Trends and determinants of contraceptive use and method choice among young Zimbabwean women from 1988 to 2015

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ABSTRACT

Fertility decline in Zimbabwe has been driven by an increase in the contraceptive prevalence rate (CPR). However, adolescent childbearing remains a challenge. Adolescent fertility increased from 103 births per 1 000 women in 1988 to 110 births per 1 000 women in 2015. The study aims to examine the trends in contraceptive use, unmet need, method choice, and determinants of contraceptive use and method choice among young women aged 15-24 in Zimbabwe from 1988 to 2015.

The study utilises six cross-sectional data sets obtained from the Zimbabwe Demographic and Health Survey (ZDHS) for the years 1988, 1994, 1999, 2005-06, 2010-11, and 2015. Descriptive statistics and multivariate logistic regression were used to achieve the objectives of the study.

Results showed that young women are sexually active and mostly outside of marital union. The use of modern contraceptives among sexually active young women increased from 39.7% in 1988 to 58.2% in 2015. Unmet need for modern contraceptives declined from 54.1% in 1994 to 41.6% in 2015. The pill remains the most common method used, and the use of injections and implants has also increased over time. The results show that young women aged 22-24, residing in urban areas, better educated, employed, married or cohabitating, with one or more living children, and those with a desire to have more children after 2 years are more likely to use modern contraceptives compared to other groups. Whereas, widowed, divorced, or separated, and women with a desire to have more children within 2 years are less likely to use modern contraceptives. Young women who are married (OR=2.265), better educated (OR=1.590), and have one or more living children (OR=18.411) are more likely to use injections compared to other groups. Women with secondary or higher education (OR = 2.748) and one or more living children (OR= 22.673) are more likely to use Norplant/Implants compared to other groups.

In conclusion, the study demonstrates that young women are sexually active and the unmet need for modern contraceptives remains a challenge. The use of contraceptives is associated with age group, residence, education level, employment status, marital status, parity, and desire for more children. There is need to strengthen young women's universal access to family planning information and services.

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1 INTRODUCTION

1.1 Background

Adolescent (15-19 years) women globally experienced the largest decline in fertility levels compared to women in other age groups (United Nations 2020). Global adolescent fertility rates declined from 64.8 births per 1000 women over the period 1990-1995 to 42.5 births in 2015-2020. However, sub-Saharan Africa remains with the largest adolescent fertility rates compared to other regions of the world (United Nations 2020). In 2015-2020, adolescent fertility rate was 104 births per 1000 women in sub-Saharan Africa (United Nations 2019).

Contraception is commonly held to be the most important proximate determinant of fertility in studies of fertility decline in most developing countries (Bongaarts and Potter 1983; Majumder and Ram 2015). Additionally, slight declines in adolescent fertility over the period 1986 to 2015 in Latin America and sub-Saharan Africa have been found to have been achieved through an increase in contraceptive prevalence (Sánchez-Páez and Ortega 2018). Studies conducted in different African countries show that contraceptive use among young women is influenced by various socio-demographic, socio-economic, and other individual level factors (Mandiwa, Namondwe, Makwinja *et al.* 2018; Olagunju, Bolarinwa and Erinfolami 2020; Sidibé, Delamou, Camara *et al.* 2020; Worku, Tessema and Zeleke 2015).

Zimbabwe experienced a decrease in the total fertility rate (TFR) and a parallel increase in contraceptive prevalence rate (CPR) over the period 1988 to 2015 (Zimbabwe National Statistics Agency (ZIMSTAT) and ICF International 2016). However, adolescent fertility remains a challenge. Adolescent fertility increased from 103 births per 1 000 women in 1988 to 110 births per 1 000 women in 2015 (Central Statistical Office [Zimbabwe] and Institute for Resource Development/Macro Systems Inc. 1989; Zimbabwe National Statistics Agency (ZIMSTAT) and ICF International 2016). This study seeks to understand why adolescent fertility remain high, whilst TFR has declined over time. It does so by looking at the determinants of contraceptive use among young women in Zimbabwe over the period 1988 to 2015.

1.2 Problem statement

This research uses data from Zimbabwe Demographic Health Surveys (ZDHS) conducted between1988 and 2015 to examine the determinants of contraceptive use and method choice among young women. Individual level factors that determine

contraceptive use that will be analysed include age group, residence, region, education, marital status, parity, employment status, knowledge of contraceptive methods, and desire for more children.

Young women who give birth at an early age are at higher risk of pregnancy related complications which lead to maternal and child mortality (Ahmed, Li, Liu *et al.* 2012; Gubhaju 2002; Pradhan, Wynter and Fisher 2015). Additionally, early age childbearing can have socioeconomic consequences for the mother and may contribute to rapid population growth through population momentum (United Nations 2013). Hence, it is important to understand the determinants of contraceptive use among young women in Zimbabwe so that appropriate interventions can be developed to reduce adolescent childbearing.

1.3 Research objectives

The aim of this study is to examine the trends in contraceptive use, unmet need, method choice, and determinants of contraceptive use and method choice among young women aged 15-24 in Zimbabwe from 1988 to 2015. The specific objectives are as follows.

1. To examine the age at sexual debut for young women.
2. To examine the trends in contraceptive use, unmet need, and method choice.
3. To analyse the relationship between contraceptive use and its determinants over time in Zimbabwe.
4. To analyse if the determinants of contraceptive use also influence method choice in Zimbabwe.

1.4 Study outline

The study consists of five chapters. Chapter 2 reviews the literature on contraception historical background, contraceptive use among young women, determinants of contraceptive use among women in developing countries, and contraceptive use in Zimbabwe. Chapter 3 outlines an overview of the methods and data used in achieving the study objectives. Results obtained using methods described in Chapter 3 are presented in Chapter 4. Chapter 5 concludes the study by summarising findings, outlining limitations of study, and making recommendations.

2 LITERATURE REVIEW

Family planning programmes played a major role in influencing the increase in contraceptive use in developing countries. Section 2.1 reviews literature on the historical background of the establishment of family planning programmes as policy response to rapid population growth in developing countries and any changes thereafter. Section 2.2 reviews literature on contraceptive use among young women.

Section 2.3 reviews some of the factors found to be associated with contraceptive use among women from other studies. Section 2.4 reviews literature on contraceptive use in Zimbabwe. Section 2.5 summarises the findings from previous literature and highlights gaps observed from literature.

2.1 Introduction

Bongaarts and Potter (1983) regards contraceptive use as a proximate determinant of fertility. Three others include postpartum infecundability, proportion of married women, and induced abortion. The applicability of Bongaarts and Potter's theory was demonstrated by Majumder and Ram (2015) who investigated the effect of these proximate determinants on Asian countries' fertility decline. Majumder and Ram (2015) concluded that contraceptive use was the most influential factor in Asian fertility decline especially among poor populations. They also highlighted a decrease in proportion of married women as the second important factor and induced abortion having minor effect on Asian fertility decline.

However, contraceptive use is not always the most influential determinant of fertility decline in all countries or societies as observed in the Romanian society. After 1900, Romanian fertility declined sharply and at the same time abortion was being widely used to limit births (Bradatan and Firebaugh 2007). Additionally, a study by Frejka (1985) concluded that Romanian fertility decline over the years 1958 to 1966 was mostly influenced by induced abortion.

The reductions in fertility and population growth in developing countries was influenced by an increase in the use of contraceptives (Bongaarts, Mauldin and Phillips 1990). This increase in contraceptive use was achieved through the efforts of family planning programmes in increasing contraception availability and encouraging small family sizes.

Family planning programmes in developing countries were established as a policy response to rapid population growth (Bongaarts and Sinding 2009). The events leading to the establishment of family programmes as policy interventions are complex in nature. However, studies by Hodgson (1983) and (Szreter 1993) show that their development is linked to the demographic transition theory. This theory relates the process of fertility and mortality decline to socioeconomic development. The demographic transition theory was formulated in the mid-1940s by United States (US) demographers through the study of historical fertility decline in Western Europe which had started in the late nineteenth century (Hodgson 1983).

According to Hodgson (1983), the idea of family planning programmes as policy intervention is a result of a shift in the mindset of US demographers in the 1940s and 1950s. US demographers had recognised fertility decline in Western Europe before 1945 to have been influenced by socioeconomic development brought by industrialization.

However, after the Second World War, US demographers were posed with a different situation of rapid population growth in developing countries. This population growth was seen as an obstacle to achieving socioeconomic development which in turn influences fertility decline. Developing countries' demographic changes failed to follow the stages of demographic transition as what had happened in Europe. Hodgson (1983) argues that this motivated a shift in demographers' mindset from an investigative one that seeks to understand past demographic changes to a mindset that needed to induce future fertility decline. In other words, demographers shifted from being social scientists to policy scientists.

Szreter (1993) disagrees with Hodgson's arguments. Instead Szreter (1993) argues that family planning programmes were products of social scientific study of fertility before the 1950s. In other words, policy consideration influenced the formulation of demographic transition theory. The theory was to be used by US planners of development to plan assistance for other countries after Second World War and build international relations.

However, US demographers noted the possibility of reversal in causation of demographic transition theory in developing societies (Szreter 1993). Unlike Western Europe, developing countries had to undergo demographic transition at a time where modernization was brought to them through colonization. Mortality started to decline due to improvement in health care systems. On the other hand, fertility levels remained high resulting in rapid population growth. This led to larger population sizes in

developing countries compared to the experiences of Western Europe when demographic transition started. In addition, developing countries had to undergo the transition at a time when they had no access to cheap world trade market. Hence developing countries were expected to have different experiences of demographic transition.

In addition to the possible reversal of demographic transition theory, political events in Asia posed a threat to the US ideas of international trade market and relations. Over the period 1948 to 1949, China fell into the hands of a communist government (Szreter 1993). According to Szreter (1993), rapid population growth and poor economic growth were seen as providing conducive environments for the rise of communists leaders. To find solutions, questions were posed to demographers on how their theories can be used to induce reduction in population growth and in turn influence socioeconomic development.

Faced with a possible reversal in causation of demographic transition theory and Asian political events, US demographers needed to find an intervention method that induced fall in birth rates. With an increase in population research carried out in Asian countries, demographers started advocating for government organised family planning programmes as interventions (Szreter 1993). The Indian government was very open to these ideas (Szreter 1993), and was the first government to adopt national family planning programme in 1952 (Bongaarts, Mauldin and Phillips 1990). Since then, research on family planning increased. From the late 1950s, more effective modern contraceptives such as the pill, Intra-Uterine Devices (IUD), Injection, and Implants were invented (Garenne 2018).

The introduction of a national family planning programme in India was followed by the first trial experiment on population control. The experiment was carried out in the Khanna rural village in Punjab province over the period 1954 to 1959 (Wyon and Gordon 1971). This trial was then followed by an increase in the implementation of family planning programmes in other developing countries (Garenne 2018).

In Africa the implementation of family planning programmes occurred later compared to other regions of the world (Sharan, Ahmed, May *et al.* 2011). Their introduction was affected by politics, cultural beliefs, and social norms contesting against the programme. In addition, legal factors such as the 1920 French law also affected the introduction of family planning programmes in Africa (Garenne 2018). This law prohibited the use of contraception or abortion as birth control methods in France

after the First World War. This law also applied to French colonies in Africa and these countries had to revoke this law before introducing family planning programmes. All these barriers, in turn slowed down the process of fertility decline in the continent.

According to Tsui, Brown and Li (2017), developments in the health sector of African countries contributed to the improvement of family planning programmes in the continent. Firstly, the onset of the HIV/AIDS epidemic among African populations in the 1990s and 2000s forced countries with high rates of infections to improve their weak health care systems and health expenditure per capita. To offer specialized care and treatment, these countries started to receive international funding for HIV programmes, and for tuberculosis and malaria. Measures taken by policy makers and the public to eradicate the HIV/AIDS epidemic when they recognized it was sexually transmitted also benefited maternal and child health areas and family planning programmes. The use and encouragement of using contraception methods such as condoms as disease prevention methods increased. The use of male circumcision and pre-exposure prophylaxis (PrEP) regimens also increased.

Secondly, Tsui, Brown and Li (2017) links the improvement of family planning programmes in Africa to the 48 health ministers' adoption of the African Union's Maputo Programme of Action (MPoA) in 2006. Improving family planning programmes was one of the six important strategies aimed at achieving the MPoA universal goal to providing access to reproductive health by 2015.

The support for family planning programmes increased globally in the 1970s up to mid-1990s and by 1996, family planning policies had been implemented in 115 countries (Bongaarts, Cleland, Townsend *et al.* 2012). This recognition and awareness was partly influenced by population conferences organised since 1965 (Garenne 2018), which also in turn led to family planning prioritization by donors (Bongaarts, Cleland, Townsend *et al.* 2012).

Additionally, the International Conference on Population and Development (ICPD) held in Cairo in 1994 played a major role in influencing donors. At the ICPD, population policy was redefined leading to the integration of family planning into reproductive and sexual health care (McIntosh and Finkle 1995). The Programme of Action of the ICPD indicate that women have a right to access contraception methods of their choice, have the freedom to make their own family planning choices, as well as the right to access to health care services to reduce maternal and child mortality

UNFPA (2014). Hence, access to family planning methods also became important in improving women's reproductive health.

2.2 Contraceptive use among young women

Many women especially in low- and middle-income countries (LMIC) die from maternal complications (World Health Organization 2018). Reducing fertility levels among adolescent (15-19 years) women is one way of reducing maternal mortality. It also helps the achievement of Sustainable Development Goal (SDG) number 3 targets to prevent maternal and child mortality.

According to the United Nations (2020), high levels of fertility declines since 1990 were experienced among adolescent women compared to other women of reproductive ages. Birth rates declined globally from 64.8 births per 1 000 over the period 1990-1995 to 42.5 births per 1 000 women in 2015-2020. Sub-Saharan Africa experienced the largest declines compared to other regions of the world. However, it still remains with the highest rates of adolescent childbearing compared to other regions of the world (United Nations 2020).

The non-use and lack of access to contraceptives is one of the risk factors associated with adolescent pregnancies in developing countries (Pradhan, Wynter and Fisher 2015). Women who give birth at an early age are at high maternal and child mortality risk. Because of incomplete pelvic development, young women aged less than 18 years are at high risk of maternal mortality (Ahmed, Li, Liu *et al.* 2012). The chances of having stillborn babies or babies suffering injuries at birth are high among adolescent women (Gubhaju 2002). Additionally, adolescent women are more likely to give birth to premature or low birth weight babies (Gubhaju 2002).

Early age childbearing also affects the socioeconomic status of the mother. Raising children requires investment in time and energy. For women who bear children an early age whilst in school especially high school, raising children interferes with their studies. Most of them usually end up dropping out of school to raise children (Fortney 1987). When they drop of school, they may end up living in poverty because of low earnings or employment opportunities.

Early age childbearing results in rapid population growth because of population momentum (United Nations 2013). Population momentum is the tendency of population to continue growing in size even if fertility rates decline to replacement levels (Keyfitz 1971). Cohorts of many children result when women in successive reproductive age cohorts have children at an early age and not lengthening birth intervals. In addition,

women who give birth at an early age are more likely to have many children in their lifetime because of prolonged exposure to their reproductive life span (United Nations 2013). Large cohorts of these children later enter their reproductive period and bear children. This results in a young population structure. Young population structure is the primary cause of population momentum and accounts for about half of the population growth in developing countries (Bongaarts 1994). Bongaarts (1994) suggest delaying childbearing as a way of reducing the effects of population momentum.

Contraception is one of the interventions that can be used to reduce adolescent fertility. Sánchez-Páez and Ortega (2018) using 1986 to 2015 Demographic Health Surveys (DHSs) data concluded that 6.8% and 4.1% decline in adolescent fertility had already been achieved through an increase in contraceptive prevalence in Latin America and sub-Saharan Africa, respectively.

However, contraceptive use among adolescent women remains a challenge. According to Gupta (2014), young (15-24 years) women have low access contraception. Since the year 2000, adolescent unmet need for contraception in sub-Saharan Africa has increased (United Nations 2020). In other parts of the world, it has either declined or remains unchanged. Additionally, a study by Chandra-Mouli, McCarraher, Phillips *et al.* (2014) concluded that adolescents from low-and middle-income countries are sexually active and experiencing an unmet need for contraception. Coll, Ewerling, Hellwig *et al.* (2019) also noted a low prevalence of modern contraceptives among married women aged 15-19 without children in low-and middle-income countries.

Ahinkorah, Hagan Jr, Seidu *et al.* (2020) studied the influence of the capability of women aged 15-19 from 32 sub-Saharan African countries in making health decisions on contraceptive use. Health decision-making capability was measured as the ability of women to refuse their partners sexual intercourse and request the use of condoms from their partners during sexual intercourse. The study concluded that adolescents could make health decisions and those who make health decisions have a higher likelihood of using contraceptives.

From the conclusions drawn by Ahinkorah, Hagan Jr, Seidu *et al.* (2020), it may be noted that barriers exist that result in low usage of contraceptives among young women in low-and middle-income countries. Williamson, Parkes, Wight *et al.* (2009) using literature from 1970 to 2006 explain some of these barriers as those that include cultural beliefs against premarital sexual activities, misconceptions of modern family planning, and societal pressure on women to conceive soon after marriage.

A study by Sanchez, McGuire, Calhoun *et al.* (2021) showed that some of the barriers to using contraceptives also affect young women's contraceptive method choices. They argue that young women's decisions to use a specific method is influenced by side-effects of the method, reliability, privacy, cost, accessibility, and length of protection from pregnancy. In terms of side effects, young women are concerned with contraceptives causing infertility. Young women prefer reliable methods that are not prone to user error such as long-acting methods that do not require the user to constantly interact with the method. Sanchez, McGuire, Calhoun *et al.* (2021) also found contraceptive method selection to be influenced by medical professionals providing services, peers, parents, and partners. Parents who do not support young women's use of contraceptives have been linked with the decision to use long-acting methods. Long-acting methods such as injections and implants allow young women to use the method without the parents knowing. Medical professionals and peers have been linked with providing family planning information. Partners have been linked with covering cost of contraceptives and influencing the method chosen by young women.

Contraceptive use among young women can also be influenced by different factors. These factors can be analysed by looking at individual level factors, household level factors, or contextual factors. Studies by Mandiwa, Namondwe, Makwinja *et al.* (2018); Olagunju, Bolarinwa and Erinfolami (2020); Sidibé, Delamou, Camara *et al.* (2020) investigated the effects of individual level factors on contraceptive use among young women aged 15-24.

Mandiwa, Namondwe, Makwinja *et al.* (2018) focused on sexually active young women and implemented multivariate logistic regression to analyse the determinants of contraceptive use. The advantage of using multivariate analysis is that it simultaneously analyses the effect of multiple covariates on contraceptive use (Hair, Black, Babin *et al.* 2009).

Worku, Tessema and Zeleke (2015) examined how individual level factors were associated with contraceptive use changes among married young women between 2000 and 2011 in Ethiopia. Multivariate decomposition analysis was used to achieve the objectives of the study. The study concluded that individual women's characteristics played a major role in the overall increase in modern contraceptive use. These factors included age, education, fertility preference, religion, and agreement on family size.

A study analysing the effect of contextual factors on contraceptive use was carried out by Ngome and Odimegwu (2014) among sexually active young women aged 15-19

in Zimbabwe using the 2010-11 DHS data. The study investigated community level variables as contextual factors, and other individual and household level factors. Multilevel analysis was implemented to examine the factors associated with contraceptive use. The study found parity, marital status, and access to media as the individual level factors associated with contraceptive use. Provincial mean number of children, provincial education level, and access to health care at provincial level were the community level factors found to be associated with contraceptive use.

Ngome and Odimegwu (2014) derived community level factors from provincial data as they were not included in DHS survey. This is an example of the problems researchers encounter when using multilevel analysis to examine the effects of contextual factors on contraceptive use (Stephenson, Baschieri, Clements *et al.* 2007). The other problem encountered when using multilevel analysis is that the more variables added, the more complex the model and difficult to interpret (DiPrete and Forristal 1994).

Examining the effect of contextual factors is essential as young women's decision to use contraceptives can be influenced by factors beyond the individual or household level. However, it is more practical to investigate the effect of individual or household level factors due to the complexity of multilevel models used to measure the effect of contextual factors.

2.3 Determinants of contraceptive use in developing countries

The covariates analysed in the preceding chapters are based on previous theoretical work. This section reviews literature on the relationship between these covariates and contraceptive use among women in developing countries.

2.3.1 Age

The likelihood of using contraceptives among couples in young ages is hypothesised to be low due to low fecundity (Njogu 1991). Most studies have found contraceptive use among young women to increase with age. A study by Nyarko (2015) in Ghana showed that young women aged 18-19 were 3.5 times more likely to use contraceptives compared to those aged 15-17. Studying contraceptive use among women aged 15-24 in Guinea, Sidibé, Delamou, Camara *et al.* (2020) found that women aged 20-24 were 2.8 times more likely to use modern contraceptives than those aged 15-19.

Contradicting results were observed by Kistiana, Gayatri and Sari (2020) in Indonesia. Kistiana, Gayatri and Sari (2020) observed that the odds of using modern contraceptives were lower for women aged 20-24 than women aged 15-19. They explain

that this might be because adolescent women could be aware of consequences of pregnancy. Knowing that pregnancy has maternal risks and might end or delay their education, adolescents may choose to use contraceptives to delay childbearing.

2.3.2 Residence

We expect contraceptive use to be higher among urban women compared to rural women. Women in urban areas have better access to health care facilities and education (El-Moselhy, Abo-Rahma, Moftah *et al.* 2017). They also have better access to health information and its use (Chen, Orom, Hay *et al.* 2019). A study by Mandiwa, Namondwe, Makwinja *et al.* (2018) concluded that young rural women from Malawi were 24% less likely to use contraceptives compared to women residing in urban areas. Ahinkorah, Hagan Jr, Seidu *et al.* (2020) also found adolescent women residing in rural areas less likely to use contraceptives than urban adolescents in sub-Saharan Africa.

2.3.3 Region

Regional variation in contraceptive use is linked to differences in accessing health facilities. In African countries, women face challenges in physically accessing health care facilities. Studies by Blanford, Kumar, Luo *et al.* (2012); dos Anjos Luis and Cabral (2016) show that the number of and distance to health care facilities differ across provinces within a country. In other words, the number of available health care facilities are different for each province. The distance travelled by women to access health care facilities is also different for each province. Ettarh and Kyobutungi (2012) found that women of reproductive age residing in regions with low physical access to health care facilities are less likely to use contraceptives. Hence the region in which a young woman resides becomes an important determinant of contraceptive use.

Studies by El-Moselhy, Abo-Rahma, Moftah *et al.* (2017); Mandiwa, Namondwe, Makwinja *et al.* (2018) found region to be significant factor associated with contraceptive use. The study by El-Moselhy, Abo-Rahma, Moftah *et al.* (2017) concluded that women residing in rural Egypt regions had lower rates of using modern contraceptives than those in urban regions.

2.3.4 Education

Educated women are more likely to visit a health facility, approve of family planning and have knowledge of contraceptive methods (Gordon, Sabates, Bond *et al.* 2011). When women visit health facilities, they are more likely to receive information on contraception which can influence them to use contraceptives. Educated young women are more likely to be aware of the consequences associated with not using

contraceptives. In addition to this, they may wish to postpone childbearing and remain in school. Hence, they end up using contraceptives to prevent pregnancy.

Nyarko (2015) observed that an increase in education level among adolescent women was associated with an increase in the likelihood of using family planning. Olagunju, Bolarinwa and Erinfolami (2020) found that young women in Western African countries with primary, secondary, or higher education level were more likely to use modern contraceptives than those with no education.

2.3.5 Marital Status

Married women are expected to be using contraceptives more than never married women in developing countries. This is because of social beliefs that are against premarital sexual activities and encouraging childbearing upon marriage (Williamson, Parkes, Wight *et al.* 2009). A study by Chola, Hlongwana and Ginindza (2020) in Zambia concluded that married or cohabitating adolescent women had a higher likelihood of using contraception than those who were never married. Ngome and Odimegwu (2014) also gave a similar conclusion in a study among adolescent women in Zimbabwe. However, they have also been a study which found contradicting results. A study by Sidibé, Delamou, Camara *et al.* (2020) found that young Guinean women who were never married were more likely to use contraceptives than those ever married.

2.3.6 Parity

Young women in developing countries are more likely to start using family planning after they have had their first child. The reason could be that in many regions young women are expected to prove their fertility soon after marriage (Chandra-Mouli, McCarraher, Phillips *et al.* 2014). Additionally, they also have misconceptions about modern family planning causing infertility (Chandra-Mouli, McCarraher, Phillips *et al.* 2014). Hence, once they have had their first child, they would have proven their fertility and can adopt contraceptives.

Ngome and Odimegwu (2014) found contraceptive use among Zimbabwean adolescent women to be associated with parity. The study concluded that women with one or more children were more likely to use contraception than those who never had children. Studies by El-Moselhy, Abo-Rahma, Moftah *et al.* (2017); Islam (2018); Kistiana, Gayatri and Sari (2020) came to similar conclusions.

2.3.7 Employment status

Employment status is expected to influence the number of children women desire, and hence their use of contraceptives (Shapiro and Tambashe 1994). Employed women may

be motivated to have small family sizes, postpone or delay having children because of the pressure that comes in trying to balance work and raising children. Hence, they may be motivated to use contraceptives. Employed women are more likely to be exposed to contraceptive information and may be able to afford contraceptives compared to unemployed women (Mandiwa, Namondwe, Makwinja *et al.* 2018).

Islam, Mondal, Khatun *et al.* (2016) found employed married women having higher rates of using contraceptives than unemployed women in Bangladesh. A study by Nyarko (2015) found that employed adolescent Ghanaian women were three times more likely to use family planning than unemployed women.

2.3.8 Knowledge of contraceptive methods

In general, we expect women with no knowledge of contraception not to be using contraceptives. However, having knowledge of contraception does not mean they will use contraceptives. A study by Olagunju, Bolarinwa and Erinfolami (2020) found modern contraceptive use among women in West African countries to be associated with knowledge of modern contraceptives.

2.3.9 The desire for more children

From Pressat (1985)'s definition of family planning, contraceptive users can be grouped into those who want to stop childbearing and those who want to space birth intervals. Timæus and Moultrie (2008) suggest the need to postpone or delay childbearing as another motive for using contraception. Young women are less likely to have reached their desired number of children and most of them might indicate using contraceptives for birth spacing and postponing or delaying childbearing.

A study by Asiimwe, Ndugga, Mushomi *et al.* (2014) in Uganda found that women who desired to have more children after two years were 2.5 times more likely to use modern contraceptives than those who wanted children within two years. Similar findings were also observed by Islam (2018) in Bangladesh. Kistiana, Gayatri and Sari (2020) found young married women in Indonesia who wanted to stop having children more likely to use contraceptive compared to those who desired to have another child.

2.4 Contraceptive use in Zimbabwe

In Zimbabwe, family planning practices started before the introduction of modern contraceptives. In the past traditional methods such as extended periods of postnatal abstinence, use of herbs, coitus interrupts, extended breastfeeding periods of up to 2 years, and polygamy were used to lengthen birth intervals (Zinanga 1992). Most

traditional methods of contraception stopped being practised with the coming of urbanization.

Modern family planning was first introduced to Zimbabwe in 1953 at a time where the country was called Rhodesia (Zinanga 1992). It was first introduced by volunteers in urban white communities. Later, one of the volunteers introduced modern family planning services among Africans residing in Harare province. In 1965, the volunteer groups merged to form the Family Planning Association (FPA).

According to Zinanga (1992), a census carried out in 1961-62 showed an increase in annual growth rate of the African population in Rhodesia. This influenced the white regime government to engage in a structural collaboration with the FPA. The FPA started to receive small annual grants from the government. Modern contraceptives were made available by the Ministry of Health in government health care facilities from the year 1967.

In the 1970s, the number of facilities providing family planning services was expanded. Several FPA clinics were opened in urban areas, government institutions providing family planning services also increased, private sector joined in providing family planning services and grants to the FPA, and clinics providing family planning services were built in commercial farms. By 1973, modern family planning coverage was extended by using mobile clinics and recruiting fieldworkers to work as educators and motivators of contraception in underserved communities (Zinanga 1992). This initiative was successful and in 1976, these educators and motivators were permitted to distribute contraceptives.

The gaining of Zimbabwean independence in 1980 resulted in a change to a new African government. According to Zinanga (1992), the new government made major health sector policy changes. Primary Health Care system were adopted by the Ministry of Health. Shortly after a Maternal Child Health/Family Planning (MCH/FP) department was established under the Ministry of Health.

In September 1981 the government took over the running of FPA resulting in the resignation of white management team from the organisation. When the African government took over the FPA in 1981, it also banned the use of Depo-Provera as a contraception (Zinanga 1992). Depo-Provera had been introduced by FPA in 1969, a decade later after the introduction of the pill (Kaler 1998). According to Kaler (1998), in the 1970s Depo-Provera became the most prevalent method used by women. It allowed them to use it without their husbands and in-laws' knowledge. At the same time, it was

also negatively perceived by Africans as a white colonial way of controlling the African population whilst promoting the immigration of white people (West 1994). Kaler (1998) argues that Depo-Provera was banned because of political reasons of it being associated with white colonialism, it taking away the power of men in determining their women's fertility, and actual health concerns. After its ban, women kept requesting its return and it was finally re-legalised in 1992 (Kaler 1998).

In 1982, the Zimbabwe family planning programme was ranked as weak through a worldwide family planning evaluation study (Boohene and Dow Jr 1987). This might be because the programme's efforts ranked low in major categories which include policy and stage setting activities; service and service-related activities; record-keeping and evaluation; and availability and accessibility of services

At first, the new government was very careful with implementing family planning policies or make public statements (Boohene and Dow Jr 1987). However, the situation changed in 1983 when cases of an increase in infant abandonment, infanticide, teenage pregnancies, and illegal abortions started being reported in newspapers. In response, Zimbabwean women started demanding accessible and affordable family planning services countrywide from the government (Boohene and Dow Jr 1987).

In 1983, the FPA went through different name changes until it was finally renamed as the Zimbabwe National Family Planning Council (ZNFPC) in 1984 (Boohene and Dow Jr 1987; Zinanga 1992). The new government became more aware of population issues such that by 1985, the Population and Planning Unit had been established within the Central Statistical Office. The role of the unit was to promote the use of demographic data in state planning, and policy making and implementation (Boohene and Dow Jr 1987). In 1985, the World Leaders' Population Stabilization statement was signed by the then Prime Minister Robert Mugabe (Zinanga 1992). Under the Ministry of Health, ZNFPC received policy support and family planning training was integrated into the health professionals' curriculum (Boohene and Dow Jr 1987).

Additionally, the number of Community-Based Distributors (CBDs), and Youth Advisory Units were increased in 1984, and new units namely the Information Education and Communication (IEC) and Evaluation Research Unit (ERU) were established (Zinanga 1992). The CBDs were equipped with bicycles and would move around in communities distributing oral contraceptives, male condoms, and referring clients to clinics and hospitals. Youth Advisory Units were established to educate youths in and out of schools about family planning to reduce rising teenage pregnancies. The

IEC's role was to provide family planning information to the public and service providers using mass-media.

Zimbabwe's family planning programme efforts were revaluated in 1985. The programme was ranked in higher levels of moderate effectiveness (Boohene and Dow Jr 1987). This is because the programme had managed to improve its structure and operations.

According to Guilkey and Jayne (1997), fertility levels in Zimbabwe started to decline in the mid-1980s. Since then, these fertility levels declined to one of the lowest levels in sub-Sahara Africa and these levels are mostly explained by contraceptive use (Mturi and Kembo 2011). This was influenced by the government's efforts in building a strong family planning programme and promoting women empowerment (Zinanga 1992). Women empowerment is associated with lower fertility rates, extended birth intervals, and lower rates of unwanted pregnancies (Upadhyay, Gipson, Withers *et al.* 2014). It also influences the use of family planning and Maternal Health Care services (Yaya, Uthman, Ekholuenetale *et al.* 2018).

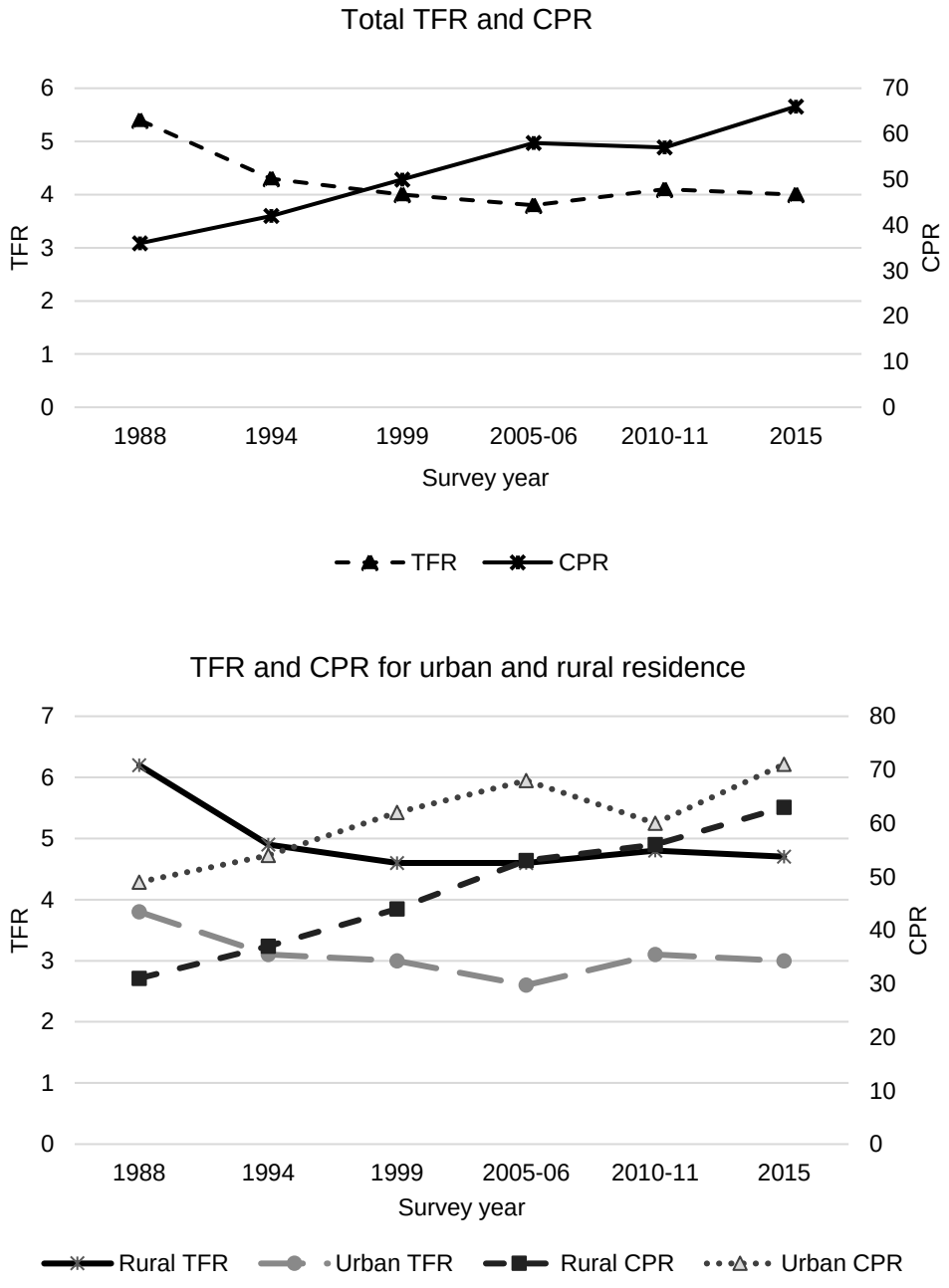
The Zimbabwe Demographic Health Survey (ZDHS) shows the trends in fertility and contraceptive use since the 1980s. There was a 30% increase in contraceptive prevalence rate (CPR) from 36% in 1988 to 66% in 2015 (Zimbabwe National Statistics Agency (ZIMSTAT) and ICF International 2016). DHS defines CPR as the proportion of married women aged 15-49 who are currently using modern contraceptives. During the same period, the total fertility rate (TFR) decreased from 5.4 in 1988 to 4.0 in 2015.

Figure 2.1 shows the TFR and CPR for the past 27 years between 1988 and 2015 in Zimbabwe. The overall CPR increased rapidly from 1988 to 2015. It slightly decreased from 58% in 2005-06 to 57% in 2010-11. On the other hand, the TFR decreased from 5.4 in 1988 to 3.8 in 2005-06, increased to 4.1 in 2010-11 and later declined to 4.0 in 2015. Additionally, Figure 2.1 also shows that the rural TFR remains higher than urban TFR. At the same, CPR also differs with residence. Urban women have higher CPR rates compared to rural women. These trends seem to agree with conclusions made by Mturi and Kembo (2011).

Mturi and Kembo (2011) carried out a study on fertility decline and contraceptive use in Zimbabwe. Using Bongaarts's proximate determinants framework, they found contraceptive use as a proximate determinant of fertility in Zimbabwe. In addition, using ZDHS data, they fitted logistic regression models for each survey from 1988 to 2005-06 to analyse factors associated with contraceptive use among married women

aged 15-49. They found region, residence, wealth index, education level, respondent's occupation, number of lifetime marriages, and number of living children associated with contraceptive use.

Figure 2.1: Total fertility rate (TFR) and contraceptive prevalence rate (CPR) in Zimbabwe from 1988 to 2015



Source: Derived from ZDHS 1988, 1994, 1999, 2005-06, 2010-11, and 2015

In another study in Zimbabwe, Magure, Manene, Munjanja *et al.* (2010) found adolescents, never married sexually active women, uneducated women, poor women, nulliparous women, and women from Matabeleland provinces to have the highest rates

of unmet need for contraceptives. In addition to having a high contraceptive unmet need, adolescent women are also experiencing pregnancy at an early age. Using a cross sectional survey, the Ministry of Health and Child Care (2016) found that 17% of young women aged 15-19 had experienced pregnancy. They also found that 48% of first pregnancies among adolescents were unplanned.

ZDHS also show high fertility levels among young women aged 15-19. Figure 2.2 shows the trends in adolescent births rates from 1988 to 2015. Zimbabwe experienced low adolescent birth rate of 99 per 1 000 women in the years 1994 and 2005-06. In other years the birth rates were above 100 births per 1 000 women.

Figure 2.2: Age specific fertility rates for women aged 15-19

Source: Derived from ZDHS 1988, 1994, 1999, 2005-06, 2010-11, and 2015

Since contraceptive use is a proximate determinant of fertility, it is crucial to understand young women's contraception behaviour to develop appropriate interventions for reducing adolescent fertility. They are few studies focusing on contraceptive use among young women in Zimbabwe. One study by Ngome and Odimegwu (2014) looked at the influence of contextual factors on the use of contraceptive use among sexually active young women aged 15-19.

Another study investigating sexual activity, contraceptive knowledge and use, and pregnancy among young men and women aged 14-24 from Harare province was carried out by Boohene, Tsodzai, Hardee-Cleaveland *et al.* (1991). The study used data from the 1986 Zimbabwe Reproductive Health Survey for Young Adults (ZRHSYA). They found that most young adults initiated sexual intercourse outside of marriage. Childbearing

among most adolescents start within marriage. They also found that young adults have high knowledge of contraception and low rate of using contraceptives. The consequences of low use of contraceptive were found to be high rate of unwanted premarital pregnancies.

2.5 Summary

In summary, young women in developing countries are sexually active and experiencing unmet need for contraception. They also have low contraception prevalence. Additionally, they face barriers in accessing contraception and these barriers also influence their contraceptive method choices. In Zimbabwe, adolescent fertility remains above 100 births per 1 000 women. They also have an unmet need for contraception.

Studies focusing on contraceptive use among young women in Zimbabwe did not look at the trends in contraceptive use and unmet need over time. They also did not look at the young women's contraceptive method choices. Hence, there is need to analyse these trends to understand the contraceptive behaviours of young women over time. There is also a need to investigate the age these young women start engaging in sexual activities.

A study by Ngome and Odimegwu (2014) with findings that can be generalized for the whole country focused on the relationship between contextual factors and contraceptive use. It also focused on young women aged 15-19 and excluded those age 20-24. Hence, there is need to investigate the effects of individual level factors on contraceptive use among young women. They is also a need to include those aged 20-24 to investigate any difference in contraceptive behaviour between young women in the older and younger ages.

3 METHODOLOGY

This section focuses on the data and methods of analysis used to obtain the results presented in Chapter 4. Section 3.1 describes the data sources, section 3.2 describes the study population, and section 3.3 describes how a study sample was selected from the study population. The variables used are set out in section 3.4 and section 3.5 gives a description of the data used in the study. Background characteristics of sexually active young women included in the selected sample are described in section 3.6. The statistical methods of analysis used to obtain results in Chapter 4 are described in section 3.7.

3.1 Data Source

The data used for the study was obtained from the six Zimbabwe Demographic Health Surveys (ZDHS) conducted in 1988, 1994, 1999, 2005-2006, 2010-2011, and 2015. These surveys are nationally representative (Central Statistical Office [Zimbabwe] and Institute for Resource Development/Macro Systems Inc. 1989; Central Statistical Office [Zimbabwe] and Macro International Inc 1995; Central Statistical Office [Zimbabwe] and Macro International Inc. 2000, 2007; Zimbabwe National Statistics Agency (ZIMSTAT) and ICF International 2012, 2016). The surveys are designed to elicit information on women's fertility levels, family planning information, maternal and child health, and (where married or cohabiting) information on their partner. Women aged 15-49 and men aged 15-54 from selected households were eligible for interviews. Permanent residents of the selected household or visitors who had spent the night before survey were considered for interviews.

All the surveys implemented two-stage sampling strategies. The first stage involved selection of EAs and selection of households from selected EAs was the second stage. Table 3.1 shows the sample design implemented for each year. Sampling frames were obtained from population censuses.

Table 3.1: Description of sample design

	Survey year					
	1988	**1994**	**1999**	**2005-06**	**2010-11**	**2015**
Sampling frame (year of census)	1982	1992	1992	2002	2002	2012
Strata		18	18	34		
Census enumeration areas (EAs)	167	230	230	400	406	400
Urban	53				169	166
Rural	114				237	234
Households sampled	4 107	5 984	6 369	9 385	9 756	10 534
Women 15-49 sampled	4 201	6 128	5 907	8 907	9 171	9 955

3.2 Study population

The study population includes women aged 15-24 in the respective surveys, taking into consideration the sampling frame and design, and weighting to make the sample nationally representative.

3.3 Study sample

The study selected a total weighted sample of 9 164 women aged 15-24 from DHS surveys. Table 3.2 shows a summary of how the study sample was selected. Women who never had sex, currently pregnant, declared infecund, and sterilized were excluded from the study because they are currently not at risk of pregnancy. Women with missing information were also excluded.

Table 3.2: Description of study sample selection (Weighted)

	Survey year						
	1988	**1994**	**1999**	**2005-06**	**2010-11**	**2015**	**Total**
N	1 861	2 741	2 741	4 104	3 786	3 895	19 128
Remove							
Women who never had sex	814	1 254	1 186	1 783	1 560	1 741	8 339
Currently pregnant women	160	246	230	329	339	276	1 582
Women declared infecund and sterilized	6	8	0	6	6	5	32
n	874	1 231	1 324	1 981	1 882	1 872	9 164

A second study sample was also selected from DHS and Multiple Indicator Surveys (MICS). This sample is used to compare the results on rates of contraceptive use between the MICS and DHS. The 2009 MICS data is compared with the 2010-11 DHS data and the 2014 MICS to the 2015 DHS because these are the closest in time. The 2009 MICS data did not contain a variable for age at first sex. Thus, for easy comparison with DHS 2010-11 data, women who never had sex were not removed from the MICS 2009 and DHS 2010-11 surveys. Table 3.3 summarises how the sample was selected.

Table 3.3: MICs and DHS sample selection (Weighted)

	MICS 2009	**DHS 2010-11**	**MICS 2014**	**DHS 2015**
N	5 028	3 786	5 677	3 895
Remove				
Currently pregnant		339		276
Unsure or do not know if pregnant	18		42	
Never had sex			2 330	1 741
n	4 537	3 447	2 799	1 877

3.4 Variables

This section describes the variables used in the study. These variables were classified into response and explanatory variables.

3.4.1 Response variables

Current contraceptive use and contraceptive method choice were considered as the response variables. The current contraceptive use variable in the DHS datasets (v313) was recoded to reflect "modern contraceptive use" and "non-modern or none use". Modern contraception as defined by DHS includes the pill, injections, male condoms, Norplant or implants, Intrauterine Device (IUD), female condom, and emergency contraception. Non-modern methods include folkloric and traditional methods. Current contraceptive method choice is considered as the method an individual is currently using. It is defined as not using, using the pill, injections, male condom, and Norplant\implants.

3.4.2 Explanatory variables

All explanatory variables are described in Table 3.4. These variables were chosen because of previous theoretical work described in Chapter 2.

Women were categorised into four different age groups because of different sexual behaviours. Most women aged 15-17 have not started engaging in sexual activities whilst at age 18-19, the numbers start to increase. As young women reach age 20-24; sexual activity, marriage, and having children become common. However, the rate of marriage and childbearing is higher among 22–24-year-olds compared to 20–21-year-olds.

We observed very few young women with no education or higher education. Hence, we combined those with no education with those with primary education, and those with secondary level with those with higher education. Parity was defined in a way that allows the comparison of the difference in contraceptive use behaviours between women with and without children.

All the other variables in Table 3.4 were either re-coded to fit the purpose of the study or used as they are in the DHS data. Some of the re-coded variables include marital status, knowledge of contraceptive methods and desire for more children. These variables are presented in the table after being re-coded.

Table 3.4: Description of explanatory variables

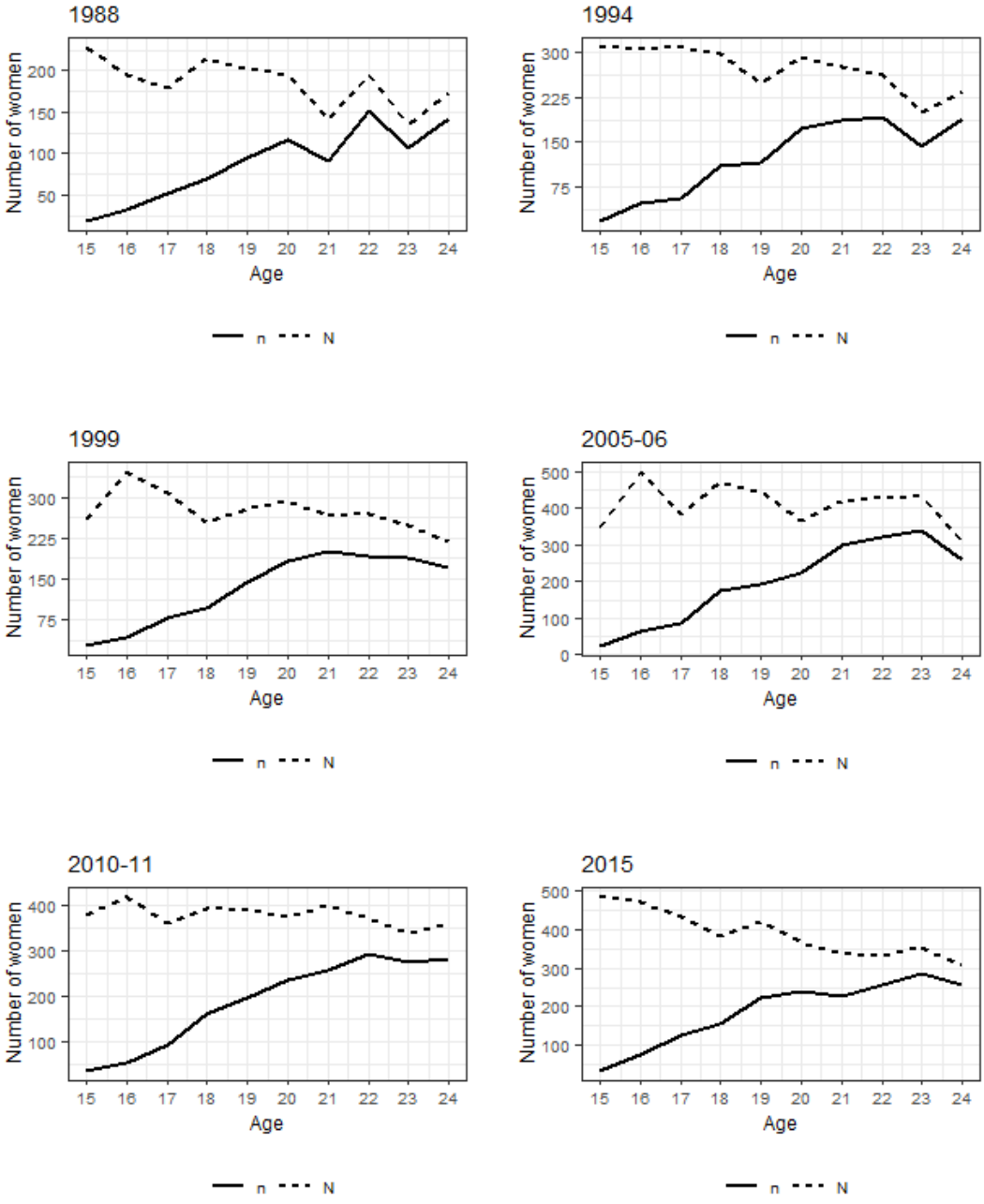
Variable	Description
Age group	Respondent's current age grouped into 15-17, 18-19, 20-21, and 22-24.
Region	Province in which respondent was interviewed. It is categorised into Manicaland, Mashonaland Central, Mashonaland East, Mashonaland West, Matabeleland North, Matabeleland South, Midlands, Masvingo, Harare and Bulawayo.
Residence	Urban or rural residents in which the respondent was interviewed.
Education	Highest level of education attained by respondent. It is categorised into none or primary, and secondary or higher.
Marital status	Current marital status of respondent grouped into never married, married, cohabitating, and divorced, widowed, or separated.
Parity	The total number of living children grouped into none and one or more.
Employment status	Respondent currently employed or unemployed.
Knowledge of contraceptive methods	Whether respondent knows any modern contraceptive methods. It is categorised into none or non-modern and modern
The desire for more children	Whether an individual desires to have another child. It is categorised into no more, within two years, after two years, and undecided/unsure

3.5 Data description

Figure 3.1 show that in all surveys the selected sample contains fewer women compared to the study population, with those in the younger ages having been reduced the most. This is because a high number of women in the younger ages are not sexually active. Figure 3.2 show that the study population constitute mostly of young women from rural areas. It also shows that a high number of young women are sexually active.

Figure 3.3 show the same patterns in the number of women for MICS and DHS which are close in time, although MICS contain higher numbers. A decrease in the number of women with increase in age in MICS 2009 and DHS 2010-11 is observed. In the MICS 2014 and DHS 2015 samples, they are very few women in the younger ages because few of them are sexually active.

Figure 3.1: Study and sample population by age, Zimbabwean DHS



N and n refer to study population and sample respectively

Figure 3.2: Study population by area of residence and ever had sex, Zimbabwean DHS

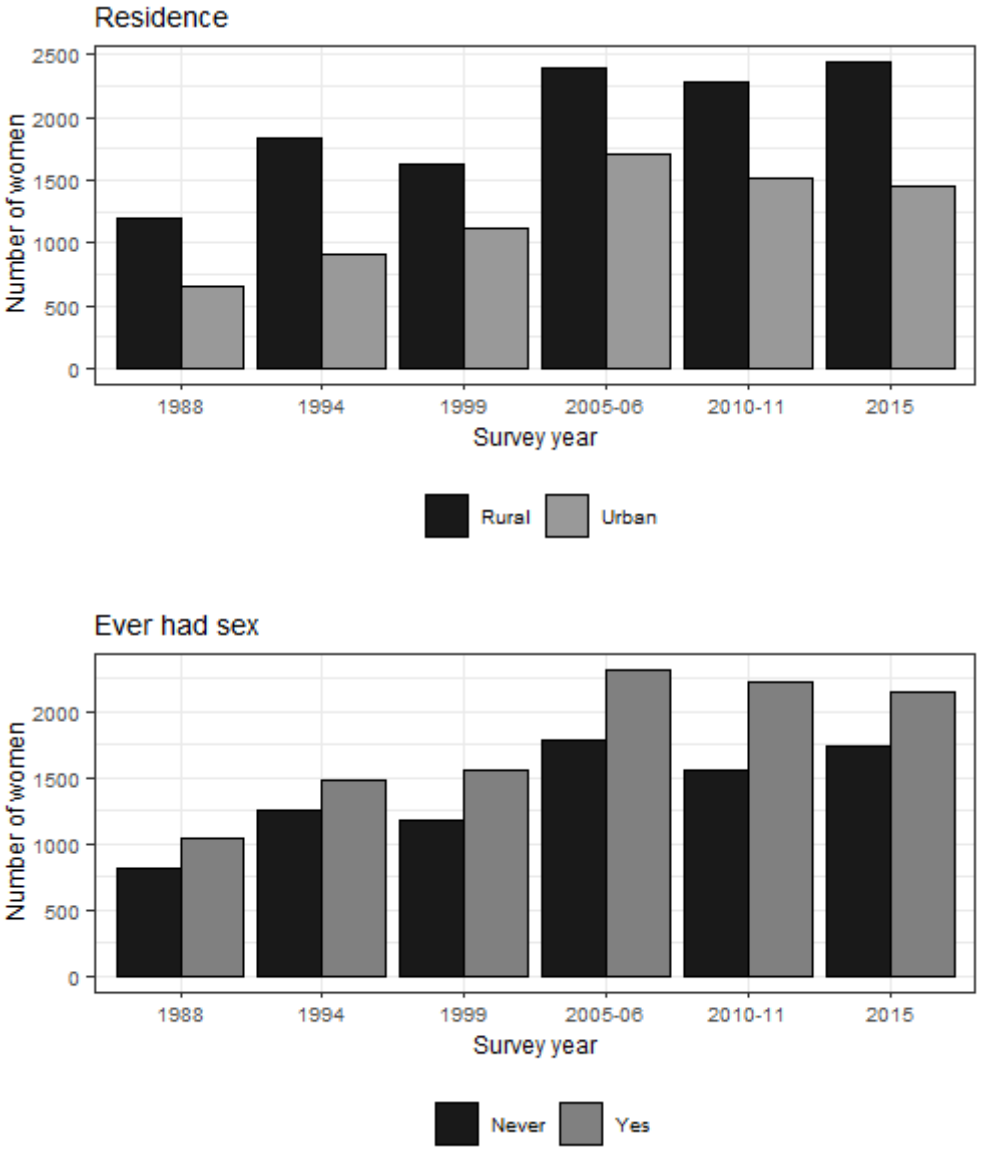
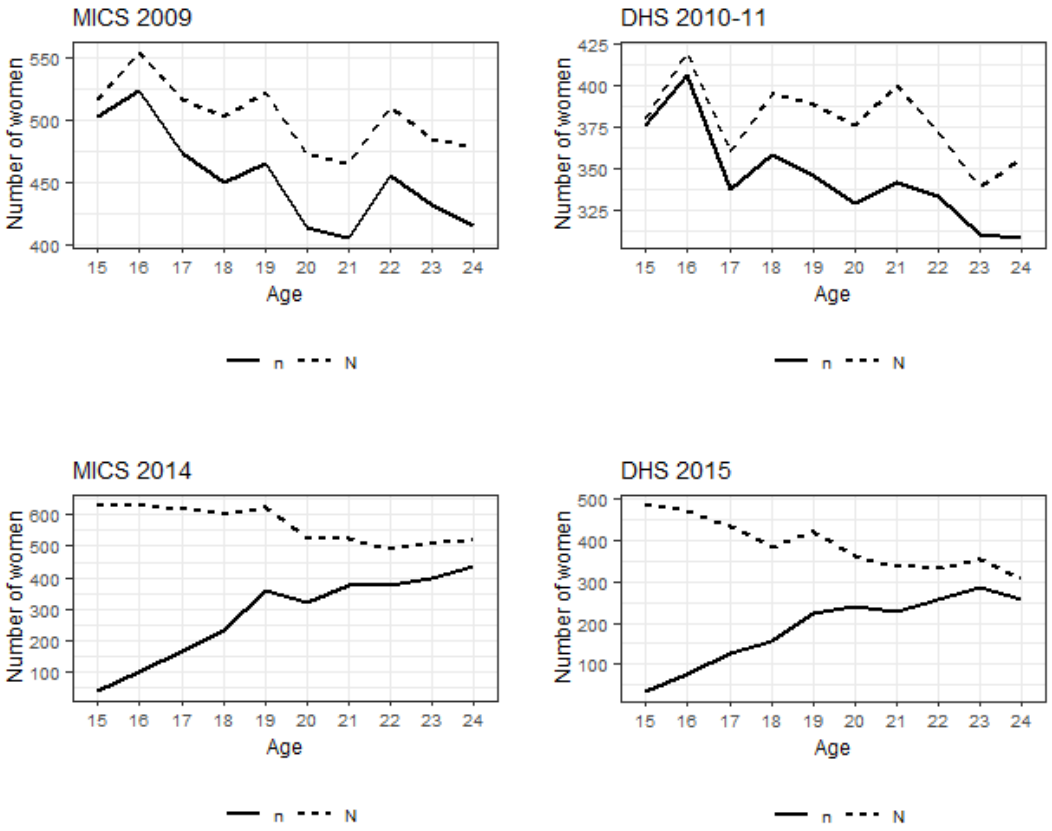


Figure 3.3: Study and sample population by age, Zimbabwean MICS and DHS



3.6 Background characteristics of sexually active young women in the sample

The background characteristics of sexually active young women are presented in Table 3.5. Over time, we observe that sexually active young women aged 15-17 are exceptionally low in proportion (ranging between 8.7% and 12.3%) compared to other age groups. The reason is that they are less likely to be sexually active. The samples for all surveys consist of high proportions of young women from rural areas. Additionally, high proportions of these women were from Harare province over the period 1994 to 2010-11. Since Harare is an urban city, most sexually active women being from rural areas is explained in the fact that all other eight provinces are largely rural (see Figure A1).

Most sexually active young women are educated and the proportions of those with secondary or higher education have increased from 44.1% in 1988 to 70.1% in 2015. Most young women are unemployed. High proportions of sexually active young women are married with most of them having at least one child. Most sexually active women have a desire to have more children after 2 years. Young women are highly knowledgeable of modern contraceptive methods.

Table 3.5: Characteristics of sexually active young women aged 15-24 by background characteristics, Zimbabwean DHSs (Weighted)

	Survey year					
Variable	**1988**	**1994**	**1999**	**2005-06**	**2010-11**	**2015**
n	874	1 231	1 324	1 981	1 882	1 872
Age group (%)						
15-17	11.8	9.7	11.3	8.7	9.6	12.3
18-20	32.0	32.4	31.9	29.8	31.4	33.0
21-22	27.8	30.8	29.6	31.4	29.3	25.7
23-24	28.4	27.1	27.2	30.1	29.7	29.0
Region (%)						
Manicaland	10.6	13.2	13.2	11.6	13.0	12.9
Mashonaland Central	7.2	8.8	8.3	10.3	10.1	9.2
Mashonaland East	12.5	7.9	7.4	7.8	9.3	9.5
Mashonaland West	11.2	12.4	10.6	9.4	11.9	10.7
Matabeleland North	6.1	8.6	5.7	7.1	5.2	5.7
Matabeleland South	9.6	5.9	6.7	5.0	6.1	6.5
Midlands	13.7	12.2	11.9	12.3	12.3	14.9
Masvingo	10.2	9.1	8.9	13.1	9.3	10.1
Harare	8.0	16.0	20.0	16.7	16.5	13.9
Bulawayo	10.9	5.9	7.4	6.8	6.3	6.6
Residence (%)						
Rural	67.0	68.5	59.8	63.1	64.5	67.5
Urban	33.0	31.5	40.2	36.9	35.5	32.5
Education (%)						
None/Primary	55.9	46.0	39.5	31.6	27.7	29.9
Secondary/Higher	44.1	54.0	60.5	68.4	72.3	70.1
Marital status (%)						
Never married	25.4	20.4	21.0	19.6	16.9	22.4
Married	62.7	69.0	63.1	65.7	68.3	60.5
Cohabitating	0.0	0.0	7.0	2.1	3.2	5.4
Widowed/Divorced/Separated	11.9	10.6	8.9	12.6	11.5	11.7
Parity (%)						
None	23.8	25.4	26.9	23.8	22.0	24.1
≥ 1	76.2	74.6	73.1	76.2	78.0	75.9
Mean number of living children	1.6	1.5	1.4	1.4	1.4	1.4
Knowledge of contraceptive methods (%)						
None/Non-modern	1.5	0.9	1.6	1.1	1.3	0.6
Modern	98.5	99.1	98.4	98.9	98.7	99.4
Employment status						
n	874	1 230	1 324	1 979	1 882	1 872
Unemployed (%)	72.9	56.1	55.7	68.0	71.4	68.6
Employed (%)	27.1	43.9	44.3	32.0	28.6	31.4
The desire for more children						
n	546	1 231	1 324	1 979	1 882	1 872
No more (%)	6.8	13.4	15.0	20.2	13.0	11.8
Within 2 years (%)	28.0	26.2	25.8	20.7	22.5	22.0
After 2 years (%)	61.2	54.8	51.3	48.3	54.0	60.0
Undecided/Unsure (%)	4.0	5.7	8.0	10.9	10.5	6.2

3.7 Statistical analysis

All data analyses were carried out using R version 4.0.5 (R Core Team 2021). Objectives 1 and 2 from section 1.3 were achieved using descriptive statistics. Statistical means were used to calculate mean age at sexual debut. Trends in contraceptive use, unmet need, and method choice were analysed using proportions.

Multivariate logistic regression was used to achieve objectives 3 and 4. Binary logistic regression was used to analyse the association between current contraceptive use and its determinants. Multinomial logistic regression was used to analyse if the determinants of contraceptive use are also associated with contraceptive method choice. The use of logistic regression is explained in the following sections.

3.7.1 Binary logistic regression

Binary logistic regression is a statistical modelling approach used to analyse how explanatory variables X are related to a categorical response variable Y (Hosmer Jr, Lemeshow and Sturdivant 2013). The response variable is defined as $Y=0$ (negative status of event) or $Y=1$ (positive status of event). In logistic regression, we are interested in the probability of $Y=1$ and how it is influenced by explanatory variables.

In this research the explanatory variables X are age group, region, residence, education, marital status, parity, employment status, knowledge of contraceptive methods, and the desire for more children. The response variable Y is current contraceptive use.

In logistic regression, there is no need for a linear relationship between the response and explanatory variables. Secondly, there is no need for residuals (error terms) to be normally distributed (Schreiber-Gregory 2018). Lastly, according to Schreiber-Gregory (2018) the assumption of homoscedasticity (different samples have equal variance) is not required. However, the following assumptions still apply. Firstly, observations should not be from repeated measurements. Secondly, there should be weak or no multicollinearity among explanatory variables. Thirdly, explanatory variables are required to be linearly related to log odds. Lastly, a large sample size is required for an increased accuracy of the effect measure (Bujang, Sa'at and Bakar 2018). Bujang, Sa'at and Bakar (2018) recommend a minimum sample of 500 individuals or the rule of event per variable (EPV) of 50 and use of the formula

$$n = 100 + 50i$$

where i represents the number of explanatory variables included in the model.

The logistic regression model in this study can be presented in the form:

$$\log\left(\frac{p_i}{1-p_i}\right) = logit(p_i) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \cdots + \beta_n x_n \quad (1)$$

where p_i is the probability of current modern contraceptive use by woman i, and X_is represent the determinants of contraceptive use. We can write model (1) in terms of the odds ratio of a woman currently using modern contraceptives relative to a woman not using as model (2) below. The odds ratios will be used to present the results of logistic regression model as they have a more intuitive meaning.

$$\frac{p_i}{1-p_i} = e^{\beta_0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\cdots+\beta_n x_n} \quad (2)$$

3.7.2 Multinomial logistic regression

Harrell Jr (2001) defines multinomial regression as a form of logistic regression modified to incorporate a response variable with more than two categories. In this study the multinomial regression model can be presented in the form:

$$\begin{aligned}
\ln\left(\frac{Pr(Y=1)}{Pr(Y=0)}\right) &= \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \cdots + \beta_n x_n \\
\ln\left(\frac{Pr(Y=2)}{Pr(Y=0)}\right) &= \beta_0 + \beta_2 x_2 + \beta_3 x_3 + \cdots + \beta_n x_n \\
&\vdots \\
\ln\left(\frac{Pr(Y=4)}{Pr(Y=0)}\right) &= \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \cdots + \beta_n x_n
\end{aligned} \quad (3)$$

where Y=0, Y=1, Y=2, Y=3, and Y=4 represents women not using any method of contraception, using the pill, injections, male condom, and Norplant/Implants, respectively. The X_is represent the explanatory variables age group, region, residence, education, marital status, parity, employment status, knowledge of contraceptive methods, and the desire for more children.

4 RESULTS

The results in this chapter are based on the selected sample as described in Chapter 3. These results were obtained after adjusting for sampling design using sampling weights, stratification, and clustering.

4.1 The age at sexual debut among sexually active young women

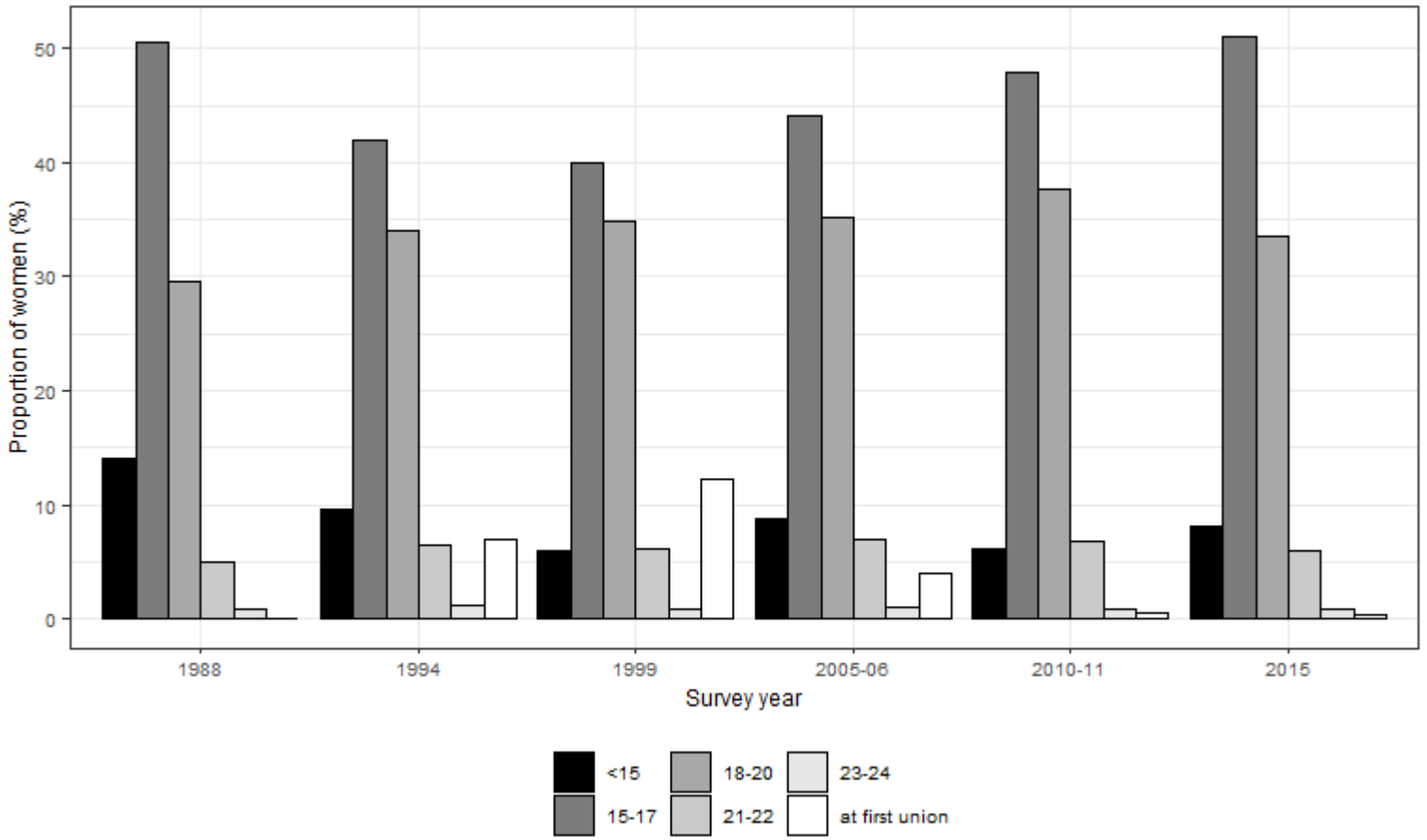
The results in this section are based on all sexually active women including pregnant, infecund, and sterilised women. In case where age at first sex was categorised as at first union, the age at first marriage was used instead to calculate mean age at first sex. Table 4.1 show that on average the age at sexual debut over time is about 17 years.

Table 4.1: The mean age at first sex among young women, Zimbabwean DHSs

	Survey year					
	1988	**1994**	**1999**	**2005-06**	**2010-11**	**2015**
n	1 021	1 485	1 555	2 316	2 213	2 153
Mean age at first sex	16.7	17.2	17.4	17.3	17.4	17.1

Additionally, Figure 4.1 shows that a high proportion of young women initiate sexual activities outside of marital union, mostly between the ages of 15 and 17 years. They are also a few young women who initiate sexual intercourse before the age of fifteen.

Figure 4.1: The proportional distribution of young women by age at first sex, Zimbabwean DHS

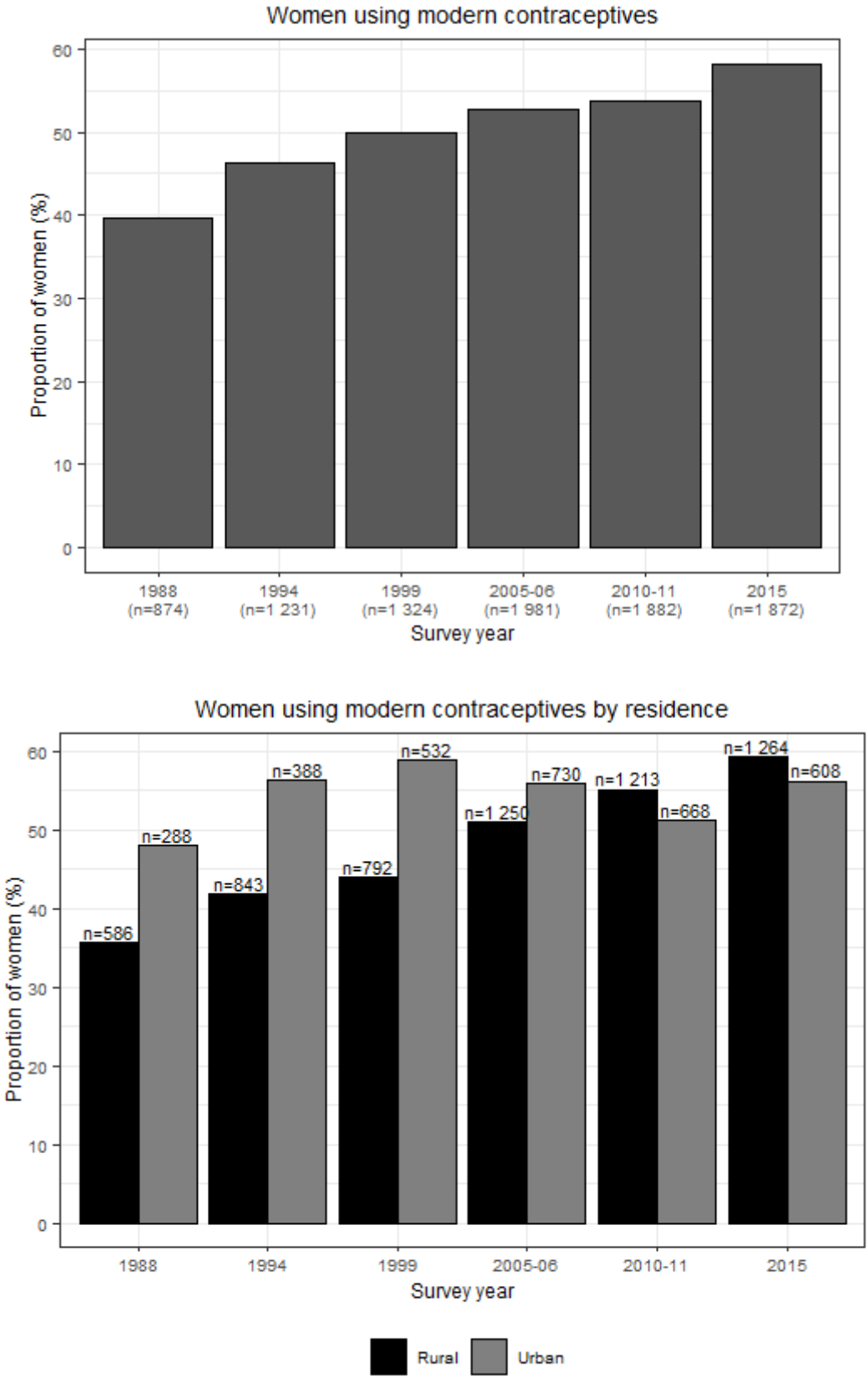


4.2 Trends in contraceptive use, unmet need, and method choice among sexually active young women

4.2.1 Trends in contraceptive use

Figure 4.2 shows that there was an increase in sexually active young women using modern contraceptives from 39.7% in 1988 to 58.2% in 2015. Additionally, there was a steady increase in modern contraceptive use from 35.7% in 1988 to 59.3% in 2015 among rural women. Among urban women, the rate of use increased from 47.9% in 1988 to 58.8% in 1999, declined to 51.1% in 2010-11, and slightly increased to 56.1% in 2015. We also observe that in 2010-11 and 2015, the rate of using modern contraceptives was higher among rural women compared to their urban counterparts.

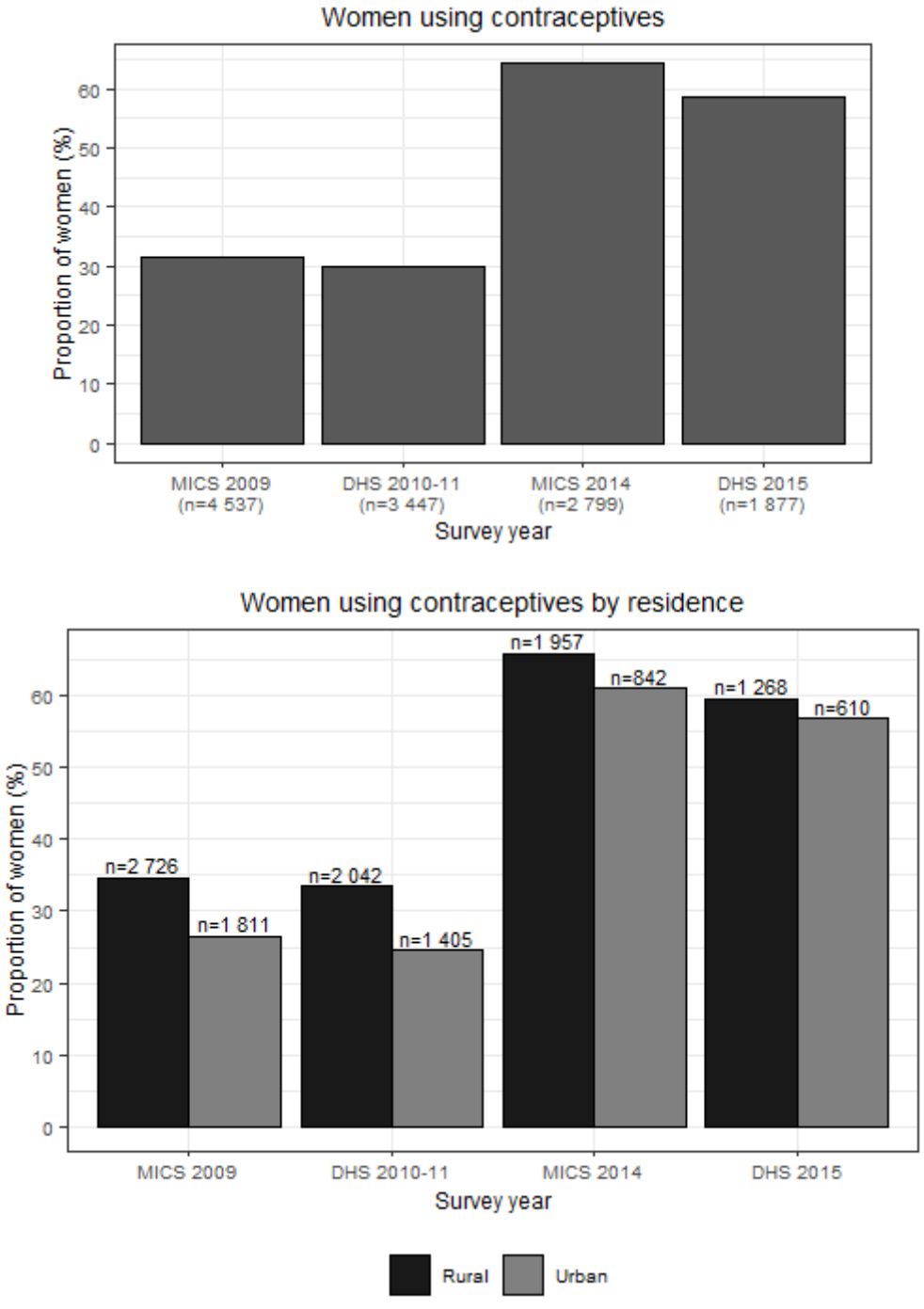
Figure 4.2: Trends in modern contraceptive use among sexually active young women, Zimbabwe DHSs



4.2.1.1 MICS and DHS contraceptive use comparison

Contraceptive use in this section was defined as women who are currently using any method to prevent pregnancy. It includes those using traditional or folkloric methods. Figure 4.3 shows small difference in proportions of women using contraceptives between MICS and DHS, although MICS is higher. It also shows higher rates of using contraceptives among rural women compared to urban women in both MICS and DHS.

Figure 4.3: Young women currently using contraceptives, Zimbabwean MICS and DHSs

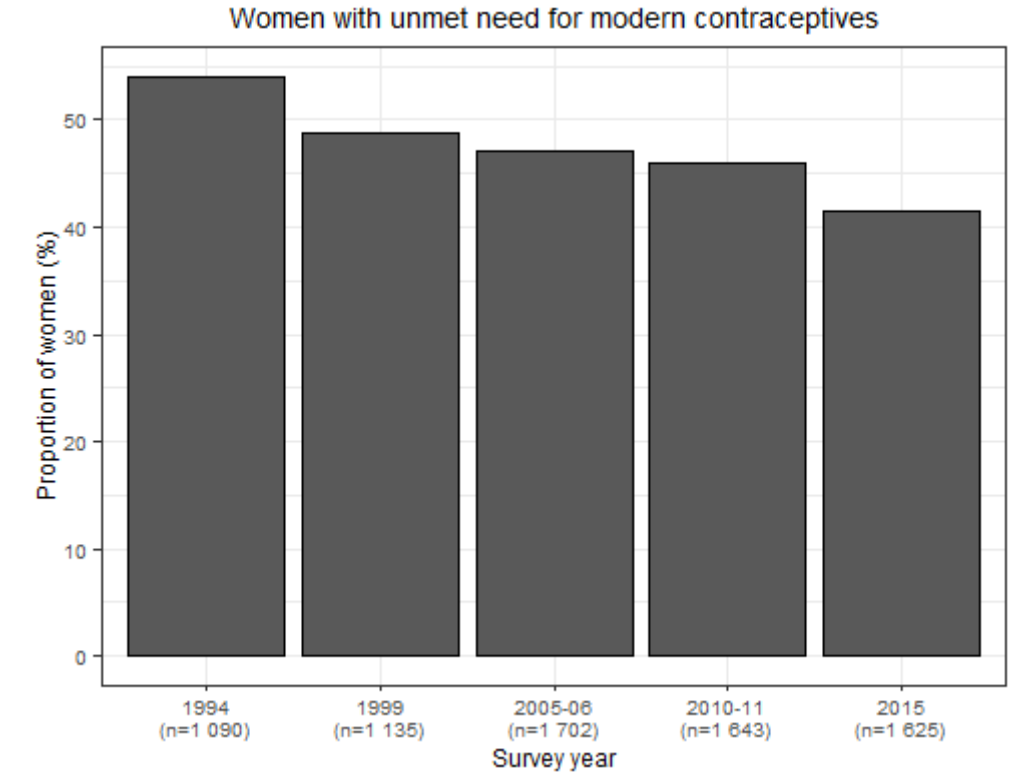


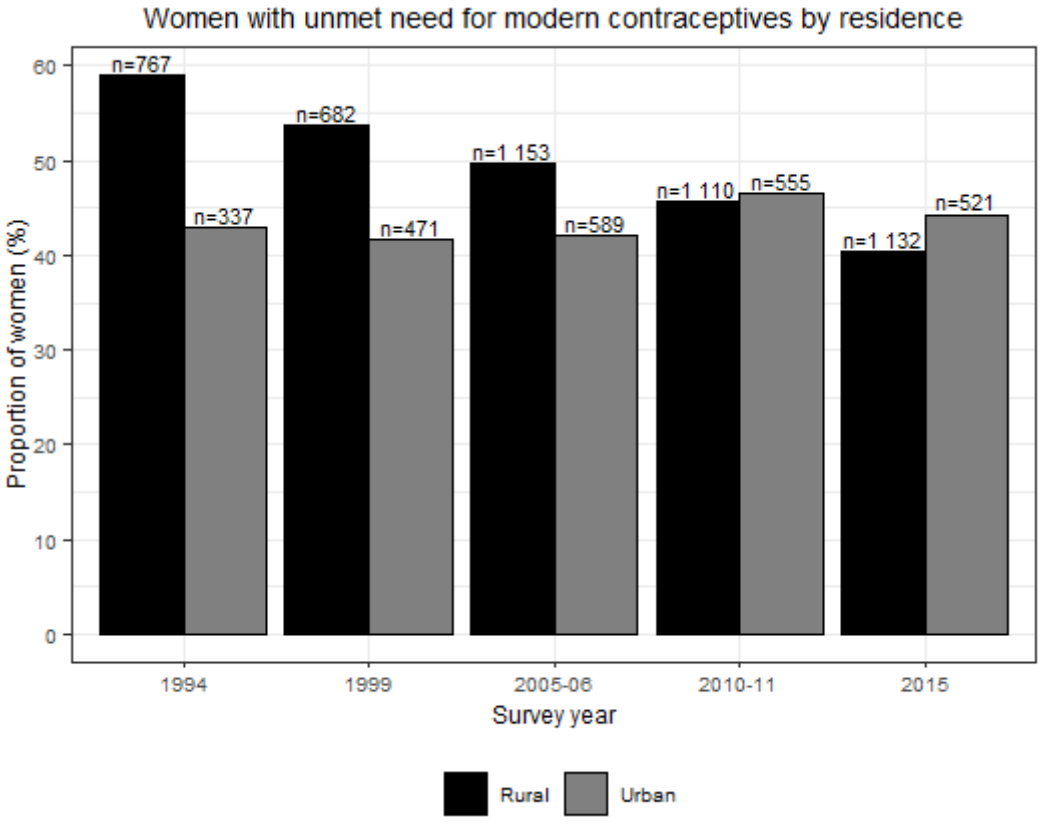
4.2.2 Trends in contraceptive unmet need

This section focuses on trends in unmet need for modern contraceptive among young women. As defined by DHS, women with unmet need for contraception are those who are sexually active not using a modern contraceptive method but who either want no more children or want to delay pregnancy by two years. Currently pregnant or postpartum amenorrhoeic young women who had unwanted pregnancies were also included. In the 1988 DHS data, unmet need among currently pregnant and postpartum amenorrhoeic women could not be measured because the DHS variable (m10) which defines women who had unwanted pregnancies was not included in the data. Hence for consistence results, the 1988 survey was excluded.

Figure 4.4 shows that there was a decline in unmet need for modern contraceptives among young women from 54.1% in 1994 to 41.6% in 2015. We also observe that unmet need for modern contraceptives was higher among rural women from 1994 to 2005-06 compared to urban women. In 2010-11 and 2015, unmet need for modern contraceptives was slightly higher among urban women compared to rural women.

Figure 4.4: Trends in unmet need for modern contraceptives among sexually active young women, Zimbabwean DHSs





4.2.3 Trends in contraceptive method choice among young women

Figure 4.5 shows that the pill is the most common modern contraceptive method used by sexually active young women. It also shows that the proportion of young women using injections and Norplant/implant have increased over time. The use of male condoms increased over the period 1988 to 1999, declined between 1999 and 2005-06, and increased between 2005-06 and 2015. Over time the rate of using male condom remains below 5%.

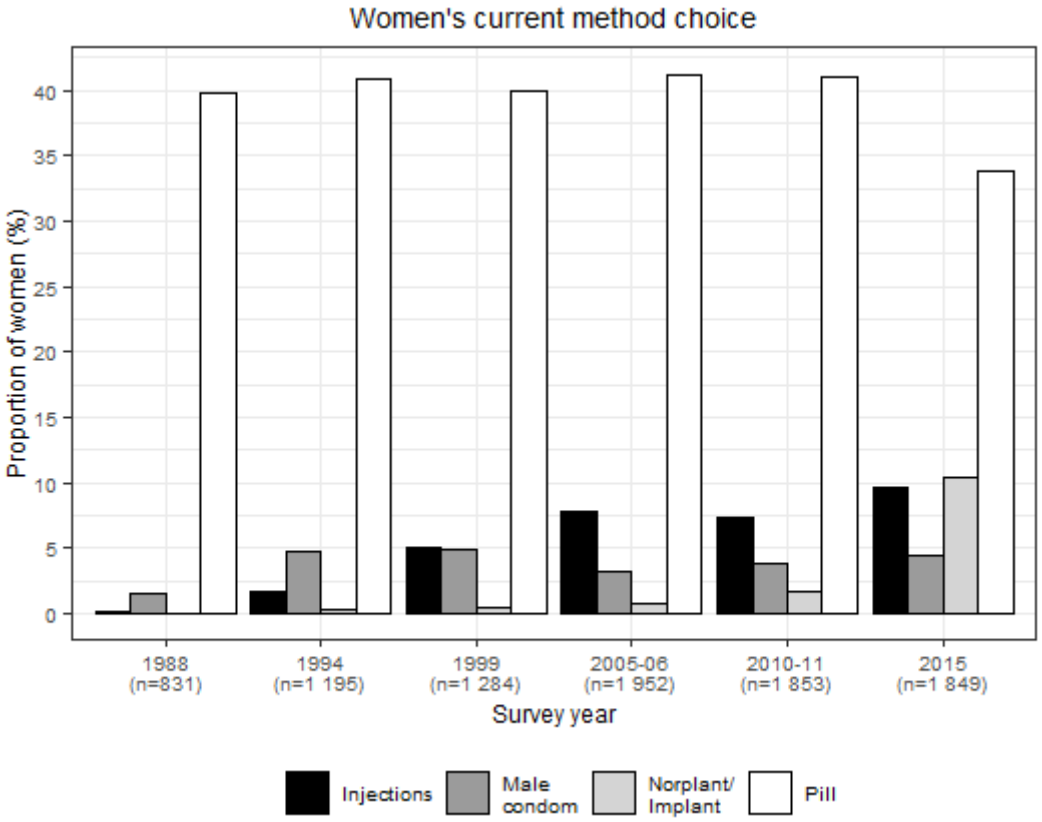
Urban young women had higher rates of using the pill from 1988 to 1999 compared to their counterparts residing in rural areas. Whereas from 2005-06 to 2015, rural women had higher rates. We also observe that from 1994 to 2015, there was a steady decrease in urban women using the pill.

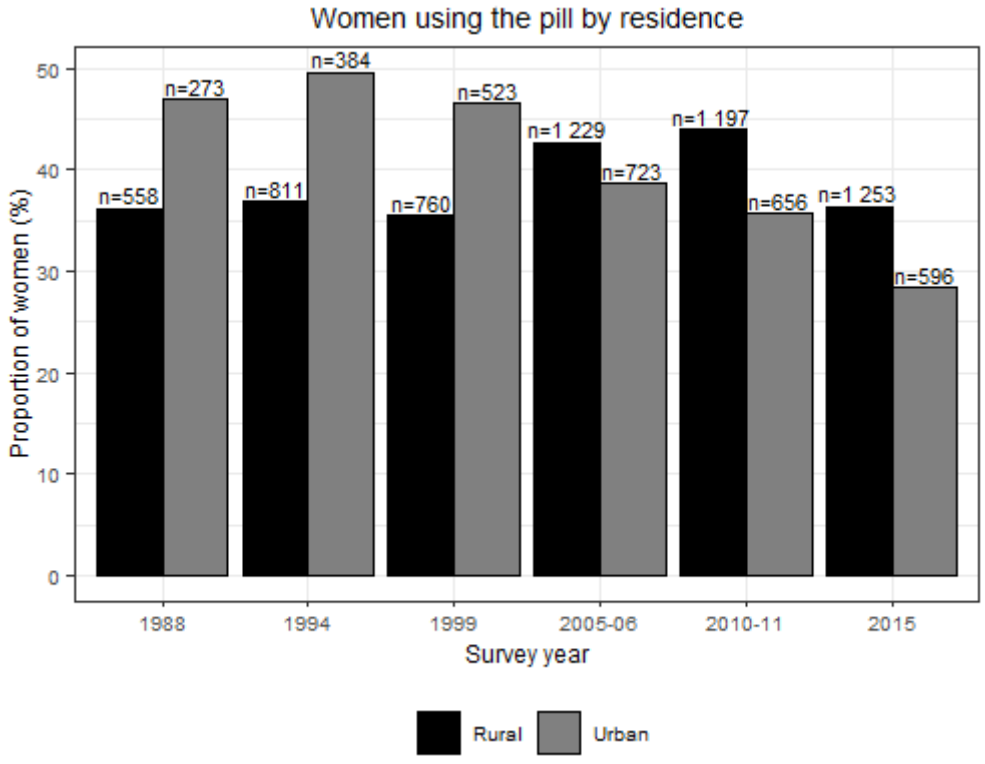
Over time, the use of injections increased among young women residing in rural areas. Among young women residing in urban areas, the use of injections increased from 1988 to 2005-06, and declined over the period 2005-06 to 2015.

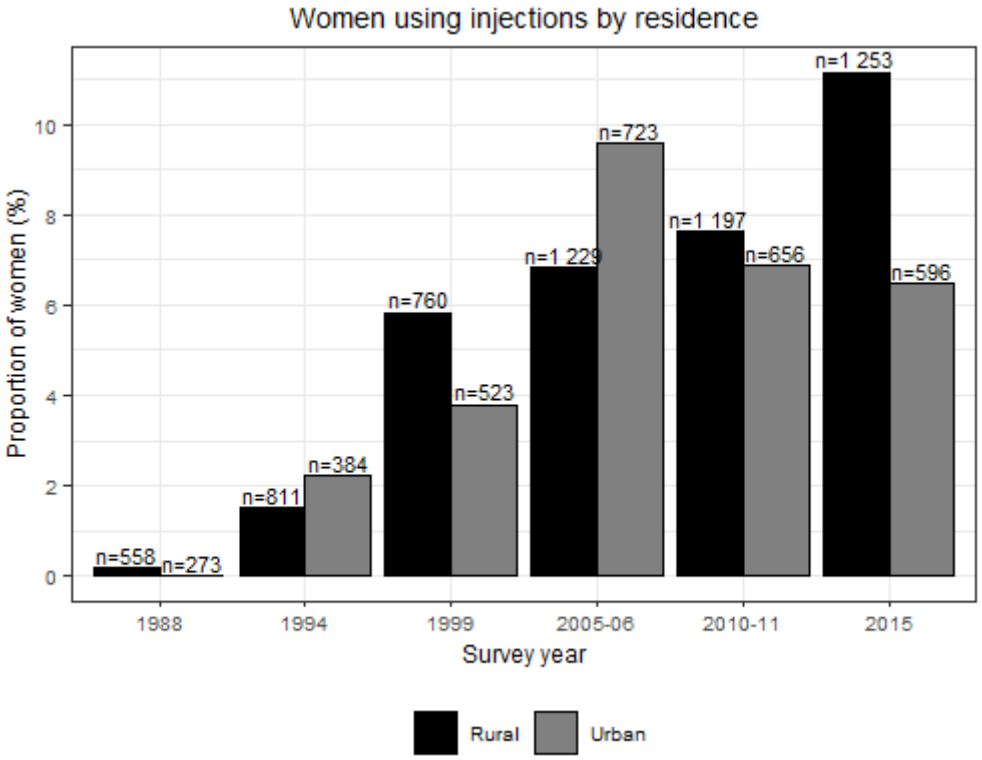
Over time, the rate of using male condom was higher among young women residing in urban areas except in the 1994 survey.

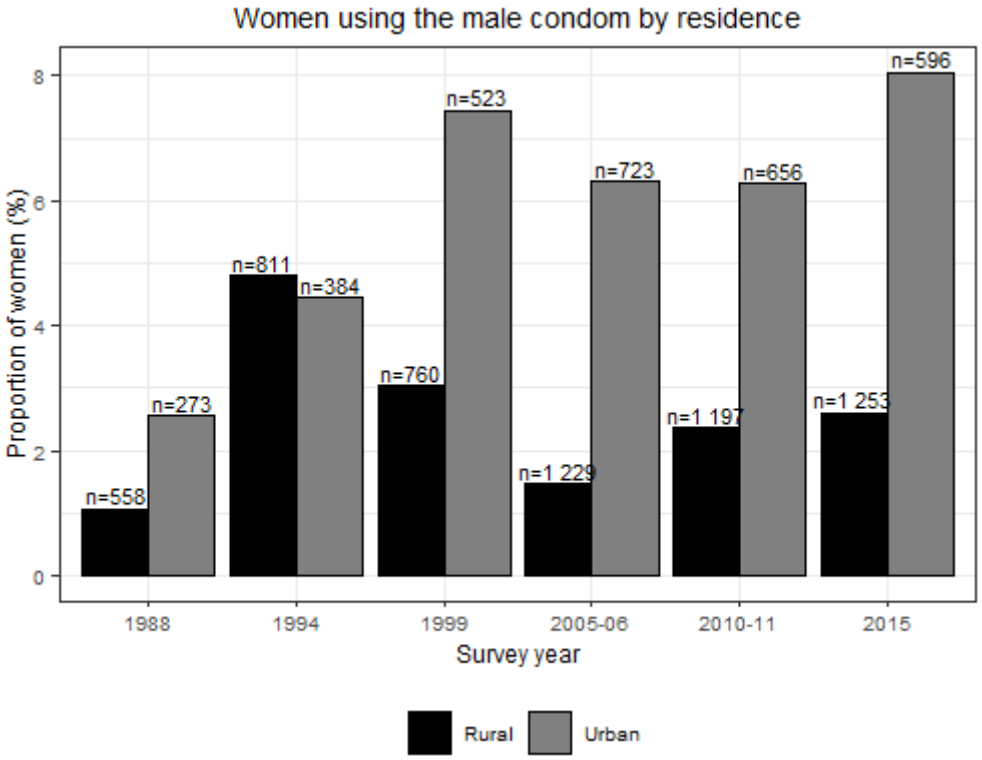
The use of Norplant/implant increased over time for both urban and rural women. However, urban women have higher rates of using compared to their rural counterparts.

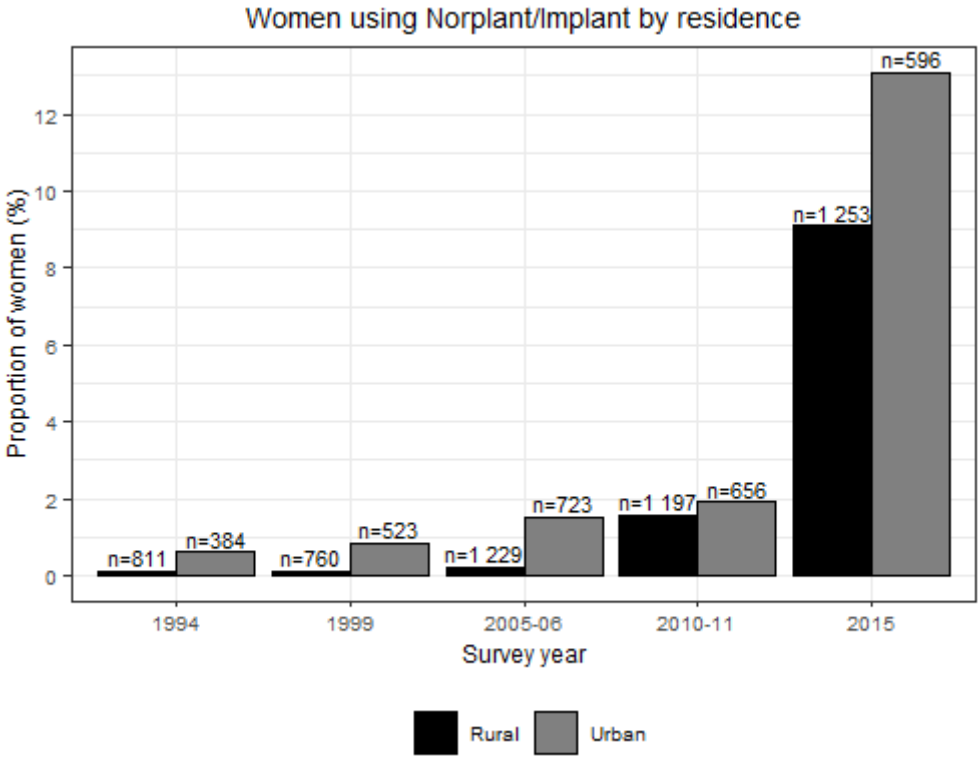
Figure 4.5: Current contraceptive method choice among sexually active young women, Zimbabwean DHSs






Women using injections by residence
Proportion of women (%)
0
2
4
6
8
10
n=558
n=273
n=811
n=384
n=760
n=523
n=1 229
n=723
n=1 197
n=656
n=1 253
n=596
1988
1994
1999
2005-06
2010-11
2015
Survey year
Rural
Urban


Women using the male condom by residence
Proportion of women (%)
0
2
4
6
8
n=558
n=273
n=811
n=384
n=760
n=523
n=1 229
n=723
n=1 197
n=656
n=1 253
n=596
1988
1994
1999
2005-06
2010-11
2015
Survey year
Rural
Urban


Women using Norplant/Implant by residence
Proportion of women (%)
0
2
4
6
8
10
12
n=811
n=384
n=760
n=523
n=1 229
n=723
n=1 197
n=656
n=1 253
n=596
1994
1999
2005-06
2010-11
2015
Survey year
Rural
Urban

4.3 Factors associated with contraceptive use

4.3.1 Binary logistic regression results

R was used to investigate the association between contraceptive use and the covariates described in section 3.4.2. The most parsimonious binary logistic regression was fitted, and the results are presented in Table 4.2.

When fitting a logistic regression model, all missing values are excluded. This resulted in a sample of only married young women in the 1988 survey. Hence for consistency in the analysis and the results, we excluded this survey from the most parsimonious model. The 2015 survey was also excluded because the results obtained were counterintuitive with respect to education. We observed that sexually active young women with none or primary level of education had higher odds of using contraceptives than those with secondary or higher education.

Additionally, we observed counterintuitive odds ratios for 2010-11 and 2015 survey with respect to the region variable. Despite the presents of bias in the region variable, we included the 2010-11 survey in the model in Table 4.2. These, unfortunate, findings are dealt with in much greater detail in section 4.5.

Above 95% of sexually active young women have knowledge of modern contraceptives as highlighted in Table 3.5. Thus, the variable knowledge of contraceptive methods was excluded from the model because it was highly correlated with the response variable. Additionally, the variable region was excluded from the model despite being relevant in some of the surveys.

The *p*-value was used to test the significance of coefficients in the model. A *p*-value of less than 0.05 indicates that a variable is statistically significant at the 5 percent level of significance. Table 4.2 presents odds ratios of statistically significant variables in the model. Odds ratios of less than one mean women have lower chances of using modern contraceptives, whilst odds ratio of greater than one mean higher chance of using modern contraceptives relative to a chosen baseline (reference) category.

Age group, residence, education, and employment status are statistically significant although not in all surveys. Marital status, parity, and desire for more children are statistically significant in all surveys.

From 1999 to 2010-11 young women aged 15-17 were less likely to use modern contraceptives relative to those aged 22-24. In 2010-11, young women aged 18-19 were 55.4% less likely to use modern contraceptives compared to those aged 22-24. Young women residing in rural areas were 54.7%, 58.9%, and 47.1% less likely to use modern contraceptives than those living in urban areas in 1994, 1999, and 2005-06, respectively.

The odds of using modern contraceptives were 36.8% higher for young women with secondary or higher education relative to women with none or primary education in the 1999 survey. In 1994, 2005-06, and 2010-11, employed young women were more likely to use modern contraceptives than unemployed women.

Over time, married and cohabitating young women were more likely to use modern contraceptives compared to those who never married. Widowed, divorced, or separated women were 52.7% less likely to use modern contraceptives in 2010-11 compared to women who never married. Young women with one or more living children were more likely to use modern contraceptives relative to those with no living children over time.

Over time, women with a desire to have more children within 2 years were less likely to use modern contraceptives compared to those who no longer want more children. Women with a desire for more children after 2 years were 80.3% and 54.5% more likely to use modern contraceptives than those who want no more children in 2005-06 and 2010-11, respectively.

Table 4.2: Odds ratios of binary logistic regression for contraceptive use by selected women's characteristics, Zimbabwean DHSs

	1994		1999		2005-06		2010-11	
	Odds ratio	***p*-value**	**Odds ratio**	***p*-value**	**Odds ratio**	***p*-value**	**Odds ratio**	***p*-value**
Number of women		1 231		1 324		1 981		1 882
Age group								
22-24 (ref)								
15-17	0.623	0.127	0.541	0.023*	0.538	0.012*	0.494	0.013*
18-19	0.805	0.219	0.793	0.231	0.835	0.267	0.446	0.000*
20-21	0.988	0.939	0.799	0.202	0.881	0.435	0.768	0.105
Residence								
Urban (ref)								
Rural	0.453	0.000*	0.411	0.000*	0.529	0.000*	0.898	0.471
Education level								
None/Primary (ref)								
Secondary/Higher	1.342	0.058	1.368	0.022*	1.260	0.052	1.218	0.114
Employment status								
Unemployed (ref)								
Employed	1.882	0.000*	1.086	0.577	1.435	0.004*	1.503	0.010*
Marital status								
Never married (ref)								
Married	2.959	0.000*	4.208	0.000*	3.850	0.000*	3.203	0.000*
Cohabitating	N/A	N/A	2.439	0.002*	3.526	0.003*	2.683	0.005*
Widowed/Divorced/Separated	1.294	0.378	0.857	0.599	0.609	0.093	0.473	0.005*
Parity								
None (ref)								
≥1	3.180	0.000*	3.594	0.000*	5.884	0.000*	4.661	0.000*

	1994		1999		2005-06		2010-11	
	Odds ratio	***p*-value**	**Odds ratio**	***p*-value**	**Odds ratio**	***p*-value**	**Odds ratio**	***p*-value**
Desire for more children								
No more (ref)								
Within 2 years	0.249	0.000*	0.257	0.000*	0.461	0.000*	0.326	0.000*
After 2 years	1.098	0.655	1.377	0.135	1.803	0.000*	1.545	0.029*
Undecided/Unsure	0.543	0.106	0.587	0.121	0.853	0.573	0.757	0.209

*Significant (p-value < 0.05), ref refers to reference category

4.3.2 Average Marginal effects (AMEs)

Table 4.3 show the Average Marginal Effects (AMEs) of the regression model presented in Table 4.2. The AMEs represents an average change in the probability of using modern contraceptives when each covariate *X* increases by one unit (Norton, Dowd and Maciejewski 2019). A negative AME indicates a decrease in probability of using modern contraceptives.

From 1999 to 2010-11, the probability of using modern contraceptives was lower for young women aged 15-17 compared to those aged 22-24. In 2010-11, the probability of using modern contraceptives was 14.3% lower among young women aged 18-19 relative to those aged 22-24.

The probability of using modern contraceptives is lower for young women residing in rural areas compared to those in urban areas. In 1999, the probability of using modern contraceptives increased by 5.5% among women with secondary or higher education compared to those with lower education. The probability of using modern contraceptives increases among employed young women compared to those unemployed.

There is an increase in probability of using modern contraceptives among married and cohabitating young women compared to never married women. Additionally, the probability of using modern contraceptives among widowed, divorced, or separated women decreased by 13.7% in 2010-11 relative to never married women.

Among young women with one or more living children, the probability of using modern contraceptives is higher compared to those with no living children. Young women's desires to have more children within 2 years decreases the probability of using modern contraceptives relative to those who no longer want more children. In 2005-06 and 2010-11, young women with a desire for more children after 2 years had 10.7% and 8.0% lower probability of using modern contraceptives compared to those who no longer want more children, respectively.

Table 4.3: The Average Marginal Effects (AMEs) for binary logistic regression, Zimbabwean DHSs

	1994		1999		2005-06		2010-11	
	AME	***p*-value**	**AME**	***p*-value**	**AME**	***p*-value**	**AME**	***p*-value**
Number of women		1 231		1 324		1 981		1 882
Age group								
22-24 (ref)								
15-17	-0.089	0.125	-0.110	0.022*	-0.109	0.015*	-0.125	0.018*
18-19	-0.041	0.221	-0.042	0.229	-0.031	0.274	-0.143	0.001*
20-21	-0.002	0.939	-0.040	0.202	-0.022	0.436	-0.046	0.114
Residence								
Urban (ref)								
Rural	-0.148	0.000*	-0.156	0.000*	-0.106	0.000*	-0.018	0.465
Education level								
None/Primary (ref)								
Secondary/Higher	0.055	0.056	0.055	0.020*	0.039	0.051	0.034	0.113
Employment status								
Unemployed (ref)								
Employed	0.119	0.000*	0.015	0.575	0.061	0.003*	0.069	0.012*
Marital status								
Never married (ref)								
Married	0.209	0.000*	0.273	0.000*	0.265	0.000*	0.225	0.000*
Cohabitating	N/A	N/A	0.169	0.002*	0.249	0.002*	0.193	0.003*
Widowed/Divorced/Separated	0.047	0.381	-0.027	0.594	-0.091	0.089	-0.137	0.003*
Parity								
None (ref)								
≥1	0.224	0.000*	0.242	0.000*	0.345	0.000*	0.299	0.000*

	1994		1999		2005-06		2010-11	
	AME	***p*-value**	**AME**	***p*-value**	**AME**	***p*-value**	**AME**	***p*-value**
Desire for more children								
No more (ref)								
Within 2 years	-0.266	0.000*	-0.251	0.000*	-0.146	0.000*	-0.213	0.000*
After 2 years	0.019	0.654	0.062	0.138	0.107	0.000*	0.080	0.028*
Undecided/Unsure	-0.125	0.101	-0.104	0.116	-0.030	0.574	-0.053	0.211

4.4 Factors associated with contraceptive method choice

In R, the *svrepmisc* package which implements *svymultinom* command used in fitting multinomial logistic regression is not integrated with the *margins* package. This means the *margins* package cannot be implemented to calculate marginal effects for multinomial logistic regression model in R. Hence, all data analysis procedures in this section were carried out using Stata version 15.1.

4.4.1 Multinomial logistic regression results

In this section, multinomial logistic regression was used to assess the association between contraceptive method choice and the factors found to be associated with contraceptive use in section 4.3.

In the 1994, 1999, and 2005-06 surveys, we observed no young women were using injections and Norplant/Implants with respect to some characteristics levels of age group, education level, marital status, parity, and desire for more children. As an example, we observed no young women aged 15-17 using injections or Norplant/Implants, and no women aged 18-19 using Norplant/Implants in the 1994 survey. The same observations were made with respect to other variables and surveys. Because of this, results containing remarkably high uninterpretable odds ratios were observed. Hence, multinomial logistic regression model was only fitted for the 2010-11 survey.

Table 4.4 shows the odds ratios of statistically significant coefficients of the model. Age group was excluded from the model because there were no young women aged 15-17 using Norplant/Implants and hence uninterpretable odds ratios were observed. Of the variables included in the model; education, employment status, marital status, parity, and desire for more children are statistically significant.

Sexually active young women with secondary or higher education are 2.7 times more likely to use Norplant/Implants compared to those with none or primary education. They are also 59.0% more likely to use injections compared to those with low education level. Employed young women are 2.5 times more likely to use the male condom relative to unemployed women.

Married and cohabitating young women are more likely to use the pill compared to never married women. The odds of using injections are 2.3 times higher for married women compared to never married women. Married women are 61.4% less likely to use the male condom than never married women.

Young women with or more living children are more likely to use either the pill, injections, or Norplant/Implants compared to those with no children. Young women with a desire to have more children within 2 years are less likely to use either the pill, injections, or Norplant/Implants.

Table 4.4: Odds ratios of multinomial logistic regression for contraceptive method choice by selected women's characteristics, Zimbabwean 2010-11 DHS

	Pill		Injections		Male condom		Norplant/Implants	
	Odds ratio	***p*-value**	**Odds ratio**	***p*-value**	**Odds ratio**	***p*-value**	**Odds ratio**	***p*-value**
Number of women				1 882				
Residence								
Urban (ref)								
Rural	0.965	0.851	0.978	0.938	0.613	0.059	0.914	0.810
Education level								
None/Primary (ref)								
Secondary/Higher	1.263	0.127	1.590	0.048*	1.091	0.786	2.748	0.025*
Employment status								
Unemployed (ref)								
Employed	1.396	0.061	1.390	0.156	2.536	0.001*	1.855	0.108
Marital status								
Never married (ref)								
Married	14.125	0.000*	2.265	0.006*	0.386	0.009*	0.703	0.354
Cohabitating	9.193	0.000*	0.993	0.992	1.217	0.796	2.346	0.260
Widowed/Divorced/Separated	0.994	0.986	0.626	0.287	0.579	0.359	0.574	0.304
Parity								
None (ref)								
≥1	24.967	0.000*	18.411	0.000*	0.554	0.059	22.673	0.003*
Desire for more children								
No more (ref)								
Within 2 years	0.383	0.001*	0.376	0.018*	0.753	0.611	0.105	0.019*
After 2 years	1.603	0.063	0.918	0.763	1.944	0.151	0.703	0.412
Undecided/Unsure	0.750	0.307	0.474	0.102	1.209	0.729	0.532	0.241

4.4.2 Marginal Effect at the Means (MEMs)

In this section we used Marginal Effect at the Means (MEMs) to explain probability change in contraceptive method choice when each covariate increases by one unit for the multinomial logistic regression model presented in Table 4.4. When computing MEM for a variable, all other variables are held constant at their mean values. Table 4.5 shows the MEM results obtained for the 2010-11 survey

Young women with secondary or higher education have a 0.9% increase in probability of using Norplant/Implants compared to those with none or primary education. Employed women have a 2.6% increase in probability of using the male condom compared to those unemployed.

Married and cohabitating young women have 41.2% and 30.4% increase in probability of using the pill relative to those who never married, respectively. A 6.2% decrease in probability of using the male condom is observed among married women relative to those never married.

Young women with one or more living children have 40.2%, 9.6% and 1.6% increase in probability of using the pill, injections, and Norplant/Implants, respectively. Women with a desire to have more children within 2 years have a 13.6% and 2.2% decrease in probability of using the pill and Norplant/Implants compared to those who no longer want more children, respectively. Young women who want more children after 2 years have a 10.4% increase in probability of using the pill compared to those who no longer want more children.

Table 4.5: Marginal Effect at the Means (MEMs) for multinomial logistic regression, Zimbabwean 2010-11 DHS

	Pill		Injections		Male condom		Norplant/Implants	
	MEM	***p*-value**	**MEM**	***p*-value**	**MEM**	***p*-value**	**MEM**	***p*-value**
Number of women				1 882				
Residence								
Urban (ref)								
Rural	-0.002	0.955	0.001	0.976	-0.014	0.105	-0.001	0.861
Education level								
None/Primary (ref)								
Secondary/Higher	0.034	0.251	0.026	0.081	-0.001	0.928	0.009	0.048*
Employment status								
Unemployed (ref)								
Employed	0.050	0.158	0.013	0.434	0.026	0.024*	0.006	0.281
Marital status								
Never married (ref)								
Married	0.412	0.000*	0.015	0.399	-0.062	0.000*	-0.013	0.071
Cohabitating	0.304	0.000*	-0.023	0.409	-0.017	0.696	0.011	0.605
Widowed/Divorced/Separated	0.004	0.851	-0.021	0.301	-0.030	0.350	-0.008	0.362
Parity								
None (ref)								
≥1	0.402	0.000*	0.096	0.000*	-0.051	0.000*	0.016	0.002*
Desire for more children								
No more (ref)								
Within 2 years	-0.136	0.006*	-0.052	0.074	0.001	0.950	-0.022	0.034*
After 2 years	0.104	0.037*	-0.024	0.318	0.013	0.212	-0.010	0.265
Undecided/Unsure	-0.038	0.483	-0.049	0.121	0.008	0.567	-0.010	0.364

4.5 Problems with the Zimbabwean 2010-11 and 2015 DHS data

4.5.1 2010-11 DHS

The binary logistic regression model presented in section 4.3.1 excluded the explanatory variable region. However, when the binary logistic regression model in section 4.3.1 was fitted with region as the only explanatory variable, we observe counterintuitive odds ratios for the 2010-11 survey. In all the other seven provinces except Matabeleland South and Bulawayo, young women have higher odds of using modern contraceptives relative to those in Harare province as shown in Table 4.6.

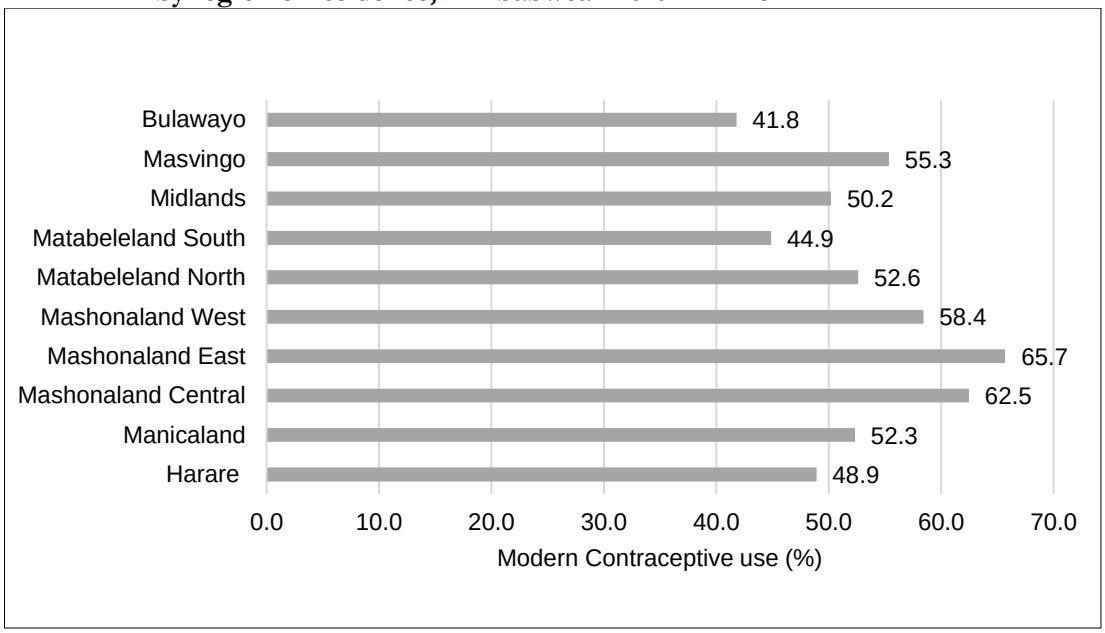
Table 4.6: Odds ratios of binary logistic regression for contraceptive use by women's region of residence, Zimbabwean DHSs

	Survey year				
	1994	**1999**	**2005-06**	**2010-11**	**2015**
Number of women	1 231	1 324	1 981	1 882	1 872
Region					
Harare (ref)					
Manicaland	0.465	0.293	0.584	1.147	0.931
Mashonaland Central	0.665	0.780	0.635	1.738	1.688
Mashonaland East	0.652	0.663	0.850	2.001	1.560
Mashonaland West	0.671	0.938	0.982	1.468	1.945
Matabeleland North	0.286	0.270	0.298	1.160	1.361
Matabeleland South	0.252	0.253	0.232	0.850	1.057
Midlands	0.593	0.545	0.796	1.053	1.581
Masvingo	0.416	0.714	0.566	1.295	1.256
Bulawayo	0.606	0.472	0.594	0.750	1.364

Descriptive statistics results shown in Figure 4.6 show that women from Harare province have the third lowest rate of using modern contraceptives compared to other regions. These are unexpected observations considering the other eight provinces (excluding Harare and Bulawayo) are largely rural (see Figure A1). We would expect women from Harare province to have a higher rate of using modern contraceptives compared to other provinces based on the theoretical work in section 2.3.2 and 2.3.3.

In conclusion, there is indication of results bias with respect to the region of residence of the young women. However, since the region variable was excluded from the model in section 4.3.1, we included the 2010-11 survey in the binary logistic regression model.

Figure 4.6: The proportional distribution of young women using modern contraceptives by region of residence, Zimbabwean 2010-11 DHS



4.5.2 2015 DHS

When the binary logistic regression model presented in section 4.3.1 was fitted to the 2015 survey data, the results obtained were counterintuitive with respect to education. The odds of using modern contraceptives were lower for young women with secondary or higher education compared to those with none or primary education (see Table A9). These results do not agree with the hypothesis that women with higher education level are more likely to use contraceptives compared to those with lower education level. They also contradict the findings by Nyarko (2015); Olagunju, Bolarinwa and Erinfolami (2020).

Additionally, the descriptive statistics in Table 4.7 show an overall high rate of using modern contraceptives among all young women with none or primary education compared to those with secondary or higher education. We also observe that in nearly every age, women with none or primary education have higher rate of using modern contraceptives compared to those with secondary education.

The 2015 DHS sample design implemented the 2012 Census as the sampling frame (Zimbabwe National Statistics Agency (ZIMSTAT) and ICF International 2016). However, the characteristics of young women by age and education level in the sampling frame differ from those in the selected DHS sample. The results in Table 5.10 of the 2012 Census report (Zimbabwe National Statistics Agency 2012) show that there were no young women aged 15-19 who had completed secondary or higher education.

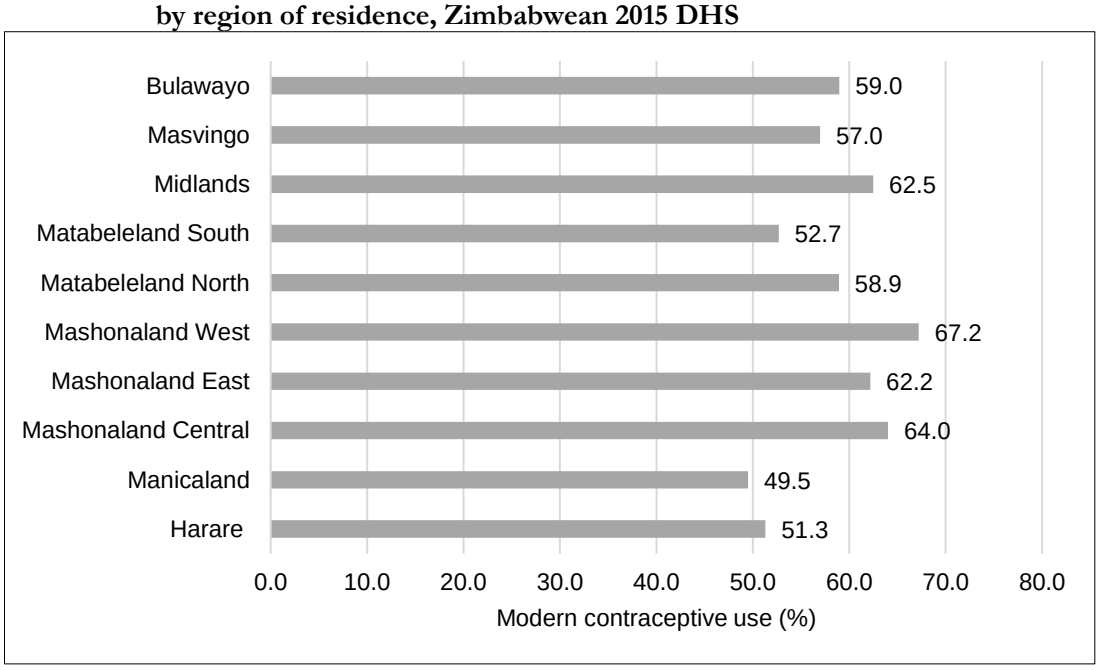
Whereas, in Table 4.7 we observe women aged 15-19 with secondary or higher education.

Table 4.7: Current modern contraceptive use by age and education level among sexually active young women, Zimbabwean 2015 DHS

	None/Primary education		Secondary/Higher education	
Age	n	contraceptive use (%)	n	contraceptive use (%)
15	18	27.6	13	28.9
16	45	46.0	31	14.5
17	51	36.8	73	31.3
18	56	43.8	100	46.3
19	57	57.3	164	52.7
20	67	60.8	172	54.0
21	59	80.0	167	60.9
22	70	64.2	186	67.3
23	71	71.5	216	63.5
24	67	69.5	190	72.9
15-24	560	59.1	1312	57.9

Moreover, we observe counterintuitive results when region was fitted as the only variable in the binary logistic regression model in section 4.3.1. We observed that young women from all the other eight provinces (excluding Manicaland) had higher odds of using modern contraceptives compared to those in Harare province as shown in Table 4.6. Figure 4.7 also show that women from Harare province have the second lowest rate of using modern contraceptives compared to other regions.

Figure 4.7: The proportional distribution of young women using modern contraceptives by region of residence, Zimbabwean 2015 DHS

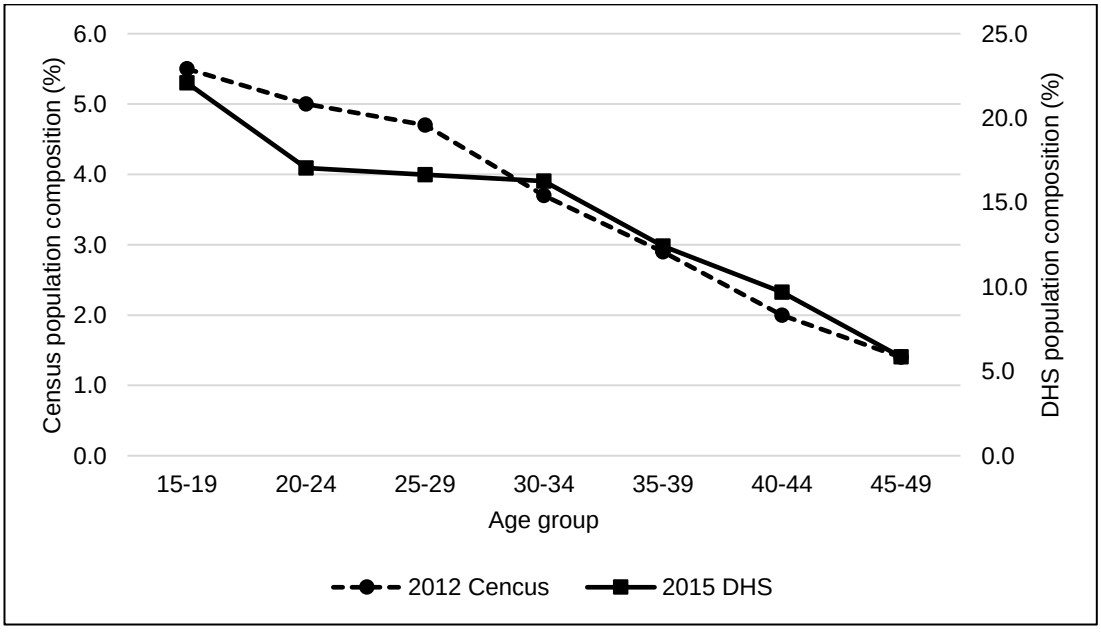


In Figure 4.8 we also compare the percentage population composition of women aged 15-49 included in the Zimbabwe 2012 Census and 2015 DHS. We observe a deviation in the 2015 DHS sample composition of women aged 20-24 from those in the sampling frame.

All these results indicate bias in some of the demographic characteristics of young women included in the 2015 DHS. They also show a distortion in the DHS sample of 20–24-year-olds compared to that presented in the sampling frame. This could be due to sampling or non-sampling errors. Sampling errors may have been introduced by the sampling design and non-sampling errors during the interview processes of data collection (Bethlehem 2009). Non-sampling errors could have resulted from some young women in the sampling frame not being available during the time of DHS interviews. Additionally, some young women may have provided false information during the interviews because they were required to recall some information about past events.

The education variable was found relevant in the model fitted in section 4.3.1 and the young women's characteristics are biased with respect to their education levels. Therefore, we excluded the 2015 survey from the logistic regression model.

Figure 4.8: Population composition of women aged 15-49, Zimbabwean 2012 Census and 2015 DHS



Source: Derived from the Zimbabwe 2012 Census and 2015 DHS

4.6 Discussion

This section summarise the logistic regression results presented in prior sections. Problems were encountered with 1988 and 2015 surveys. Due to missing values, results for 1988 survey were only for a sample of sexually active married young women. Results for the 2015 survey were counterintuitive with respect to education. Hence, the conclusions drawn are based solely on the data from the 1994, 1999, 2005-06, and 2010-11 surveys.

4.6.1 Factors associated with contraceptive use among young women

The findings in section 4.3 indicate that age group, residence, education level, employment status, marital status, parity, and desire for more children are significantly associated with contraceptive use among young women in Zimbabwe. Furthermore, the findings indicate that being married or cohabitating, having one or more living children and having a desire to have more children within two years remain significant determinants of using modern contraceptives among young women over time.

Married and cohabitating women have a higher likelihood and probability of using modern contraceptives compared to those who never married. Chola, Hlongwana and Ginindza (2020) had similar findings in a study among adolescent women in Zambia. These findings may be explained in the fact that once young women are married, access to contraceptives also improves. Married young women might no longer face social/cultural barriers (including beliefs against premarital sexual activities) to accessing contraceptives. Therefore, they can openly obtain and use modern contraceptives.

As expected, we observed that young women with one or more living children have higher odds and probability of using modern contraceptives compared to those without children. Other studies have made similar observations (Islam 2018; Kistiana, Gayatri and Sari 2020; Ngome and Odimegwu 2014; Palamuleni 2014). Women with children are more likely to be married and exposed to frequent engagement in sexual intercourse. Hence may adopt the use of modern contraceptives to delay and stop childbearing.

Young women with a desire to have more children within 2 years are less likely to use modern contraceptives than women who want no more children whilst those that want after 2 years are more likely to use. Asiimwe, Ndugga, Mushomi et al. (2014); Islam (2018); Kistiana, Gayatri and Sari (2020) observed similar findings.

Although age group was found to be insignificant in some surveys, the study found that young women in the younger ages (15-17 and 18-19 years) are less likely to use modern contraceptives compared to those in the older ages (22-24 years).

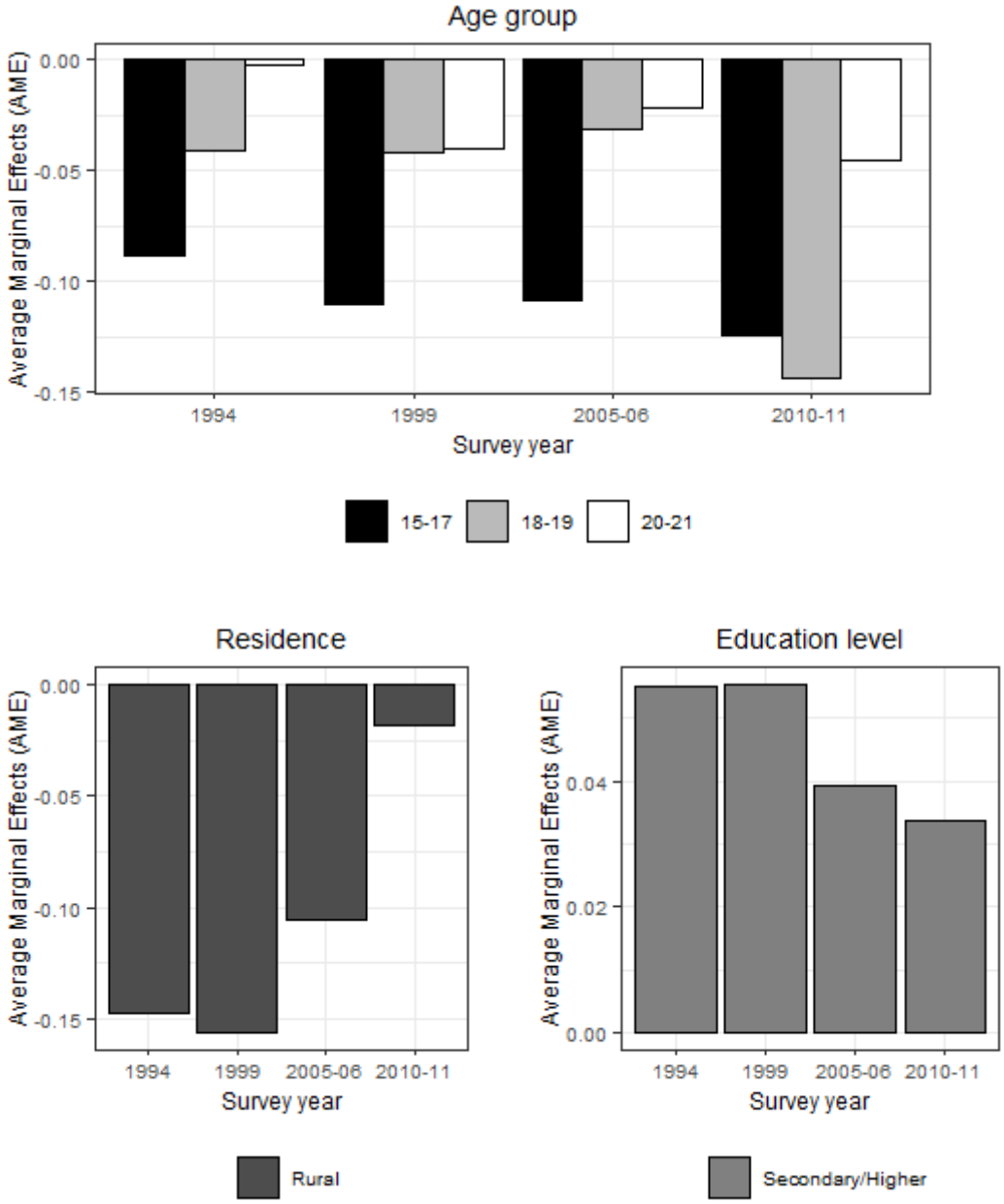
Additionally, there is an improvement in the probability of using modern contraceptives with increase in age of young women. These findings are similar to those found by (Sidibé, Delamou, Camara *et al.* 2020), who found young women aged 20-24 more likely to use modern contraceptives compared to those aged 15-19. These findings may be explained by the fact that young women in older ages are more likely to be sexually active, married and have had children which may influence their use of contraceptives. They are also more likely to be aware of the consequences of not using contraceptives.

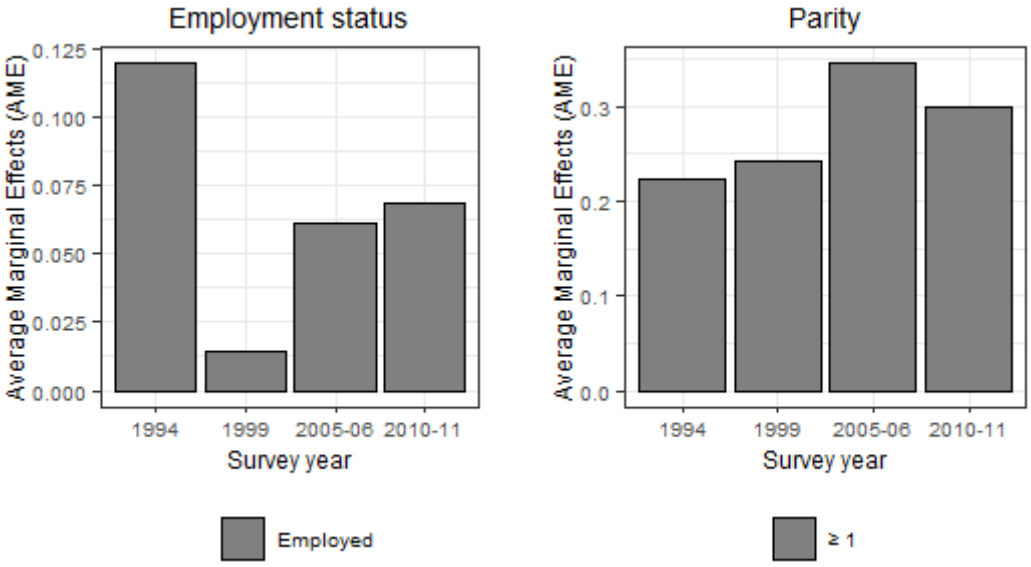
This study showed that young women residing in rural arears have lower odds and probability of using modern contraceptives relative to those in urban areas. Similar findings have been observed among adolescent women in sub-Saharan Africa (Ahinkorah, Hagan Jr, Seidu *et al.* 2020; Nketiah-Amponsah, Arthur and Abuosi 2012).

Despite education level being found to be significant only in the 1999 survey, we observed that young women with secondary or higher education are more likely to use modern contraceptives compared to those with none or primary education. These findings are consistent with other findings from previous studies which have shown an improvement in contraceptive use with increase in education (Nyarko 2015; Olagunju, Bolarinwa and Erinfolami 2020; Palamuleni 2014). Better educated women may want to delay childbearing to continue with education. Thus, they use modern contraceptives to prevent pregnancies. Additionally, they may have better access to contraceptive information and awareness of the consequence of not using contraceptives.

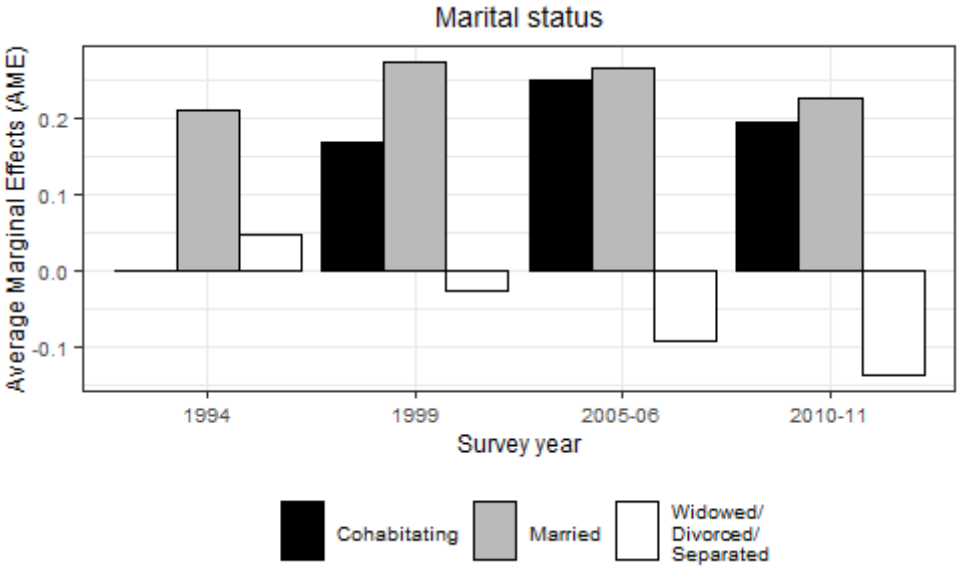
Employed women have a higher likelihood and probability to use modern contraceptives compared to those unemployed. Our findings are similar to those found by Islam, Mondal, Khatun *et al.* (2016).

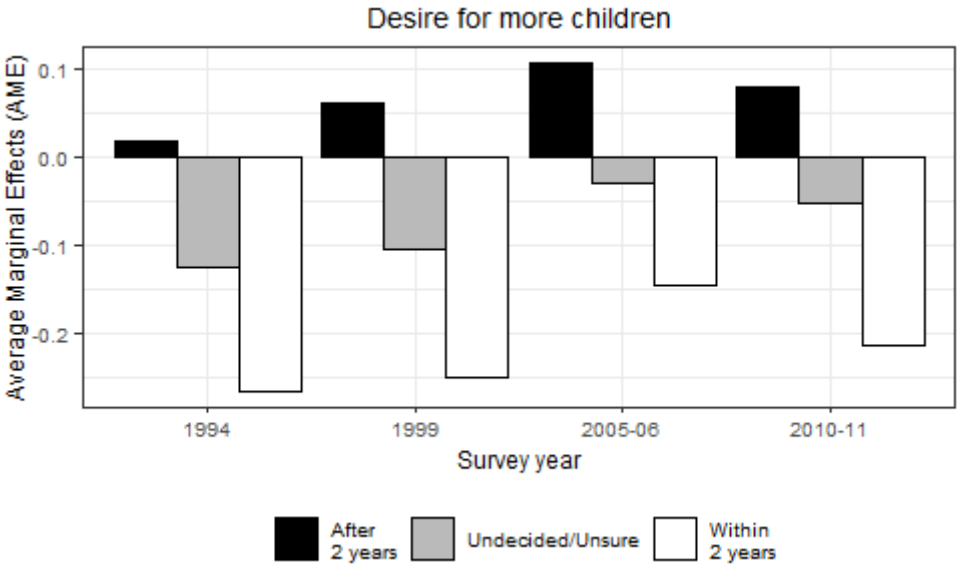
Figure 4.9: The Average Marginal Effects (AMEs) for binary logistic regression, Zimbabwean DHSs




Employment status
Average Marginal Effects (AME)
0.125
0.100
0.075
0.050
0.025
0.000
1994
1999
2005-06
2010-11
Survey year
Employed

Parity
Average Marginal Effects (AME)
0.3
0.2
0.1
0.0
1994
1999
2005-06
2010-11
Survey year
≥ 1


Marital status
Average Marginal Effects (AME)
0.2
0.1
0.0
-0.1
1994
1999
2005-06
2010-11
Survey year
Cohabitating
Married
Widowed/
Divorced/
Separated


Desire for more children
Average Marginal Effects (AME)
0.1
0.0
-0.1
-0.2
1994
1999
2005-06
2010-11
Survey year
After
2 years
Undecided/Unsure
Within
2 years

4.6.2 Factors associated with contraceptive method choice

We further analysed if the factors associated with contraceptive use are also associated with contraceptive method choice. Due to lack of women using injections and Norplant/Implants with respect to some categorical levels of covariates age group, education level, marital status, parity, and desire for more children, imprecise results containing high uninterpretable odds ratios were observed in the 1994, 1999, and 2005-06 surveys. Hence the results were determined using the 2010-11 survey.

The Marginal Effects at the Means (MEMs) were used to measure the probability change in contraceptive method choice with change in categorical level of each covariate. The covariates in the study are all categorical variables. Thus, the mean value of each covariate is merely the proportional distribution in the sample. This means the mean values used when analysing MEMs do not reflect the actual characteristics each woman has. For example, the mean value for rural women was 0.647, which means there is no woman who 64.7% resides in rural areas. In actual reality, its either the woman lives in rural or urban area. This is one of the limitation of using the MEMs as described by Williams (2012).

The findings in section 4.4 indicate that contraceptive method choice among young women in Zimbabwe is associated with education level, employment status, marital status, parity, and desire for more children.

Young women with secondary or higher education are more likely to use Norplant/Implants and injections compared to those with lower education level. This results contradict findings from other studies in Kenya which found women with higher education levels less likely to use long term contraceptive methods compared to those with lower education levels (Kungu, Agwanda and Khasakhala 2020; Magadi and Curtis 2003). The explanation for our findings may be because educated women are more likely to have knowledge of contraceptive methods and may also want to postpone childbearing to remain in school. Injections and Norplant/Implants can protect women from pregnancy for a longer period compared to the daily pill. This may influence their use among women with higher education to avoid any unwanted pregnancies that may hinder them from focusing on their education.

Ochako, Izugbara, Okal *et al.* (2016) found women in formal employment more likely to use traditional and long-term (including implants) contraception methods than those self-employed. This indicates that employment status is a determinant of contraception method choices. In this study, we found employed women to have a higher likelihood and probability of using the male condom compared to those

unemployed. This might be because employed women are more likely to be exposed to contraceptive information. Hence, they might be aware of the benefits of using condoms in preventing the transmission of sexually transmitted diseases STDs. They may also be able to afford any cost of obtaining condoms.

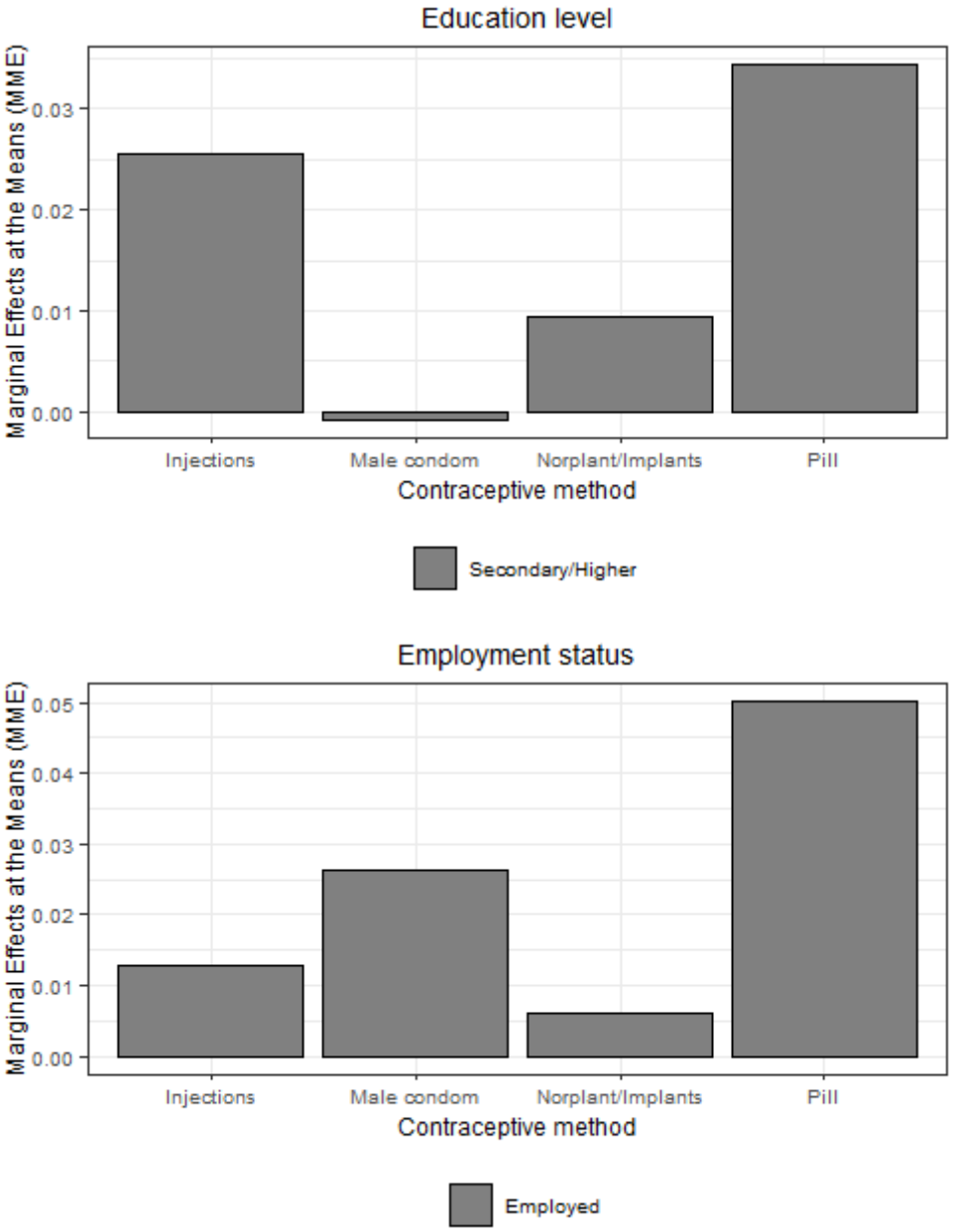
Married and cohabitating young women are more likely to use the pill compared to those never married. Additionally, married women are more likely to use injections compared to those never married. Married or cohabitating women are more likely to have high frequent exposure to sexual intercourse. Hence, they are more likely to use the pill or injections to prevent unplanned pregnancies. These findings are consistent with those found by Ochako, Izugbara, Okal *et al.* (2016).

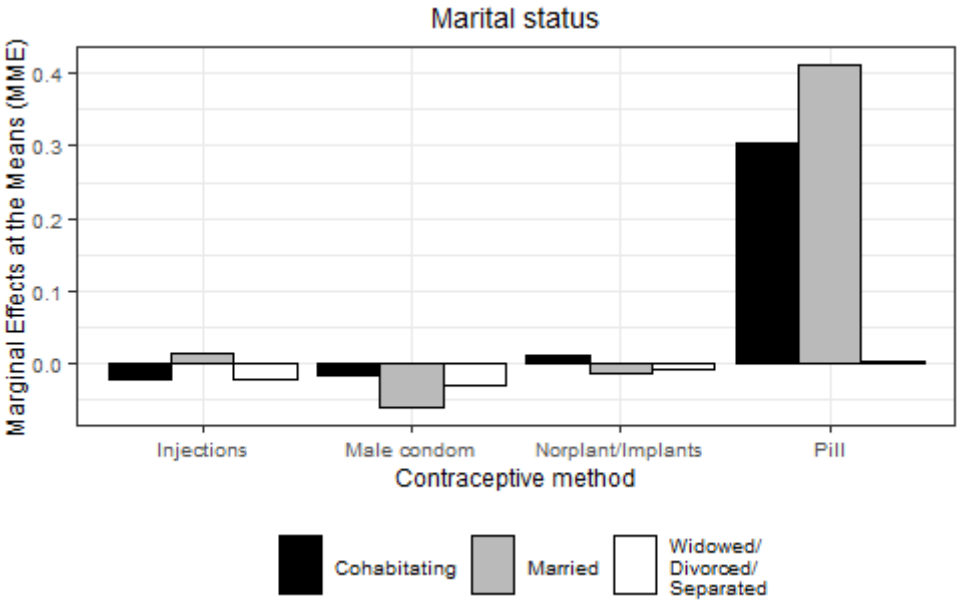
However, we also observed contradicting results when we found that married women are less likely to use the male condom compared to those never married. The explanation for this could be that married women may face cultural barriers in using the male condom. Married women are expected to bear children upon marriage and condom use is seen as an inhibiting factor in fulfilling this expected role (Dube, Nkomo and Khosa 2017). Dube, Nkomo and Khosa (2017) also argues that the use of condoms is viewed as a method that promotes promiscuous behaviours. Additionally, male condom is a male-controlled contraception and considering that Zimbabwe is a patriarchy society, men may have the final decision on which contraception their wives use. This makes it difficult for married women to negotiate the use of condoms.

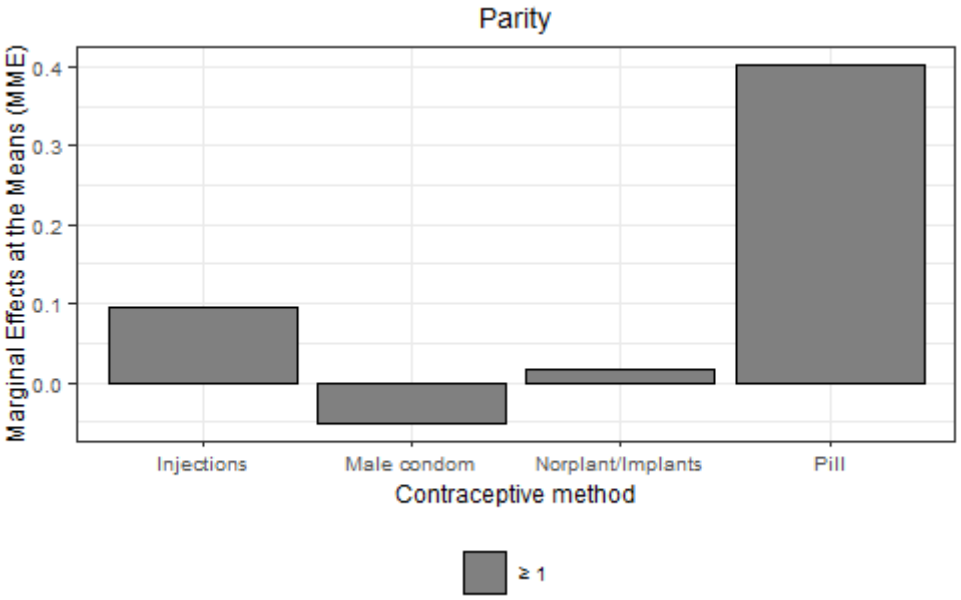
Young women with one or more living children are more likely to use the pill, injections, and Norplant/Implants compared to those with no living children. Magadi and Curtis (2003) made similar observations. This might be because once women bear children, they have proved their fertility and are no longer concerned with the misconceptions of contraceptive use causing infertility. Hence, their rate of using the pill, injections, and Norplant/implants may increase to limit family size and space birth intervals.

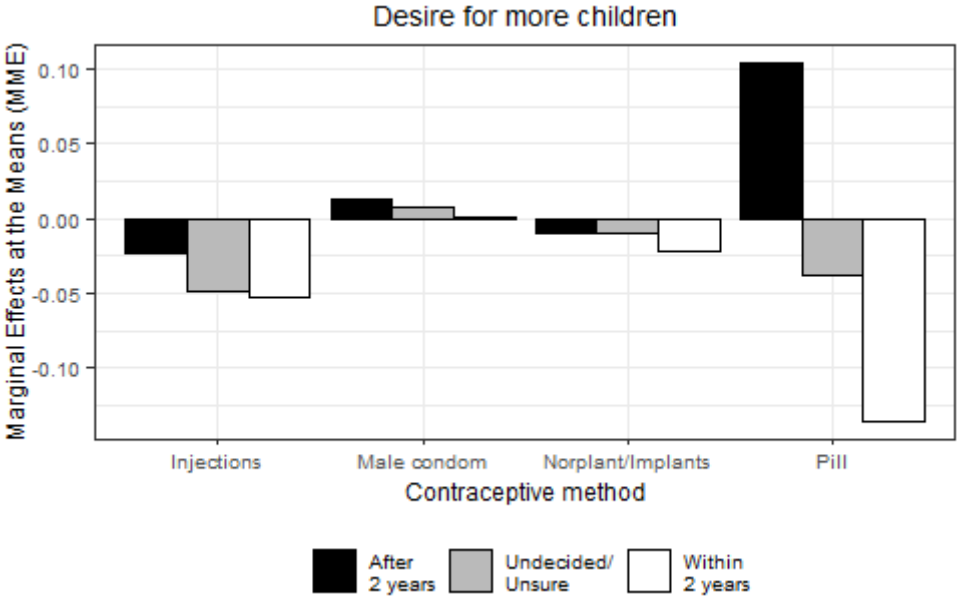
As expected, young women with a desire to have more children within 2 years are less likely to use the pill, injections, and Norplant/Implants compared to those who want no more children. The reduced rate of using modern contraceptive methods among women who want children within two years might be because some of them may be trying to conceive.

Figure 4.10: Marginal Effects at the Means (MEMs) for multinomial logistic regression, Zimbabwean 2010-11 DHS




Marital status
Marginal Effects at the Means (MME)
0.4
0.3
0.2
0.1
0.0
Injections
Male condom
Norplant/Implants
Pill
Contraceptive method
Cohabitating
Married
Widowed/
Divorced/
Separated


Parity
Marginal Effects at the Means (MME)
0.4
0.3
0.2
0.1
0.0
Injections
Male condom
Norplant/Implants
Pill
Contraceptive method
≥ 1


Desire for more children
Marginal Effects at the Means (MME)
0.10
0.05
0.00
-0.05
-0.10
Injections
Male condom
Norplant/Implants
Pill
Contraceptive method
After
2 years
Undecided/
Unsure
Within
2 years

5 CONCLUSION

5.1 Conclusion

The aim of this study was to examine the trends in contraceptive use, unmet need, and method choice, and determinants of contraceptive use and method choice among young women aged 15-24 in Zimbabwe from 1988 to 2015.

The first objective of the study was to examine young women's age at sexual debut. Based on the results, it can be concluded that most young women in Zimbabwe are sexually active. The results indicate high premarital initiation of sexual intercourse by most young women and mostly between the ages of 15 to 17 years. Adolescent women are at a higher risk of pregnancy related complications (Ahmed, Li, Liu *et al.* 2012; Gubhaju 2002). Hence, it is critical that young women have a universal access to modern contraceptive information and services.

The second objective of the study was achieved using descriptive statistics in examining trends in contraceptive use, unmet need, and method choice. Based on the results, it can be concluded that the use of modern contraceptives among sexually active young women has significantly improved over time.

This study illustrates that unmet need for modern contraceptives has declined over time but raises the question of why unmet need was higher among young women dwelling in urban areas compared to those in rural areas in the years 2010-11 and 2015. The results also suggest that unmet need for modern contraceptives remains a challenge that needs to be addressed. Family planning information and services coverage should be increased among young women. These family planning service providers should be youth friendly to encourage young women to use contraceptives.

Despite high use of the contraceptive pill, the results indicate significant improvement in the use of injections and Norplant/Implants. This shows an increase in the need by young women to use long-acting reversible contraceptive methods. Unlike the pill which requires to be taken daily and is prone to users forgetting to take it, injections and Norplant/Implants are convenient, effective, and less prone to user error.

This research also raises concerns in the use of male condoms. The results indicate low rate of using male condoms which keeps changing over time. This shows that there is need for family planning programmes to also target men because male condoms are a male-controlled contraceptive method. Van Rossem and Meekers (2007) found that men exposed to family planning and HIV/AIDS information through mass

media are more likely to use the condom. Condoms should also be made available in places where young women frequently use such as school toilets and bathrooms, private and public hospitals, clinics, pharmacies, and other places.

The last two objectives of the study were achieved using multivariate logistic regression. Based on the results, it can be concluded that young women who are older, residing in urban arease, better educated, employed, married cohabitating, with one or more living children, and those with a desire to have more children after 2 years are more likely to use modern contraceptives compared to other groups. Whereas, widowed, divorced, or separated, and those with a desire to have more children within 2 years are less likely to use modern contraceptives.

Moreover, young women who are married , cohabitating , and with one or more living children are more likely to use the contraceptive pill compared to other groups, whilst those with a desire to have more children within 2 years are less likely to use. Women with better education andwith one or more living children are more likely to use Norplant/Implants compared to other groups, whilst those with a desire for more children within 2 years are less likely to use. Women who are married, better educated, and with one or more living children are more likely to use injections than other groups, whilst those with as desire for more children within 2 years are less likely to use. Employed women are more likely to use male condoms than those unemployed. Whereas married women are less likely to use male condoms compared those who never married.

The findings suggest that there is need to promote the use of modern contraceptives among young women in the younger ages, who are never married, and without children through family planning educational programmes. Increasing family planning education among this group of women may also help to address any misconceptions about modern contraceptives they might have. These educational programmes must be extended into the society to address any cultural beliefs which may inhibit them from using contraceptives. Additionally, barriers this group of young women may face in accessing modern contraceptive services and information should be addressed.

Considering that a large proportion of the Zimbabwean population lives in rural areas (Zimbabwe National Statistics Agency 2012), our findings suggest that modern contraceptive use should be promoted among young women living in rural areas. Contraceptive use should also be promoted among their urban counterparts as we have

observed a decline in modern contraceptive use in the 2010-11 survey among urban dwellers.

Despite an increase in young women with secondary or higher education over time, education should continue to be promoted, in-order to enhance women's autonomy. Additionally, there is need to increase employment opportunities for young women. Education and employment are positively associated with women empowerment. Women empowerment is associated with lower fertility rates, extended birth intervals, and lower rates of unwanted pregnancies (Upadhyay, Gipson, Withers *et al.* 2014). It also influences the use of family planning and Maternal Health Care Services (Yaya, Uthman, Ekholuenetale *et al.* 2018). The promotion of women empowerment can also be used in promoting small families among young women with desires to have more children.

5.2 Study limitations

In this study we had to exclude the 2015 survey from logistic regression model presented in section 4.3.1 because the results were counterintuitive with respect to young women's education and region of residence. Additionally, the 2010-11 model results were counterintuitive with respect to young women's region of residence. However, we included the 2010-11 survey in the logistic regression model because the region variable was not relevant in the model in section 4.3.1. All these issues with the 2010-11 and 2015 surveys have overall impact on the quality and reliability of the research findings.

Another limitation is that the surveys are based on participants recalling past events and the research may be affected by recall bias. This could also have contributed to the issues found in the 2010-11 and 2015 surveys. In this research we used secondary data and some important variables were not available in some surveys. We had to exclude the 1988 survey in analysing the trends in contraceptive unmet need because one of the important variables (m10) used to measure unwanted pregnancy was not included in the data.

DHS uses a cross-sectional design; hence we cannot examine temporal or causal associations between modern contraceptive use and its determinants. Considering that Zimbabwe is a patriarchy society, young women's use of contraceptives may be influenced by their partners' background characteristics. However, this study may be limited by the determinants of contraceptive use being based solely on women's individual level factors which excluded information on their partners such as partners'

desire for more children. The study did not also look at the effects of household and community level factors that may affect women's contraceptive use.

In Zimbabwe, there is a growing population of religious groups that prohibit members from using western medicine and health care facilities. The Apostolic faith sector is one group that has adopted this belief, and this has a negative impact on the sexual reproductive, maternal and child health of its members (Ha, Salama, Gwavuya et al. 2014). However, due to the religion variable not being classified by religious sector in the 1988, 1994, and 1999 surveys, it was excluded from the study for consistent results.

5.3 Further research and policy implications

Although unmet need for modern contraceptives has declined over time, it remains a challenge. Further research may examine the factors influencing unmet need for modern contraceptives considering differentials by residence. Understanding these factors could help reduce unwanted pregnancy. Modern contraceptive use among urban young women declined in 2010-11 and 2015 to lower levels than rural women. Further research may analyse the role of migration on this trend. Further research could also consider using longitudinal data to analyse determinants of contraceptive use over time.

The use of contraceptives may also be influenced by the husband or partners' background characteristics. Further research may include factors such as partners' education, employment status, and others. Factors beyond the individual level may also influence contraceptive use among young women. Further studies may analyse the effect of community level factors such as community access and quality of health facilities, community cultural beliefs, community economic and political factors.

The findings in this study must be considered and reflected in public health policies to address the problems that could be barriers to the use of contraceptives among young women. Family planning coverage among young women should be intensified by the government, policy makers, and decision makers. This is highly recommended in-order to reduce early age childbearing in Zimbabwe.

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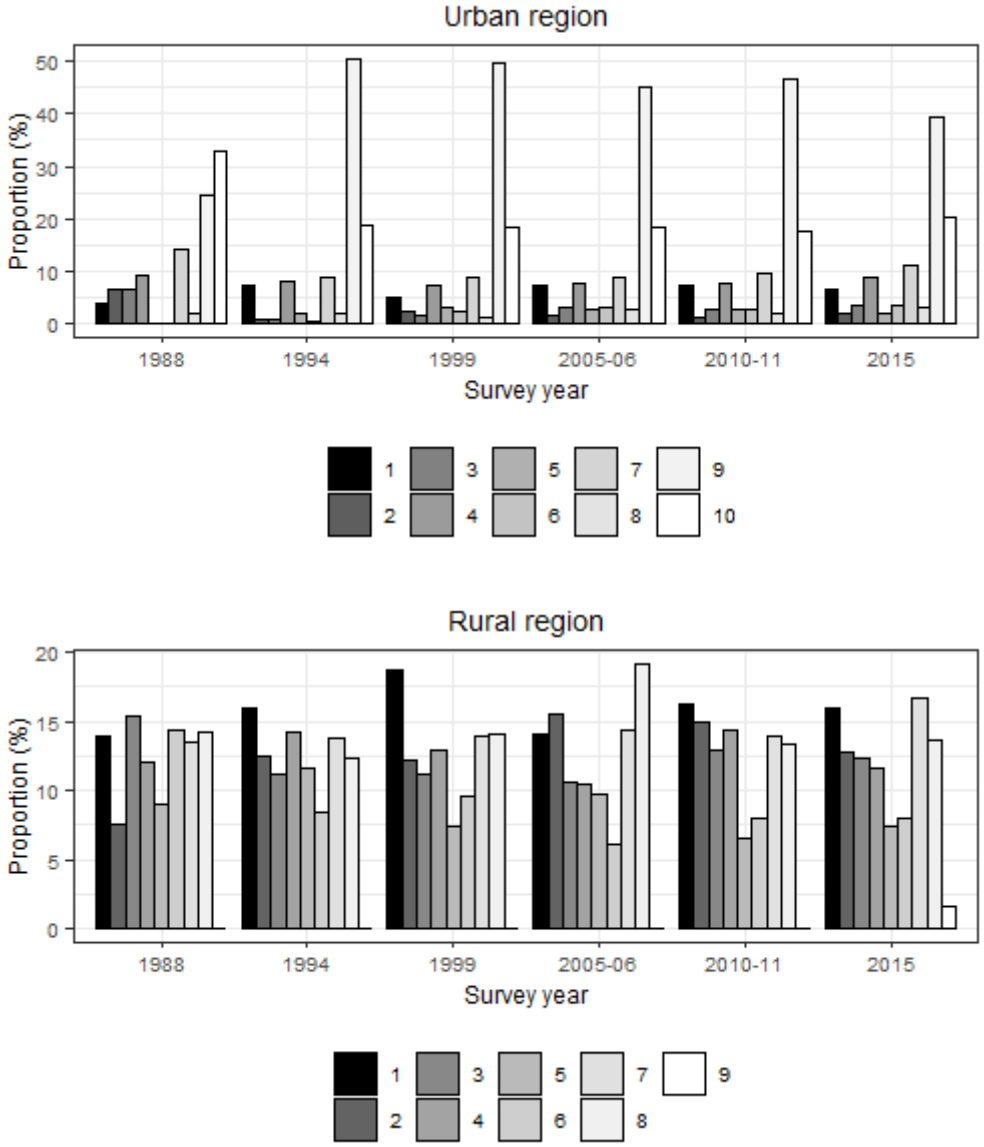
Appendix A1: Background characteristics of sexually active young women

Figure A1: Characteristics of sexually active young women aged 15-24 by region of residence, Zimbabwean DHSs



Region 1,2,3,4,5,6,7,8,9, and 10 refers to Manicaland, Mashonaland Central, Mashonaland East, Mashonaland West, Matabeleland North, Matabeleland South, Midlands, Masvingo, Harare, and Bulawayo provinces, respectively.

Appendix A2: Trends in contraceptive use, unmet need, and method choice among young women

Table A1: Trends in contraceptive use and unmet need among sexually active young women, Zimbabwean DHSs

	Survey year					
Variable	**1988**	**1994**	**1999**	**2005-06**	**2010-11**	**2015**
Contraceptive use among young women						
Current contraceptive use						
n	874	1 231	1 324	1 981	1 882	1 872
Modern (%)	39.7	46.3	49.9	52.8	53.7	58.2
Contraceptive use among rural women						
n	586	843	792	1 250	1 213	1 264
Modern (%)	35.7	41.7	43.9	51.0	55.1	59.3
Contraceptive use among urban women						
n	288	388	532	730	668	608
Modern (%)	47.9	56.2	58.8	55.9	51.1	56.1
Contraceptive need among young women						
Modern contraceptive need						
n		1 090	1 135	1 702	1 643	1 625
Unmet need (%)		54.1	48.7	47.1	45.9	41.6
Modern contraceptive needs among rural women						
n		767	682	1 153	1 110	1 132
Unmet need (%)		59.0	53.7	49.7	45.6	40.3
Modern contraceptive needs among urban women						
n		337	471	589	555	521
Unmet need (%)		42.9	41.6	42.0	46.5	44.3

Table A2: Trends in contraceptive method choice among sexually active young women, Zimbabwean DHSs

	Survey year					
Variable	**1988**	**1994**	**1999**	**2005-06**	**2010-11**	**2015**
Current contraceptive method choice						
n	831	1 195	1 284	1 952	1 853	1 849
Not using (%)	58.6	52.4	49.7	46.9	46.1	41.7
Pill (%)	39.7	40.9	40.0	41.2	41.1	33.9
Injections (%)	0.1	1.7	5.0	7.9	7.4	9.7
Male condom (%)	1.6	4.7	4.8	3.3	3.8	4.4
Norplant/Implant (%)	0.0	0.3	0.4	0.7	1.7	10.4
Current contraceptive method choice among women residing in rural areas						
n	558	811	760	1229	1 197	1 253
Pill (%)	36.2	36.8	35.5	42.7	44.0	36.4
Injections (%)	0.2	1.5	5.8	6.8	7.6	11.2
Male condom (%)	1.1	4.8	3.1	1.5	2.4	2.6
Norplant/Implant (%)	0.0	0.1	0.1	0.2	1.6	9.1
Current contraceptive method choice among women residing in urban areas						
n	273	384	523	723	656	596
Pill (%)	46.9	49.6	46.5	38.7	35.8	28.5
Injections (%)	0.0	2.2	3.8	9.6	6.9	6.5
Male condom (%)	2.6	4.5	7.4	6.3	6.3	8.1
Norplant/Implant (%)	0.0	0.6	0.9	1.5	1.9	13.1

Table A3: Trends in contraceptive use by background characteristics among sexually active young women, Zimbabwean DHSs

Variable	Survey year 1988	1994	1999	2005-06	2010-11	2015
Current contraceptive use by age group						
Age group 15-17						
n	103	119	150	173	181	231
Modern (%)	15.5	21.6	26.7	23.0	29.1	32.7
Age group 18-20						
n	280	399	422	589	591	617
Modern (%)	34.6	42.6	45.6	49.0	45.7	52.5
Age group 21-22						
n	243	380	392	622	551	480
Modern (%)	49.4	50.1	53.7	57.7	62.2	66.2
Age group 23-24						
n	248	333	360	596	559	543
Modern (%)	46.0	55.3	60.5	60.1	61.6	68.6
Current contraceptive use by region						
Harare						
n	70	197	265	330	311	260
Modern (%)	54.3	60.5	63.0	63.0	48.9	51.3
Manicaland						
n	93	162	175	230	245	242
Modern (%)	25.8	41.6	33.3	49.8	52.3	49.5
Mashonaland Central						
n	63	108	110	204	190	173
Modern (%)	50.8	50.5	57.1	51.9	62.5	64.0
Mashonaland East						
n	109	97	97	154	175	177
Modern (%)	37.6	50.0	53.1	59.1	65.7	62.2
Mashonaland West						
n	98	152	140	187	224	199
Modern (%)	51.0	50.7	61.5	62.6	58.4	67.2
Matabeleland North						
n	53	106	75	141	98	106
Modern (%)	26.4	30.5	31.5	33.6	52.6	58.9
Matabeleland South						
n	84	73	88	99	114	122
Modern (%)	25.0	27.9	30.2	28.3	44.9	52.7
Midlands						
n	120	151	157	244	232	279
Modern (%)	45.8	47.6	48.2	57.5	50.2	62.5
Masvingo						
n	89	112	118	259	175	190
Modern (%)	40.4	39.0	54.9	49.0	55.3	57.0
Bulawayo						
n	95	73	98	134	118	123
Modern (%)	37.9	48.2	44.6	50.3	41.8	59.0
Current contraceptive use by education						
None/Primary						
n	489	566	523	625	521	560
Modern (%)	35.0	40.5	43.8	48.7	51.6	59.1
Secondary/Higher						
n	385	666	801	1 355	1 361	1 312
Modern (%)	45.7	51.3	53.9	54.7	54.5	57.9

Variable	Survey year 1988	1994	1999	2005-06	2010-11	2015
Current contraceptive use by marital status						
Never married						
n	222	251	278	389	319	419
Modern (%)	20.3	25.2	25.9	24.4	24.8	31.4
Married						
n	548	850	836	1 301	1 285	1 133
Modern (%)	48.0	54.1	60.6	65.9	65.2	69.6
Cohabitating						
n			93	42	61	102
Modern (%)			47.6	63.6	58.9	71.3
Widowed/Divorced/Separ						
n	104	131	117	250	217	218
Modern (%)	37.5	36.0	32.4	26.7	26.1	44.8
Current contraceptive use by parity						
None						
n	208	312	356	472	414	452
Modern (%)	6.7	15.2	16.7	14.2	13.1	16.0
≥ 1						
n	666	919	968	1 509	1 467	1 420
Modern (%)	50.0	56.9	62.1	64.9	65.1	71.7
Current contraceptive use by knowledge of contraceptive						
Knowledge of modern methods						
n	861	1 220	1 303	1 959	1 857	1 862
Modern (%)	40.3	46.8	50.7	53.4	54.4	58.6
Current contraceptive use by employment status						
Unemployed						
n	637	690	738	1 346	1 343	1 285
Modern (%)	38.5	40.6	50.3	51.3	51.6	56.1
Employed						
n	237	540	586	632	539	587
Modern (%)	43.0	53.5	49.3	56.0	58.7	62.9
Current contraceptive use by desire for more children						
No more						
n	37	165	198	400	245	222
Modern (%)	48.6	56.8	54.9	55.6	55.1	63.9
Within 2 years						
n	153	322	342	409	424	411
Modern (%)	16.3	19.1	20.8	26.9	25.6	30.8
After 2 years						
n	334	674	679	955	1 016	1 124
Modern (%)	61.4	58.6	64.4	66.5	68.1	69.3
Undecided/Unsure						
n	22	70	105	215	197	115
Modern (%)	59.1	29.1	41.4	35.6	38.2	37.6

Appendix A2: Binary logistic regression results

Table A4: Binary logistic regression results for married young women in the 1988 survey

	Odds ratio	Estimate	Std. Error	t value	Pr(>|t|)	[95% conf. interval]	
Constant	0.045	-3.102	1.104	-2.811	0.006	-5.265	-0.939
Age group							
15-17	1.104	0.099	0.414	0.238	0.812	-0.712	0.909
18-19	1.167	0.155	0.292	0.530	0.597	-0.417	0.727
20-21	0.764	-0.270	0.218	-1.239	0.217	-0.696	0.157
Residence							
Rural	0.521	-0.651	0.251	-2.589	0.011	-1.144	-0.158
Education level							
Secondary/Higher	2.186	0.782	0.201	3.896	0.000	0.389	1.175
Employment status							
Employed	1.237	0.213	0.261	0.814	0.417	-0.299	0.724
Parity							
≥1	22.593	3.118	1.031	3.025	0.003	1.098	5.137
Desire for more children							
Within 2 years	0.363	-1.014	0.411	-2.466	0.015	-1.821	-0.208
After 2 years	1.853	0.617	0.405	1.521	0.130	-0.178	1.411
Undecided/Unsure	3.298	1.193	0.693	1.722	0.087	-0.165	2.552

Table A5: Binary logistic regression results for the 1994 survey

	Estimate	Std. Error	t value	Pr(>|t|)	[95% conf. interval]	
Constant	-1.365	0.376	-3.629	0.000	-2.102	-0.628
Age group						
15-17	-0.473	0.309	-1.531	0.127	-1.079	0.133
18-19	-0.217	0.176	-1.233	0.219	-0.561	0.128
20-21	-0.012	0.162	-0.077	0.939	-0.331	0.306
Residence						
Rural	-0.791	0.151	-5.254	0.000	-1.086	-0.496
Education level						
Secondary/Higher	0.294	0.154	1.908	0.058	-0.008	0.597
Employment status						
Employed	0.632	0.136	4.660	0.000	0.366	0.898
Marital status						
Married	1.085	0.216	5.022	0.000	0.661	1.508
Widowed/ Divorced/ Separated	0.258	0.291	0.884	0.378	-0.313	0.828
Parity						
≥1	1.157	0.251	4.602	0.000	0.664	1.650
Desire for more children						
Within 2 years	-1.390	0.287	-4.848	0.000	-1.952	-0.828
After 2 years	0.093	0.208	0.448	0.655	-0.314	0.500
Undecided/Unsure	-0.610	0.375	-1.624	0.106	-1.346	0.126

Table A6: Binary logistic regression results for the 1999 survey

	Estimate	Std. Error	t value	Pr(>|t|)	[95% conf. interval]	
Constant	-1.255	0.363	-3.453	0.001	-1.967	-0.543
Age group						
15-17	-0.615	0.269	-2.286	0.023	-1.142	-0.088
18-19	-0.232	0.193	-1.202	0.231	-0.609	0.146
20-21	-0.225	0.176	-1.281	0.202	-0.569	0.119
Residence						
Rural	-0.889	0.157	-5.646	0.000	-1.197	-0.580
Education level						
Secondary/Higher	0.313	0.135	2.316	0.022	0.048	0.578
Employment status						
Employed	0.083	0.148	0.558	0.577	-0.207	0.373
Marital status						
Married	1.437	0.199	7.209	0.000	1.046	1.828
Cohabitating	0.891	0.288	3.096	0.002	0.327	1.456
Widowed/ Divorced/ Separated	-0.155	0.294	-0.526	0.599	-0.732	0.422
Parity						
≥1	1.279	0.232	5.520	0.000	0.825	1.733
Desire for more children						
Within 2 years	-1.359	0.293	-4.634	0.000	-1.934	-0.784
After 2 years	0.320	0.213	1.501	0.135	-0.098	0.738
Undecided/Unsure	-0.533	0.342	-1.557	0.121	-1.204	0.138

Table A7: Binary logistic regression results for the 2005-06 survey

	Estimate	Std. Error	t value	Pr(>|t|)	[95% conf. interval]	
Constant	-1.994	0.312	-6.401	0.000	-2.604	-1.383
Age group						
15-17	-0.620	0.247	-2.511	0.012	-1.104	-0.136
18-19	-0.180	0.162	-1.111	0.267	-0.498	0.138
20-21	-0.127	0.162	-0.782	0.435	-0.444	0.191
Residence						
Rural	-0.637	0.158	-4.023	0.000	-0.947	-0.327
Education level						
Secondary/Higher	0.231	0.119	1.949	0.052	-0.001	0.464
Employment status						
Employed	0.361	0.124	2.904	0.004	0.117	0.604
Marital status						
Married	1.348	0.219	6.143	0.000	0.918	1.778
Cohabitating	1.260	0.421	2.991	0.003	0.434	2.086
Widowed/ Divorced/ Separated	-0.496	0.295	-1.682	0.093	-1.073	0.082
Parity						
≥1	1.772	0.214	8.295	0.000	1.353	2.191
Desire for more children						
Within 2 years	-0.773	0.211	-3.667	0.000	-1.187	-0.360
After 2 years	0.589	0.136	4.328	0.000	0.322	0.856
Undecided/Unsure	-0.159	0.281	-0.565	0.573	-0.709	0.392

Table A8: Binary logistic regression results for the 2010-11 survey

	Estimate	Std. Error	t value	Pr(>|t|)	[95% conf. interval]	
Constant	-1.690	0.316	-5.352	0.000	-2.308	-1.071
Age group						
15-17	-0.706	0.284	-2.490	0.013	-1.262	-0.150
18-19	-0.808	0.224	-3.614	0.000	-1.246	-0.370
20-21	-0.264	0.162	-1.625	0.105	-0.582	0.054
Residence						
Rural	-0.108	0.150	-0.722	0.471	-0.401	0.185
Education level						
Secondary/Higher	0.197	0.124	1.584	0.114	-0.047	0.440
Employment status						
Employed	0.408	0.158	2.580	0.010	0.098	0.717
Marital status						
Married	1.164	0.176	6.620	0.000	0.819	1.509
Cohabitating	0.987	0.349	2.825	0.005	0.302	1.672
Widowed/ Divorced/ Separated	-0.748	0.263	-2.843	0.005	-1.263	-0.232
Parity						
≥1	1.539	0.227	6.768	0.000	1.093	1.985
Desire for more children						
Within 2 years	-1.120	0.225	-4.973	0.000	-1.561	-0.679
After 2 years	0.435	0.198	2.195	0.029	0.047	0.823
Undecided/Unsure	-0.278	0.221	-1.259	0.209	-0.712	0.155

Table A9: Binary logistic regression results for the 2015 survey

	Odds ratio	Estimate	Std. Error	t value	Pr(>|t|)	[95% conf. interval]	
Constant	0.266	-1.325	0.327	-4.058	0.000	-1.965	-0.685
Age group							
15-17	0.518	-0.657	0.205	-3.199	0.002	-1.060	-0.255
18-19	0.729	-0.317	0.162	-1.954	0.052	-0.634	0.001
20-21	0.784	-0.243	0.165	-1.472	0.142	-0.567	0.081
Residence							
Rural	0.797	-0.227	0.148	-1.537	0.125	-0.517	0.063
Education level							
Secondary/Higher	0.934	-0.069	0.140	-0.493	0.622	-0.342	0.205
Employment status							
Employed	1.452	0.373	0.151	2.468	0.014	0.077	0.669
Marital status							
Married	2.989	1.095	0.188	5.834	0.000	0.727	1.463
Cohabitating	4.105	1.412	0.295	4.792	0.000	0.835	1.990
Widowed/ Divorced/ Separated	0.737	-0.305	0.220	-1.388	0.166	-0.736	0.126
Parity							
≥1	6.060	1.802	0.187	9.659	0.000	1.436	2.167
Desire for more children							
Within 2 years	0.303	-1.194	0.264	-4.526	0.000	-1.711	-0.677
After 2 years	1.395	0.333	0.205	1.624	0.105	-0.069	0.734
Undecided/Unsure	0.661	-0.414	0.293	-1.412	0.159	-0.989	0.161

Appendix A3: Multinomial regression results

Table A10: Multinomial regression results for women using the pill, Zimbabwean 2010-11 DHS

	Coef.	Std. Error	t value	Pr(>|t|)	[95% conf. interval]	
Constant	-5.280	0.544	-9.710	0.000	-6.349	-4.211
Residence						
Rural	-0.036	0.190	-0.190	0.851	-0.409	0.338
Education level						
Secondary/Higher	0.234	0.153	1.530	0.127	-0.067	0.534
Employment status						
Employed	0.334	0.177	1.880	0.061	-0.015	0.683
Marital status						
Married	2.648	0.285	9.280	0.000	2.087	3.209
Cohabitating	2.218	0.423	5.240	0.000	1.386	3.051
Widowed/Divorced/Separated	-0.006	0.359	-0.020	0.986	-0.712	0.700
Parity						
≥1	3.218	0.460	6.990	0.000	2.313	4.122
Desire for more children						
Within 2 years	-0.959	0.284	-3.370	0.001	-1.518	-0.400
After 2 years	0.472	0.253	1.870	0.063	-0.025	0.969
Undecided/Unsure	-0.288	0.282	-1.020	0.307	-0.842	0.266

Table A11: Multinomial logistic regression results for women using injections, Zimbabwean 2010-11 DHS

	Coef.	Std. Error	t value	Pr(>|t|)	[95% conf. interval]	
Constant	-4.820	0.655	-7.360	0.000	-6.107	-3.533
Residence						
Rural	-0.022	0.280	-0.080	0.938	-0.572	0.528
Education level						
Secondary/Higher	0.464	0.234	1.980	0.048	0.003	0.924
Employment status						
Employed	0.329	0.232	1.420	0.156	-0.126	0.785
Marital status						
Married	0.817	0.293	2.790	0.006	0.241	1.394
Cohabitating	-0.007	0.682	-0.010	0.992	-1.348	1.334
Widowed/Divorced/Separated	-0.469	0.439	-1.070	0.287	-1.333	0.395
Parity						
≥1	2.913	0.551	5.290	0.000	1.829	3.997
Desire for more children						
Within 2 years	-0.979	0.411	-2.390	0.018	-1.787	-0.172
After 2 years	-0.086	0.284	-0.300	0.763	-0.643	0.472
Undecided/Unsure	-0.747	0.455	-1.640	0.102	-1.642	0.148

Table A12: Multinomial regression results for women using the male condom, Zimbabwean 2010-11 DHS

	Coef.	Std. Error	t value	Pr(>|t|)	[95% conf. interval]	
Constant	-2.163	0.551	-3.930	0.000	-3.245	-1.080
Residence						
Rural	-0.489	0.259	-1.890	0.059	-0.998	0.019
Education level						
Secondary/Higher	0.087	0.319	0.270	0.786	-0.541	0.714
Employment status						
Employed	0.931	0.284	3.270	0.001	0.372	1.489
Marital status						
Married	-0.951	0.360	-2.640	0.009	-1.659	-0.243
Cohabitating	0.196	0.757	0.260	0.796	-1.292	1.684
Widowed/Divorced/Separated	-0.547	0.596	-0.920	0.359	-1.719	0.624
Parity						
≥1	-0.591	0.312	-1.890	0.059	-1.204	0.022
Desire for more children						
Within 2 years	-0.284	0.557	-0.510	0.611	-1.379	0.811
After 2 years	0.665	0.461	1.440	0.151	-0.243	1.572
Undecided/Unsure	0.190	0.548	0.350	0.729	-0.888	1.267

Table A13: Multinomial regression results for women using Norplant/Implants, Zimbabwean 2010-11 DHS

	Coef.	Std. Error	t value	Pr(>|t|)	[95% conf.	interval]
Constant	-6.086	1.132	-5.380	0.000	-8.312	-3.860
Residence						
Rural	-0.089	0.372	-0.240	0.810	-0.822	0.643
Education level						
Secondary/Higher	1.011	0.448	2.260	0.025	0.131	1.891
Employment status						
Employed	0.618	0.384	1.610	0.108	-0.137	1.373
Marital status						
Married	-0.353	0.380	-0.930	0.354	-1.099	0.394
Cohabitating	0.853	0.755	1.130	0.260	-0.632	2.338
Widowed/Divorced/Separated	-0.555	0.539	-1.030	0.304	-1.615	0.506
Parity						
≥1	3.121	1.056	2.960	0.003	1.045	5.197
Desire for more children						
Within 2 years	-2.251	0.959	-2.350	0.019	-4.136	-0.366
After 2 years	-0.352	0.429	-0.820	0.412	-1.196	0.491
Undecided/Unsure	-0.631	0.537	-1.180	0.241	-1.688	0.425

Appendix A4: R code

All R codes for this study can be found on https://github.com/Audrey945/Thesis.git.