1 Data source

The data come from the 2005-6 and 2010-11 Zimbabwe Demographic and Health surveys, which included HIV testing. A total of 18078 women were interviewed in the two surveys and 13028 were eligible for HIV test. For the purpose of this chapter, all women who reported having been previously tested for HIV, received test results, and were currently using any form of contraceptive methods were included in the analysis. Women who had been declared infecund, those who were pregnant, and non-respondents to the survey's HIV test were excluded from the sample. This yielded a final sample of 3757 women of whom 13.5% (506) were confirmed HIV positive and 86.5% (3251) HIV negative. The final sample represents women who knew their HIV serostatus and were using contraceptives at the time of the surveys. To create the analytical file, HIV serostatus data was merged with the woman's individual file which also contained household variables. Women who were not using any methods of contraceptives were excluded to avoid modelling the differential decision processes of choosing to adopt contraception and choosing a specific contraceptive method (Mayondi et al., 2016) and this is in line with Heys (2009) who stated that inclusion of non-users in the models obscures the variation in factors associated with use of each type of contraceptive method. Therefore, the models in this study are largely driven by the decision to adopt any form of contraception.

7.3.2 Methods of analysis

The analysis of the determinants of choice of each particular contraceptive method was initially carried out by bivariate and later by multinomial logistic regression analysis. To begin with, it is plausible that some factors that drive knowledge of contraceptive methods and hence demand for a particular method may operate at the community level. For example, cultural beliefs around childbearing tend to be localised. Also contraceptive methods choice in the same community may be correlated due to unobserved factors such as the availability of specific methods or community's perception of specific methods (Magadi and Curtis 2003). In this case, a multilevel multinomial logistic regression modelling technique for measuring the separate influence of individual level correlates and community effect was used in order to account for unobserved community level determinants of contraceptive methods choice. The multilevel multinomial logistic regression applied two-level models that take into account the woman-level 1 and the unobserved community-level 2 effects. These models estimated the probability of choosing a particular method holding other factors constant. Details of the multilevel multinomial logistic regression used are provided below.

7.3.2.1 Multivariate multilevel multinomial logistic regression analysis

The multinomial regression analysis adopted here expands from the binary logistic regression discussed in chapters 4-6. We have seen how logistic regression models were used in a situation where we have a binary response outcome, for example whether or not an individual has been tested for HIV (ref chapter 4). Where we have more than two response categories we make use of multinomial models. In this chapter the response variable has more than two responses and the model was built in stages. The model sees individual women as being nested within communities.The general equation of the random intercepts two-level multinomial Logistic regression model used for analysis of determinants of contraceptive methods choice therefore takes the form:

$$log \left[\frac{\pi_{ij}^{(s)}}{\pi_{ij}^{(t)}} \right] = \beta_0^{(s)} + \beta_1^{(s)} X_{1ij} + \beta_2^{(s)} X_{2ij} + \ldots + \beta_k^{(s)} X_{kij} + u_j^{(s)}, \quad s=2,3,4.$$

where: $\pi_{ij}^{(s)}$ denotes the probability of using a particular contraceptive method (s) (i.e. long-term methods=2, condom=3 or other=4) for woman i, in the jth community ; $\pi_{ij}^{(t)}$ is the probability of

using hormonal methods (t=1 for hormonal methods used as reference category) for woman i, in community j; $\beta_0^{(s)}$ are the regression intercepts/constant for contraceptive methods s; $X_{(1-k)ij}$ are 1-k explanatory variables defined at woman or community level; $\beta_{(1-k)}^{(s)}$ are the associated usual regression parameter estimates for contraceptive methods choice (s); and $u_j^{(s)}$ are the community-level residuals for contraceptive methods choice (s). These are assumed to be normally distributed with mean zero and variance $\sigma_u^{2(s)}$. The community random effects may be correlated across contraceptive methods choice categories: covariance $(u_j^{(s2)}, u_j^{(s3)}) = \sigma_u^{(s2, s3)}$, (s2=long-term, s3=condom; and s4=other methods). (Rasbash et al. 2016).

7.3.2.2 **Fixed and Random Effects**

The model was estimated initially by IGLS and then by Markov chain Monte Carlo (MCMC) estimation with an initial burn-in of 500 simulations followed by 5k simulations. Fixed effects are the level-1 and level-2 covariates, expressed as relative risk (RR) and 95% confidence intervals (95% CI). The random effects are the measures of variances in contraceptive methods choice across communities (level-2). The ratio of the variance at the community level to the total variance is called inter-class correlation coefficient (ICC), which is a tool of measuring the degree of homogeneity within units such as households or communities. According to Browne (2014) the ICC measurements are used to gauge whether contextual variables have any effect on the outcome. The results of random effects are expressed as variance partition coefficient (VPC), which is in this study equal to the ICC. The models were estimated in MLwin 2.36 (Rasbaschet al.2016), by bayesian methods using Markov chain Monte Carlo (MCMC) estimation (Browne. 2017).

7.3.3   Outcome variables

7.3.3.1   Contraceptive choice

The dependent variable is the choice of the contraceptive methods. This comes from the ZDHS question which asks a woman; *which methods are you currently using*? This question solicited multi response (not using any, intrauterine devices, implants and sterilization, pills, condoms, spermicides, injectables, traditional methods). For the purpose of this study, those who reported not using any method were excluded. The remaining were classified into four categories: hormonal methods (injectables, pill); long-term methods (sterilisation, implants/ IUD); condoms (female and male condoms); and other methods (mainly withdrawal, abstinence). This grouping was informed by previous studies that suggested that hormonal methods are easily accessible (Bertrand et al., 2014; Johnson et al., 2009) while long-term methods are effective for HIV positive women and that condoms prevent both unplanned pregnancy and HIV infection (Habte and Namasasu, 2015). The 'other methods'- category was as a result of small sample sizes in other contraceptive methods used by women.

7.3.4   Key predictor variables.

The key predictor variable in this study is the women's HIV status, and knowledge of their HIV status. To create the key variable, HIV biomarker data collected in the surveys were combined with the individual file. The variable HIV status and knowledge of HIV status was created from a sample of women who responded to questions about their HIV testing history and whether they received their HIV testing results following previous testing. This was deemed important as it may have influenced the respondent's contraception behaviour (Kurewa et al., 2011). The two categories were: 1=HIV positive and knew the results; 0=HIV negative and knew their results.

7.3.5   Selection of control variables

Control variables were selected and classified into two groups relating to predisposing individual level factors such as woman's age, place of residence, marital status, religion, educational attainment of the woman, parity, household wealth, exposure to family planning messages, multiple sex patners; HIV factors (i.e awareness, stigma and knowing someone who died of HIV/AIDS); and predisposing community level factors such as HIV prevalence,

poverty and family planning media exposure. The choice of individual level factors was informed by previous studies on factors influencing contraceptive use. Because the topic of how community context influence contraceptive method choice is a relatively new area of research, there is presently a lack of theory to provide a framework for selecting community level variables included in the models. The variables were initially screened for problems of multicollinearity before being included in the regression models. These variables were selected for the following reasons:

7.3.5.1 Predisposing individual level factors

HIV awareness: HIV awareness may be associated with reduced desire to child bearing (want no more child) to prevent perceived risk of mother to child HIV transmission (Magadi and Agwanda and Obare, 2007). Therefore, it is postulated that women who know their HIV sero-status who have comprehensive knowledge about how HIV is transmission and prevented are more likely to use condoms and long-term methods to prevent both childbearing and HIV transmitted to their infants, particularly if they know their HIV positive status. The variable was derived from a series of questions on knowledge of how HIV is transmitted and ways to avoid infection. The resulting index is classified into quartiles and the higher the index, the higher the knowledge

HIV stigma: Motivation for preventing childbearing may stem from an individual's attitude towards pregnant women living with HIV (Johnson et al., 2009). Women may choose to stop child bearing if they observe stigma and discrimination towards mothers who are perceived to be HIV positive in the communities (Church et al., 2014). It is therefore expected that women who observe stigma and discrimination against people living with HIV are more likely to use more effective contraceptive methods to prevent child bearing. The variable is derived from a set of four DHS questions on HIV/AIDS stigma. The resulting score is classified as '0' low, '1-2' medium and '3-4' high

Knowing someone who died of HIV/AIDS: like stigma and discrimination, personal experience with death related to HIV/AIDS, particularly death of a child perceived to be HIV positive may affect whether or not the mother wants to have another child (Turan et al., 2008).In such circumstances, women who know their HIV status who have witnessed death

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that can be attributed to HIV/AIDS may be more likely to adopt effective contraceptive methods to prevent child bearing. The variable is a single item derived from a DHS question relating to whether or not the respondent personally knows someone who has or died of HIV/AIDS. The variable was Coded 1=if respondent personally knows someone who has or died of HIV/AIDS; 0=otherwise.

Woman's age: This study proposes that an increased age comes with an increase in the use of more effective contraceptive methods such as long-term methods for delaying and limiting child birth (Johnson et al., 2009) and condoms for HIV prevention (Church et al., 2014; Wagner and Wanyenze, 2013). This hypothesis agrees with other studies which postulate that with increased age and an improved knowledge of HIV, there is an increased likelihood of choosing long-term and condom contraceptive methods (Reynolds et al., 2008). Due to the importance of knowledge of HIV and the availability of contraceptive options (including long-term and condoms), it is highly likely that older HIV positive women who know their HIV status may choose long-term methods and condoms relative to hormonal methods. For younger women, regardless of their HIV status and their knowledge of HIV status, research has shown that they may prefer reversible contraceptive methods in anticipation of future childbearing (Mumah et al., 2014) or condoms particularly to prevent both unplanned pregnancies and HIV infection (Nattabi et al., 2009). In the DHS, age is a categorical variable classified into five groups ranging from 15-49 years of age. However, for the purpose of this study, age is categorised into three groups: 15-24 coded as 1; 25-34 coded as 2; and 35 and above was coded as 3, this was due to the fact that some of the categories such as 15-19 and in the original data had few cases to allow for a meaningful analysis.

Parity: in the DHS, the number of children ever born is a continuous variable. Just as with the preceding variable, this variable was categorised into three groups: 0-1 births coded as 1; 2 births as 2; and 3 or more birth order as 3. Generally, the number of births a woman has is likely to result in the need to prevent further pregnancies (Magadi, 2016). Women with higher order births are more likely to seek out more long-term methods than women with lower order parity and more reliable methods are adopted after a subsequent childbirth regardless of HIV status (Gray et al., 2005 cited in Reynolds et al., 2008). It is postulated that, once a woman has had a first birth, the priority shifts towards birth spacing, primarily for economic reasons as more children affect caring for other offspring (Laher et al., 2009). The ability to delay and

space childbearing is crucial to women's social and economic advancement (Shelton and Burke, 2016); therefore, women with higher order parity are more likely to use irreversible methods.

Education: Extant literature suggests that increased education usually translates into the use of modern contraceptive methods (Bertrand et al., 2014). However, in the case of contraceptive choice, research have shown that because the knowledge required for contraceptive choice is highly specific and not widespread, it is possible that education may not predict contraceptive choice (Mumah et al., 2014). Also, due to the fact that family planning issues are not taught in the university in Zimbabwe, it is likely that graduates from secondary or higher probably do not have more knowledge of family planning issues than women who did not attend secondary or higher. This variable was created by regrouping educational attainment categories in the DHS into two categories; coded as '1' primary and below; and 2 secondary and above.

Marital status: Research suggests that marital status matters most in predicting women's contraceptive methods choice. Generally, married women may elect sterilisation only when they have a strong aversion to future births (Johnson et al., 2009). On the other hand single women, particularly young women who are ambivalent and uncertain of their future fertility desire are not likely to use long-term methods (Dasgupta et al., 2015). When HIV comes into play, the motivation for the choice of contraceptive methods becomes complicated regardless of the woman's marital status. For married women who know their HIV-positive status and who have not achieved their desired number of children, motivation to achieve pregnancy and to prevent HIV re-infection should be their primary concern (Church et al., 2014) leading to continued use of hormonal methods or other reversible methods and inconsistent use of condoms. Among married women who know their HIV-positive status and who have achieved their fertility desire, motivation to prevent both pregnancy and HIV re-infection should be their predominant concerns and this should lead to sterilisation and condoms (Johnson et al., 2009). However, research has shown that condom use within marriage is highly unlikely particularly among HIV positive women due to disclosure concern (Akinyemi et al., 2010), feeling of rejection (Laher et al., 2009), abuse and concern for partner compliance with condom use (Church et al., 2014; Rosenberg et al., 2013). For older divorced and widowed HIV positive women, the motivation of avoiding infecting sexual partners is their greatest concern (Babalola et al., 2012) and their goal is likely achieved with condom use, while pregnancy prevention is

most likely to be achieved by using long-term methods. On the other hand, unmarried women usually don't plan for sexual encounters -they may engage in sexual intercourse, but do not want to think of themselves as sexually active, leading to condom use and traditional methods that are accessible (Do and Kurimoto, 2012). Marital splits and altered relationships may lead to renewed desire for offspring from new unions, and reversal of sterilisation contraceptive methods (Church et al., 2014).

Religion: Aside from their own HIV status, Catholic and Protestant followers tend to have higher likelihood to use modern contraceptive methods than traditional and apostolic faith followers (McCoy et al., 2014). This behaviour has been interpreted as a consequence of greater social diversity within mainstream religious groups that facilitates change of behaviour towards health care services utilisation (Muchini et al., 2010). While the conventional religious groups such as Catholic, Protestant and Pentecostal churches have a propensity of adopting modern contraceptive methods, Apostolic and traditional faith groups are more likely to use traditional methods such as withdrawal and abstinence rather than the effective methods (Singh et al., 2009) even after their HIV diagnosis, due to lack of exposure to available contraceptive methods and HIV messages that they do not embrace in their practice. A categorical variable based on religious affiliation is included in the analysis

Wealth: Higher income is believed to have a positive effect on contraceptive choice, possibly due to the fact that increased income allows for easier access to more expensive and effective methods such as a long-term methods (Dias and Oliveira, 2015). When HIV status and fertility desire were controlled for, (Dias and Oliveria, 2015) found women in the richest wealth quintiles in 13 countries in Sub Saharan African countries were more likely to choose long-term methods than women in the poorest wealth quintile. This is due to the fact that long-term methods are more expensive than short-term and are usually provided at clinics in Africa (Rademacher et al., 2016). Although research suggeststhat wealth initially increases risk for HIV acquisition it later becomes protective (Bertrand et al., 2014) such that HIV-positive women who are wealthier are more likely to afford the cost of adopting long-term methods, than poorer HIV positive women. This variable is important for assessing inequalities in the reported unmet need for particular contraceptive methods among women who know their HIV status. In the DHS, an index of household economic status is constructed based on a household's possession of consumer durables such as electricity, television, bicycle, and car.

The index also includes the quality of housing (roof, walls, and floor), as well as a household's access to amenities such as water, sanitation, and so on. The wealth index is a categorical variable, with the following five categories: lowest wealth quintile (poorest); middle (middle); and the highest wealth quintile (richest).

Family planning media exposure: This study incorporates the family planning messages exposure variable. Family planning messages incorporate HIV prevention as a motivation to use contraception. In Zimbabwe, one of the most marked changes that occurred coincided with ashift in family planning practice that has been the increase in the exposure to family planning messages through radio, TV and newspapers in the general population (ZDHS, 2010). It is hypothesised that higher levels of exposure to family planning messages are associated with a lower probability of traditional methods and higher probability of modern use. All other methods provide no protection as only condoms offer protection against HIV/AIDS transition (Stringer et al., 2007). In addition to exposure to general family planning messages through media channels, HIV positive women receive extra contraceptive counselling, particularly on persistent condom use (Habte and Namsasu, 2015). Therefore, it is also expected that exposure to the condom use media campaign will be associated with a lower probability of hormonal, long-term and others methods, and a greater use of condoms among HIV positive women who know their status. Also, the magnitude of the increase in exposure to family planning messages in Zimbabwe (ZDHS, 2010), coupled with the prevalence of HIV/AIDS prevention programmes such as Abstain, Be faithful, use of condoms (ABC) aimed at individual behavioural change (Kaida et al., 2011) have provided a compelling reason to study the effects of exposure to family planning messages on contraceptive method choice in Zimbabwe. This variable was derived to score a woman according to the number of family planning messages she received, indicating how familiar a woman is with family planning services. It is the sum of three variables indicating the woman's access to family planning messages through radio, television and newspapers. The variable was categorised into three groups coded as: 1=low, 2=medium and 3= high.

Place of residence: Research on contraceptive methods choice based on women's knowledge of her own's HIV status and their place of residence has not been prominent. However, irrespective of their HIV status women in urban areas were found to be more likely to use condoms than hormonal contraceptive methods compared with women in rural areas (Magadi,

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2016). In the context of Zimbabwe, HIV prevalence is higher among women in urban areas (Chevo and Bhatasara, 2012), this also corresponds with high prevalence of HIV/AIDS prevention programmes such as voluntary, counselling and HIV testing and PMTCT (McCoy et al., 2014) in urban than rural areas. This study hypothesises that women who know their HIV positive status and are resident in urban areas are more likely to use condoms (for prevention of HIV); and long-term methods (for pregnancy delay) than hormonal methods used by women of the same status in rural areas. This is due to the fact that women in urban areas have more access to family planning services including information about HIV/AIDS prevention (Mumah et al., 2014). Respondents from urban areas are recoded as 1 and those from rural areas as 2.

Fertility desire: This variable assesses the women's future intentions on childbirth i.e limiting, timing and spacing (Dasgupta et al., 2015) after knowing their HIV status. Studies have shown that fertility desire may change after knowing their own HIV positive status (Mayondi et al., 2016). It is postulated that HIV positive women may not want any more pregnancies leading to an increase in the use of permanent contraceptive methods among this group (Johnson et al., 2009). Their reason to avoid pregnancy is the concern that pregnancy will further compromise their health and fear of transmitting HIV to children if they conceive (Habte and Namasasu, 2015). While some HIV positive women may want to avoid pregnancy, some may desire pregnancy; and therefore, may choose less effective methods such as traditional methods. Research suggests that women who know their HIV-positive status may want to increase women's fertility desire because they may have societal and familial pressure to have children (Nattabi et al., 2009), fear that the children they already have may die (Laher et al., 2009), reassurance that prevention of mother to child HIV transmission (PMTCT) programs reduce the risk of having a HIV positive child (Homsy et al., 2009), and concern that avoiding pregnancy might give suspicion about one's HIV status (Matthews et al., 2013). This study hypothesises that women who know their HIV positive status and want to limit childbearing are more likely to use long-term methods than hormonal methods, and child spacers are less likely to use long-term methods. This variable is important because it may predict whether contraceptive choice adopted by the woman was motivated by birth spacing, limiters or diseases prevention (Magadi and Magadi, 2017).

7.3.5.2 **Predisposing community level factors**

The community level analysis includes three explanatory variables, i.e the HIV prevalence in the community, the proportion of women in poverty and those with exposure to family planning messages in the community. These covariates captured some of the structural characteristics of respondents' communities. The table 7.1 below gives a list of the variables.

**Table 7-1: Selected Covariates for Method Choice Estimation**

Description	VARIABLE
Contraceptive method choice	Current contraceptive method choice, classified as: 1=hormonal (pill/injectable); 2=condom; 3=long-term (sterilization, IUD/implants); and 4=other methods.
HIV status	Binary variable, coded as 1=if respondent was previously tested for HIV and is HIV-positive; 0 if HIV-negative
Knows someone who died of HIV/AIDS	Coded 1=if respondent personally knows someone who has or died of HIV/AIDS; 0=otherwise
HIV stigma	A composite index derived from a set of four DHS questions on HIV/AIDS stigma. The resulting score is classified as '0' low, '1-2' medium and '3-4' high
HIV awareness	A composite index derived from a series of questions on knowledge of how HIV is transmitted and ways to avoid infection. The resulting index is classified into quartiles and the higher the index, the higher the knowledge
Demographic and background socio-economic factors	
Respondent's age	Three age categories: 15-24, 25-34 and 35+.
Parity	Number of children ever born, classified into three categories: 0-1, 2 and 3+
Marital status	Marital status, classified as: never married, married widowed and divorced
Education	Highest educational attainment classified into: primary and secondary/ above.
Household wealth index	Household wealth index; coded as low =1; middle =2; rich =3; richest=5.
Desire for children	Nomore=1, within 2 years=2; later=3; and undecided=4
Respondent's religion	Religious affiliation, classified into: traditional/Catholic, Protestant, Pentecostal and Apostolic
Exposure to Family planning messages	Additive index of three family planning messages received radio, television and newspaper. Dummy variable, coded 1=low; 2=medium; and 3=high
Community level factors	
Urban residence	Binary variable, coded as 1=urban or; 0=rural residence.
Poverty	Proportion of women in poverty in the cluster
HIV prevalence	Proportion of individual in cluster who are HIV-positive
HIV/AIDS awareness	Average HIV awareness in the cluster

7.4   Results

7.4.1   Distribution of contraceptive methods choice in Zimbabwe

Figure 7.2 shows the distribution of women who knew their HIV status (n=3757) by contraceptive methods choices. The results show that the use of hormonal contraceptive (pill and injectables) was predominant among women who knew their HIV status. Over 80% of women chose hormonal methods (injectable and pill) over long-term, condoms and other methods for both the 2005/6 and 2010/11 surveys. Although, the choice of hormonal methods was high, the rate fell by 3.7% from 83% in the 2005/6 survey. Other methods, i.e. long-term (sterilisation and implants), condoms, and others methods were not very popular in Zimbabwe. While, long-term methods and condom appeared to be increasing, the change was hardly discernible, particularly for long-term methods which increased marginally from 6.9% to 8%. Condom use also increased by almost 3 points from 5.9% to 9%. Other contraceptive methods were least used in this sample, in fact the proportions in this category have declined since 2005/6 as more and more women appeared to have shifted to long-term methods and condoms.

Figure 7-2: Distribution of contraceptive methods choice for the 2005-11 ZDHS *(N=3757)*
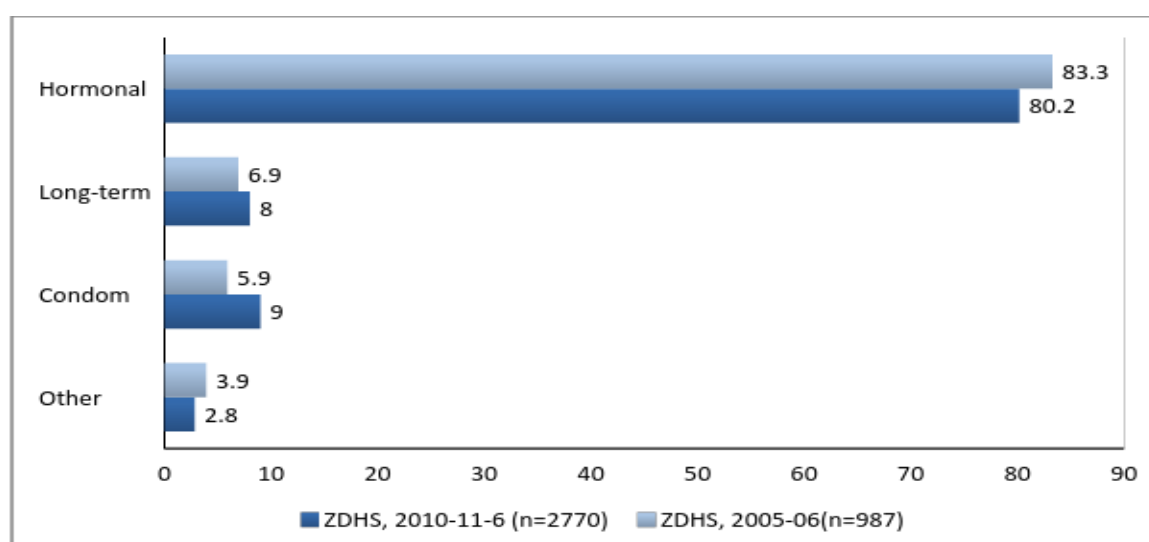
Source: ZDHS 2005/6; 2010/11.

7.4.2 Bivariate association between HIV status, background characteristics and contraceptive method choice

Table 7.2 also describes the bivariate analysis indicating association between demographic variables and contraceptive method choice for the combined surveys. Overall, hormonal methods were more popular among women from different backgrounds and including their HIV status compared with all other methods. Regarding HIV status, hormonal methods were the predominant methods of choice among both HIV-positive (80.7%) and HIV-negative women (82.2%), but long-term methods were higher among HIV infected women (8.4%) compared with those who were not infected (6.6%). Similarly, condom use was more popular among HIV-positive (8%) than HIV-negative women (5.9%). Furthermore, the use of other methods was higher among uninfected women (4.8% than infected women (2.9%). There are no discernable differences in the use of all four methods within HIV awareness, stigma and knowing someone who died due to HIV/AIDS categories, except for condom use which was more popular among women with high HIV stigma.

The use of hormonal methods was much higher in rural areas 84.9% compared with 76.1% in urban areas. Conversely, long-term and condom method were more common in urban than rural areas. The effects of age on methods choice show the tendency that the women below the age of 34 years of age were more likely to use hormonal methods than older women. For example, about 89% of women in their 20s chose hormonal methods than older women (67%) above 35 years of age. It appears that some women aged (35 years and above) may have later in their lives transitioned from using hormonal methods to long-term methods and condoms. Above all, long-term methods (5.7%), condom use (3.1%); and other methods (1.9%) were least preferred by younger women in their 20s, but condom use (14.1%), long-term methods (13.7%) and other methods (5.2%) were more predominant among older women aged 35 years and above. Women between 24 and 34 years of age were also likely to adopt long-term methods (7%) and condom use (7.7%) compared with younger women in their early 20s.

Whilst use of hormonal methods was higher among married women (85%) than those who were single (never married, widowed, and divorced), long-term methods (5.1%) and condom use (6.8%) were least preferred among this group of women. Meanwhile, long-term methods were more popular among never married women (40.8%), divorced (26%) and widowed

(21.8%) than married women. Condom use was predominant among widowed (22.7%) and divorced (13%) than never married (9.5%) and married (6.8%). Surprisingly, other contraceptive methods were more common among widowed women (10%) than any other marital category. Hormonal methods were higher among women affiliated with the a postolic faith group (85.9%) and Pentecostal (80.1%) faith groups than traditional (79.5%) and Protestant (75.5%) faith groups, but long-term methods and condoms were the least used among this group. Condom use was remarkably higher among protestant followers (12.5%) than all other faith groups and least preferred among apostolic faith group (4.2%). Meanwhile, the use of long-term methods was lowest among women with high order parity of 3 or more births (77.6%) compared with women with low birth order of one and two children (82.7% and 84.4%) respectively. The use of long-term methods and condoms were also higher among women with low order parity (10.1%) and (10.7%), respectively.

Hormonal methods were least used among the richest women (73.1%), but long-term methods (11.3%) and condoms (12.6%) were highest among this group of women. Whilst hormonal use was highest among the poorest (85.9%) and middle income women (82.5%) there was no difference in the use of condoms between the poorest and those who were in the middle income groups. Long-term methods were higher among women in the middle income (8.1%) than the poorest (5.3%). There were no marked differences regarding the use of other methods among women from different wealth categories. Hormonal method was highest among women with low family planning media exposure (83.3%) and was lowest among women with high exposure (72.8%), but long-term methods and condom use were more popular among women in the medium to high family planning exposure groups. Meanwhile, women with medium to higher family planning media exposure were more likely to use condoms and long-term methods. Long-term methods were generally predominant among women who reported wanting no-more children and those who wanted children later than two years from now than those who reported wanting a child now or within 2 years. Long-term methods and condom use were highest among women with more than three sexual partners, but hormonal method was predominant among women with few sexual partners. Education and place of residence were found to be not significantly associated with contraceptive methods choice.

Table 7-2: Bivariate associations between demographic variables and contraceptive method choice among women aged between 15-49 years of age in Zimbabwe

Background factors	Methods choice (%[a])				All cases[b]
	Hormonal	Long-term	Condom	Others	
HIV Sero status*					
Positive	80.7	8.4	8.0	2.9	3251
Negative	82.8	6.6	5.9	4.8	506
HIV Awareness					
Low	81.8	8.1	7.2	2.9	307
Medium	80.0	8.8	8.3	2.9	2157
High	80.8	7.7	8.4	3.1	1293
HIV stigma					
Low	79.2	8.7	9.2	2.9	1331
High	81.1	8.1	7.7	3.1	2426
Acquaintance with HIV victim					
Yes	79.1	8.2	8.3	2.9	3311
No	80.6	9.0	8.3	3.6	446
Place of residence					
Urban	76.1	10.6	9.8	3.6	1579
Rural	84.9	6.3	6.1	2.7	2178
Maternal age*					
15-24	89.3	5.7	3.1	1.9	1154
25-34	82.4	7.0	7.7	2.9	1740
35+	67.0	13.7	14.1	5.2	863
Marital status*					
Never married	48.3	40.8	9.5	1.4	186
Married	85.0	5.1	6.8	3.1	3251
Widowed	45.5	21.8	22.7	10.0	115
Divorced	60.6	26.0	13.0	0.4	205
Religion*					
Traditional/catholic	79.5	9.4	7.7	3.4	964
Protestant	75.5	9.2	12.5	2.8	753
Pentecostal	80.1	8.8	8.8	2.4	764
Apostolic faith	85.9	6.3	4.2	3.6	1276
Education					
Primary	82.4	8.2	6.4	3.1	966
Secondary	80.2	8.1	8.2	3.1	2791
Parity*					
1	82.7	10.1	4.7	2.5	1037
2	84.4	6.9	6.1	2.6	1119
3+	77.6	7.8	10.7	3.9	1601
Wealth*					
Poorest	85.8	5.3	5.9	3.0	1141
Middle	82.8	8.1	5.9	3.2	1625

Continued

Table 7-2 continued

Richest	73.1	11.3	12.6	3.1	991
FP media exposure*					
Low	83.3	7.3	6.5	2.8	298
Middle	74.2	11.0	10.5	4.3	459
High	72.8	10.8	12.8	3.6	400
Desire for children*					
Want no-more	76.9	11.4	7.7	4.1	1628
Later than 2 years	81.1	12.2	3.2	3.5	361
Now within 2 years	85.6	3.5	9.0	1.8	1492
Undecided	80.8	8.8	6.7	3.7	400
Multiple sex partners*					
1	86.1	4.5	6.8	2.6	2420
2	77.2	9.9	9.1	3.7	783
3+	61.5	24.0	10.1	4.7	554
All	81.0	8.1	7.7	3.1	3757

Chi-Square -*P<0.001

Source: Computed from Zimbabwe Demographic and Health Surveys, 2005-6; 2010-11.

7.4.3 Determinants of contraceptive methods choice among women who knew their HIV status in Zimbabwe

Table 7.3 reports the multilevel multinomial logistic models exploring the determinants of contraceptive method choice among women who know their HIV status. The reference category of the dependent variable method choices was hormonal methods, which was compared against long-term methods, condoms, and other methods. Based on the literature reviewed, the study had postulated that HIV factors (i.e awareness and stigma) would be strong predictors of adopting more effective contraceptive methods to prevent both unwanted pregnancy and HIV. However, the analysis of potential association between these factors and contraceptive method choice among women who know their HIV sero-status was not fully explored due to relative small proportions of women within the categories of HIV awareness and stigma who used condoms and other methods. Thus HIV awareness and stigma variables were not included in the multivariate analysis.

Time of survey was controlled for in all models because the survey year may reflect other unobservable factors influencing women's attitude or information about contraceptive methods and HIV. These factors may have independent effectson contraceptive methods choice even

when the influence of factors listed above is controlled for. The results suggest that all women who knew their HIV status were more likely to use long-term methods (RR=1.99), condoms (RR=1.71), and less likely to use other methods (RR=0.59) rather than hormonal methods in 2010/11 compared with 2005/6. The relative risk of using condoms rather than hormonal methods was significantly higher for women aged below 34 years by (RR=2.16) compared with younger women below the age of 24 years of age. Similarly, women over 35 years of age were more likely than young women below 24 years of age to use long-term methods (RR=4.24), condoms (RR=4.30), and other methods (RR=3.58) rather than hormonal methods. The relative risk of choosing long-term over hormonal methods was significantly lower for women who were married (RR=0.11), widowed (RR=0.33) and divorced (RR=0.34) compared with never married women. At the same time, married women were less likely to choose condoms than hormonal methods by (RR=0.24) compared to never married women. Religiosity also matters in decision-making about contraceptive methods choice for women who know their HIV status. Protestant religious affiliation showed higher relative risk of using condom (RR=1.63) than hormonal methods compared with traditional and Catholic affiliation.

Furthermore, relative to women who knew their HIV status and reported that they want no-more children, women whose fertility intention was to have another child later than two years were less likely to use long-term methods (RR=0.44), and more likely to use condoms (RR=3.12) than hormonal methods. Also, the relative risk of belonging to a group of women choosing long-term methods other than hormonal methods is significantly lower for higher birth order 2 by (RR=0.61) and birth order 3 plus by (RR=0.53) compared with women with zero or first birth. Meanwhile, the relative risk of using condoms rather than hormonal methods was higher among women with higher birth order of three plus pregnancies (RR=2.64) compared with women of low birth order. Additionally, being exposed to family planning messages increased the likelihood of condom use (RR=1.75) compared to hormonal methods. The relative risk of using long-term over hormonal methods was also significantly higher for women who knew their HIV status and had multiple sex partners compared with women who had only one sexual partner.

There was a clear wealth differential in methods choice; and the likelihood of using long-term methods and condoms over hormonal methods increased with wealth from richer to richest. The richest had the highest likelihood of using both long-term methods (RR=2.23) and

condoms (RR=2.10) compared to hormonal methods compared with the poorest. We have seen from the main effects that the richest women who knew their HIV status were more likely to use long-term methods and condoms than hormonal methods compared with the poorest. The question that can be posed here is whether this behaviour applies equally for wealthier HIV positive women who knew their HIV serostatus. There is reason to believe that wealthier HIV positive rather negative women are more likely to use some active form of contraceptive methods such as long-term methods which are likely to be more expensive (Dias and Oliveira, 2015). Specifying HIV positive status and wealth term resulted in substantial changes in contraceptive methods choice as compared to the simpler wealth main-effects in the model. With the interaction effect between wealth and HIV positive status on contraceptive methods choice taken into account, the association between wealth and long-term contraceptive methods choice disappeared, while that of condom use and wealth remained significant, albeit negatively than in the main effects. Compared with those in the poorest wealth category with HIV positive status, women in the middle and highest wealth category with HIV positive status were less likely to use condoms (RR=0.07) and (RR=0.09) than hormonal methods.

Although urban residence and higher levels of educational attainment were expected to result in better choice of contraceptive methods including condom use, the results suggest no evidence of an association between contraceptive methods choice and these two variables. When community level factors were controlled for, it was found that women from poor communities were less likely to use condoms by (RR=0.20) than hormonal methods compared with their counterparts from wealthier communities. A significant community effect is seen in the multilevel modelling, suggesting that unobservable community factors influence the choice of different types of contraceptive methods. As shown by the variance partition coefficient (VPC), the intra-class correlation coefficient (ICC) is estimated from 14-20 % for the three contraceptive methods choice even after controlling for individual and community level factors. Thus, about 14-20% of the total unexplained variation in contraceptive methods choice could be attributed to unobserved community-level effects with the remaining 80-86% of unexplained variation attributable to individual-level factors. An example of this variation is that of the choice between condom and hormonal methods which suggest that 20% of the total unexplained variation in the choice of hormonal methods versus condom use is attributed to community factors not included in the model. This result implies a higher degree of

homogeneity in the use of hormonal methods within the communities, but does not shed light on whether the factors behind that homogeneity are cultural or service related.

Table 7-3: Results of the multilevel multinomial logistic regression models to explore associations between HIV status and contraceptive method choice (adjusted RR and 95% CI of RR)

Parameters (Ref) Main Effects		Long-termVs Hormonal		Condom Vs Hormonal		Others Vs hormonal
	RR	95% CI	RR	95% CI	RR	95% CI
Survey (2005-6)						
2010	1.99	[1.38-2.87]*	1.70	[1.14-2.52]*	0.59	[0.37-0.93]*
Place of residence (urban)						
Rural	1.68	[0.62-4.55]	0.25	[0.07-0.88]*	0.49	[0.13-1.93]
Age groups (15-24)						
25-34	1.38	[0.91-2.08]	2.16	[1.38-3.38]*	1.49	[0.80-2.79]
35+	4.24	[2.54-7.08]*	4.30	[2.53-7.30]*	3.58	[1.68-7.63]*
Marital status (Never Married)						
Married	0.11	[0.07-0.17]*	0.24	[0.14-0.43]*	1.46	[0.55-3.90]
Widowed	0.33	[0.17-0.66]*	1.02	[0.45-2.29]	3.12	[0.84-11.64]
Divorced	0.34	[0.20-0.60]*	0.88	[0.42-1.74]	0.34	[0.04-2.59]
Education (primary)						
Secondary/higher	0.77	[0.55-1.09]	1.01	[0.72-1.42]	1.14	[0.68-1.91]
Religious(/catholic)						
Protestant	1.13	[0.75-1.69]	1.63	[1.13-2.36]*	0.74	[0.39-1.38]
Pentecostal	0.95	[0.64-1.42]	1.15	[0.78-1.69]	0.77	[0.41-1.46]
Apostolic	1.03	[0.69-1.53]	0.61	[0.42-0.89]	1.22	[0.73-2.04]
Fertility intention (no-more)						
Now - 2 year	0.85	[0.52-1.38]	1.22	[0.66-2.25]	0.95	[0.46-1.97]
Later- 2 years	0.44	[0.30-0.66]*	3.12	[2.33-4.34]*	0.61	[0.35-1.06]
Undecided	0.72	[0.41-1.24]	1.22	[0.66-2.25]	0.83	[0.35-1.98]
Parity (0-1)						
2	0.61	[0.41-0.93]*	1.29	[0.84-1.98]	0.75	[0.42-1.36]
3+	0.53	[0.32-0.61]*	2.64	[1.64-4.26]*	0.72	[0.37-1.41]
Enabling factors						
Household wealth (						
Middle	1.27	[0.75-2.16]	1.13	[0.68-1.87]	0.86	[0.40-1.87]
Rich	2.02	[1.15-3.53]*	1.06	[0.59-1.91]	1.90	[0.83-4.35]
Richest	2.23	[1.20-4.13]*	2.10	[1.09-4.07]*	0.91	[0.32-2.59]
Interaction effects						
HIV +*Wealth (poor)						
Middle	0.10	[0.24-3.84]	0.07	[0.02-0.33]*	0.48	[0.06-3.80]
Rich	0.27	[0.06-1.18]	0.34	[0.11-1.06]	0.39	[0.06-2.63]
Richest	0.63	[0.15-2.54	0.09	[0.03-0.30]*	2.10	[0.33-3.39]

Table 7-3 continued

FP media exposure (low)						
Medium	1.29	[0.85-1.94]	1.48	[0.97-2.25]	1.26	[0.65-2.46]
High	1.57	[1.00-2.44]	1.75	[1.13-2.73]*	1.39	[0.66-2.94]
Risk perceiption/need factors						
HIV- sero status (no)						
Yes	1.67	[0.52-5.58]	3.13	[1.40-7.00]*	1.62	[0.35-7.48]
Know someone died of HIV/AIDS (no)						
Yes	2.66	[1.30-5.46]*	1.53	[0.85-2.76]*	0.72	[0.37-1.42]
Multiple sex partners (one)						
2	2.06	1.48.2.86]*	1.31	[0.93-1.84]	1.45	[0.89-2.36]
3+	3.61	[2.61-5.00]*	1.36	[0.91-2.03]	1.32	[0.71-2.45]
Contextual factors						
Poverty	1.02	[0.48-2.15]	0.40	[0.17-0.92]*	0.79	[0.23-2.69]
Random effects parameters						
Community-level						
Variance (SE)	0.59	[0.141]*	0.867	[0.198]8		0.567 [0.483]*
(VPC)=ICC (%)		14		20		15

VPC=Variance Partition Coefficient, ICC=Intracluster Correlation Coefficient, *Statistical significance at 5% level p<0.05

7.5   Discussion and conclusion

The study sought to ascertain the effects of knowing HIV sero-status on contraceptive methods choice and to identify Individual and community level factors that are associated with contraceptive method choice after HIV diagnosis. While comparison of factors associated with contraceptive method choice between HIV-positive and HIV-negative women was one of the primary objectives, the analysis was not possible due to a small number of women with an HIV-positive test. However, the study did find an important association between knowledge of an HIV test and contraceptive method choice. It turned out that a known HIV positive status drives women to use condoms rather than hormonal methods. Women who knew their HIV positive status and were using contraception were more than three times more likely to use condoms rather than hormonal methods than women who knew they were HIV negative. The results are consistent with previous studies which found higher odds of condom use among women who knew they were HIV positive than HIV negative women, compared with hormonal contraceptive methods (Church et al., 2014; Habte and Namasasu, 2015; Heys et al., 2009; Johnson et al., 2009; Keogh et al., 2009; Mumah et al., 2014). The finding is a welcoming development; given that advocacy for condom use has been a major component of HIV prevention in Zimbabwe (Chevo and Bhatasara, 2011). One plausible explanation of higher use

of condoms may be that counselling received by women who knew their HIV positive status might have included contraceptive methodwhich mostly likely increased their knowledge of the benefits of condom use (Mayondi et al., 2016). Church et al., (2014) contend that increased condom use among HIV positive women results from programs focusing on condom use. Church et al., (2014) argued that even at a facility where other methods are available, providers consider condoms imperative for HIV positive women to prevent re-infection or onward transmission of HIV. This message was clearly understood by women who knew their HIV positive status; thus, infection concerns predominates over pregnancy concerns (Elul et al., 2009); and other methods are considered as aback-up (Church et al., 2014).

The result that wealthier women who knew their HIV status were more likely to use condoms and long-term methods may suggests that women with economic resources gain decision-making power within their relationships, and they use this power to insist on always using condoms, the highest level of protection (Church et al., 2014) or they have resources to afford the long-term methods which are very expensive in Zimbabwe. Poverty which correlates with education can also influence women's sexual behaviour by reducing access to information about safe sex practicing or by inhibiting their ability to put such information into practice; such that being poor, regardless of HIV status may inhibit women from accessing long-term methods and condoms (Akimenyi et al., 2010). This phenomenon helps explain the finding in this study that women who knew their HIV status and have high access to family planning messages were more likely to use condoms compared with those with low access to family planning methods. The argument here is that HIV-positive women who know their status and who are exposed to family planning messages from media are more likely to use condoms because the messages they receive may increase the knowledge of available contraceptive methods (Bankole et al., 2009). Mass media channels, radio, television, and newspapers for example, have been suggested to be vital sources of information about HIV/AIDS for ordinary people (Jesmin et al., 2013). Although, HIV/AIDS-related health promotion has mainly targeted high risk groups through media in Zimbabwe, the majority of women do live far away from health facilities or they have no means to buy newspapers and televisions. The most commonly cited source of information on family planning was radio, while television and newspapers were mentioned by a minority of women in rural areas (ZDHS, 2010/11). Thus, the results that poorer women who knew their HIV status and have low access to family planning messages are less likely to use long-term methods and condoms in Zimbabwe are

credible. These findings can be used to guide health care managers to target radio over other alternatives as a means to reach the poorest women with family planning messages.

The study further explored the interaction between HIV status and wealth on contraceptive method choice for both HIV positive and HIV negative women. It became apparent thatbeing wealthy and knowing your own HIV status matters for contraceptive method choice. The results showed being wealthier and HIV positive status decreases substantially the odds of condom use. The low condom use among wealthier women who knew their HIV positive status maybe as a result of national programs targeting poorer HIV positive women (ZIMSTA, 2016) in Zimbabwe. Other interactions checked such as HIV status and media exposure, HIV awareness and educational attainment were not significant.

Other important background correlates of contraceptive method choice among women who knew their HIV status included fertility intention, age, parity, religion, marital status and multiple sex partners. The low use of long-term methods among women who reported wanting children later does not agree with other studies which noted an increase in long-term methods indicating a desire for child spacing among the women who know their HIV status (Mayondi et al., 2013). Although it would be interesting to compare fertility desires for HIV positive and HIV negative women, analysis of this relationship was not possible in MLwin due to small numbers of women who were undecided on their fertility desire. However, it was postulated that HIV positive women may not want any more pregnancies due to fears of compromising their health and fear of transmitting HIV to children if they conceive (Habte and Namasasu, 2015), leading to an increase in the use of permanent contraceptive methods. For those who know their HIV-negative status, the results may imply that those using long-term methods are child spacers or that they want to limit childbearing for economic reasons (Bertrandet al., 2014). Research into the plight of low-income households and large families provide evidence to support this understanding (Shelton and Burke, 2016).

The apparent higher inclination towards long-term methods rather than condoms among women with multiple sexual partners compared to those with single partners is not what is expected, given the widespread condom use campaign in Zimbabwe. This may indicate that part of the C (condom use) elements of ABC health messages, involving always using condoms

with multiple sexual partners has not been effective in Zimbabwe. Studies have shown that long-term methods do not protect against HIV, only condoms can (Church et al., 2014).

The finding that older women are more likely to use long-term methods and condom rather than a hormonal method is expected. Younger women are less likely to use any form of contraception (Mayondi et al., 2016). The use of any form of contraception rises to its peak in the age range 20-29 years as women start having children and use contraception for child spacing, while non-permanent methods such as the pill and the male condom are the most preferred methods (Nattabi et al., 2009). Beyond 30-44 years, as women get older, the likelihood of use declines, and tilts towards more permanent methods such as injections (Shelton and Burke, 2016). There is evidence in support of this phenomenon (Church et al, 2014; Wagner and Wanyenze, 2013) to agree with the hypothesis of this study that increased age comes with an increase in the use of more effective contraceptive methods such as long-term methods for delaying and limiting child birth. Other studies have postulated that with increased age and an improved knowledge of HIV comes with increased likelihood of choosing long-term and condom contraceptive methods (Anand et al., 2009). Due to the importance of knowledge of HIV and the availability of contraceptive options (including long-term and condoms), it is highly likely that older HIV positive women who know their HIV status may choose long-term methods and condoms relative to hormonal methods in Zimbabwe. For younger women, regardless of their HIV status and their knowledge of HIV status, research has shown that they may prefer reversible contraceptive methods in anticipation of future childbearing (Mumah et al., 2014) or condoms particularly to prevent both unplanned pregnancies and HIV infection (Nattabi et al., 2009).

The results also show that married, divorced and widowed women who know their HIV status were less likely to choose long-term methods and condoms compared with single women. This could reflect the growing popularity of hormonal methods among women and that there is a slow shift from hormonal methods use to long-term, condom and other methods in Zimbabwe. It could also be that for single women who know their HIV status and who have not achieved their desired number of children their motive was to achieve pregnancy (Church et al., 2014) leading to their continued use of hormonal methods which are reversible. The low use of condoms among married women was expected. Studies have shown that condom use within the marriage institution are highly unlikely particularly among HIV positive women due to

disclosure concern (Akinyemi et al., 2010), feeling of rejection (Sambisa, 2008), abuse and concern for partner compliance with condom use (Rosenberget al., 2013).

The finding that women with higher order births are less likely to use long-term methods does not agree with other studies. It has been suggested that once a woman has had a first birth, the priority shifts towards birth spacing, primarily for economic reasons as more children affect caring for other offspring (Heys et al., 2009). The ability to delay and space childbearing is crucial to women's social and economic advancement (McCoy et al., 2014), therefore women with higher order parity are more likely to use irreversible methods. Therefore, this study offers no plausible explanation as to why women with higher order parity who know their HIV status were less likely to use long-term methods in Zimbabwe.

Although, there is a discernable shift in contraceptive methods choice from hormonal methods to long-term and condoms, this study argues that the level of use of long-term methods and condoms is experiencing a far too slow pace of change to justify any claim that HIV testing, family planning and condom promotion campaigns have been successful in effecting change of behaviour among vulnerable populations in Zimbabwe. Although it is agreeable that condom use adoption requires substantial adjustments in attitudes towards procreation (Habte and Namasasu, 2015); or that to expect an abrupt change in behaviour, particularly when some warnings of the threat of AIDS and methods of prevention and treatment of HIV come from largely from developed countries, which are initially received with denial and suspicion in much of Africa (Kayikiet al., 2011), a faster pace of behavioural modification in adopting condom use among women who engage in sex with multiple partners knowing their HIV status would have been highly desirable in Zimbabwe.

The central conclusion in this study is that the success pervading HIV prevention efforts through condom use and long-term contraceptive methods in Zimbabwe cannot be justified and that the investment in condom use and marketing has been an unappreciated effort, particularly for women who know their HIV status. The fact that the majority of women who know their HIV status are still using mainly hormonal methods is not a good sign of any shift of contraceptive mix in order to protect both unwanted pregnancies and HIV. There is a need for health managers to design programs that explicitly define the HIV protection component of condom use, as some women may not understand the dual protection concept of condom use,

which is being widely promoted. Although dual use of condoms with other contraceptives was of particular interest, this was not used as a distinct category because of very small numbers. However, HIV testing and receiving HIV test results which is part of voluntary and counselling HIV test prevention program does have an effect on the choice of contraceptive methods.

8 CHAPTER EIGHT: CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

This chapter summarises the contributions of this thesis and the possible impact on health policy. The central issue addressed is the problem of underutilisation of HIV and sexual and reproductive integrated services. This problem was addressed by identifying determinants of HIV testing, maternal health care and family planning service utilisation, which constitute HIV and SRH-integrated programs in Zimbabwe. The current integrated programme is a strategic intervention to increase uptake of HIV interventions through sexual and reproductive healthcare services. The conceptual framework adopted for the analysis of this thesis is a modified version of the framework by Andersen (1996) on determinants of healthcare-seeking behaviour, which proposes that health outcomes are dependent upon individual and community-level predisposing factors. This thesis is based on the 2005/06 and 2010/11 Zimbabwe Demographic and Health surveys. The main statistical methods used are multilevel binomial and multinomial logistic regression models. There are some limitations to this study that have potential implications for our findings. The first second limitation concerns the use of 2005/6 and 2010/11 DHS data. This thesis has acknowledged that these data are relatively old, and the information provided might not reflect the current situation and practices. In countries like Zimbabwe, where the scaling up of prevention of parent-to-child HIV transmission is happening, use of the 2015/16 DHS data would have helped capture more recent progress. However, the 2015/16 DHS data were not yet available at the time the analysis of this thesis was being undertaken. The second limitation relates to the cross-sectional nature of the DHS data analysed, which does not permit temporal ordering of the events of interests. Therefore, the patterns observed represent simple associations and cannot offer insights into cause-and-effect relationships. Furthermore, because DHS surveys rely on a self-reported method of data collection, inaccuracies can come up because of intentional deception, poor memory, or misunderstanding of questions. Finally, this study has focused on major determinants of antenatal HIV testing in Zimbabwe with respect to demand-related factors (i.e. cultural, demographic and socio-economic etc). However, as argued by Buzdugan et al. (2015), service-related factors are also important determinants of exclusion and need investigation. Future research should explore the impact of the providers' characteristics of HIV and ANC-integrated service delivery. Elements such as quality of care, type of provider, actual distance and attitude of staff need to be explored. Nevertheless, the representation of the whole country

is a major strength of the data analysed in this study, as it allows generalisation of the findings nationally.

8.2   Summary of key findings

This thesis consists of four analytical chapters: the determinants of HIV testing; the determinants of ANC and delivery care; and knowledge of HIV status and contraceptive method choice in Zimbabwe. The analysis showed that these services were determined by approximately the same set of factors, thus, the key findings and objectives of chapters 4 to 7 are brought together (Table 8.2). By integrating the summary of findings, this thesis attempts to reveal and compare how determinants of the utilisation of HIV and SRH-integrated services interplay. The overall findings from this thesis are located within the general analytical framework outlined in Section 2.4 of chapter 2. Based on the analytical framework, this thesis' hypothesis is that a continuum of individual and community factors relating to 'predisposing', 'enabling' and 'need/perceived risk' factors (see fig 2.2 of chapter 2) are the key determinants of HIV and SRH service utilisation. The use of multilevel models has helped to better explain the different levels at which various factors influence outcomes, for instance, at individual and community levels in the case of population-based data. The multilevel results showed small variations in HIV and SRH service utilisation across communities in Zimbabwe. The variations were mainly explained by individual-level predisposing factors, such as background characteristics, and enabling factors, relating to socio-economic status as well as the perceived risk/need of HIV and/or the need for healthcare services, rather than community factors that were included in the models used throughout this research. Although some variables influenced the outcomes, there is evidence that some factors in the models were affecting the uptake of different HIV and SRH-integrated services differently. This means that policymakers have to be careful in terms of structuring the strategies to improve the HIV and SRH-integrated programme in Zimbabwe. For instance, a strategy that might improve delivery care may not necessarily have a significant impact on HIV testing, maternal healthcare service utilisation and the contraceptive choices of women who know their HIV status. Policymakers have to appreciate these differences and strategies should be targeted at specific components of HIV and SRH-integrated service utilisation rather than planning umbrella strategies.

Controlling for community-level factors such as HIV prevalence, awareness and stigma, the effect of individual 'predisposing', 'enabling' and 'perceived risk/need' factors remain largely

the same across the study outcomes under scrutiny. This may suggest that HIV factors relating to community prevalence, stigma and awareness do not explain much of the differences in HIV and SRH service utilisation that are observed. The models suggest that 'predisposing' individual-level factors (i.e. place of residence, age, marital status, education, religion, parity and age at marriage) were the most important factors for predicting HIV and maternal healthcare service utilisation and explained most of the variance, while there was also a reasonable amount of variance explained by 'enabling' factors (e.g. household wealth, media exposure, access to health care and HIV testing during pregnancy and timing of ANC for delivery care). The results provided further evidence that uptake of antenatal care services, such as ANC in the first trimester, ANC HIV testing and optimal ANC visits are key factors for delivery care. Given that having ANC visits in the first trimester, having four or more ANC visits and having ANC HIV testing were significantly associated with delivery care, encouraging women to seek ANC care and to have HIV testing during pregnancy may enable pregnant women to have institutional and professional delivery. More importantly perhaps, focus should be on reducing involuntary HIV status disclosure to families and friends who accompany pregnant women during labour and delivery. Asking permission from pregnant women to allow families and friends to be present during delivery care may reduce stigma associated with involuntary disclosure (chapter 6). Finally, the study found little evidence of the impact of integrating HIV testing services with delivery care, apart from the negative effect of HIV status awareness on institutional delivery which may be a result of pregnant women being concerned with how their information relating to HIV is held. The summary of integrated findings for chapters 4 to 6 is presented in table 8.1 below.

Table 8-1: Summary of the effects of individual and community factors of HIV and SRH outcomes

Parameters	HIV testing	1st trimester ANC	ANC HIV Testing	4 + ANC visits	Delivery care	Method choice
Individual predisposing factors						
Gender (males)						
Females	[+]	N/A	N/A	N/A	N/A	N/A
Residence (rural)						
Urban	[+]	[+]	N/S	N/S	[-]	[*]
Age groups (15-24)						
25-29	[-]	[-]	[-]	[-]	[-]	[*]
30-34	[-]	[+]	[+]	[-]	[+]	[*]
35+	[+]	[+]	[-]	[-]	[+]	[*]
Marital status (never married)						
Married	[+]	[+]	[-]	[-]	[+]	[*]
Widowed	[+]	[+]	[-]	N/S	[+]	[*]
Divorced	[+]	[+]	[-]	[-]	N/S	[*]
Wanted child (yes)						
Later	N/A	[-]	[-]	[+]	[-]	[*]
Not wanted	N/A	[-]	N/S	[+]	[-]	[*]
Parity (0-1)						
2	N/A	[-]	N/S	[+]	[-]	[*]
3+	N/A	[-]	[-]	[+]	[-]	[*]
Enabling and perceived/need factors						
Wealth (poor)						
Richer	[+]	[+]	[+]	N/S	[+]	[*]
Richest	[+]	[+]	[+]	[-]	[+]	[*]
Education (primary)						
Secondary plus	[+]	N/S	[+]	N/S	[+]	N/S
Media exposure (low)						
Higher	[+]	[+]	[+]	N/S	[+]	[*]
Previous HIV test (no)						
Yes	N/A	[+]	[+]	[+]	N/S	[*]
ANC HIV testing (no)						
Yes	N/A	N/A	[+]	[+]	[+]	N/A
HIV/AIDS Awareness (low)						
High	[+]	N/S	N/S	N/S	N/S	N/S
HIV/AIDS stigma (no)						
Yes	[-]	N/S	[-]	N/S	[-]	N/S
HIV disclosure concern(No)						
Yes	[-]	[-]	N/S	[-]	[-]	N/S
Knows someone died of Aids(no)						
Yes	[+]	[+]	[+]	N/S	[+]	[*]

Table 8-1 continued

Timing of ANC visits (no)						
1st trimester	N/A	N/A	N/A	N/A	[+]	N/A
No. of ANC visits (less than 4)						
4 or more	N/A	N/A	N/A	N/A	[+]	N/A
Community factors						
HIV/AIDS stigma	[-]	N/S	N/S	N/S	[-]	N/S
Media exposure	[+]	N/S	N/S	N/S	N/S	N/S
HIV awareness	[+]	N/S	[+]	N/S	N/S	N/S

(-) =decreases the odds of an outcome   (+) = increases the odds of an outcome
(*)=significantly correlated, N/S=not significant at 5% level, N/A = Not applicable

8.2.1 Association between individual-level predisposing factors and HIV and SRH-integrated health outcomes

The results presented here reveal that the individual-level 'predisposing' determinants of HIV and maternal health outcomes under scrutiny are comparable. The associations observed are largely consistent with patterns observed in other SSA countries whereby the healthcare service utilisation was determined by gender, place of residence, age, marital status, education, parity, child wantedness/fertility intention and religion. In particular, the findings are in agreement with studies relating to HIV testing in Ethiopia and Botswana (Godif et al., 2015; Obermeyer et al., 2013), timing and frequency of ANC visits in Tanzania and Kenya (Gross et al., 2012; Magadi et al., 2000), delivery care (Johnson et al., 2009) and contraceptive choices among women (both infected and uninfected with HIV). The observed gender disparity in HIV testing, discussed in chapter 4, supports findings from earlier studies suggesting that females are more likely than males to have an HIV test due to the fact that they are more likely to be exposed to healthcare services, probably through maternal healthcare and family planning services (MacPhail et al., 2009). This clearly calls for policy makers to consider couple-oriented HIV counselling and testing where men accompany their spouses to HIV screening during pregnancy. Couple-oriented HIV testing has the potential to help increase HIV uptake for males and reduce gender disparities. This may also help increase the uptake of the continuum of the HIV and SRH-integrated programme in Zimbabwe, including contraceptive choice. This is because couple-oriented HIV counselling and testing has been shown to improve dialogue and spousal communication about issues related to SRH and HIV (Kalembo et al., 2013) leading to increased service utilisation by couples.

The evidence put forward in this thesis suggests that urban residence is associated with a higher uptake of HIV testing and ANC visits in the first trimester. However, it is also associated with poor delivery care and low use of condoms and long-term contraceptive methods. There are no significant differences detected between antenatal HIV testing and frequency of ANC visits by place of residence. The observed patterns for place of residence and antenatal HIV testing and frequency of ANC visits contradict the results from earlier studies suggesting that women from urban areas are more likely to have antenatal HIV testing and to have more ANC visits due to easier access to ANC services, including prevention of mother-to-child transmission (PMTCT) services (Chapter 5). Taking key factors into account, we can attest that the lack of significance of place of residence to antenatal HIV testing confirms that PMTCT programmes are now achieving comparable HIV testing coverage in urban and rural areas. However, the fact that rural residents are not necessarily worse off, in terms of their access to HIV testing, compared to their urban counterparts of similar characteristics (Table 5.8, Chapter 5), may not necessarily suggest equity in healthcareaccess. Some urban sub-groups may require particular attention, taking into account the different nature of deprivation within urban areas (Matthews et al., 2010). It has been suggested that the urban poor have very similar or perhaps even lower levels of progress, in terms of access to healthcare, than in rural areas due to urbanisation (Usman, 2016). More recent evidence (Usman, 2016) reveals that health and social services in urban areas have not kept pace with urban population growth due to large-scale migration from rural to urban areas in Zimbabwe, leading to health inequities within urban areas.

The significant negative impact of rural residence on HIV and SRH outcomes observed in this study could be in accordance with the notion of urban health advantages which has been described in chapters 4 to 6. This could be a revelation of the challenges, such as the lack of education and information relating to HIV, that women in rural areas in Zimbabwe are facing, preventing their access to healthcare services. In order to fill the gap in education and address the lack of HIV-related information, health workers can be used to provide knowledge to village communities, using non-written methods of communication, such as pictures, for those who are illiterate (Chapter 5). Tweya et al. (2014) have associated increased household visits by health workers and a higher density of health committees with an increased knowledge relating to HIV among rural communities, resulting in a better timing of ANC visits and greater acceptance of HIV testing in Malawi.

The relationship between rural residence and contraceptive methods choice, discussed in chapter 7, is also worth mentioning because the low use of condoms and long-term contraceptives in rural areas may be the result of better access to hormonal contraceptive methods at the expense of condoms in rural areas. The fact that condom use is lower in rural areas ran counter to the aim of HIV and family planning integrated services which promote condom use for both HIV prevention and unwanted pregnancies (Chapter 7). Regardless of HIV status, policymakers are now aware of the need to design a programme aimed at increasing condom use in rural areas.

The results revealed mixed effects of age on HIV and SRH service measurement outcomes. It emerged that young individuals were, in general, less likely to use HIV and SRH services. One important observation to emerge from the analysis of chapter 7 was the fact that, despite their HIV serostatus, the relative risk of using condoms and long-term contraceptive methods rather than hormonal methods was significantly higher for women aged above 34 years compared with younger women below the age of 24 years of age. The limited choice of contraceptive methods available to young women has important implications for prevention of mother-to-child HIV transmission (PMTCT) programmes through condom use and long-term contraceptive methods. The low use of HIV and SRH services including condoms and long-term contraceptive methods among young people has been attributed to the fact that HIV and SRH healthcare services are geared towards older and married women in most SSA countries (Buzdugan et al., 2015). Although various policies exist aimed at improving HIV and SRH health outcomes for adolescents, like sex education in communities and in schools (Chevo and Bhatasara, 2012), for instance, they are not well implemented and do not ensure comprehensive coverage ofhealth services for young people. Further steps need to be taken to improve the health of young people which may include the provision of youth-friendly health services, the dissemination of information and the raising of awareness regarding the implications of HIV on their health. If adopted, these methods would improve the conditions and address the HIV and SRH health needs of young and unmarried women.

Furthermore, the results revealed that older individuals (over 35 years of age) are less likely to have ever been tested for HIV or to have antenatal HIV testing and four or more ANC visits. I attest that this could be due to the false perception of diminished HIV risk as a result of having been previously tested for HIV or previously given birth to presumably healthy children, both

of which are key factors for future utilisation of HIV and SRH-integrated services (Chapter 5). This is consistent with Ochako and Gichuh's (2016) finding that pregnant women who had previously given birth to presumably healthy children were less likely to opt-in to voluntary HIV testing in subsequent pregnancies. The finding that older women are less likely to use HIV and SRH-integrated services certainly implies that the campaigns to promote PMTCT programmes have not been effective among this group of individuals. While it is important to improve HIV and SRH service utilisation among youth, policymakers should also pay special attention to the improvement of health needs of older individuals, and older women in particular.

It has also been noted that older women were less likely to have at least four ANC visits throughout pregnancy, but more likely to have ANC visits in the first trimester. This finding supports Mason et al.'s (2015) observation that being given a registration card was the main motivation for women to attend ANC in the first trimester so that they could receive medication and deliver in hospital in case of emergency. As discussed in Chapter 6, hospital delivery is denied to women who do not have a registration card in Zimbabwe. The results of this research certainly imply that once a pregnant woman is registered and has received a card, presumably in the first trimester, she stops visiting health facilities for fear of associated financial costs as well as the opportunity costs of the time she would spend to do so (Moindi et al 2015). She would then rely on a traditional birth attendant (TBA) for her subsequent ANC after the initial registration and presumable HIV testing (Maruva et al., 2014). While the need to obtain a registration card may be an important reason for initiating ANC in the first trimester, the higher odds of institutional and professional delivery for older women observed in this thesis may mean that this group has benefited enormously from information and education campaigns as well as community mobilization efforts aiming to increase institutional and professional delivery (Loewenson et al., 2012). Although the majority of pregnant women have reported having ANC in the first trimester, there is a need to raise awareness on the importance of HIV testing and regular ANC visits, given their central role in HIV and SRH service delivery.

Marital status has shown paradoxical associations with HIV and maternal healthcare service utilisation. However, in line with the findings of many studies (for example, Semali et al., 2014) this study found positive associations between being married, divorced and widowed and better timing of antenatal care visits, institutional delivery and uptake of HIV testing. The findings,

particularly that unmarried women - usually young teenagers - were less likely to have ever been tested for HIV, have an ANC visit in the first trimester or institutional delivery, have important implications for prevention of mother-to-child HIV transmission (PMTCT) programmes. This can certainly increase mother-to-child HIV transmission among the youth. Thus, it is important to provide information and raise awareness of PMTCT programmes to prevent further mother-to-child HIV infection among unmarried young mothers in Zimbabwe.

It was found that women with higher-order parity and those reporting unwanted or mistimed pregnancies were less likely to use HIV and maternal healthcare services, but were more likely to use condoms. The fact that pregnant women with a higher-order birth parity were less likely to initiate ANC in the first trimester and delivery care may be a reflection of lack of time, limited resources in the household, constraints related to their responsibilities towards their other children and negative perceptions resulting from previous pregnancies, if the woman was in her second or higher-order pregnancy (Chapters 5, 6). Higher-order parity and mistimed or unwanted pregnancy may also be a reflection of a lack of access to appropriate family planning services (Chapter 7). Previous studies have suggestedthat a pregnancy that is mistimed or not wanted leads to non-utilisation of maternal healthcare services and worse choices regarding contraceptive methods (Muchabaiwa et al., 2012; Ochako and Gichuh, 2016). While the findings in this thesis uphold the conviction that a pregnancy that is mistimed or not wanted may lead to non-utilisation of maternal healthcare services (Nattabi et al., 2009), there is still a need, however, to identify women who get unwanted pregnancies in Zimbabwe to allow for targeted intervention. It is likely that if they are teenagers, they will be afraid of revealing that they are pregnant (Renju et al., 2010), or they may have a false perception of low risk of HIV transmission. The implication is that they will be left out of the HIV and SRH-integrated programme because of fear. In fact, it has been reported elsewhere in this thesis' analysis that teenagers are less likely to receive adequate HIV and SRH healthcare services compared with older women. Policymakers and programme designers may need to target women with higher-order parity and those who reported unwanted pregnancies, particularly young teenagers, as the priority of programmes aimed at increasing uptake of ANC in the first trimester. They should also intensify integration of family-planning services that aim to increase uptake of more effective contraceptive use, such as long-term methods, across sexual and reproductive healthcare delivery services (Chapter 7).

While policymakers and programme designers are now informed that individual-level predisposing factors must be the priority for programmes aimed at increasing uptake of HIV and SRH-integrated service utilisation, we must bear in mind that these factors are not the ultimate determinants of service utilisation. Individuals' predisposing demographic factors alone may not be enough for the actual use of health services (Framework 2.2). The individual and community enabling, perceived risk or need factors that were found to be associated with HIV and SRH service utilisation in Zimbabwe are presented and discussed in the following sections.

8.2.2 Association between individual and community-level social and economic enabling factors and HIV and SRH-integrated health outcomes

The study identified the remarkable influence of social and economic enabling factors on HIV and SRH-integrated health outcomes, confirming and strengthening my analytical framework which originally assumed that enabling factors relating to socio-economic status (SES) such as wealth, education and media can facilitate or inhibit individuals from accessing health care services (Chapter 3). The household socio-economic status was observed to be particularly important, influencing all the indicators of HIV and SRH-integrated services, with higher household socio-economic status being associated with improved HIV and SRH-integrated healthcare services. These findings are supported by various studies cited in chapters 4 to 7. In chapters 5 and 6, it was notedthat poverty may decrease the likelihood of service utilisation due to a lack of financial wherewithal that would enable individuals to have access to maternal healthcare services. As was highlighted in chapter 5, pregnant women from poor households, especially in rural areas, are exempted from user fee payment. However, it cannot be ignored that the implicit cost of healthcare, outside of the user fees, charged for actually receiving the services may inhibit poor women from accessing maternal healthcare services. Women from poor households are less likely to be able to afford the costs associated with access to healthcare (e.g transport), as well as the fact that they may also have little access to information and education on HIV and its implications (Chapter 5). This means that even public health expenditure meant to help the poor ends up benefiting the rich as individuals from wealthier households are more likely to afford both user fee charges and transport costs (Muchabaiwa et al., 2012).

It was also interesting to note gender differences in the likelihood of HIV testing according to wealth in chapter 4. Household wealth was a more important factor for males, while community wealth or poverty was more significant for females. The gender disparity found here within the wealth factor may suggest that more males are economically empowered and have more resources enabling them to access healthcare services than females, thus, economic programmes that aimed at improving uptake of HIV and SRH-integrated programmes should be aimed at improving economic well-being of communities which in turn benefit women. In chapter 7, the importance of wealth in contraceptive choice by women with HIV status was examined. It turned out that, for females, being wealthier and HIV-positive was associated with decreased likelihood of condom use. Lower condom use among wealthier women who knew their HIV-positive status may be the result of national programmes targeting poorer HIV-positive women (ZIMSTA, 2016) in the country. It is important that policymakers put forward a standardised campaign for condom use across the country to ensure a homogenous type of healthcare services to be received by all individuals irrespective of where they live and their wealth status.

A number of economic policies to improve women's SES status can be recommended from these findings. Firstly, there is a need to intensify efforts to reach out to economically disadvantaged women in order to improve uptake of these services. Policymakers and programme managers should recognize that poverty reduction must be part of a greater societal approach that includes strategies to promote economic development for women. There is a need to invest resources in healthcare services that are affordable and accessible, especially those that promote antenatal and delivery care in disadvantaged communities. Secondly, the introduction of financial incentives may stimulate access to HIV and ANC integrated services by providing compensation for transport costs and the opportunity costs of time associated with access to these services for individuals. Monetary incentives can reduce both socio-economic barriers and HIV-related stigma as it may provider a broader reason for going to a health facility for HIV and SRH care (chapter 5). Acknowledging this allows better targeting of health policy and enables more accurate need-based planning. Thirdly, there is a need to increase the number of health facilities both in rural and urban areas which will likely ease the economic and geographical burden incurred by pregnant women seeking care. Efforts at bridging access to health care services by the government must start with providing the enabling infrastructure to bridge institutional determinants for intended users (Chapter 6).

The evidence from this study has also underlined the importance of educational attainment and access to media to HIV and SRH service utilisation. However, it was noted that while having higher educational attainment is an important key factor for HIV testing, antenatal HIV testing and institutional and professional delivery, the converse is true for the timing and number of ANC visits. Generally, education is a key indicator of socio-economic status and more educated people are more likely to have better health due to their ability to have better access to health information and to understand and respond to such information (Chapters 4-7). It is also possible that the disparities in HIV and maternal service utilisation by education may be caused by differences in awareness of the importance of testing, access to testing centres and riskier sexual behaviour (Chapter 4). Hence, as has occurred in other studies, health workers can be used to provide knowledge to villages which can be simplified, in the form of pictures, for those who are illiterate (Chapters 5, 6). Use of health workers may fill the void of formal education lacking in some sections of the population. A study in Ethiopia by Birhane et al. (2015) reported that many women acknowledged that their knowledge of PMTCT came from health workers. In addition to that, social groups, such as inter-governmental organisations' networking, mother's clubs and health committees can also be useful in promoting HIV and SRH-integrated services (Chapter 5).

There is also a need to invest in women's education in communities, particularly at the secondary and higher level in order to increase knowledge and awareness of HIV. Although, secondary educational attainment is near universal in Zimbabwe, there is a disparity in educational attainment between boys and girls, with girls lagging behind. Policymakers should adopt an education policy that compels parents to send their girl children to school (i.e. compulsory education). This can be achieved by enacting legislation that makes it illegal for parents not to send a girl child to secondary education. For those who cannot afford to pay school fees, a bursary support system should be established (chapter 5). In fact, the government's Basic Education Assistance Module (BEAM) programme was a step in the right direction and it should be continued. In order to make education more useful in respect to HIV and SRH-integrated healthcare service delivery, the school curriculum should include sex education, with emphasis on HIV and SRH. It is important to introduce HIV and SRH topics early so that young people can take control of their sexual lives by understanding dangers of risk behaviour and how to protect themselves against HIV transmission.

Access to information about HIV and SRH services can considerably increase the rates with which health services are being used. This study's findings illustrate a clear indication that exposure to mass media (i.e. newspapers, radio and television) plays a major role in informing women about HIV and SRH services. It was found that mass media is associated with use of all the components of HIV and SRH-integrated programmes, including that concerning contraceptive choice among women who know their HIV status. For instance, women who listened to the radio every day had higher odds of having ever been tested for HIV and antenatal care than those who listened less than once a week. Moreover, the likelihood of the use of institutional deliveries increases with media exposure, whereas women who are not exposed to media use maternal health services less frequently. Condom use among women who knew their HIV status was also higher among those who were exposed to media. Various studies have argued that exposure to mass media influences the use of HIV and maternal health services (Chapters 4, 5, 6). The finding that HIV and SRH service utilisation increases with increasing access to media might reflect the fact that individuals who are exposed to mass media may have the opportunity to learn the benefits of HIV testing, where and how HIV counselling and testing is given, and this subsequently improves their awareness towards HIV risk and HIV related knowledge. The results from this study would therefore provide valuable evidence and information to advocate for on-going community-based HIV and SRH media campaigns in Zimbabwe. The rationale for targeting interventions in communities with high levels of deprivation/disadvantage (i.e. poverty, low access to media etc.) is that it provides the most effective way of reaching families most in need, especially in a multi-cultural and diverse country like Zimbabwe (Chapter 5). However, community-based interventions have been criticized due to evidence that most of them were designed to be delivered in a local community or to respond to the variety of community needs, while few of them were actually designed to foster positive neighbourhood effects by treating the community itself as a factor effecting outcomes. Since my results showed that community media was not salient for the uptake of most of the outcomes, it can be suggested that the on-going electronic mass media (television, print and radio) should be scaled-up to include areas where it does not currently exit and should be strengthened in areas where it is weak.

8.2.3 Association between HIV 'enabling' and 'perceived risk/need'factors and HIV and SRH-integrated health outcomes

Our results suggest that HIV 'enabling' and 'perceived risk/need' factors that were influencing the different indicators of HIV and SRH service utilisation were not the same. However, both individual and community-level HIV awareness and stigma were found to be important for HIV testing, antenatal care HIV testing and institutional delivery, but not for ANC timing and frequency of visits or professional delivery. These associations were observed after considering the effects of education, implying that the patterns observed are not attributed to higher educational attainment among those with higher HIV/AIDS awareness or higher stigma. The patterns may be suggestive of a reasonable integration of HIV and reproductive information, education, and communication (IEC), such that individuals and communities with higher HIV/AIDS awareness or higher stigma are now endorsing HIV and SRH messages that tend to encourage HIV testing and institutional delivery. This pattern may also be a result of the success of HIV/AIDS awareness programs that are aimed at reducing stigma in the communities. The results that, in Zimbabwe, pregnant women who hold higher perceptions of HIV-related stigma are more likely to deliver at home is not good news because pregnant women remain at risk of HIV-infection throughout pregnancy (Chapter 6). Thus, more efforts should be focused on reducing HIV-related stigma among women who test HIV-negative during ANC. For those who test HIV-positive during ANC, other considerations, including her perceptions of the risk of mother-to-child transmission of HIV, or whether or not she has disclosed her HIV status to her husband and family, may be at the fore (Mlay et al., 2008; Turan et al., 2015). The importance placed on avoiding unwanted disclosure of HIV status in HIV-positive women's decisions about where to give birth has been reported in other studies (Manzi et al., 2014; Rochat et al., 2006). Other studies suggested that some HIV-positive women prefer a home delivery or to deliver somewhere their status is not known to avoid involuntary disclosure (Mucheto et al., 2011). It is therefore important that women who deliver at home be counselled to receive HIV testing when they first bring their infants in for vaccination or other postnatal care services (Fetene et al., 2010).

The fact that HIV/AIDS awareness and stigma in the community are important for HIV testing and institutional delivery suggests that those who were never tested for HIV and those who give birth at home would benefit from projects addressing issues of HIV awareness and

stigma/prejudice in higher settings (Chapters 4, 5). Policymakers are now informed that the community should be an important target of their efforts to help these specific high-risk groups living in communities with high stigma and low HIV/AIDS awareness. Programme managers should use both electronic media (i.e. television, radio, internet, phone) and print media (i.e. leaflets, booklets and posters) to communicate and spread awareness, taking advantage of the widespread access to print and electronic media in Zimbabwe. More importantly perhaps, awareness raising should focus on avoiding stigmatising and discriminatory behaviours, so that pregnant women can develop positive attitudes towards people living with HIV/AIDS. This method of awareness raising can also help fill the gap of formal education, which is lacking in some sections of the population. It can also be used to influence decisions in cases where pregnancies are mistimed or unwanted as well as to change attitudes in the case of sociocultural enabling factors like religious affiliation.

This study found a strong association between timing of ANC visits and previous-HIV testing and counselling. It could be argued that pre-test HIV counselling which includes information on prevention of mother-to-child HIV transmission in the DHS is an enabling factor for early ANC attendance, in view of the fact women may be aware of their test results. Having previously tested for HIV before a pregnancy seems to have a greater impact on the utilisation of HIV and ANC-integrated care (Jayleen et al., 2016). Although knowledge of HIV sero-status was not controlled, due to fewer cases of HIV-positive women in the data, the behavioural changes among all women who had a previous HIV test, whether HIV-positive or not, has emerged as one of the key channels through which HIV and ANC uptake can be increased. While the study has not put forward a well-developed understanding of how knowledge of HIV-positive status from previous tests may affect utilisation of ANC, the results certainly imply that broader efforts at improving timing of ANC visits should be targeted at pregnant women with no previous HIV testing history. There is ample scope for the testing of all women in the relevant communities, which can complement the on-going national HIV testing programme in the country.

Confidentiality concern has also emerged as a significant barrier for increasing the uptake of all HIV and SRH service outcomes, but not for antenatal HIV testing. Pregnant women with no confidentiality concerns were more likely to have four or more ANC visits as well as delivery care. This may be that pregnant women who have had ANC in the first trimester may

have been tested for HIV and are more confident of their HIV status enabling them to attend further ANC (Lepine et al., 2014). The fact that antenatal HIV testing is not associated with concern may also be due to the fact that, in Zimbabwe, women are given private individual counselling and space to make a private decision without staff and group interference. However, as reported by Loewenson et al. (2002), infrastructural limitations, such as a lack of space and healthcare personnel, can reduce the effectiveness of service integration in Zimbabwe. This is in agreement with a study by Mucheto et al. (2011) which reported that providers felt that more rooms and staff in the health facility for simultaneous counselling on HIV and SRH would increase the likelihood of their clients receiving health services. This implies that stigma related to HIV in pregnancy still undermines the uptake of HIV and maternal healthcare. Policymakers in Zimbabwe are now informed that individuals with confidentiality concerns about how HIV information is handled are less likely to have HIV and SRH care. The policy on protecting confidentiality should therefore focus on individuals who report that they have concerns about privacy and how their information will be handled. Knowing either someone living with HIV or someone who died of AIDS was associated with an increased likelihood of HIV and SRH-integrated service utilisation. This may suggest that being personally acquainted with AIDS victims may be a catalyst for behavioural change, leading individuals to take protective measures, including condom use, to protect themselves against HIV infection. It can also have the effect of encouraging both infected and uninfected women to use long-term contraceptives to prevent unintended pregnancies (Chapter 7). Knowing someone who either is living with HIV or has died of HIV is common in communities where a HIV epidemic is more advanced, like in Zimbabwe.

Perhaps the most important finding reported in this thesis relates to evidence of antenatal care effects on delivery care. It was found that the majority of women who had institutional and professional delivery had their first ANC visit in the first trimester, had previously been tested for HIV as part of ANC and had had four or more ANC visits. These findings are consistent with the notion that access to antenatal care increases knowledge of risks associated with delivery care (Sanga et al., 2017; Sharma et al., 2015), including the fact that HIV can be transmitted during labour and delivery. The results imply that programme managers need to intensify efforts to link these services in order to reach as many women who are likely to have home-based deliveries as possible, through their contact with health services. Hence, HIV intervention programmes need to continue to convey information about the importance and

benefits of institutional and professional delivery for all women during pregnancy and to promote the idea that ANC, particularly antenatal HIV testing, is a standard part of delivery care.

8.3   Recommendations, policy and research implications

The analytical framework used for this analysis proposed that individual and community-level predisposing, enabling and perceived risk/need factors are associated with the use of integrated HIV and SRH services. Among the most important findings, one set of key factors which cut across all the analysis chapters is the important role of predisposing individual demographic factors relating to gender, age, and marital status, enabling factors, such as socio-economic status (i.e household wealth, education, media exposure), and, to some extent, HIV perceived risk/need factors like HIV awareness, stigma and sero-status. It is therefore important that policy and HIV intervention programmes focus mainly on predisposing and enabling factors in order to improve the use of HIV and SRH-integrated services in Zimbabwe. The existing Zimbabwe health policy and strategic documents gleaned are strongly focused on improving geographical accessibility, and primary healthcare policy on SRH services aims to have a health facility in every community. The third Zimbabwe National HIV and AIDS Strategic Plan for 2015-2018 (ZNASP III) further outlines that all of these facilities should be equipped to provide HIV prevention services. Therefore, health policy targets the quantity of HIV and SRH health facilities; however, increasing the number of HIV and SRH facilities might constrain the quality of improvement of an integrated model of healthcare delivery, unless we know which populations to target for increasing the uptake of these services. In the context of Zimbabwe, it is also questionable whether the ambitious large quantities of health facilities providing both HIV and SRH care can be supported in the next few years against the backdrop of a lack of financial and human capital, as discussed in this study and elsewhere. Although the policy and strategic plans are sound, more needs to be done in order to identify factors that influence uptake of HIV services, maternal healthcare and family planning (particularly condom use and long-term contraceptive methods).

First, we should note that HIV testing remains a critical service in the national response to the HIV epidemic in Zimbabwe. Therefore, without progress in improving HIV testing services, the policy of integration of HIV and SRH services will yield limited gains in HIV reduction. The observed gender disparities in determinants of HIV testing discussed in chapter 4 call for

a gender specific response. For males, household wealth and HIV factors such as risky sexual behaviour are critical for improvements in HIV testing. Given that household wealth was a significant predictor of HIV testing for males, the introduction of financial incentives may stimulate males to access HIV testing services by providing compensation for transport costs and opportunity costs of time associated with accessing HIV testing services. Monetary incentives could reduce barriers and stigma as they may provide a broader reason for going to testing centres. More importantly perhaps for both sexes, awareness creation on HIV counselling and testing service utilisation should focus on avoiding stigmatising and discriminatory behaviours so that clients can develop positive attitudes towards people living with HIV/AIDS. Couple-oriented HIV counselling and testing services, where men accompany their spouse to HIV screening during pregnancy, may help increase HIV testing uptake for males and reduce gender disparities. However, there are some references in the literature acknowledging that it may be difficult for pregnant women to invite their partners to accompany them to maternity care due to fear of stigma and violence (Byamugisha et al., 2011; Godif et al., 2015; Kalembo et al., 2013; Mohlala et al., 2011; Theuring et al.,2016; Yargawa, 2015). Policy, programmes or intervention to address the issue of partner involvement should be sought to involve male partners through awareness raising and to encourage index testing (household testing) for women found to be HIV-positive. An evaluation of index testing in Malawi has shown that household testing has a potential to increase male HIV testing uptake (Kalembo et al., 2013).

The role of HIV testing in maternal healthcare underscores the need to consider strategies to retain women in the HIV and maternal health intervention programme. Antenatal HIV testing was identified as a major contributor to adequate antenatal care, yet many pregnant women are lost to the health system after antenatal care HIV testing. Community mobilisation and home-based follow-up care, encouraging pregnant women lost in the system to give birth in a facility, may help increase uptake of PMTCT among women who test HIV-positive during ANC. Experience from various community projects indicates that, where there is low uptake of maternal healthcare at the facility, community health workers can take up the role of promoting antenatal care and facility delivery (Akinyi et al., 2015).

The coverage of HIV testing should be expanded and improved, intensifying the targeting of individuals and groups of people, such as older females and those who express confidentiality

concerns about the health information, and male non-condom users. Policies, programmes and interventions targeting older women and non-condom users need to develop new methods of communication that take into account some basic knowledge of how HIV is transmitted. It is also important that the Zimbabwe National Behavioural Change programme that was rolled out to young people and community-based HIV testing in rural areas should expand to include older females and non-condom users (ZNNP, 2015-2018). These types of programmes may also help reduce risky behaviour and help keep the spread of HIV in check. There is wide agreement that when people know their HIV status they make better decisions about sexual behaviour.

8.3.1   Poverty as a potential impediment to utilization of services

We have also noted that women of low social economic status or in deprived communities are less likely to use HIV and SRH care services in general, implying that there is ample room for the advancement of women and their position in the society. Policies to address the issue of poverty must be part of a greater societal approach that includes strategies to promote economic growth in all areas of the country, reducing unemployment, increasing wages, accessible and affordable quality SRH care and removal of other barriers that prevent economically disadvantaged vulnerable groups from gaining employment or engaging in economic activities. Alternatively, conditional cash transfers to women living in poor households may be implemented, although evidence in support of this strategy is limited. One study in Zimbabwe on the effect of cash transfers on women's health reported that pregnant women who participated in a cash transfer programme were twice as likely to have adequate antenatal and delivery care (Gregson et al., 2011). On the other hand, financial insecurity places many women in economically dependent relationships with men, limiting women's autonomy to make decisions, including those around HIV and SRH (Church et al., 2016). A higher level of poverty, particularly in the context of gender inequalities, undermines women's decision-making power, which in turn undermines their SRH, thus, in policy-making perspectives, women who are economically poor need to be supported.

A striking finding is that rural residents are not worse off than their urban counterparts of similar characteristics before other factors are considered. As urbanisation is on the rise, populations in the cities are growing faster than the infrastructure is, creating a lack of resources and healthcare in Zimbabwe. Hundreds of thousands of poor women live in slums, without

proper access to healthcare or health professionals. In the literature it is shown that slums are predominantly served by privately owned and unlicensed health facilities with limited skilled staff and equipment, whereas most of the formal health facilities are located outside the slums (Fotso et al., 2011). This means that individuals living in slums in Zimbabwe are less likely to have delivery care than women living in rural areas. Although some may argue that, as opposed to rural people, the urban poor have better access to healthcare due to the proximity of facilities, large healthcare disparities within urban areas would suggest that proximity to health facilities cannot be interpreted as equal access to services (Magadi et al., 2003). Many of the development projects surrounding improvement of HIV and SRH healthcare have been focused on rural areas in Zimbabwe because they lack resources in the way that urban areas do not (Makate and Makate, 2016). For example, there are maternity home shelters in rural hospitals designed to accommodate pregnant women who are closer to giving birth in rural areas, but not in the urban areas.

Recognizing that the poorest in urban areas often have no access to essential healthcare services due to various barriers, HIV and SRH intervention programmes should target women with low income and those living in slums in urban areas. Although the government affirms the rights of all women to maternal healthcare and officially endorse increased services for the poor, its own health system struggles with constant lack of funding to cover healthcare in slum areas (Chatiza and Mlalazi, 2009). The problem of funding may be solved by strengthening non-governmental organisations working in maternal health by providing technical support and allowing them to work without political interference. While, we report that place of residence is crucial for antenatal care in Zimbabwe, the role played by an antenatal HIV testing and optimal frequency of antenatal visits in ensuring delivery care cannot be underestimated. The government should ensure universal access to prenatal care services, irrespective of the ability to pay.

8.3.2   The need to target the youth

It was also reported in the study findings that young women are less likely to use health services than older women. Government policy should make known the importance of HIV testing, maternal healthcare and family planning in averting HIV-pregnancy related problems. There is a need to meet the health needs of adolescent girls and young women, particularly, by providing

friendly and easier HIV and SRH services. There are reports that many of the health facilities are not youth friendly and services for adolescents are poorly publicised in Zimbabwe (Buzdugan et al., 2015). In addition, there are also some reports indicating that service providers' attitudes and biases greatly undermine adolescent healthcare uptake (Sibanda et al., 2013) in Zimbabwe. Policy and intervention to address the needs of adolescents must consider making health facilities youth-friendly by allocating specific times or space to serve youth. Such programmes may get young people to use health services without the fear of the providers judging them. The youth-friendly 'corner' health facilities that provide peer-counselling, family planning, HIV testing, maternal health information and distribution of condoms have proved to be a success in increasing the use of SRH care services by young people in South Africa (Matthews et al.,2009, Renju et al.,2010) as well as in Botswana, Malawi and Mozambique (Underwood et al., 2014).

Additionally, counselling on sexuality and safer sex are needed to empower youth to make healthy decisions, including protecting themselves from unwanted pregnancies and STI/HIV. Policymakers may consider school and community based approach programmes. There is evidence that 'in-school' interventions provide convenient means for HIV and sexual reproductive health education and have been demonstrated to be effective in improving knowledge and attitudes, particularly concerning HIV and uptake of sexual and reproductive health services (Harrison et al., 2010). Therefore, the school curriculum should emphasise SRH topics that need to be introduced early so that young people can take control of their sexual lives by understanding the dangers of early sex and learning how to protect themselves. Another way of increasing HIV awareness among young people is to provide life-skills through anti-AIDs social clubs and sports. Although there has not been a national programme to evaluate community life-skills training programmes for young people, local area programming suggests young people from rural areas enrolled in the programme are receptive to HIV information in Zimbabwe (Chevo and Bhatasara, 2012). Thus, I argue this programme should be scaled-up to include areas where it does not exist, and should be strengthened in areas where it is weak.

8.3.3 HIV perceived risk/need factors

Among the HIV perceived risk/need factors, confidentiality concerns and knowledge of one's HIV status emerge as major predictors of HIV and sexual and reproductive service utilisation.

In Zimbabwe, confidentiality concerns and stigma are still widely perceived as socially dangerous. The inadvertent or improper disclosure of HIV status, which may result in discrimination and stigma, is a significant risk faced by people living with HIV. Pregnant women may be afraid that a provider may share the reason for their visit to the facility with their relatives (Anyait et al., 2012). Thus, policy should focus on protecting confidentiality of HIV-related information, the rights and obligations of people living with HIV with respect to disclosure of HIV status. Privacy and confidentiality by healthcare providers must be a top priority and possible legal action when unauthorised disclosure of someone's HIV must occur. This intervention may also apply to condom use and long-term contraceptive methods for women who know their HIV-positive status. This may be an important policy for addressing unmet needs in HIV and maternal health services in Zimbabwe. At the health facility, privacy and confidentiality may be increased by minor renovations of facilities, such as partitioning of rooms or adding doors, as well as changes in the practices of providers, like minimising interruptions during client visits, for instance. This notion finds support in the literature where it is argued that individuals are more likely to use health services if their right to confidentiality is guaranteed (Hardon et al., 2012; Turan et al., 2008). An enabling policy, rooted in a legal and social environment, should be a pre-requisite to successfully reduce HIV stigma and discrimination at health facilities which is central to the promotion of human rights in the context of HIV.

This thesis' findings further indicated that HIV prevention awareness programmes targeting women who know their HIV status, to encourage them to use condoms and long-term methods of contraception, are not working. There is a great need to re-strategise the campaigns on condom use, especially in rural areas and among women who are married. Similarly, policy on long-term contraceptive method use should target women in rural areas and those with higher-order parity. It is important that policymakers suggest policy that will ensure that campaigns for condom use will be intensified in rural areas, and that there be a standardisation campaign across the country to provide a homogenous type of service for all women, irrespective of their HIV status.

8.3.4   Knowledge of HIV status as trajectory to better choice of contraceptive methods

Chapter 7 ascertained the extent to which knowledge of HIV status would enable women to choose appropriate contraceptive methods to meet their reproductive goals and needs. The analysis indirectly contributes to debates on family planning and HIV-integrated programmes that are aimed at increasing condom and long-term contraceptive methods use for prevention of both HIV infection and unintended pregnancy. It is important to note that, whilst a majority of women (both infected and uninfected) are still using hormonal methods, some have shifted to the use of condoms, long-term and other methods. It turned out from the analysis that women who know they are HIV-positive (as determined by our proxy variable of receipts of HIV test results from the previous test) were more likely to use condoms than hormonal methods. The result that women who know they are HIV-positive are more likely to use condoms is a positive outcome and suggests that being HIV-positive is associated with a felt need to prevent HIV transmission to partners. Therefore, condom use among HIV-positive women reflects a higher perception of risk of HIV transmission rather than the need for limiting child-bearing. This notion is reflected in our results which suggest no differences in women's choices to use long-term methods, whether they know they are HIV-positive or know they are HIV-negative. However, the fact that there is no difference in the choice of long-term methods, with hormonal , suggests that the information about the use of long-term methods as preventive measures for unintended pregnancies has been more integrated in family planning services and is now increasingly widely accepted. As a result of these findings, policymakers and programme managers in Zimbabwe should give special attention to HIV-positive women's needs for condoms, while at the same time, continue to address the unmet requirements for long-term methods to prevent unintended pregnancies for both infected and uninfected women.

It is worrisome to note that shifting from hormonal methods to condom and long-term methods use is not taking place as a response to the wider campaigns encouraging women to use condoms and long-term methods to protect themselves against HIV infection, whether they are uninfected or already infected with HIV and wish to prevent unintended pregnancies. Policymakers and programme managers may need new strategies for scaling-up the integration of HIV prevention programmes within family planning services. However, taken together, the findings from this thesis suggest that integration of condom distribution in family planning services may already be functioning and can be scaled-up country wide. As condom

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distribution within family planning services continue, women are learning more about the importance of condoms in the prevention of HIV.

8.3.5   Final remarks

While, it is reported in this thesis that individual–level predisposing, enabling and HIV perceived factors are all important in the delivery of HIV and SRH services, there is also a need to develop preventative measures which are appropriate for different local contexts, targeting different age groups and sub-groups, particularly for delivery care. Although, the study highlights the key role played by both socio-economic, demographic and HIV factors on integrated services, there is a need to use mixed methods research to further understand the geographical differential distribution of individuals who use these services. There is also a need to base such studies on sound theories, at the design stage, for the purpose of providing reasonable explanations for the associations seen in these studies, especially at the community-level. There have been no studies conducted in Zimbabwe to test theories such as the Social Ecological Models of Health Promotion and Structural and Environment theories (Stokvol, 1996), which is important because the analysis of this study showed that some community-level factors are associated with HIV and SRH-integrated services, when individual-level factors are considered. Also in the mainstream HIV sector, governmental policies and non-governmental organisations should take emerging new strategic information and knowledge, global trends, practices in human rights, and gender into consideration as they relate to HIV response.

Table 8-2: Summary implication for health policy in Zimbabwe

HIV testing for primary prevention of HIV-
- Engage in social mobilisation to reduce stigma and gender inequities   - Integrate information and education on PMTCT into all education, health care and HIV and AIDS messaging and programming.   - Increase the use of HIV counselling and testing (HCT) at all levels, with increased use of couples counselling and testing.

• As social and behaviour change communication cuts across a wide range of other HIV and AIDS interventions, coordination and harmonisation of prevention interventions will be critical. • Integration of Social and Behaviour Change Communication interventions in the work place, schools and community development programmes
HIV and maternal health care • Facilitate access and promote regular attendance to antenatal care for pregnant women. • Intensifying education, awareness, and community mobilisation to generated demand for maternal health care services • Promote opt-out/routine HCT for pregnant women in antenatal care and for their male partners. • Provide home-based and community-based counselling on PMTCT for all pregnant women and their male partners, • Empower non-governmental organisations to implement delivery care in urban areas
Contraceptive choice • Facilitate information and access at the community level to modern contraceptives to prevent unplanned pregnancy. • Promote the use of dual methods of contraception to include condoms to prevent transmission of HIV. • Establishment of condom distribution outlets and in particular friendly outlets for youth and key populations • Integration of condom education and distribution in other health and sexual reproductive services including family planning • Promotion of consistent and correct use of condoms among sero-discordant couples. • Promotion of male and female correct and consistent use of condom among key and most at risk populations.

In conclusion, the analysis shows that HIV and SRH service uptake did increase significantly between 2005/6 and 2010/11. However, there is evidence that some factors included in the models may have influenced the uptake of different HIV and SRH-integrated services differently. This means that policy makers have to be careful in terms of the structuring strategies to improve the HIV and SRH-integrated programme in Zimbabwe. For instance, a strategy that might improve delivery care may not necessarily have a significant impact on HIV testing, ANC and contraceptive choice of women who know their HIV status. While this thesis found little evidence of the impact of HIV on sexual and reproductive healthcare outcomes, the existing HIV initiatives such as HIV awareness campaign to provide HIV services to men and women in Zimbabwe need to be commended. However, there is an urgent need to build on their strengths and address their shortcomings. Plans to implement the set of recommendations listed above should be put in place and be part and parcel of the HIV and SRH-integrated programme. Given the findings and recommendations, it is hoped that this will strengthen the on-going HIV and SRH-integrated programme and help reduce the rate of MTCT of HIV in Zimbabwe.

Peer reviewed publications extracted from this thesis are listed below:

Gazimbi MM, Magadi MA (2018) Individual and Community-level Determinants of Antenatal HIV Testing in Zimbabwe. *Journal of Biosocial Science*; JBS-4363 (in press)

Gazimbi MM, Magadi MA (2017). A multilevel analysis of the determinants of HIV testing in Zimbabwe: Evidence from the demographic and health surveys. *HIV/ AIDS Res Treat Open J*. 2017; 4(1): 14-31. doi: 10.17140/HARTOJ-4-124

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Appendices

Appendix 4.1 Average odds of HIV testing from multilevel logistic regression models (95% confidence intervals are given in square brackets) males and females

Parameters	Model 1	Model 2	Model 3
Survey (2005-6)			
2010-11	4.16[3.80-4.55]*	5.30 [4.67-6.02]*	5.60 [4.90-6.37]*
Gender (males)			
Females	1.98[1.85-2.13]*	1.84 [1.63-2.07]*	1.83 [1.63-2.07]*
Residence (urban)			
Rural	0.79[0.72-0.86]*	1.12 [1.00-1.26]*	1.18 [1.04-1.34]*
Age groups (15-24)			
25-29	1.30[1.17-1.43]*	1.20[1.08-1.33]*	1.20 [1.08-1.33]*
30-34	0.90 [0.80-1.01]	0.83 [0.74-0.94]*	0.83 [0.74-0.94]*
35-39	0.75[0.66-0.86]*	0.69 [0.61-0.79]*	0.69 [0.61-0.79]*
40+	0.60[0.53-0.69]*	0.55 [0.49-0.63]*	0.55 [0.49-0.63]*
Marital status (never married)			
Married	2.01[1.78-2.26]*	2.30 [2.03-2.60]*	2.30 [2.03-2.59]*
Widowed	2.39[1.98-2.88]*	2.50 [2.07-3.03]*	2.51 [2.07-3.04]*
Divorced	1.83[1.56-2.16]*	1.80 [1.52-2.13]*	1.80 [1.52-2.13]*
Occupation(unemployed)			
Professional	1.31[1.18-1.46]*	1.21 [1.08-1.35]*	1.21 [1.09-1.35]*
Manual work	1.28[1.15-1.42]*	1.20 [1.08-1.34]*	1.21 [1.08-1.34]*
Agriculture	1.03 [0.93-1.14]	1.00 [0.91-1.11]	1.01 [0.91-1.11]
Religion (Catholic)			
Protestant	1.08 [0.98-1.18]	1.04 [0.95-1.15]	1.05[0.96-1.15]
Pentecostal	1.18[1.08-1.29]*	1.17 [1.06-1.28]*	1.17 [1.06-1.29]*
Apostolic	0.98 [0.90-1.05]	1.01 [0.93-1.09]	1.01 [0.93-1.09]
Secondary	1.67[1.55-1.80]*	1.49 [1.38-1.61]*	1.50 [1.39-1.62]*
Higher	3.62[3.04-4.31]*	2.82 [2.36-3.38]*	2.84 [2.37-3.40]*
Enabling and perceived/need factors			
Wealth (poorest)			
Poorer		1.00 [0.90-1.11]	1.01 [0.90-1.12]
Middle		1.12 [1.01-1.25]*	1.13 [1.01-1.26]*
Richer		1.25 [1.10-1.42]*	1.24 [1.09-1.41]*
Richest		1.40 [1.20-1.62]*	1.38 [1.18-1.60]*

Appendix 4.1 continued

Media exposure (low)			
Medium		1.22 [1.12-1.34]*	1.21 [1.10-1.32]*
High		1.62 [1.36-1.92]*	1.52 [1.28-1.82]*
HIV/AIDS Awareness(low)			
Medium		1.75 [1.51-20.2]*	1.76 [1.52-2.03]*
High		1.85 [1.58-2.16]*	1.86 [1.59-2.17]*
Observed AIDS stigma(no)			
Yes		0.81 [0.73-0.91]*	0.81 [0.73-0.91]*
HIV disclosure concern(no)			
Yes		0.83 [0.76-0.91]*	0.83 [0.76-0.91]*
Knows someone died with Aids(no)			
Yes		1.30 [1.14-1.48]*	1.29 [1.13-1.48]*
History of STI (no)			
Yes		1.66 [1.38-2.00]*	1.66 [1.38-1.99]*
Community factors			
HIV/AIDS stigma-gm			0.62 [0.42-0.92]*
Media exposure-gm			1.47 [1.14-1.89]*
Random Variance (SE)	0.129(0.016)*	0.112(0.015)*	0.11(0.015)*
(VPC)=ICC(%)	3.8	3.3	3.3

VPC=Variance Partition Co-efficient, ICC=intra-cluster correlation, *Statistical significance

at 5% level p<0.05

Appendix 6.1 Average odds of HIV testing from multilevel logistic regression models (95% confidence intervals are given in square brackets) institutional and professional delivery

Parameters	Institutional Delivery	Professional Delivery
Predisposing factors		
Survey 2010	0.41 [0.32-0.53]*	0.44 [0.34-0.56]*
Place of residence (rural)		
Urban	0.39 [0.30-0.50]*	0.38 [0.29-0.49]*
Age groups(15-24)		
25-29	1.68 [1.43-1.97]*	1.74 [1.49-2.04]*
35+	1.77 [1.44-2.19]*	1.99 [1.61-2.45]*
Marital status(never married		
Married	1.39 [1.03-1.88]*	1.27 [0.94-1.72]
Widowed	1.75 [1.19-2.57]*	1.42 [0.97-2.09]
Divorced	1.11 [0.81-1.52]	0.95[0.69-1.30]
Women's education (primary)		
Secondary	1.69 [1.50-1.91]*	1.67 [1.48-1.89]*
Religion(Catholic)		
Protestant	1.53 [1.26-1.84]*	1.59 [1.32-1.92]*
Pentecoastal	1.30 [1.07-1.57]*	1.33 [1.10-1.61]*
Apostolic	0.94 [0.82-1.07]	0.94 [0.82-1.08]
Wanted child (now)		
Later	0.78 [0.68-0.89]*	0.76 [0.66-0.87]*
Not wanted	0.77 [0.67-0.92]*	0.71 [0.59-0.85]*
Parity		
2	0.60 [0.50-0.70]*	0.59 [0.50-0.70]*
3+	0.38 [0.32-0.47]*	0.36 [0.30-0.44]*
Wealth (poor)		
Medium	1.64 [1.35-2.00]*	1.70 [1.40-2.07*
Rich	2.66 [1.94-3.65]*	2.76 [2.00-3.80]*
Employment status(No)		
Yes	0.94 [0.83-1.07]	0.97 [0.85-1.10]
Media exposure (Lowl)		
Medium	1.23 [1.07-1.40]*	1.21 [1.06-1.39]*
High	1.29 [1.10-1.51]*	1.28 [1.09-1.50]*
Decision making (husband)		
Women alone	0.98 [0.80-1.20]	0.96 [0.78-1.17]
Jointly	0.95 [0.80-1.13]	0.98 [0.82-1.17]

Appendix 6.1 continued

Access problem (no)		
Yes	0.79 [0.69-0.91]*	0.83 [0.72-0.95]*
No. of ANC visits (no)		
4 plus	4.14 [3.28-5.21]*	5.90 [4.82-7.24]*
ANC-HIV test (no)		
Yes	2.77 [2.43-3.16]*	2.75 [2.41-3.13]*
HIV sero-status (negative)		
Positive	1.01 [0.86-1.19]	0.10 [0.85-1.18]
HIV awareness (low)		
Medium	1.14 [0.99-1.31]	1.13 [0.98-1.30]
High	0.84 [0.72-0.98]	0.84 [0.72-0.97]*
HIV stigma(low)		
Medium	1.04 [0.86-1.27]	1.01 [0.3-1.23]
High	0.95 [0.77-1.17]*	0.89 [0.73-1.10]
Confidential concern (yes)		
No	1.18 [1.05-1.32]*	1.19 [1.06-1.33]*
Knows someone with AIDS (no)		
Yes	1.25 [1.05-1.49]*	1.21 [1.02-1.45]*
Contextual Factors		
HIV awareness-gm	1.22 [0.73-2.04]	0.73[0.33-1.51]
HIV stigma-gm	1.26 [0.71-2.24]	1.07 [0.60-1.92]
HIV prevalence-gm	0.68 [0.31-1.46]	1.2]6 [0.75-2.13
Random effects parameters		
Community-level		
Variance (SE)	0.447[0.061]*	0.526 [0.083]*
(VPC)=ICC (%)	12	14