Analysis of the impact of sexual and reproductive health interventions, and determination of factors influencing the uptake of long-acting reversible contraceptives among young people in Zimbabwe

By

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ABSTRACT

Analysis of the impact of sexual and reproductive health interventions, and determination of factors influencing the uptake of long-acting reversible contraceptives among young people in Zimbabwe.

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According to the United Nations, sexual and reproductive health (SRH) problems account for about 20% of the worldwide disease burden. Despite increased attention to family planning in Africa, unmet need is still high among adolescents and young people, who comprise more than 20% of the population. Over the years, many sub-Saharan African countries, including Zimbabwe, have implemented family planning programs. However, there is a paucity of information on the impact of these interventions on SRH outcomes. Targeting young people, this study was aimed at identifying the SRH interventions implemented in sub-Saharan Arica, and then Zimbabwe in particular, and their impact on SRH outcomes.

Firstly, through a scoping review: community-based programs, mHealth, SRH education, counselling, community health workers, youth friendly health services, economic support and mass media interventions were found to have positive effects on SRH outcomes. Secondly, using regression and difference-in-differences analysis, when implementing the Zimbabwean Adolescent Sexual and Reproductive Health (ASRH) strategy, increased program intensity was found to have no impact on SRH outcomes. Thirdly, the study explored the socio-economic factors associated with long-acting reversible contraceptives (LARCs) uptake among young women. Multinomial logistic regression modelling showed that women with tertiary education, living with children, highest wealth class status, and/or no desire to have more children, had increased likelihood of LARCs usage.

Generally, SRH interventions have a positive impact on SRH outcomes in Sub-Saharan Africa. However, in Zimbabwe, increased ASRH program intensity had no impact on SRH outcomes, implying that more resources alone do not necessarily result in improved outcomes. Additionally, the study established that LARCs usage is rising among young women, with a potential to increase their uptake by addressing the socioeconomic and demographic predictors of their use. The findings could guide the designing of future SRH strategies aimed at improving SRH services access and utilization by young women.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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PREFACE

The contents of this work have not been submitted in any form to another university and, except where the work of others is acknowledged in the text, the results reported are due to investigations by the candidate.

The research described in this dissertation was carried out in Harare, Zimbabwe using Zimbabwe Demographics and Health Surveys 2015 data sets. The research was conducted under the supervision of Professor Bruce Hollingsworth (Health Economics and Policy Division of Health Research Graduate College Lancaster University, UK) and Dr Saurabh Singhal (Economics Department Lancaster University, UK). Formal approval to access the Zimbabwe Demographics and Health Surveys datasets was given by the Demographic and Health Surveys.

Professor B. Hollingsworth	**Dr S. Singhal**
(Supervisor)	**(Supervisor)**

Isaac Chipako
Student

DECLARATION: PLAGIARISM

I, Isaac Chipako, declare that:

i. The research in this dissertation, except where otherwise indicated or acknowledged, is my original work.
ii. The thesis has not been submitted in full or in part for any degree or examination to any other university;
iii. This thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons;
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    a) Their words have been re-written, but the general information attributed to them has been referenced;
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CHAPTER 1: BACKGROUND AND LITERATURE REVIEW

1.1 INTRODUCTION

The field of sexual and reproductive healthcare offers a diverse range of services to enable individuals to make informed decisions about when and whether to become parents, have safe pregnancies, deliver healthy babies, and enjoy satisfying and safe sexual life. The main reason these services are worthwhile investments is that they improve people's quality of life and enable them to exercise their sexual and reproductive rights, benefitting both the society of today and the generations to come (Sully et al., 2020). As per findings by the United Nations (UNCTAD, 2021), sexual and reproductive health (SRH) problems make up 18% of the disease burden, globally. This burden mainly involves uterine and ovarian cancers, benign cysts of the breasts or ovaries, pelvic inflammatory disease, dysmenorrhea, iron deficiency anaemia, and postpartum haemorrhage (PPH) (Amarin & Abduljabbar, 2020).

An estimated 295,000 women, mostly in low- to middle-income countries (LMICs), die each year because of difficulties during pregnancy and childbirth (May, 2017). Approximately a third of maternal fatalities could be averted on a yearly basis if women with no desire to conceive were granted the opportunity to attain and implement efficient methods of birth control (WHO, 2023). For adolescent girls and young women, getting pregnant and becoming young mothers carries with it numerous physical risks. Apart from these physical risks, these early pregnancies also diminish educational opportunities for these young women consequently reducing their economic potential (Larsson & Stanfors, 2014; Ramdén & Swartling, 2021). Furthermore, adolescent girls are more susceptible to the risk of being exposed to sexually transmitted infections (STIs), HIV/AIDS, sexual coercion, exploitation and violence (Melesse et al., 2020). Evidence shows that adolescent girls in developing countries are at a greater risk of contracting STIs, unwanted pregnancy, early marriage, and early child-bearing (WHO, 2016). All these factors significantly negatively impact the affected individuals' mental and physical wellbeing, resulting in long-term consequences for them, their families, and communities at large. Therefore, healthcare policy makers worldwide, particularly in LMICs, should strive to include sexual and reproductive healthcare issues on their priority lists.

Unfulfilled demand for SRH services, particularly family planning, continues to be a pertinent issue across many countries, although globally, there has been an increase in family planning initiatives over the last 20 years. Over the years, several countries in sub-Saharan Africa, one of the LMICs regions with high unmet demand for family planning, have implemented SRH interventions targeting young people (Sully et al., 2020). In Zimbabwe, the first Adolescents Sexual and Reproductive Health (ASRH) strategy was implemented between 2010 and 2015 to reduce unmet need and improve SRH outcomes among adolescents and young people aged 10 to 24 years (MoHCC, 2009).

However, following the implementation of the ASRH strategy, there is limited information on whether the strategy was effective in that regard. The current study was, therefore, aimed at evaluating the impact of the Zimbabwean 2010 to 2015 ASRH strategy on abortion, modern contraceptive methods usage, unmet need for family planning, attitude towards fertility (desire for more children) and knowledge of modern contraceptive methods among sexually active adolescents and young people in Zimbabwe. Furthermore, the more effective long-acting reversible contraceptives (LARCs) are not being utilized in Zimbabwe as much as the more user dependent and less effective short-acting reversible contraceptives (SARCs). There is even less use among adolescent girls and young women despite substantial evidence that LARCs help them to avoid or delay pregnancies and reduce the incidences of abortions and maternal mortality. Hence, additionally, the study sought to determine the factors that are associated with the utilization of LARCs among sexually active adolescents and young people in Zimbabwe.

Firstly, a systematic review was conducted to determine the SRH interventions targeting young people implemented in sub-Saharan Africa and their impact on SRH outcomes. This was followed by regression and difference in differences analyses to determine the impact of the Zimbabwean ASRH program, and then an exploration of the possible factors associated with the utilization of LARCs among adolescents and young people in Zimbabwe.

1.2 BACKGROUND INFORMATION

According to the World Health Organisation (WHO), women with unmet need for family planning are classified as those who want to either stop or postpone conception but are not actually using any method of contraception (WHO, 2006). Unmet need is most prevalent in LMICs as illustrated in Figures 1.1 (Married) and 1.2 (Unmarried) using the 15-24 age group for comparison. The high number of unwanted pregnancies in LMICs, which come

because of unmet demand for family planning, further instigates rapid population growth in these regions (Morris & Rushwan, 2015). Estimates from 2019 show that there is inadequate availability of SRH services in LMICs, where around 218 million women of reproductive ages (15–49) were reported to have unfulfilled demand for modern contraception, that is, they are not able to use modern methods of contraception, even though they desire to avoid pregnancy. Almost half (49%) of all pregnancies in LMICs, which equates to about 111 million annually, are unplanned, of which 77% of them are due to an unmet need for family planning. Additionally, 127 million women become mothers each year, and tens of millions of them do not have access to sufficient antenatal care and healthcare services for their newborn babies (Sully et al., 2020).

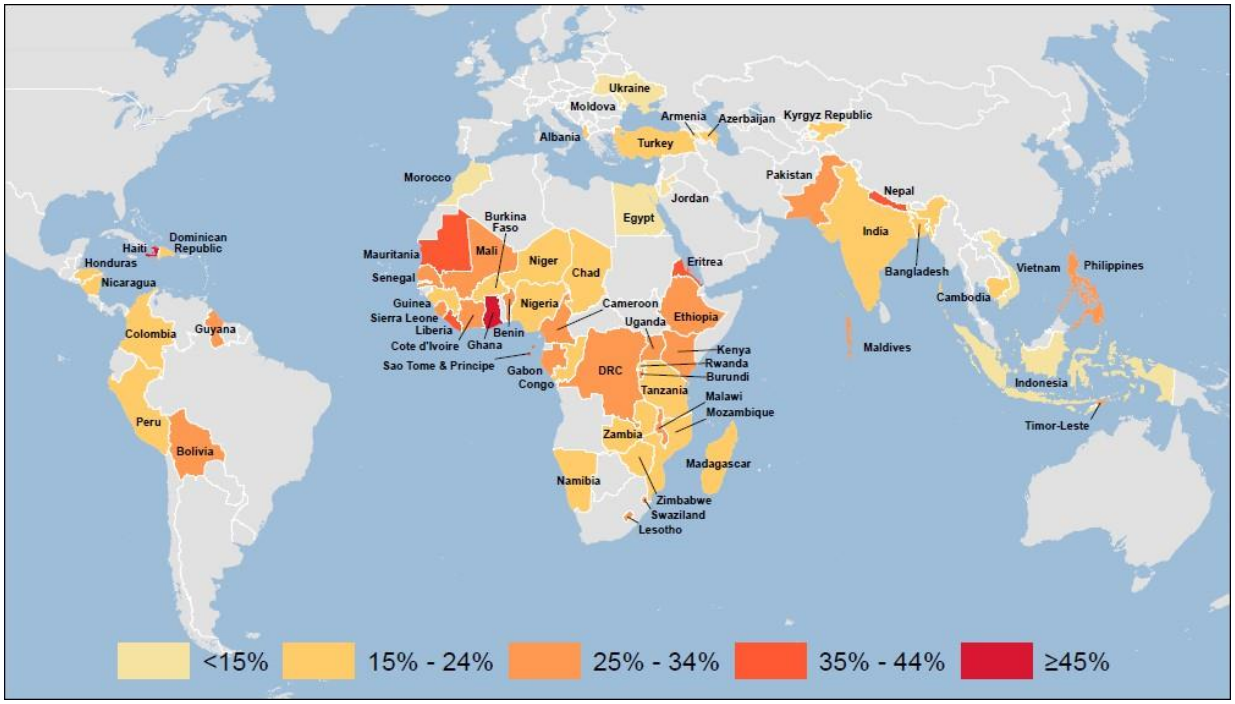

Figure 1.1: Unmet need for family planning among married adolescent girls and young women aged 15-24 years.

(Source: DHS Comparative Reports No. 34 USAID, 2014)

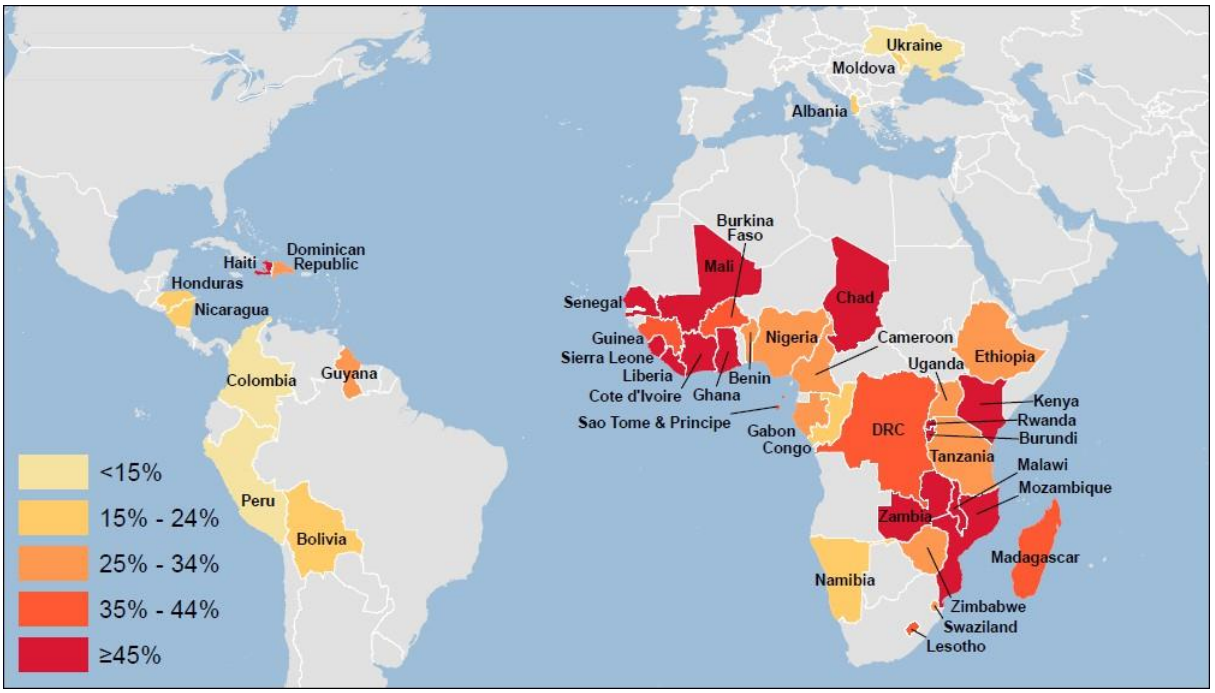

Figure 1.2: Unmet need for family planning among unmarried sexually active adolescent girls and young women aged 15-24 years.

(Source:** DHS Comparative Reports No. 34 **USAID, 2014)

Globally, adolescents constitute a larger portion of the demographic that has unmet demand for SRH services, particularly in LMICs. For instance, as illustrated in Figure 1.3 below, young women between the ages of 15 and 19 who do not want to get pregnant have a much higher unmet demand for modern contraception, as compared to all reproductive age groups of women who want to avoid getting pregnant (43% vs. 24%). In LMICs, there are about 21 million adolescent pregnancies every year and 50% of them are unintended (Sully et al., 2020). There are numerous barriers standing between adolescent women and contraceptive healthcare access and utilisation, including fear of divulging that they are sexually active (as unmarried women) and social pressure that compels them to have a child (as married women) (Stonehill et al., 2020).

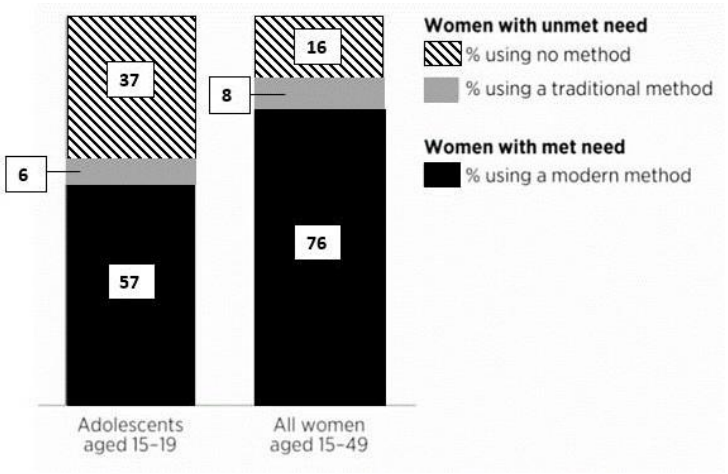

Figure 1.3: Disparity of unmet need for modern contraception among adolescents wanting to avoid a pregnancy in LMICs (Estimates are for 2019).

Source: (Sully et al., 2020).

Over the decades, several initiatives have been undertaken in various LMICs worldwide with the aim of increasing women's access to, and utilisation of modern methods of family planning. These initiatives are being taken through revisiting policies, financing, service delivery, supply and socio-cultural barriers to family planning service accessibility and utilisation (Apanga et al., 2020). In sub-Saharan Africa, several family planning programs have been implemented with the main objective of reducing unfulfilled demand for family planning and curtail teen pregnancies (Darroch et al., 2021).

Family Planning is a crucial and cost-effective accelerator of improved health outcomes. Globally, the use of contraceptives is averting approximately 2.7 million infant deaths, 215,000 maternal deaths, 187 million unintended pregnancies and 105 million abortions each year (Sully et al., 2020). Investing in SRH services results in an increase in the number of people taking up family planning, which would in turn significantly decrease unintended pregnancies as well as the need for pregnancy-related and neonatal care (Onarheim et al., 2016; Sully et al., 2020). In a report for the Guttmacher Institute, Sully and colleagues (2020), highlighted that every United States Dollar (USD) spent on family planning services would reduce the cost of pregnancy-related and neonatal care by US$3 (Sully et al., 2020). Another study also reported that the healthcare system will save up to USD1.85 for each dollar that is spent on family planning interventions (Onarheim et al., 2016). In Zimbabwe, a statistical modelling initiative undertaken by the Ministry of Health and Childcare (MOHCC) and the Zimbabwe National Family Planning Council in

2014, confirmed the benefits of family planning to the local population. The study reported that for every additional one USD invested in family planning, there was an additional USD2 to USD 4 savings in healthcare costs (UNFPA, 2022).

Adolescents and young people aged 15–24 years constitute 20% of the total Zimbabwean population; and approximately 42% of women of the child-bearing age, and 34% of maternal deaths are within this age-group (Maziwisa, 2021). Table 1.1 highlights some of the SRH challenges that were faced by adolescents and young people in Zimbabwe between 2010 and 2015. During that period, high rates of adolescent girls' fertility (that is, total teen fertility or adolescent pregnancies), maternal mortality and unmet family planning needs were recorded. Moreover, despite a significant proportion of adolescent boys and girls reporting to be involved in sexual activities, only 62% of males aged 15-24 years used condoms in their last sexual encounters and a low adolescent contraception prevalence rate of 10% was reported in 2015 (ZimStat, 2015).

The situation is further worsened by a method mix heavily skewed towards the less effective short-acting reversible contraceptives (SARCs) compared to the more effective long-acting reversible contraceptives (LARCs) (Toweka et al., 2021). Two studies using data obtained from the Multiple Indicator Cluster Surveys (MICS) and the Demographics and Health Surveys (DHS) across 37 sub-Saharan African countries, including Zimbabwe, reported high utilization of SARC methods at over 72.6%, compared to 19.3% of LARC methods utilization among women of reproductive age (Apanga et al., 2020; Boadu, 2022). Most of the SRH challenges are much more prevalent among unmarried sexually active adolescents and young women in the reproductive age group (Ezeh et al., 2016). This is supported by the USAID 2014 DHS Comparative report No. 34 which shows the distribution of unmet need for family planning among adolescent girls and young women aged 15-24 years (See Figures 1.1 and 1.2 above).

Table 1.1: Sexual and reproductive health status of adolescents and young people in Zimbabwe, MOHCC Data, 2015

Sexual and reproduction issue	Prevalence 15-24		Total	Year the information was reported
	Boys	Girls		
Condom use	62% condom use at last intercourse. 79.9% in the 15-24 years age group. 71.9% 15-19 years age group.			2015
Total teen fertility		17% in the 15-19 years age group have given birth. 22% have begun childbearing. 17% were pregnant with first child.	Total fertility rate (15-19) Urban 63/1000 Rural 138/1000 20-24 Total fertility rate (20-24) urban 153/1000 rural 243/1000	2015
Contraception utilization			Low adolescent contraception prevalence rate of 10%	2015
Family planning unmet need		12.6% unmet need in 15-19 years age group. 10.1% in the 20-24 years age group	11.7% in urban settings 14.5% in rural settings	2015
Maternal mortality		24% in the 15-19 years age group		2010

Source: National Adolescent and Youth Sexual and Reproductive Health Strategy II: 2016-2020.

In Zimbabwe, married adolescent girls and young women have a lower unmet need for family planning prevalence, ranging from 15%-24%, compared to their unmarried sexually active counterparts with a prevalence ranging from 25%-34% (Phiri et al., 2023). To address the sexual and reproductive health (SRH) obstacles, Zimbabwe put into effect its inaugural nationwide ASRH strategy between 2010 and 2015 (Blum et al., 2015)

introduced above. Evaluating the impact of this strategy was the main focus of this study, followed by an investigation of the factors influencing the choice of contraceptive methods among adolescents and young women in Zimbabwe, with a particular focus on LARCs.

1.3 BACKGROUND LITERATURE

1.3.1 Global sexual and reproductive health challenges

Seventy-four million women who live in LMICs have unplanned pregnancies every year. This consequentially results in 25 million unsafe abortions and 47 000 maternal deaths annually (Sully et al., 2020). While unplanned pregnancies do not necessarily mean pregnancies that are unwanted, they can result in various health hazards for both the mother and the offspring, including undernourishment, illness, mistreatment, abandonment, and even mortality. High quality family planning, such as contraception, has multiple benefits for maternal and child health, as well as social and economic development, education, and women's empowerment (WHO, 2019; Kantorová et al., 2020).

1.3.2 Pregnancy, contraception and abortion among adolescents and young people

It has been reported that 42% of the world population is below the age of 25, with sub-Saharan Africa and South Asia being home to nearly half of the global youth population aged between 12 and 24 years (World Bank, 2017). Whilst there are differences in sexual initiation and sexual activity by regions and country, adolescents are reaching puberty earlier and engaging in sex several years before marriage, resulting in them being sexually mature for longer periods before marriage than in the previous years (Chandra-Mouli et al., 2014). About 11% of all births worldwide each year are among the 15–19-year-olds, and 95% of these are happening in LMICs. However, there is greater variation by region, for example, births among adolescents as a proportion of all births ranges from about 2% in China to 18% in Latin America and the Caribbean to greater than 50% in sub-Saharan Africa (Morris & Rushwan, 2015).

Pregnancy rates are high among young girls and women in LMICs, particularly in sub-Saharan Africa, South Central Asia, and Southeast Asia. Furthermore, it has been reported that the risk of maternal death and other complications such as anaemia, malaria, HIV and other STIs, postpartum haemorrhage, and mental disorders, such as depression are four times higher in teenagers under 16 years of age than in older women (Morris & Rushwan,

2015). The link between low socioeconomic status, substance abuse, and inadequate prenatal care is evident in pregnant teenage girls. The children of adolescent mothers often experience negative outcomes such as preterm birth, low birth weight, asphyxia, and perinatal and neonatal mortality (Lopez et al., 2015). Therefore, ignoring ASRH could bring with it a traumatic or harmful transition into adult life prone to negative ongoing effects that can last a lifetime.

1.3.3 Unfulfilled need for modern contraception

Worldwide, it is estimated that an excess of 270 million women in LMICs have unmet demand for family planning (Family Planning, 2019). Research suggests that present contraceptive usage avoids around 272 000 maternal mortalities per year, and if current family planning demand was met, another 104 000 lives would be saved, the majority of which would belong to the adolescent age group (Sully et al., 2020). Increases in usage are slightly higher among adolescents compared to older women. However, adolescents are more impacted by contraceptive failure and cessation rates. Moreover, use of the generally less effective traditional contraceptive methods is still significant among this age group (Sundaram et al., 2019). Consequently, unmet need for both unmarried and married adolescents is still very high (Chandra-Mouli et al., 2014). Furthermore, married adolescents typically have reduced contraceptive usage rates, despite them not wanting to become pregnant immediately (Blanc et al., 2009). For example, in Bangladesh use of contraception among women aged 10–49 years went up from 49% − 61% between 1996–2011, while for married adolescents aged 15–19 years it rose from 33% − 47% during the same period (United Nations, 2013). Correspondingly, in Malawi, contraceptive use among married women aged 15 to 49 years increased from 13% − 46% from 1992–2010, while among married youths aged 15–19 years it rose from 7% − 29% (United Nations, 2013).

In LMICs, 24% of women desiring to avoid pregnancy lack access to modern contraceptive methods (Figure 1.4). Furthermore, the figure clearly indicates that the gap between women's reproductive intentions and contraceptive utilization is most pronounced in LMICs, wherein nearly half of women (46%) who wish to avoid conception do not employ contemporary contraceptive techniques. Discrepancies also exist categorised by age-group, socioeconomic status and urban-rural residence (Sully et al., 2019; Victora et al., 2017).

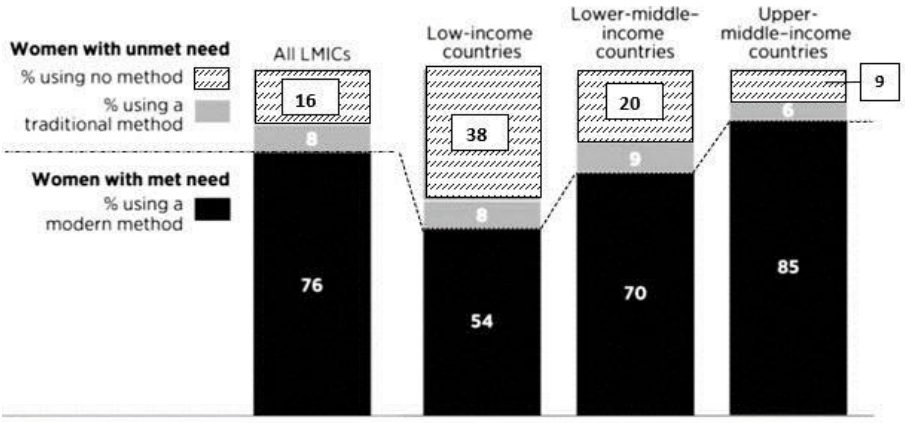

Figure 1.4: Illustration of worldwide unmet need for modern contraception among women who want to avoid a pregnancy. *Source: (Sully et al., 2020).*

1.3.4 Understanding and addressing unmet demand

The decision women make about whether to delay or stop having children can affect the contraceptive methods they choose, and the options provided to them by healthcare providers. Women who wish to postpone pregnancy often choose methods such as condoms, pills, and injectables, known as short-acting reversible contraceptives (SARCs). On the other hand, those who no longer wish to have more children may opt for long-acting reversible contraceptives (LARCs), such as implants or intrauterine devices (IUDs), or permanent sterilization. However, women who want to delay pregnancy can also use LARC methods, which are removable and highly effective in preventing unplanned pregnancies (Darroch et al., 2021). Reports on family planning are consistent on the notion that women have unfulfilled need due to a lack of access to contraceptive services, however that is only one of many reasons fuelling the lack of use of contraceptives (Cleland et al., 2014). When asked why they do not use contraceptives, many women who want to avoid pregnancy reported that they have concerns about their own health or adverse side effects of the contraception; believe they are unlikely to get pregnant, or say that their family is opposed to the use of contraception (Sedgh et al., 2016). Provider bias, especially the reluctance to supply contraceptive products to young, unmarried or childless women, contributes as another barrier to the use of contraception and, more broadly, to reproductive autonomy (Solo & Festin, 2019).

Furthermore, studies have revealed that numerous women who employ reversible modern contraceptive methods often fail to use them consistently, discontinue their use due to

dissatisfaction with the method, concerns about side effects, or encounter difficulties in obtaining supplies (Cleland et al., 2014). A study of 33 LMICs revealed that an average of 20% of users of SARCs who do not want to get pregnant cease to use the method within the first year (Li et al., 2020). Only 11% of IUD users and 8% of implant users who wish to avoid pregnancy cease use within the first year, even though these techniques are more difficult to discontinue owing to the need for them to be removed by a health professional. Women who stop using contraception account for a considerable share of the overall unmet need for modern techniques. In a 2013 survey of 34 LMICs, women who stopped using contraceptive methods and so had unmet need accounted for 38% of total unmet need. Therefore, to address unmet need, it is essential to provide high-quality services, such as counselling services, to women who have already been served, in addition to catering to new users. (Jain et al., 2013).

1.3.5 Effects of modern contraceptive use

In LMICs, 228 million pregnancies happen each year, with approximately half of them unplanned (Sully et al., 2020). Unintended pregnancies typically arise when couples either fail to use contraception or experience contraceptive failure, such as incorrect or irregular use, or the contraceptive method itself not being effective. When no modern contraceptive method is utilised, the probability of an unintended pregnancy increases dramatically, 24% of women who want to avoid pregnancy have an unmet demand because they do not utilise any method or use a conventional method. Furthermore, 35% utilise short-acting methods such as tablets, injectables, and condoms, 17% use (LARCs), and 24% sterilise. The bulk of unwanted pregnancies (77%) occur among the 24% of women who want to avoid pregnancy but do not use modern contraception (Figure 1.5). An additional 20% of unplanned pregnancies happen among those using short-acting contraception, and merely 3% occur among the women who depend on sterilization or LARCs (Sully et al., 2020).

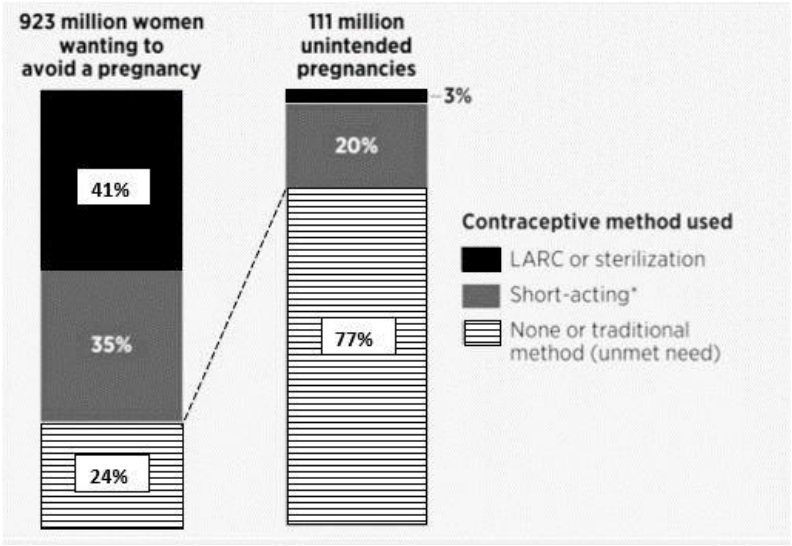

Figure 1.5: Women using no contraceptive method or a traditional method account for the vast majority of unintended pregnancies in LMICs. ***Source: (Sully et al., 2020).***

1.3.6 Contraceptive use and unmet need

Out of the 261 million adolescent women between the ages of 15–19 in LMICs, 88% are not at risk of unintentionally getting pregnant and currently do not need contraception. This is maybe because they are unmarried and report not having had sex over the most recent 30 days (Figure 1.6). Others do not require contraception since they want to have a child in the following two years, are pregnant or post pregnancy and intending to get pregnant or are not able to conceive.

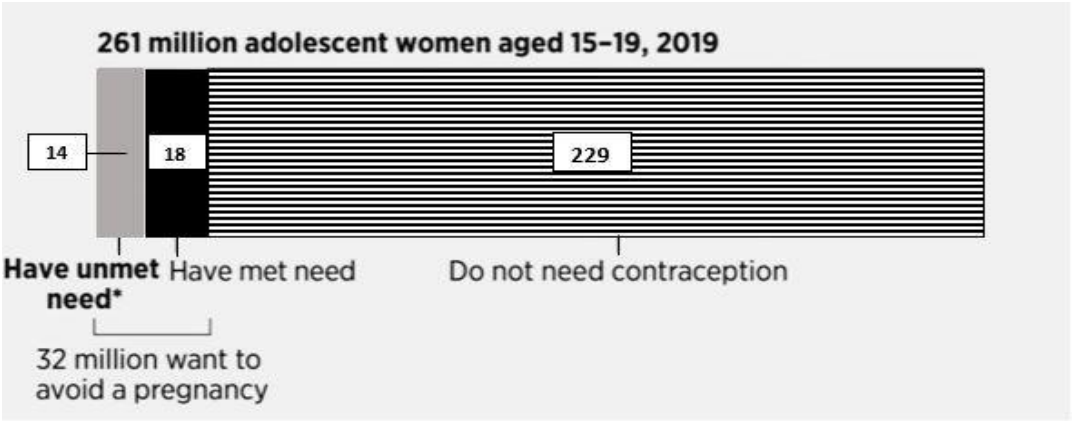

Figure 1.6: Need for modern contraception among Adolescent women in LMICs.

Source: (Sully et al., 2020).

Twelve percent of women aged 15–19 in LMICs (translating to 32 million adolescent women) are currently sexually active and hence need contraceptives. Women within this statistic can either be married or not, and it is not their wish to bear a child for at least two years. Of the adolescent female population in need of contraception, 57% of them use a modern method. The need for modern contraception is unfulfilled for the remaining 43% of women. It is important to highlight that differences in modern method use by age are greater than differences in socioeconomic level or living in rural versus urban areas. In addition, compared to youth in upper-middle-income nations, young people in LMICs have a proportionately higher unmet need for modern methods (Figure 1.7) (Sully et al., 2020).

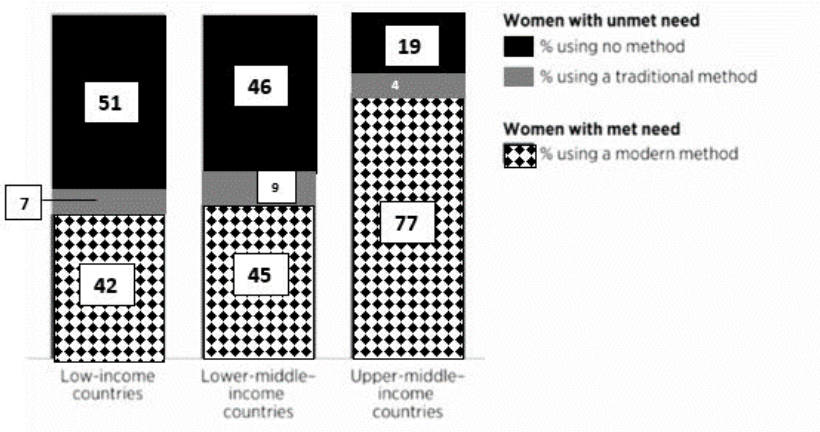

Figure 1.7: Unmet need among adolescent women is highest in low-income and lower-middle–income countries. ***Source: (Sully et al., 2020)***

1.3.7 Contraceptive prevalence rate

Over the last couple of years, the use of contraceptives has radically increased (United Nations, 2020), as couples have incrementally chosen to bear less children. This has been mostly attributed to the expansion in the accessibility of modern contraceptive methods via non-governmental organisations, public family planning programs, and private clinics and pharmacies. On the other hand, a significant portion of women who wish to postpone, space out, or cease having children do not use a modern form of birth control. The quality and accessibility of contraceptive options are still inadequate in some of the world's poorest nations, yet couples are increasingly choosing to have fewer children. (Starrs et al., 2018).

The World Health Organisation estimates that nearly 74% of married or in-union women in Africa have access to modern contraceptives. According to the latest available data (United Nations, 2020), the contraceptive prevalence rate in Africa has been steadily increasing over the years. As of 2020, the contraceptive prevalence rate in Africa was estimated to be around 37%, which indicates that approximately 37% of women of reproductive age (15-49 years) were using some form of contraception. Figure 1.8 is showing the prevalence of modern contraceptive use among women with no fertility intention in different sub-Saharan Africa countries.

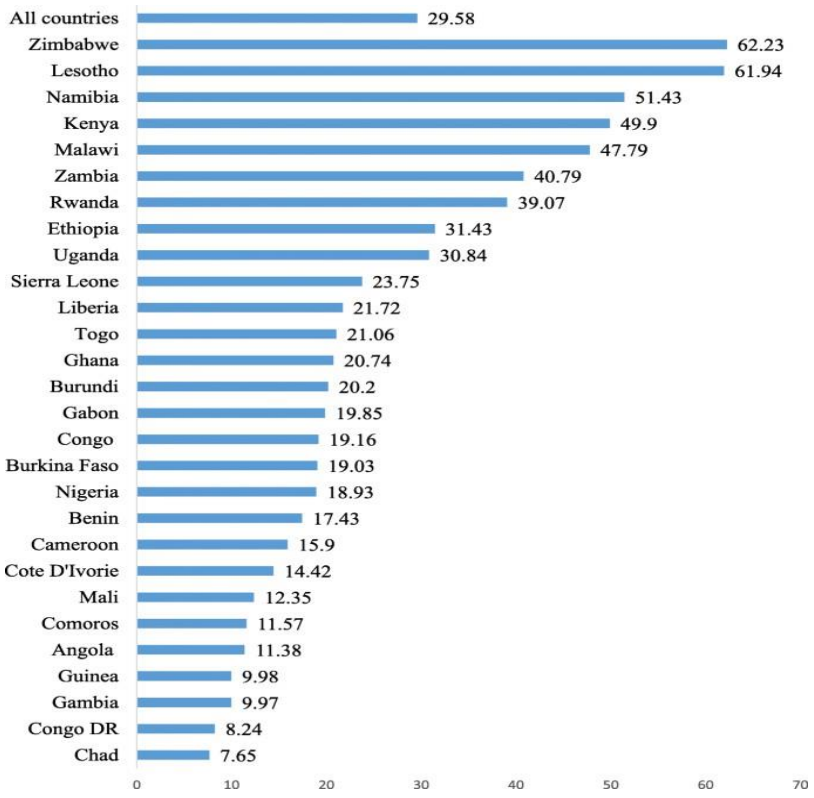

Figure 1.8: Prevalence of modern contraception use in sub-Saharan Africa among women with no fertility intention.

Source: https://doi.org/10.1186/s40834-021-00165-6)

1.3.8 Factors affecting contraception utilization in sub-Saharan Africa.

Contraceptive health is a key pillar of family planning practices, however, adolescents and young people face various challenges when it comes to accessing and utilising contraceptives (Blanc et al., 2009). It is, therefore, important to note that certain factors such as religious beliefs, cultural norms, education levels and access to healthcare services contribute to these variances. These factors determine how individuals exercise their

reproductive rights effectively (Chandra-Mouli et al., 2015). Hence, there is a need to ensure that all individuals regardless of age, gender and socio-economic status, have universal access to family planning services. It should be noted that when individuals can make informed decisions about their reproductive health, positive sexual and reproductive results become attainable. Another important matter is the high prevalence of unsafe abortions because of restrictive laws. Young girls often resort to unsafe methods to end unwanted pregnancies due to traditional norms and values that discourage seeking medical help. This puts their health at great risk and can result in problems such as infections, infertility, or even death (Morris & Rushwan, 2015).

1.3.9 Sexual reproductive health outcomes

Sexual and reproductive health (SRH) is the state of complete physical, mental, social and emotional wellbeing in all aspects relating to reproductive systems and processes, not merely the absence of disease, infirmity or dysfunction (WHO, 2021; Thupayagale-Tshweneagae et al., 2019). SRH includes the ability to be free from unintended pregnancies and unsafe abortions (Abdurahman et al., 2022; Blum et al., 2015), and the freedom to decide when to reproduce as well as how often. Both neonatal and maternal health are important measures of SRH outcomes. The five main elements of sexual reproductive health outcomes are the provision of quality family planning (contraception) services; prevention of abortions; improvement of neonatal care; prevention or treatment of sexual related infections and promotion of good sexual health practices (Mmusi-Phetoe et al., 2019). Specific SRH outcomes focused on in this study are knowledge of modern contraceptives, use of modern contraceptives, unmet need, abortion and attitude towards fertility.

1.3.10 Factors influencing access to SRH services

The primary reason adolescents use contraceptive is to avoid becoming pregnant, although some individuals may also use condoms to prevent the transmission of HIV and other STIs and to exert greater control over their own body (Darteh et al., 2014). However, a myriad of multidimensional barriers are currently keeping good sexual and reproductive health care out of reach for adolescents. At the political level, ASRH is not a high priority issue and as such, there are often restrictive laws and policies in place. There are numerous people who influence the information and services accessed by adolescents, including peers, parents, family members, teachers, along with healthcare workers (Gynecology &

Obstetrics, 2011). Countless healthcare workers discourage youths from using their services because they lack confidentiality, they are judgemental, disrespectful, or do not take their young patients' needs seriously (Morris & Rushwan, 2015).

In Zimbabwe, the availability and utilization of sexual and generative well-being amenities for the younger generation may be influenced by predominantly socio-demographic, cultural, communal, governmental regulations, and health system elements. In general, the structure of the current public health system was reported to provide significant obstacles to youths' access to and use of SRH services. (Regmi et al., 2010). The factors that contribute to low access and utilisation of ASRH services include socioeconomic factors, religious and cultural beliefs, including individual and community perception, a lack of funding and coordination, a shortage of skilled staff, restrictive and conflicting laws and policies, low knowledge and awareness of services (Morris & Rushwan, 2015). Therefore, a multi-sectoral approach is required to evaluate the effectiveness of helping adolescents access sexual and reproductive health services, and to improve their capacity to talk about sexual issues in a variety of contexts, in addition to implementation and funding considerations (Ngome & Odimegwu, 2014).

1.3.11 Impact evaluations of interventions to reduce unwanted pregnancies, drawing from sources across the world

As discussed before in this thesis, unwanted pregnancies remain a significant public health concern globally, with far-reaching consequences for individuals, families, and communities. This section examines the impact evaluations of various approaches aimed at reducing unwanted pregnancies, drawing from research conducted across different regions of the world.

1.3.11.1 Contraceptives access and education

One of the primary strategies for reducing unwanted pregnancies is improving access to and knowledge of contraceptive methods. Several studies have evaluated the impact of interventions that focus on enhancing contraceptive availability and education. For example, a randomized controlled trial (RCT) conducted in Zambia explored the effects of providing free contraceptives and comprehensive family planning counselling to adolescent girls. The study found that participants in the intervention group were significantly more likely to use modern contraceptives and experienced a 26% reduction in pregnancy rates compared to the control group (Jain et al., 2020). Similarly, an

evaluation of a community-based program in Ethiopia that combined contraceptive distribution and education reported a 40% decrease in unintended pregnancies among participating women (Onarheim et al., 2016). In India, a quasi-experimental study assessed the impact of a mobile-phone-based intervention that provided contraceptive information and reminders. The results showed that women in the intervention group were 1.5 times more likely to use modern contraceptives and experienced a 23% reduction in unwanted pregnancies compared to the control group (Madhavan et al., 2020). Another study in Pakistan examined the effects of a community-based family planning program that trained local women as providers of contraceptive services. The intervention was found to significantly increase the use of modern contraceptives and reduce unintended pregnancies by 30% (Azmat et al., 2018). These findings highlight the effectiveness of interventions that combine improved access to contraceptives with comprehensive education and counselling, particularly in resource-limited settings where barriers to family planning services may be more pronounced.

1.3.11.2 School based interventions

A cluster-randomized trial in Malawi evaluated the impact of a school-based comprehensive sexuality education program. The intervention was found to significantly increase knowledge, self-efficacy, and uptake of contraceptives among participating adolescents, leading to a 26% reduction in pregnancy rates (Haberland , 2015). Similarly, a quasi-experimental study in South Africa assessed the effects of an integrated sexual and reproductive health program for in-school youth. The program, which included contraceptive access and counselling, was associated with a 35% decrease in unintended pregnancies (Speizer et al., 2018). Another study in the Philippines examined the effects of a school-based program that provided comprehensive sexuality education and access to contraceptives. The intervention was found to significantly increase the use of modern contraceptives and reduce unintended pregnancies by 32% among participating students (Amoako Johnson et al., 2017). These findings underscore the importance of tailored, multifaceted approaches that address the unique needs and challenges faced by adolescents in accessing sexual and reproductive health services.

1.3.11.3 Community based approaches

In addition to initiatives focused on improving contraceptive access and education, some impact evaluations have examined the effectiveness of community-based interventions in reducing unwanted pregnancies. For instance, a cluster-randomized trial in Tanzania

evaluated the impact of a community-based family planning program that trained local women as volunteer providers of contraceptive services. The intervention was associated with a 24% reduction in unintended pregnancies among participating women (Bintabara et al., 2019). Similarly, a quasi-experimental study in India assessed the effects of a community mobilization program that engaged local leaders and stakeholders to improve access to and utilization of family planning services. The program was found to significantly increase the use of modern contraceptives and reduce unintended pregnancies by 28% (Patel et al., 2018). In Uganda, researchers evaluated the impact of a community-based intervention that combined family planning education, contraceptive distribution, and male engagement. The study found that the intervention led to a 32% decrease in unintended pregnancies among participating women (Shattuck et al., 2011).

These community-based approaches highlight the importance of engaging local stakeholders, leveraging community resources, and addressing social and cultural barriers to family planning services.

1.3.11.4 Multi-level interventions

Some impact evaluations have explored the effectiveness of interventions that operate at multiple levels, addressing individual, community, and policy-level factors to reduce unwanted pregnancies.

A quasi-experimental study in Burkina Faso assessed the impact of a multi-level intervention that combined community mobilization, provider training, and advocacy for policy change. The intervention was found to significantly increase the use of modern contraceptives and reduce unintended pregnancies by 35% (Mwaikambo et al., 2013). Similarly, a cluster-randomized trial in Kenya evaluated the effects of a multilayered program that included community-based education, youth-friendly services, and advocacy for policy reforms. The intervention resulted in a 41% reduction in pregnancy rates among participating adolescents (Erulkar & Onoka, 2015). In Peru, researchers examined the impact of a multi-level program that integrated family planning services into the national health system, provided training for healthcare providers, and engaged community leaders. The study found that the intervention led to a 29% decrease in unintended pregnancies among women of reproductive age (Huaynoca et al., 2017). Another evaluation in Mexico assessed the effects of a comprehensive program that combined contraceptive access, education, and policy advocacy. The intervention was associated

with a 33% reduction in unintended pregnancies among participating women (Saavedra-Avendano et al., 2018).

These multi-level approaches highlight the importance of addressing the complex, interrelated factors that contribute to unwanted pregnancies, including individual knowledge and behaviours, community norms, and policy-level barriers.

1.3.11.5 Impact evaluations from high-income countries

While most of the research in this area has focused on low- and middle-income settings, there are also some impact evaluations from high-income countries. For example, a randomized controlled trial in the United States examined the impact of providing free long-acting reversible contraceptives (LARCs) to adolescents and young adults. The study found a 62% reduction in pregnancy rates among participants compared to the control group (Ricketts et al., 2014). In Australia, a quasi-experimental study evaluated the effects of a school-based comprehensive sexuality education program. The intervention was associated with a 28% decrease in unintended pregnancies among participating students (Ollis et al., 2017). A study in the United Kingdom assessed the impact of a multi-component program that combined contraceptive access, education, and youth-friendly services. The intervention was found to significantly increase contraceptive use and reduce unintended pregnancies by 35% (Philliber et al., 2002). These studies from high-income countries provide additional evidence on the effectiveness of targeted interventions in reducing unwanted pregnancies, even in settings with relatively higher access to sexual and reproductive health services.

Impact evaluations from high-income countries show levels of effectiveness in reducing unintended pregnancies, with reductions ranging from 26% to 62%. This is comparable to the 20-60% reductions reported in studies from LIMCs. The studies from high-income countries suggest that well-designed interventions can also be effective in reducing unintended pregnancies in higher-resource regions. Findings from both the LIMCs and the HICs demonstrate that targeted interventions can be effective in reducing unintended pregnancies across diverse economic, cultural, and geographic contexts. The consistency of results across these different settings strengthens the evidence and underscores the potential for scalable, context-appropriate solutions (Peipert et al., 2012; Bongaarts & Casterline, 2013).

1.3.11.6 Limitations and considerations

While the impact evaluations reviewed in this section demonstrate the effectiveness of various interventions in reducing unwanted pregnancies, it is important to consider the limitations and contextual factors, where the specific social, cultural, and economic dynamics may differ from other regions, that may influence their generalizability. Additionally, interventions are often tailored to the unique needs and resources of the target communities, which may limit their direct applicability to different settings. For instance, high-income countries can leverage more advanced contraceptive technologies and robust education systems, while low/middle-income settings may require a stronger emphasis on improving access and integrating services within existing community-based platforms. These differences reflect the distinct contextual factors and health system capacities between high-income and low/middle-income settings. Accounting for these nuances can help inform the design and implementation of more tailored and effective interventions to reduce unintended pregnancies across diverse global contexts (Chandra-Mouli 2014; Cleland et al., 2012).

1.3.12 Family planning programs in sub-Saharan Africa

In sub-Saharan Africa, several countries have successfully implemented family planning programs. South Africa and Zimbabwe, for instance, have experienced lower fertility and higher contraceptive use at a faster pace than the rest of sub-Saharan Africa (May, 2017). It has been argued that a well-run family planning program in Sub-Saharan Africa countries could benefit these nations with an economic return through a demographic dividend when a reduction in fertility results in a relatively larger working-age population and a decreased dependency ratio (Admassie et al., 2015; Mason & Lee, 2006). However, despite the well documented benefits of family planning, some African governments are reluctant to address the existing family planning and population challenges. Donors, primarily in the form of non-governmental organisations (NGOs), have taken up the tasks of demographic data collection, family planning programs' financing, population policy advocacy, and in some cases, they work directly with governments to support and further national population policies (Storeng et al., 2018; May, 2017). For instance, donors have been funding the Demographic Health Surveys (DHS) and the World Fertility Surveys (WFS), which are assisting African countries to better understand their population and development challenges, thereby facilitating the designing of appropriate population and family planning policies and programs (Odimegwu & Kekovole, 2014).

1.3.13 Family planning programs in Zimbabwe

In Zimbabwe, family planning programs started in 1953, well before the country's independence in 1980. A significant boost to the national family planning program was given by the establishment, through an Act of Parliament, of the Zimbabwe National Family Planning Council in 1985, which is tasked with the coordination of the provision of family planning and sexual and reproductive services aimed at improving maternal and child health. Notable achievements of the Zimbabwe national family planning program include the increase in the contraceptive prevalence rate from 43% in 1988 to 67% in 2015, the decline of unmet contraceptive need from 34% in 1988 to 10.4% in 2015, the decline of total fertility rate from 6.7 in 1984 to the current 4.0, as well as increasing the number of facilities that offer family planning services and information with heightened focus on the youth and young people (ZimStat, 2016). Together with Botswana and Kenya, Zimbabwe was among the first nations in sub-Saharan Africa to witness a decline in fertility from 6.7 to 4.0 births per woman between 1984 and 2015 (WHO, 2016). Yet, at the same time, the country has experienced a rise in the number of teenage pregnancies and a rise in the youth population, and even though the unmet need continues to decline, it is still very high.

The Zimbabwean family planning program is, at present, encountering some challenges. Although the country's long-term success in sustaining an mCPR that is higher than the average for sub-Saharan Africa indicates a conducive enabling environment for a thriving program, there is still unmet need to be fulfilled. Other gaps in the country's program include the failure to expand the method mix to include long-acting reversible contraceptives (LARCs) such as implants and intrauterine contraceptive devices (IUCDs), and a failure to address resource inadequacies (WHO, 2015). For any family planning program, achieving commodity security is crucial, but in Zimbabwe, doing so is proving to be extremely difficult. Commodity security is a situation in which everyone has access to high-quality contraceptives at any time they need them. Currently, family planning products are supplied via a push system known as the Delivery Team Topping Up (DTTU), which is predicated on historical contraceptive usage trends for each service delivery point. Nevertheless, the system faces challenges such as a lack of sufficient funding to purchase goods and restricted access to a wide variety of contraceptive options (WHO, 2016).

Moreover, several fundamental issues with service delivery impede future efforts to guarantee access to a wide variety of contraceptive methods and voluntary, informed choice. The mix of methods used currently exhibits a significant bias towards short-acting methods (particularly the pill), low LARCs uptake (particularly in rural areas), a high unmet need among young, single, sexually active women, and high rates of contraceptive discontinuation (WHO, 2016). At least 40.9% of users use oral contraceptives, with injectables and implants coming in second and third, respectively, at 9.6% and 8.6%. The lactational amenorrhoea method, female condoms, intrauterine contraceptive devices (IUCDs), male sterilisation, and female sterilisation are the least used methods, with less than 1% of cases. The benefits of contraceptive protection against unintended pregnancies are further limited by the high discontinuation rate of 24% for currently available contraceptives, primarily the pill (WHO, 2016). In order to encourage LARCs usage and subsequently lower discontinuation rates and unwanted pregnancies, it is necessary to look into potential factors influencing LARC use. Among adolescents and young women, LARCs use is even lower. However, implants are now the second most popular form of birth control among teenagers and young women in other African nations, like Kenya, after injections (Kungu et al., 2020).

The World Health Organisation (WHO, 2010) recommended LARCs as safe and appropriate for young women and adolescent girls, including nulliparous girls. In addition, FP2020 released a global declaration advocating for the inclusion of LARCs in the method mix for adolescent girls and young women (FP2020, 2015). LARCs can lower the rate of maternal mortality and assist these young women in delaying or avoiding pregnancies (Darroch et al., 2016). Furthermore, increased use of LARCs has been reported to significantly lower unwanted pregnancies and abortions among adolescents and young women (Shoupe, 2016).

LARCs usage can lower discontinuation, which is prevalent in young women and adolescent girls, because the medications are long-term and pose fewer adherence challenges. Young women under 25 tend to use short-acting contraceptives like pills, condoms, and injections despite the many advantages of LARCs. Therefore, to increase the evidence supporting LARCs' potential to reduce unwanted pregnancies among this group of women, it is necessary to identify the factors associated with LARC use among adolescents and young women aged 15 to 24.

Family planning practices in Zimbabwe have changed, leading to a rise in teenage pregnancies (which currently stand at 22%), an increase in the number of young people, and a persistently high rate of unmet family planning need (roughly 17%) (MICS, 2019). Given this situation and the difficulties mentioned above, research on the effects of family planning interventions (like the ASRH program) on outcomes related to sexual and reproductive health is necessary in order to determine how best to allocate resources (May, 2017).

1.3.14 Adolescent fertility and teenage pregnancies in Zimbabwe

Approximately 16.2 million people live in Zimbabwe, with 53.6% of them being under 20. The population is predicted to double in the next 48 years at a growth rate of 2.35% per year (Zimstat, 2022). Adolescents in Zimbabwe, like in other LMICs, are primarily without adequate access to SRH services. With over one in five teenage girls between the ages of 15 and 19 presumed pregnant, meeting the SRH needs of young people remains a challenge (ZimStat, 2015). From 99 births per 1000 women in 2005 and 2006 to 110 births per 1000 women in 2015, the age-specific fertility rate for 15 to 19-year-olds grew. A higher percentage of adolescent pregnancies and a lower mean age at first birth were two indicators of the notable increase in the fertility rate.

The likelihood of motherhood for girls in rural areas is over twice that of their urban counterparts, primarily because of disparities in socioeconomic conditions (WHO, 2016; Kassa et al., 2018). More so, the same age group continues to bear the highest burden of maternal deaths, making up 34% of cases (WHO, 2015). Furthermore, when adolescents visit service delivery points in either outreach or static facilities, only 3% of them have access to family planning advice (ZimStat, 2015). Between the ages of 15 and 24, one in five Zimbabweans are youth, of which 42% are women of child-bearing age group (ZimStat, 2015). As a result, any modifications to mCPR must address their access problems.

In comparison to the national average of 10.4%, 12.0% of married adolescent girls and 20.3% of sexually active single young women reported having unmet family planning needs (ZimStat, 2016). It can be inferred that most teenage pregnancies in Zimbabwe occur spontaneously and are also linked to other detrimental health outcomes (Norton et al., 2017). Therefore, it is critical to recognise, comprehend, and address adolescents' SRH

needs to reduce unintentional pregnancies that might negatively affect their health (Darroch et al., 2016; Cahill et al., 2020).

Overall, it is noteworthy to point out that the SRH issues among adolescents in Zimbabwe have undergone changes over the years. The significance of addressing ASRH has come into greater awareness. Notably, the Zimbabwean government and several NGOs and international organisations have worked to prioritise this problem and put efforts to improve access to SRH services (Mavodza et al., 2022). The Ministry of Health and Child Care (MoHCC) in collaboration with other stakeholders developed the National Sexual and Reproductive Health Policy of Zimbabwe (2016-2020). This policy was aimed at providing a framework for the provision of comprehensive SRH services to all individuals in Zimbabwe. It also highlights the significance of promoting SRH rights, preventing unplanned pregnancies, and guaranteeing vulnerable populations have access to high-quality SRH services (WHO, 2016). The policy acknowledges that teenagers have particular needs and vulnerabilities when it comes to SRH, which helps to address issues pertaining to ASRH. Furthermore, the policy is significant because it recognises the value of involving boys and men in the promotion of SRH (Ministry of Health and Child Care, 2016). Therefore, it should be noted that the goal of implementing this policy is to enhance the general well-being of the populace, irrespective of gender, age, or socioeconomic status.

1.3.15 The Zimbabwe Adolescent Sexual and Reproductive Health Strategy

Zimbabwe used several policies, including the National Reproductive Health Policy, the Zimbabwe National HIV and AIDS Strategic Plan, the National Health Strategy, and the Educational Policy, to implement the International Centre for Population Development's (ICPD) action plan and improve the results of ASRH. Poor ASRH outcomes were documented in the Zimbabwe Demographic Health Survey (ZDHS) for the years 2005–2006. These included high-risk sexual behaviour, such as paid sex or sex with significantly older partners, a rise in STIs, a low uptake of HIV testing, and barriers to youth-friendly services. Among the factors found to worsen ASRH outcomes are a lack of comprehensive social and behaviour change communication (SBCC) materials, a lack of education about life skills, scarce ASRH outreach services, and exorbitant transportation costs to referral health facilities. Only adolescents over the age of 16 were permitted to receive voluntary HIV counselling and testing. Healthcare workers were unaware of ASRH issues and

lacked the necessary skills to address them. Furthermore, despite the absence of a properly defined ASRH package throughout the Zimbabwean health system, supplies needed for ASRH programme implementation were limited (Landa & Fushai, 2018).

In response to the deficiencies identified above, the Zimbabwean government developed the country's first National ASRH strategy for the period 2010-2015 through the National Adolescent Sexual and Reproductive Coordination Forum and the MoHCC. The strategy established a set of ASRH services to be provided through community-based, health-care facility-based, and school-based approaches. The program interventions were available to people aged 10 to 24 years old, implying that youths and adolescents in the specified age group could access youth-friendly corners, youth-friendly services, and were a target for youth-friendly awareness activities through hospitals, schools, and the community between 2010 and 2015. The ASRH strategy's main goals were to encourage young people to adopt safer SRH practices, to increase the availability, access, and utilisation of friendly SRH services by young people, to create a safe and supportive environment for addressing SRH issues for young people, and finally to strengthen coordination and partnerships for evidence-based ASRH programming. The ASRH strategy aimed to address four main intervention areas: (1) behaviour change communication (BCC), life skills and livelihoods; (2) policy and advocacy; (3) service delivery; and (4) networking and coordination. The national strategy noted that, in addition to outlining key action items within each of the four intervention areas, no standard monitoring and evaluation system or framework for ASRH programming had been established, and the National Health Management Information System was not sensitive to the adolescent age group (10-24 years).

Hence, the ASRH strategy addressed these gaps by aiming to improve the capacity of all ASRH stakeholders in social research methods, monitoring and evaluation and identifying and prioritizing research needs of ASRH through training and developing a standard monitoring and evaluation framework, together with data collection tools to monitor national indicators on ASRH (Blum et al., 2015). The ASRH strategy used three models to provide family planning and sexual and reproductive services. These are the Facility Based Services which operate from primary level institutions to tertiary institutions, the community-based services (through Village Health Workers; Community Based

Distributors & Peer Educators) and the Outreach Services meant for the marginalised communities & hard to reach areas.

1.4 JUSTIFICATION OF THE STUDY

Some cultural, socio-economic, and political factors have been found to act as barriers to the delivery of SRH information and services to young people. Failure to provide youth friendly SRH services, unwelcoming behaviour and negative attitudes by healthcare workers are some of the barriers to young people's access to SRH (Mchome et al., 2015; Morris & Rushwan, 2015). Over the last quarter century youth-friendly SRH services have been promoted and implemented globally to improve delivery and access of SRH services to young people (Mazur et al., 2018; Mchome et al., 2015). However, despite these efforts, there is a paucity of evidence supporting the effectiveness of these programs on family planning outcomes in sub-Saharan Africa, Zimbabwe included. The Systematic Review in Chapter 2 and the empirical study presented in Chapter 3 sought to gather evidence on the impact of the various SRH interventions carried out in Sub-Saharan Africa and the ASRH Strategy implemented in Zimbabwe from 2010 to 2015, respectively. Best use of the available resources could be inferred from the findings from the impact of program studies, so that future interventions will comprise only of those interventions which are the most cost-effective. This is important, since one of the challenges facing the national family planning program is a large funding gap (WHO, 2018).

Furthermore, despite positive advances in family planning adoption, Zimbabwe's method mix remains heavily skewed towards SARCs and the high discontinuation rate of 24% of SARCs comparatively limit the benefits of contraceptive protection against unintended pregnancies (WHO, 2016). Even though the use of implants and IUCDs has increased significantly, the proportion of LARCs remains very low. The main reason for their scarcity was reported to be a lack of capacity among health care workers to provide LARCs. Inadequate demand creation was also reported to contribute to low uptake. Despite their numerous benefits and recommendations (Darroch et al., 2016; Shoupe, 2016; WHO, 2018), LARCs are underutilised in Zimbabwe, with utilisation even lower among adolescent girls and young women (ZimStat, 2015). Hence, Chapter 4 sought to explore the factors associated with LARCs usage in adolescent girls and young women.

Findings of this study could assist policy makers in formulating policies that could support improved access to, and utilization of family planning services and ultimately SRH outcomes, in a manner that is cost-effective and efficient.

1.5 SPECIFIC AIMS AND OBJECTIVES.

1.5.1 Aims

Given the justification and context above, the aim of the study was to evaluate the impact of the 2010-2015 Zimbabwean ASRH program intensity on SRH outcomes among adolescents and young people. Furthermore, the study sought to determine the factors associated with the use of LARCs in adolescent girls and young women in Zimbabwe. Investigating the impact of the 2010-2015 Zimbabwean ASRH program intensity on SRH outcomes among adolescents and young people could inform the optimisation of future programs and reduce unintended pregnancies and their associated negative effects among this age group. Findings from this study could help pave the way for policies that identify potential threats and opportunities to promote access to, and utilisation of SRH services among adolescents and young people.

1.5.2 Specific objectives

1. To estimate the impact of the Zimbabwean ASRH program intensity on abortion, modern contraceptive methods usage, unmet need, attitude towards fertility and knowledge of modern contraceptive methods among adolescent girls and young women.
2. To estimate the impact of the Zimbabwean ASRH program intensity on modern contraceptive methods usage, attitude towards fertility and knowledge of modern contraceptive methods among adolescent boys and young men.
3. To determine the socioeconomic and demographic factors associated with LARCs uptake among adolescents and young women in Zimbabwe.

1.6 DATA REQUIREMENTS

Randomised trials are widely accepted as a gold standard for program impact evaluation (Angrist & Krueger, 1999). However, this is not feasible in this case because we are dealing with social policies that are not implemented with randomization in mind. As a result, the study used ZDHS data to estimate the program's impact using adjusted regressions, matching techniques, instrumental variables, and difference-in-differences

(DID) techniques. It has been demonstrated that combining these methods with covariate matching produces estimates that are comparable to randomised experiments (Daw & Hatfield, 2018). Because of its before and after design, the DID method is appropriate for the current study. It is intended for panel and repeated cross-section data, and it accounts for time-invariant unobserved heterogeneity better (Heckman & Vytlacil, 2007; Villa, 2016). Matching has the potential to reduce selection bias (Villa, 2016). Furthermore, fixed effects and clustering were employed to control for province-specific and age-specific attributes that do not vary across time and to allow for correlation between observations within each province under investigation, respectively.

1.7 ZIMBABWE DEMOGRAPHIC AND HEALTH SURVEY.

The estimated population of Zimbabwe was approximately 16 million people in 2022 (United Nations, 2023). The age structure in Zimbabwe is as follows; 0-14 years: 38.32% (2,759,155 males and 2,814,462 females); 15-24 years: 20.16% (1,436,710 males and 1,495,440 females); 25-54 years: 32.94% (2,456,392 males and 2,334,824 females); 55-64 years: 4.07% (227,506 males and 363,824 females) and 65 years and over: 4.52% (261,456 males and 396,396 females) (ZimStat, 2022). Zimbabwe is a religiously diverse country with various religious affiliations. Most of the population are Christians, which encompasses Protestants, Roman Catholics, Apostolic sects and Pentecostal. Additionally, there are other populations in the African Traditional Religion, Muslims, Hindu and other minority religious groupings (MICS, 2019).

The Zimbabwe National Statistics Agency (ZIMSTAT) conducts the Zimbabwe Demographic and Health Survey (ZDHS). Other agencies and organisations that provide technical or financial assistance to the survey's successful implementation include the Zimbabwean government, the United States Agency for International Development (USAID), the United Nations Population Fund (UNFPA), the United Nations Development Programme (UNDP), the United Nations Children's Fund (UNICEF), the United Kingdom Department for International Development (DFID), the Royal Danish Embassy, and the Australian Embassy (ZimStat, 2015).

The primary objective of ZDHS is to provide current estimates of basic demographic and health indicators through collection of information on "*fertility levels, marriage, sexual activity, fertility preferences, awareness and use of family planning methods,*

breastfeeding practices, nutritional status of mothers and young children, early childhood mortality, maternal mortality, maternal and child health, knowledge and behaviour related to HIV/AIDS and other STIs, smoking, knowledge of cervical cancer, and male circumcision" (Zimstat, 2015).

ZDHS programs are designed to yield representative information for most indicators for the country, for urban and rural areas, and for each of Zimbabwe's ten provinces. Administratively, each province in Zimbabwe is divided into districts, which are then divided into smaller administrative units called wards. Each ward is subdivided into convenient areas, which are called census enumeration areas (EAs). For demographic health surveys the samples are selected with a stratified, two-stage cluster design, with EAs as the sampling units for the first stage followed by listing exercises for all households in the survey sample. Questionnaires are used to collect targeted demographic information for the surveys (ZimStat, 2015).

1.8 CONCEPTUAL FRAMEWORK

The study employed the WHO framework for Operationalizing Sexual Health and its Linkages to Reproductive Health (see Figure 1.9 below) (WHO, 2017). The framework is a comprehensive model that provides a holistic and strategic approach to addressing sexual and reproductive health challenges. This framework emphasizes the importance of considering the multifaceted determinants of sexual health and the need for a coordinated, rights-based, and evidence-informed response. At the centre of the framework is the ultimate objective of sexual health: the attainment of physical, emotional, mental and social well-being in relation to sexuality. In certain settings and for certain populations, crucial aspects of this objective may be overlooked when sexual health is grouped under or together with the domain of reproductive health. The framework, therefore, aims to operationalize WHO's comprehensive working definition of sexual health to ensure that it receives full attention in programming and research, alongside reproductive health, for all populations, everywhere. The graphic framework separates out the individual components of the definition, setting them in relation to one another at three levels.

Figure 1.9: WHO framework for Operationalizing Sexual Health and its Linkages to Reproductive Health (WHO, 2017)

At the first level, there is the "foundation of guiding principles". These are six crucial, cross-cutting principles (shown at the base of the illustration) which must be incorporated into the design of all sexual and reproductive health interventions, and which can also serve as evaluation criteria against which these interventions should be assessed. Secondly, there is the "rosette of sexual health and reproductive health interventions", in which the two groups of interventions are depicted on contrasting colours of the intertwined ribbons of a rosette – blue for sexual health and orange for reproductive health – to show that they are distinct yet inextricably linked. On the third level there is "the climate of social-structural factors". The surrounding shading in the graphic framework represents the existing cultural, socioeconomic, geopolitical and legal environment that forms the context for people's lives in different settings, and which influences sexual health interventions and outcomes. These three levels are described in more detail below.

1.8.1 The foundation of guiding principles.

These six cross-cutting and interlinked principles – which are all of equal importance – must be incorporated into the design and implementation of all sexual health interventions, and they are also the criteria against which these interventions will be evaluated. These

guiding principles are intended to provide a strong foundation upon which sexual health can be achieved for all. These are described below:

i. ***Holistic approach to sexual health:*** Sexual health is more than just the absence of disease, but a state of physical, emotional, mental, and social well-being related to sexuality and, therefore, interventions should address both disease prevention and promotion of positive sexual health.
ii. ***Linked nature of sexual health and reproductive health:*** Sexual health and reproductive health are inherently intertwined, with connections between issues like STIs, fertility, and contraception and interventions should recognize these linkages.
iii. ***Respect, protection, and fulfilment of human rights:*** Individuals have the right to exercise control over their sexuality and sexual/reproductive health without coercion, discrimination, or violence and interventions must uphold these human rights.
iv. ***Multilevel influences on sexual health:*** Achieving sexual health requires interventions at the individual, interpersonal, community, and structural levels to address the various factors that influence it.
v. ***Diversity of needs across life course and populations:*** Sexual health needs are dynamic and vary based on individual, cultural, socioeconomic, and other factors. Interventions must be inclusive and responsive to this diversity.
vi. ***Evidence-based, respectful, and positive approach:*** Interventions should be grounded in evidence, maintain privacy and confidentiality, provide unbiased information, and be delivered by competent, non-judgmental providers with appropriate supplies.

These principles provide a strong foundation for designing, implementing, and evaluating comprehensive, rights-based, and effective sexual health interventions.

1.8.2 The rosette of sexual health and reproductive health interventions

Neither sexual health nor reproductive health subsumes the other. Rather, the two are inextricably interlinked as represented in the graphic framework by a rosette, which is formed by two contrasting but interwoven ribbons. In this configuration, the eight intervention areas – four each for sexual health (blue ribbon) and reproductive health (orange ribbon) – are of equal weight. More importantly, in a mutually supportive and

protective arrangement, each intervention area enhances the impact of the others, and as a result, strengthens the attainment of sexual health as a whole. Across all eight areas depicted within the rosette in the framework, the interventions may take place in a health-care setting provided by the health sector (e.g. delivery care and STI treatment), but some may be provided in other settings, as initiatives of the education, justice, economic and/or social care sectors, for example. All interventions should be planned and designed based on the six guiding principles outlined above.

1.8.3 The climate of social-structural factors

Four interrelated, often overlapping dimensions collectively determine the cultural, socioeconomic, geopolitical and legal environment in which sexual health and reproductive health are experienced by individuals and in which the relevant interventions are implemented. Consequently, these factors – the realities of the settings in which we live – also have an influence on the effectiveness and impact of health interventions. The four dimensions encompassing all these contextual factors are represented in the graphic framework by the shading surrounding the rosette of interventions. This current climate or existing context should be considered when designing and implementing sexual health (and reproductive health) interventions to optimize effectiveness. It should be noted that progress in each of these dimensions is also necessary to support lasting improvements in sexual health. The four dimensions are outlined below:

i. ***Cultural and social norms around sexuality:*** These norms reflect values, ideologies, and accepted/unaccepted behaviours related to sexuality. They can affect access and quality of sexual health interventions.
ii. ***Gender and socioeconomic inequalities:*** These inequalities create power imbalances that influence decision-making around sexuality and access to services/resources. They are reflected at interpersonal to institutional levels.
iii. ***Human rights:*** Sexual health requires respect for human rights related to sexuality, freedom from coercion, access to information/services, and non-discrimination. The legal/policy environment shapes how these rights are protected or violated.
iv. ***Laws, policies, regulations, and strategies:*** The legal/regulatory framework sets parameters for sexual health programs and research. It can either foster or undermine sexual health, and establish mechanisms for access to justice and monitoring.

Collectively, these social-structural factors determine the context in which sexual and reproductive health is experienced and interventions are implemented. Considering this broader context is crucial for designing effective and impactful sexual health programs. In any given country or context, they play an important role in either fostering or undermining sexual health, and in promoting and protecting or violating people's human rights related to sexual health. These include national laws and policies governing the provision of health services, as well as criminal, civil, administrative and other laws that are applied to sexuality-related matters and which thus impact sexual health. The legal and regulatory framework can also serve to support transparent monitoring and review processes to record and improve sexual health outcomes across a diverse population.

By applying this comprehensive, rights-based, and evidence-informed framework, policymakers, program designers, and practitioners can develop and implement more effective, equitable, and sustainable sexual health interventions that address the diverse needs and experiences of individuals and communities.

1.8.4 Opportunities and challenges of using the framework

A variety of evaluations have used the WHO Framework for Operationalizing Sexual Health and its Linkages to Reproductive Health in the design and evaluation of impact. An example is the evaluation of the 'Our Future' Program in Malawi, a program which aimed to empower adolescent girls and young women through comprehensive sexuality education and economic strengthening interventions. Here, the framework was used to evaluate the program's influence on sexual and reproductive health knowledge, attitudes, and behaviours (Temin et al., 2020). The evaluation found improvements in contraceptive use, self-efficacy, and gender-equitable attitudes among participants. Still in sub-Saharan Africa, the framework was used to evaluate the Adolescent Girls Empowerment Program (AGEP) in Zambia. AGEP provided a combination of social, health, and economic interventions to support adolescent girls in Zambia. Researchers from the Population Council utilized the WHO framework to assess the program's influence on various sexual and reproductive health outcomes (Hewett et al., 2017). The evaluation demonstrated positive impacts on contraceptive use, HIV and STI knowledge, and self-efficacy among participating girls.

The WHO framework has also found applications in other regions of the world. In Bangladesh, the framework was used to evaluate the Bangladeshi Association for Life-

skills, Income, and Knowledge for Adolescents (BALIKA) project to empower adolescent girls through educational and livelihood interventions. Researchers from the Population Council used the WHO framework to evaluate the project's impact on various sexual and reproductive health outcomes, including knowledge, attitudes, and behaviours (Amin et al., 2018). The evaluation found that the project led to significant improvements in girls' knowledge of sexual and reproductive health, as well as increased self-efficacy and delayed marriage. The framework was also used in evaluating the HER (Health and Education for Russian) Project in Russia, which was aimed to improve the sexual and reproductive health of young women in Russia through a combination of interventions. Researchers from Pathfinder International utilized the WHO framework to assess the project's influence on knowledge, attitudes, skills, and access to services (Pathfinder International, 2020). The evaluation demonstrated significant improvements in participants' knowledge of contraception, communication with partners, and use of reproductive health services.

These examples illustrate how the comprehensive WHO framework can guide rigorous evaluations of sexual and reproductive health interventions targeting adolescents and young women, capturing the multifaceted impacts of these programs in diverse global settings.

However, there are documented challenges or limitations in applying the WHO framework for these types of evaluations. Firstly, the complexity of the framework is documented. The WHO framework is very broad and covers a wide range of sexual and reproductive health domains, which can make it challenging to operationalize and measure all the relevant indicators (Chandra-Mouli et al., 2015). Researchers have reported difficulties in determining the most important and feasible indicators to include when using the WHO framework (Mmari et al., 2019). Another challenge concerns data availability and quality. Collecting high-quality data on sensitive sexual and reproductive health topics, especially among young populations, can be difficult (Haberland & Rogow, 2015). Researchers have noted challenges in obtaining complete and accurate self-reported data from adolescents and young women on behaviours, attitudes, and experiences (Austrian et al., 2020). In addition, capturing complex social-ecological factors is a challenge. The framework emphasizes the importance of social, cultural, and environmental determinants of sexual health, which can be complex to measure and link to program impacts (Chandra-Mouli et al., 2015). Evaluations have struggled to fully

account for the influence of broader contextual factors on individual-level outcomes (Mmari et al., 2019). Another challenge is establishing causal attribution. Given the multifaceted nature of sexual and reproductive health, it can be challenging to definitively attribute changes in outcomes to specific program interventions (Haberland & Rogow, 2015). Evaluators have highlighted the need for rigorous study designs, such as randomized controlled trials, to strengthen causal inference (Austrian et al., 2020).

Despite these challenges, the examples provided demonstrate that the WHO framework has been a valuable tool for guiding comprehensive evaluations of sexual and reproductive health interventions for adolescents and young women. Researchers continue to refine methodological approaches to address the limitations and strengthen the evidence base. In the current study, data quality challenges have been addressed by the data collectors. The ZDHS data sets used were obtained by implementing rigorous sampling and recruitment and use of probability-based sampling techniques to ensure representative samples of adolescents and young women (Austrian et al., 2020) and employed community-based recruitment strategies to reach marginalized populations (Chandra-Mouli et al., 2015). In addition, the DHS provide comprehensive training to their data collectors on research ethics, rapport-building, and eliciting sensitive information from young participants (Haberland & Rogow, 2015). The ZDHS data utilised in this study is considered of good quality and reliable justifying the application of the comprehensive WHO framework in the current study.

1.9 THEORY OF CHANGE BASED ON THE WHO FRAMEWORK FOR OPERATIONALIZING SEXUAL HEALTH AND ITS LINKAGES TO REPRODUCTIVE HEALTH

Based on the current literature and the WHO framework described above, a theory of change was developed for the current study. The theory of change sought to provide a comprehensive and evidence-informed approach to driving positive change in the domain of adolescent sexual and reproductive health, in the design and implementation of the ASRH strategy in Zimbabwe, and subsequently its evaluation. This theory of change outlines the key elements and causal pathways that could lead to the achievement of desired outcomes. Using these principles, it was postulated that the ASRH strategy interventions were designed and implemented in a manner that respects, protects, and fulfils the sexual and reproductive rights of all individuals.

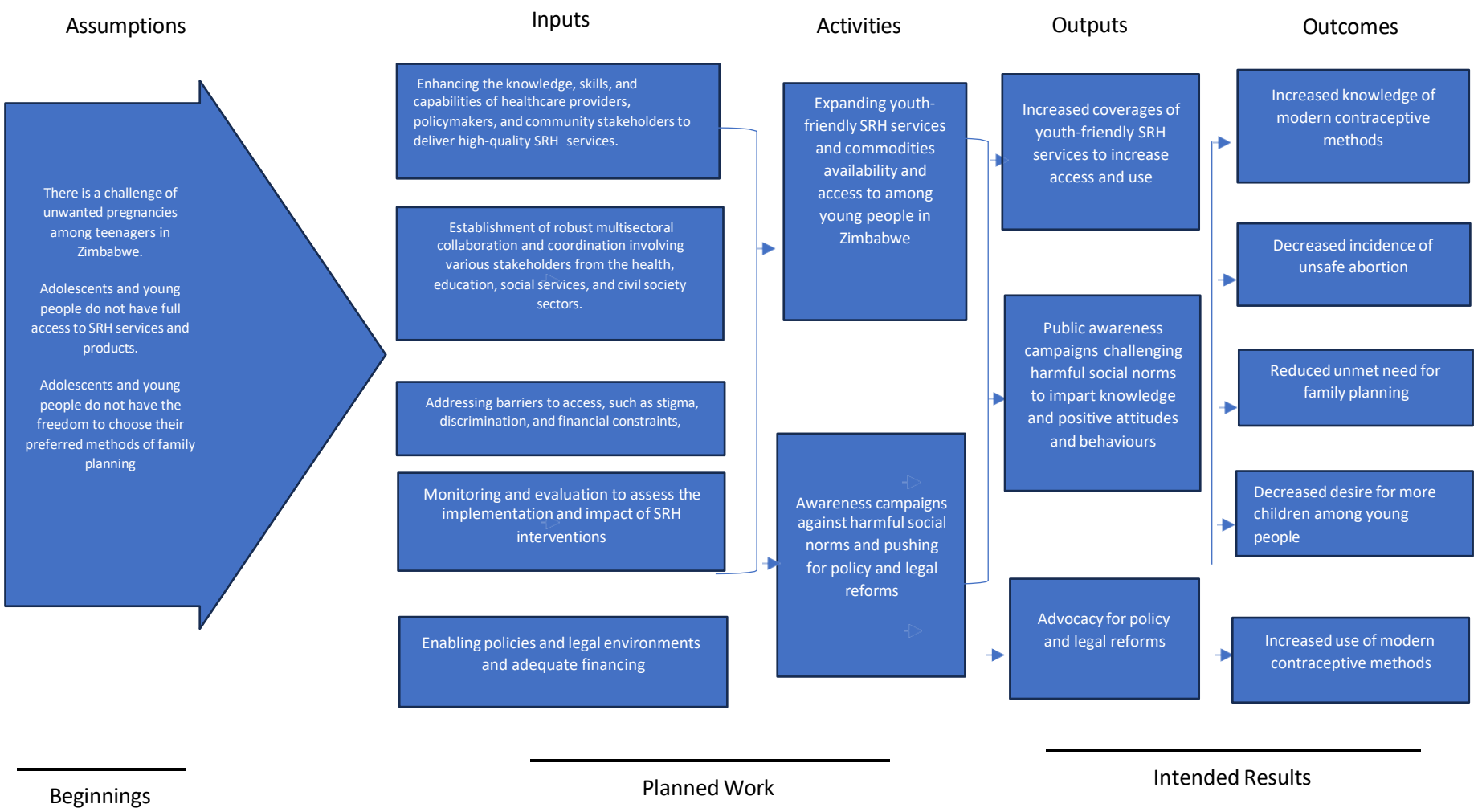

Figure 1.10: Theory of change based on the WHO framework

This diagram illustrates the key components and the causal pathways of the developed theory of change. Prior to the ASRH strategy implementation, there was a high prevalence of unwanted pregnancies among adolescents and young people in Zimbabwe. The assumption was that implementing the ASRH strategy will reduce this problem through the activities shown in the diagram. The ASRH program beneficiaries were assumed to have benefited by having full access to a broad range of SRH services and products, allowing the beneficiaries to choose their preferred methods of family planning. The carrying out of these activities was made through the application of inputs and resources, such as financial, human, and knowledge-based resources, feeding into the capacity building and strengthening efforts at the individual, organizational, and systemic levels. The multifaceted ASRH strategy was carried out through multisectoral collaboration and coordination aimed at facilitating the empowerment and engagement of communities, particularly marginalized groups, in the implementation of interventions. This, in turn, was supposed to lead to improved access and quality of comprehensive sexual and reproductive health services, addressing the barriers discussed above and ensuring client-centred approaches.

The availability of enabling policies and environments, supported by multisectoral coordination, was supposed to create a supportive ecosystem for the delivery of the SRH services to achieve improved outcomes as illustrated in ***Figure 1.10*** above. The theory of change diagram above provides a holistic and evidence-informed framework for developing, implementing, and evaluating sexual and reproductive health interventions carried out through the Zimbabwean ASRH strategy.

As shown in the diagram, to achieve positive results, there is need for the development and implementation of enabling policies, laws, and sociocultural environments that support and protect sexual and reproductive health and rights. This includes addressing discriminatory laws and social norms, as well as promoting supportive policies and financing mechanisms. Furthermore, for the SRH interventions to work, the theory of change above underscores the importance of robust monitoring, evaluation, and learning systems to assess the implementation and impact of sexual and reproductive health interventions. This data-driven approach enables the continuous refinement and adaptation of programs to enhance their effectiveness and responsiveness to the needs of the target population, in this case the young people in Zimbabwe (Temin et al., 2020; Hewett et al., 2017; Amin et al., 2018; Pathfinder International, 2020).

1.10 ETHICAL ISSUES

Ethical approval for conducting the study was granted by the Faculty of Health and Medicine Research Ethics Committee (FHMREC) of Lancaster University and the Zimbabwe Medical Research Council. Formal approval to access and use the ZDHS datasets was granted by the DHS Program.

The research was conducted in compliance with the research ethics and codes of practice that are spelt out in the Framework for Research Ethics and The Research Ethics Guidebook authored by the Economic and Social Research Council (ERSC). As per this Framework, the proposal development addressed key issues which included the researcher's independence and the upholding of the highest standards of quality and integrity during the whole study process.

Although the study used secondary data, the researcher is satisfied that the research participants' anonymity and confidentiality was ensured during the ZDHS data collection process. This is because the ZDHS data collection process involved removal of personal identifiers and participants' anonymity was ensured with systematic coding. Therefore, the reported research did not involve any obvious risks to the participants. There is assurance that the original data collectors supplied relevant information to the participants, including that their data could be reused for research. In addition, the ownership of the original data is acknowledged. Before analysis, the data was evaluated for certain criteria such as the methodology of data collection, accuracy, period of data collection and the content of the data.

The work reported in this thesis was justified since it aimed to answer important public health questions. The work was conducted under the supervision of qualified and experienced supervisors from Lancaster University. The work did not involve human participants, and therefore there was no need for a participant information sheet and consent forms. However, there is information and explanation about the study purpose, identity of the researcher and financiers of the study, and the manners in which the study findings are going to be disseminated and utilized, the contact details of the researcher and researcher's supervisors for use by the relevant stakeholders whenever they want to request more information concerning the study.

1.11 CHAPTER SUMMARY

In summary, this chapter presented the background and justification of the study, aims, objectives and research questions. The following chapter (Chapter 2) is a Systematic Review aimed at systematically identifying sexual and reproductive health interventions implemented in sub-Saharan Africa among young people and assess their impact on sexual and reproductive health outcomes. This is followed by the evaluation of the impact on sexual and reproductive outcomes among young people of the Zimbabwean ASRH strategy implemented during the period 2010-2015, in Chapter 3. Subsequently, in Chapter 4, the study sought to determine the factors which influence the use of LARCs among young women in Zimbabwe, in view of the evidence showing their underutilisation in Sub-Saharan African countries, including Zimbabwe, compared to the more user dependent and less effective SARCs.

Chapter 3 of the study used linear and logistic regression models to determine the association of the ASRH strategy program intensity with the sexual and reproductive health outcomes. This was followed by a quasi-experimental study design employing the difference-in-differences analysis to determine the impact of the ASRH strategy program intensity on the sexual and reproductive health outcomes. Chapter 4 was a cross-sectional study analysing the possible factors associated with the utilization of LARCs among adolescents and youth in Zimbabwe, using backward stepwise regression models. Data from the 2015 Zimbabwe Demographic Health Survey (ZDHS) was used to answer the study objectives in Chapters 3 and 4. Chapter 5 synthesises the study findings and discusses the possible policy implications and suggestions for future studies.

CHAPTER 2: IMPACT OF SEXUAL REPRODUCTIVE HEALTH INTERVENTIONS AMONG YOUNG PEOPLE IN SUB-SAHARAN AFRICA: A SYSTEMATIC REVIEW.

2.1 INTRODUCTION

The previous chapter introduced the current study and described the importance of sexual and reproductive health care, given that sexual and reproductive health problems account for close to 20% of the worldwide disease burden. It has been shown that most of this burden is due to unmet need of family planning services. Unmet need for family planning and the possible resultant unwanted pregnancies and abortion (sometimes unsafe) are more prevalent in LMICs and mostly affect the younger population. Over the years, many countries, globally, have implemented family planning programs. An overview of these interventions carried out in both high income and LIMCs and their evaluations has been described in Chapter 1. Most of these studies have focused on adolescents and young people with the aim of increasing sexual and reproductive healthcare knowledge, and increase access to, and utilisation of sexual and reproductive health services, thereby reducing teenage pregnancies and the associated negative effects. As discussed in chapter one, socio-demographic, cultural, community, government policies, and health-care system factors all influence young people's access to and use of sexual and reproductive health services. As much as adolescents want to access and use these services, there are several barriers that may prevent them from doing so, including service unavailability, a lack of confidentiality and privacy, high costs, inconvenient working hours, and some policies. Therefore, this requires that an ideal adolescent sexual reproductive health program should offer a holistic and comprehensive approach that seeks to address these barriers.

In view of the above, this chapter is a systematic review aimed at identifying sexual reproductive health interventions implemented in sub-Saharan Africa and assess the impact of these interventions on sexual and reproductive health outcomes.

2.2 BACKGROUND

Sexual and reproductive health (SRH) problems have been reported to account for about one-fifth of worldwide disease burden (Starrs et al., 2018), and the burden is much higher

among adolescents and young women in the reproductive age group (Ezeh et al., 2016). Sexual activity and experimentation are normative parts of adolescent development that may simultaneously be associated with adverse SRH outcomes, including the acquisition of STIs, unplanned pregnancies and abortions (Johnson, 2020; Todd & Black, 2020). Many adolescent girls and young women are at high risk of lack of access to, and inconsistent or incorrect use of contraception, leading to unintended pregnancies (Burkman & Dardano, 2004; Polis et al., 2016).

A variety of factors influence access to SRH services, including SRH knowledge and awareness of service availability, as well as access to and utilisation of these services. Several cultural, socioeconomic, and political factors impede the delivery of SRH information and services to young people. Failure to provide youth-friendly SRH services, as well as unwelcoming behaviour and negative attitudes by healthcare workers, frequently act as barriers to young people's access and utilisation of SRH services (Mchome et al., 2015; Morris & Rushwan, 2015). For example, in 2019, 218 million women in LMICs intended to avoid pregnancy but did not use any modern method of contraception. This resulted in unplanned pregnancies in about half of them and increased rates of unsafe abortions. During the same period, sixteen million women and thirteen million new-born babies were denied care for major antenatal and childbirth complications, and there were 299,000 pregnancy-related deaths and 2.5 million neonatal deaths. During the same year, 14 million adolescent women between the ages of 15 and 19 in LMICs had unmet demand for modern contraception. This contributed to ten million unplanned pregnancies among the same age group, as well as long-term negative consequences such as disruptions in their education, professional opportunities, and, most importantly, reproductive sovereignty. Inequalities like these inspired a central pillar of the SDGs: leaving no one behind. While significant progress on the SDGs has been made in recent years, some disparities have persisted, including those between rural and urban communities, as well as those caused by socioeconomic status, gender, age, and other demographic factors (Starrs et al., 2018).

Over the last quarter century, youth-friendly SRH services have been promoted and implemented globally to improve delivery and access of SRH services to young people (Mazur et al., 2018; Mchome et al., 2015). Regardless of this positive development, adolescents and young people, especially in sub-Saharan Africa, have been reported to

have limited access to SRH services (Melesse et al., 2020; Ninsiima et al., 2021). These scenarios put pressure on sub-Saharan African policy makers and practitioners to find ways of mitigating SRH challenges (Sully et al., 2020). As such, health care providers have an imperative role to play in ensuring that adolescents and young people have access to high quality and non-judgmental SRH services in youth-friendly settings that recognize their unique bio-psychosocial needs. (Todd & Black, 2020). The challenges of adolescents' sexual and reproductive health are currently recognised by Sustainable Development Goal (SDG) number 3, whose mandate is to eliminate HIV infections and provide universal access to sexual and reproductive health services, as well as to incorporate such services into national strategies (Mwale & Muula, 2017; United Nations, 2015; United Nations, 2017).

In most African countries, intensive promotion of SRH was done prior to the International Conference on Population and Development (ICPD) in 1994, which advocated for extensive approaches or strategies that shape policies, services and programs for equitable healthcare to meet individual needs, especially those of women (Hempel, 1996). Family planning promotes self-actualisation, empowerment, as well as good health and wellbeing, and reduces maternal and infant mortality through the prevention of unintended pregnancies and unsafe abortions. Efficient and effective family planning programs in Sub-Saharan African countries could bring about economic benefits when a decrease in fertility results in a relatively increased working-age group population and lower dependency ratio (May, 2017).

Several countries in sub-Saharan Africa, including Zimbabwe, Malawi, Kenya, Rwanda, Ethiopia and South Africa, have executed successful SRH programs among adolescents and young people (WHO, 2017; Tsui et al., 2017). The SRH programs or interventions usually include one or more of the following components:

- Family Planning services integrated within preventive and curative SRH care.
- Education and counselling for informed family planning decision making.
- Availability of and access to contraceptive methods.
- Family planning within integrated primary health care, including the prevention and care for STIs and HIV, cervical cancer, and breast cancer (WHO, 2017).

Thus, African countries have acknowledged the importance of ASRH and, as a result, have been implementing related strategies both at community and facility levels. These strategies have included comprehensive sexuality education (CSE), referred to as sexuality and relationship education curricula that are age-appropriate and culturally relevant (Haberland & Rogow, 2015; Haberland, 2015). They have also encompassed peer education, mass media campaigns, cash transfers and youth-friendly centres, which are spaces created for young people to access ASRH health information and services (IPPF, 2006; Denno et al., 2015; Chandra-Mouli et al., 2015), and youth-friendly services, which are accessible and appropriate services that appeal to youths in a manner that promotes equity and interactions between users and providers (Thomée et al., 2016).

Studies assessing the efficacy of ASRH strategies in low and middle-income nations have yielded diverse findings. An examination outlining the results of ASRH strategies at both facility and community levels has indicated inconclusive proof of their efficacy in enhancing ASRH outcomes among marginalized populations or raising community awareness (Denno et al., 2015). A review evaluating the impact of CSE strategies, for instance, reports its effectiveness in terms of reducing high-risk sexual behaviour (Haberland & Rogow, 2015; Michielsen et al., 2010; Rink & Wong-Grünwald, 2017), HIV, STIs and the incidence of unprotected sex (Scott-Sheldon et al., 2013; Jewkes et al., 2008). CSE was also found to delay sexual debut in African countries and improve condom use (Kirby & Laris, 2009; Michielsen et al., 2010; Vanwesenbeeck et al., 2016). Some evidence attributes the success of CSE to its design, theoretically and empirically linking its success to the right age-targeting and consideration of gender power differences (Mwale & Muula, 2017). Other interventions imparting knowledge, such as media campaigns and life skills training, have been found to reduce the prevalence of STIs and multiple sexual partners and to increase condom use, abstinence and health service utilisation (Kalamar et al., 2016).

Additional strategies that have shown efficacy are interventions that specifically address poverty by means of subsidies and monetary transfers, thereby discouraging the engagement of young individuals in hazardous SRH behaviours in their pursuit of financial gains (Heinrich et al., 2017). For example, in Kenya and South Africa, cash transfers were found to reduce pregnancy, early sexual debut (sex before the age of 18), and early marriage among female adolescents from low-income families (Handa et al.,

2017; Handa et al., 2015; Heinrich et al., 2017). Cash transfers also reduced the prevalence of STIs among adolescents in schools, albeit not in those already out of school in Malawi (Baird et al., 2012). In Kenya, the effectiveness of subsidies in reducing pregnancy and STIs was established when combined with CSE (Duflo et al., 2015).

While these and other studies have improved our understanding of how specific ASRH interventions affect service utilisation and health outcomes, this study aims to expand our understanding by evaluating the impact of these studies while focusing on study quality in Sub-Saharan Africa. In addition, the current study zeroed in on Progress-Plus factors to describe how the SRH opportunities and outcomes are stratified in the delivery of the ASRH interventions (Denno et al., 2015; Craig & Robinson, 2019). Taking into account these social and economic determinants of health allows policy makers to implement policies and programs that focus on these factors for improvement (Barreto, 2017). The current review used a hybrid approach of specific and non-specific terms to filter studies for outcomes reporting by social determinants (Prady et al., 2018).

Findings from the review could help inform funding and investment policies targeting adolescents and young people SRH services in youth friendly environments.

2.3 RESEARCH QUESTION

What is the impact or effect of SRH interventions on adolescents' and young people's sexual and reproductive health outcomes in sub-Saharan Africa?

2.4 AIM

The aim of this systematic review was to identify SRH interventions and assess the impact or effects of the interventions on SRH outcomes among adolescents and young people in sub-Saharan Africa.

2.5 METHODOLOGY

2.5.1 Methods

PRISMA-E 2012 reporting guidelines for equity-focused reviews were used to search and select the articles to be included in the systematic review (Welch et al., 2012). The PRISMA-E checklists (S1 Table 1 in Chapter 2 Appendices) were used to ensure the inclusion of all relevant information in the analysis. The PROGRESS-Plus framework proposed by the Campbell and Cochrane Equity Methods Group was used to guide data extraction and the tool ensured explicit consideration of social inequalities in the design

of the systematic review (O'Neill et al., 2014). The population, intervention, comparison, outcome and context (PICOC) model for review questions was applied to design the research question (Petticrew & Roberts, 2008).

Two reviewers independently extracted data from each article retained in the full-text review using a predefined data extraction excel spreadsheet form. Disagreements were resolved by consensus and consulting a third reviewer where necessary.

2.5.2 Study protocol and registration

The protocol for this study was developed prospectively and registered in the International Prospective Register of Systemic Reviews (PROSPERO) online database (registration number CRD42021272579).

2.5.3 Search strategy

The search strategy was carried out in five databases: the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Psychological Information Database (PsycINFO), PubMed, Scopus, and the Cochrane Library. The databases were searched using predefined keywords: contraceptives and young adults and their synonyms. Variations of each concept were discussed and developed by the authors, informed by previous systematic reviews. **Table 2.1** illustrates the search strategy for PubMed including Boolean operators, which was adapted for the other databases. Additional studies were identified by searching reference lists from primary studies and review articles. Relevant articles were also searched using the PubMed "similar articles" function. To maximise contemporary policy relevance of the findings, literature searches were limited to the time frame of January 2010 to August 2021.

Table 2.1: Search strategy in PubMed.

Query	Results
((((((Contraception[Title/Abstract]) OR ('Family plan'[Title/Abstract])) OR ('Family planning'[Title/Abstract])) OR ('Birth control'[Title/Abstract])) OR ('Birth prevention'[Title/Abstract])) OR (('Conception prevention'[Title/Abstract]) AND ('Planned parenthood'[Title/Abstract]))) AND ((((((((('Young person'[Title/Abstract]) OR ('Young people'[Title/Abstract])) OR ('Young adults'[Title/Abstract])) OR ('Young women'[Title/Abstract])) OR (Adolescents[Title/Abstract])) OR (Teenagers[Title/Abstract])) OR (Teens[Title/Abstract])) OR (Youth[Title/Abstract])) OR ('Generation Z'[Title/Abstract]))	1,984
((((((Contraception[Title/Abstract]) OR ('Family plan'[Title/Abstract])) OR ('Family planning'[Title/Abstract])) OR ('Birth control'[Title/Abstract])) OR ('Birth prevention'[Title/Abstract])) OR (('Conception prevention'[Title/Abstract]) AND ('Planned parenthood'[Title/Abstract]))) AND ((((((((('Young person'[Title/Abstract]) OR ('Young people'[Title/Abstract])) OR ('Young adults'[Title/Abstract])) OR ('Young women'[Title/Abstract])) OR (Adolescents [Title/Abstract])) OR (Teenagers[Title/Abstract])) OR (Teens[Title/Abstract])) OR (Youth[Title/Abstract])) OR ('Generation Z'[Title/Abstract]))	6,604
((((((((('Young person'[Title/Abstract]) OR ('Young people'[Title/Abstract])) OR ('Young adults'[Title/Abstract])) OR ('Young women'[Title/Abstract])) OR (Adolescents[Title/Abstract])) OR (Teenagers[Title/Abstract])) OR (Teens[Title/Abstract])) OR (Youth[Title/Abstract])) OR ('Generation Z'[Title/Abstract])	276,076
'Generation Z'[Title/Abstract]	91
Youth[Title/Abstract]	79,951
Teens[Title/Abstract]	6,840
Teenagers[Title/Abstract]	13,114
Adolescents[Title/Abstract]	77,764
'Young women'[Title/Abstract]	24,803
'Young adults'[Title/Abstract]	73,548
'Young people'[Title/Abstract]	31,456
'Young person'[Title/Abstract]	1,486
(((((Contraception[Title/Abstract]) OR ('Family plan'[Title/Abstract])) OR ('Family planning'[Title/Abstract])) OR ('Birth control'[Title/Abstract])) OR ('Birth prevention'[Title/Abstract])) OR (('Conception prevention'[Title/Abstract]) AND ('Planned parenthood'[Title/Abstract]))	65,250
('Conception prevention'[Title/Abstract]) AND ('Planned parenthood'[Title/Abstract])	3
'Birth prevention'[Title/Abstract]	262
'Birth control'[Title/Abstract]	5,425
'Family planning'[Title/Abstract]	42,229
'Family plan'[Title/Abstract]	16
Contraception[Title/Abstract]	41,049

2.5.4 Data collection and analysis

2.5.4.1 Selection of studies

Two reviewers screened the titles and abstracts independently, excluding articles that were irrelevant. Identified articles were exported into Mendeley Desktop, where duplicate articles were removed. After removal of duplicates, two reviewers screened the full texts of the remaining potentially relevant articles to determine whether they met eligibility criteria.

2.5.4.2 Data extraction

Two reviewers independently extracted data from each article retained in the full-text review using a pretested standard form. The following data were extracted from each article:

1. Bibliographic information
2. Study aims or questions
3. Study characteristics (design, sample size, number of arms)
4. Intervention and control (type and characteristics of interventions and controls)
5. Study setting (country)
6. PROGRESS-Plus factors
7. Outcome measures (type of outcome, definition of outcome)

2.5.4.3 Criteria for considering studies for the review

Studies that met the following criteria were included:

Population: Studies that focused on adolescents and young people aged 15–24 years in sub-Saharan Africa (as defined by the WHO).

Intervention: This review focused on articles that reported on the effectiveness of SRH interventions on pregnancy and contraceptive use. The review also focused on papers that report effectiveness of SRH interventions on secondary outcomes such as increased knowledge of contraceptives, positive attitude/change of conception towards contraceptives and dispelling myths and misconceptions.

Comparison: Studies with comparison groups that included older people (25 and above), no intervention, standard care group and another intervention.

Study designs: Randomised controlled trials (RCTs), interrupted time series, prospective or retrospective cohort studies and controlled before and after designs that meet the inclusion criteria were considered for the study.

Studies that met the following criteria were excluded:

- Full text and abstract were both unavailable or only the abstract was available but did not convey the needed data
- Conference abstract
- Narrative or systematic reviews
- Published before January 2010

Outcomes:

Primary outcomes

Included studies that had one of the measures listed below:

- Contraception use
    - use of a new method
    - improved use or continuation of a method
- Pregnancy (at least six months after the intervention began)

Secondary outcomes

- Knowledge of contraceptive effectiveness or effective method use
- Attitude about contraception or a specific contraceptive method

Context: Any setting (i.e., urban, suburban, rural).

2.5.4.4 Assessment of study quality

For randomised controlled trials (RCTs) the reviewers used version 2 of the Cochrane Risk-of-Bias tool for randomized trials (RoB 2). Bias was assessed as a judgment (high, low, or unclear) for individual elements from five domains (selection, performance, attrition, reporting, and other) (*RoB 2: A Revised Cochrane Risk-of-Bias Tool for Randomized Trials | Cochrane Bias*). Risk of Bias in Non-Randomized Studies - of Interventions (ROBINS-I) tool was used by the reviewers to assess risk of bias in the results of non-RCTs. The ROBINS-I tool assesses confounding participant selection, classification of the intervention, departures from the intended intervention, missing data, measurement of outcomes, selection of the reported results, and overall bias. Studies were classified as being of low, moderate, serious or critical risk of bias (Sterne et al., 2016).

2.5.4.5 Data synthesis

Due to the heterogeneity in the design of included studies, outcomes and interventions, meta-analysis was considered inappropriate. Data synthesis followed a thematic synthesis

approach to enable the development of descriptive themes from the research. A narrative summary was used to interpret the results and describe how they relate to the review's aim and questions (Edelman et al., 2017).

2.6 PATIENT AND PUBLIC INVOLVEMENT STATEMENT

There is no requirement for ethical approval because the work was conducted using previously published data, without human beings' involvement.

2.7 RESULTS

2.7.1 Identification of potential studies

Electronic searches of 5 databases identified 10383 potential articles (Pubmed: 1984, CINAHL: 1629, Cochrane library: 1771, PsycINFO: 1095, Scopus: 3904). After screening the titles and abstracts, 10012 were removed, followed by removal of 59 duplicates, hence a total of 312 full text articles were screened for eligibility. Full text screening led to a total of 13 full text articles (19 studies) that were included in the systematic review. **Fig.2-1** shows the flow chart of the studies identification and selection process.

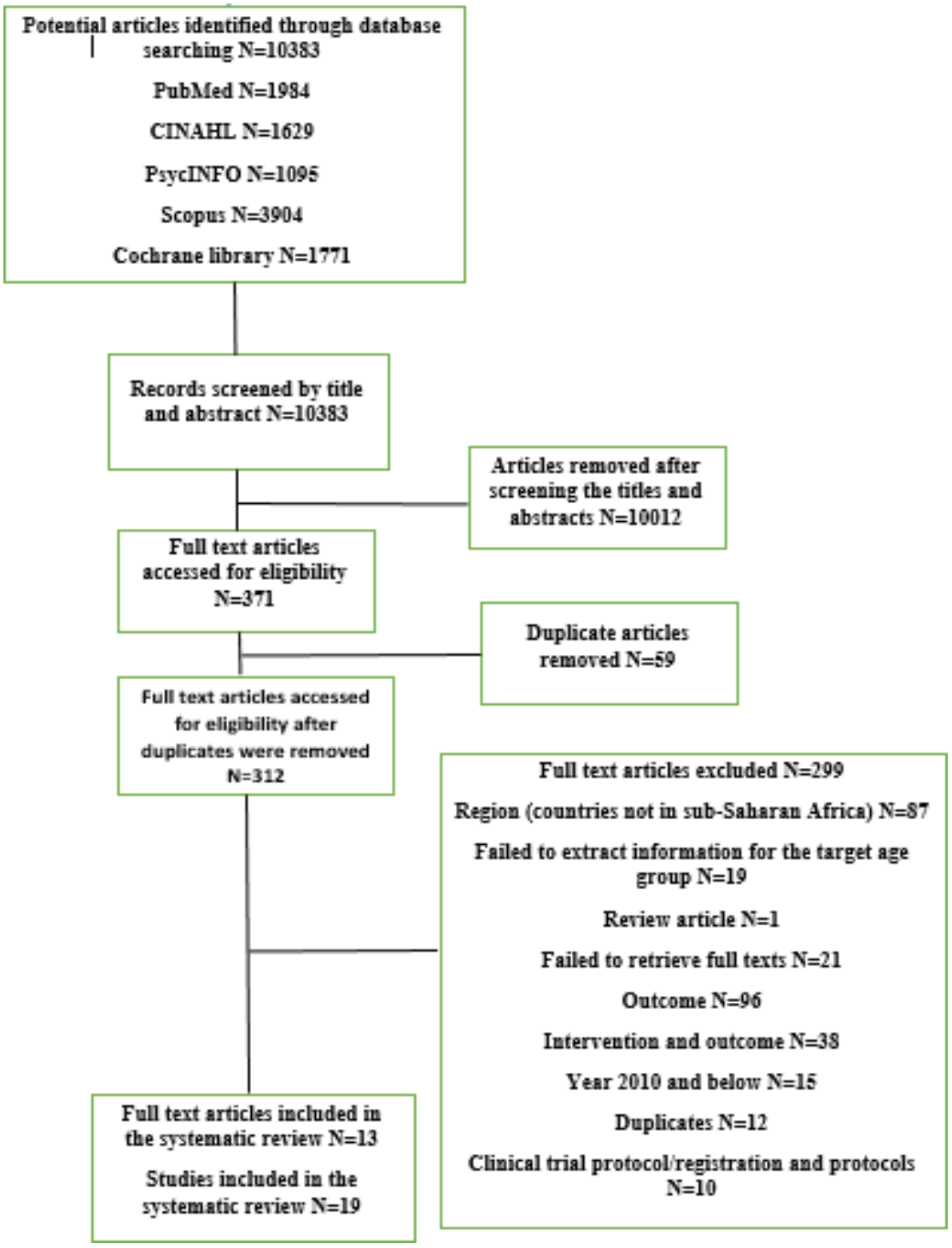

Figure 2.1: shows the flow chart of the studies identification and selection process.

2.7.2 Characteristics of the included articles

The general characteristics of the articles and studies included in the systematic review are summarised in **Table 2** (See Chapter 2 Appendices). The included articles were from 9 countries, that is, Ethiopia (n=3), Ghana (n=2), Malawi (n=2), Nigeria (n=1), Niger

(n=1), Uganda (n=1), Zimbabwe (n=1), Angola (n=1), and Kenya (n=1). Out of the 19 studies, 15 (78.9%) included in the review were non- randomized controlled trials (quantitative pre-test-post-test design, cross sectional studies, quasi-experimental and cohorts) and the remaining four studies were randomized controlled trials.

2.7.3 Usage of PROGRESS-Plus factors

All 13 articles and 19 studies reported at least 2 PROGRESS-Plus factors (**Table 2.2**). Age distribution was the most reported PROGRESS-Plus factor (reported in 17 studies) followed by marital status and education levels, which were both reported in 12 studies. Religion and gender were reported in 6 and 5 studies respectively. Place of residence, race/ethnicity and occupation were each reported in 3 studies. Socio-economic status and living situation were the least reported PROGRESS-Plus factors, being reported in two studies each. Six studies also reported parity (number of living children) which is an important factor in determining contraceptive use in young adults. Seventeen studies considered PROGRESS-Plus factors as control variables when measuring the effect of the intervention for example in logistic regression. Among these, age, education levels and marital status were most controlled for. In three studies in an article by Morgan et al., 2020 PROGRESS-Plus factors were identified, but were not included in final analyses.

Table 2.2: Usage of PROGRESS-Plus factors within all studies.

PROGRESS-Plus factor	Use of PROGRESS-Plus factors	Control variables in measuring intervention effect
Place of residence	3	3
Race/ethnicity	3	3
Occupation	3	3
Gender/sex	5	5
Religion	6	6
Education	12	12
Socio-economic status (SES)	2	2
Income	0	0
Number of living children/Parity	6	6
Age	17	17
Marital status	12	12
Living situation	2	2

2.7.4 Risk of bias in included RCT studies

The risk of biased results for RCT studies are summarised in **figs 2.2 and 2.3**. In the randomisation process domain, two studies from articles by Lemani et al, 2017 and Yakubu et al., 2019 had low risk of bias and two studies from one article by Nuwanyama et al.2020 had high risk of bias. In the deviation from intended intervention domain and missing out data domains all studies had low risk of bias. In the measurement of outcome domain, one study by Lemani et al., 2017 had high risk of bias. In the selection of reported results, domain two studies had a high risk of bias and three studies had low risk of bias. In the overall risk of bias domain, only one study by Yakubu et al., 2019) had low risk. Two studies, one by Lemani et al., 2017 and one by Nuwanyama et al., 2020 had some concerns. Two studies Nuwanyama et al., 2020 had high risk overall bias.

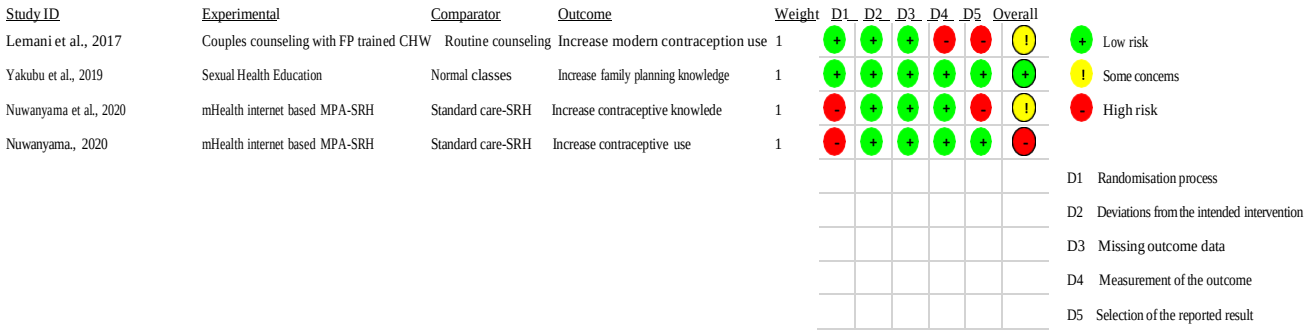

Figure 2.2: Risk of bias for each domain for RCT studies included in the review.

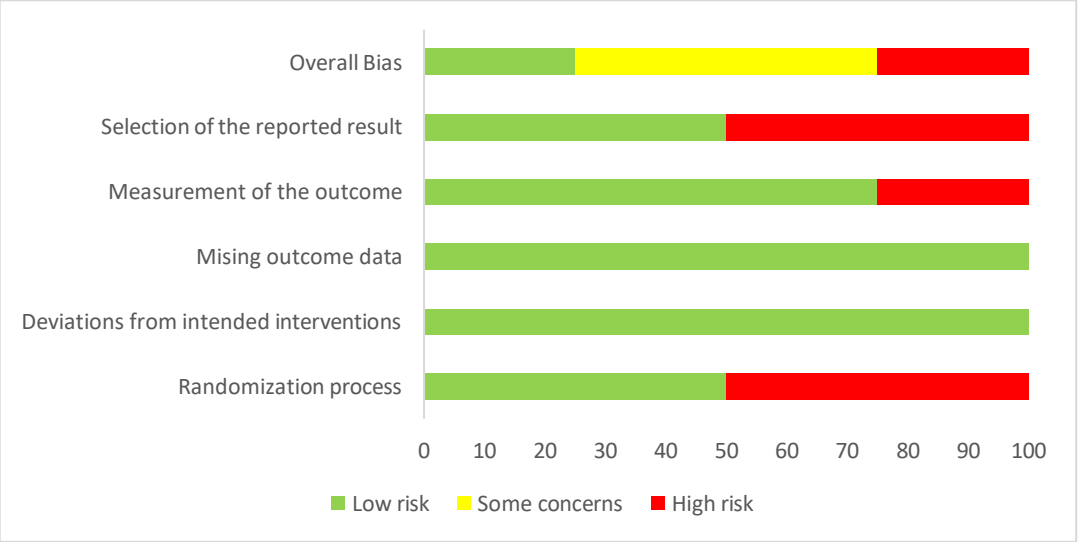

Figure 2.3: Risk of bias graph of each domain presented as percentages across all RCT included in the review.

2.7.5 Risk of bias of non-randomised control studies included in the systematic review.

The risk of bias assessment results using the ROBINS-I tool for the fifteen non-RCTs studies is shown in **Table 2.3**. Based on the ROBINS-I tool, most studies 60% (9) were labelled as moderate risk studies. Three studies, two by Gaughran et al., 2014 and one by Brooks et al., 2019 were judged as low risk studies. Two studies one by Wolf et al., 2017 and one by Fikrae et al., 2017 were labelled as serious risk studies and a study by Fikrae et al., 2018 was labelled as a 'critical risk'.

Table 2.3: Quality assessment of quantitative non-randomised controlled studies included in the systematic review.

Study	Outcome	Bias due to confounding	Bias in selection of participants into the study	Bias in classification of interventions	Bias due to deviations from intended interventions	Bias due to missing data	Bias in measurement of outcomes	Bias in selection of the reported result	Overall, Bias
Morgan et al., 2020	**Increase birth spacing intentions**	Moderate	Low	Low	Low	Moderate	Moderate	Low	Moderate
Morgan et al., 2020	**Increase knowledge of modern contraceptives**	Moderate	Low	Low	Low	Moderate	Moderate	Moderate	Moderate
Morgan et al, 2020	**Decrease myths and misperceptions of using modern contraception**	Moderate	Low	Low	Low	Moderate	Moderate	Low	Moderate
Morgan et al., 2020	**Increase modern contraception use**	Moderate	Low	Low	Low	Moderate	Moderate	Low	Moderate
Fikrae et al., 2017	**Increase contraceptive (LARCs) use**	Serious	Low	Low	Low	Low	Low	Moderate	Serious
Fikrae et al., 2018	**Decrease Myths and Misconceptions about LARCs**	Serious	Critical	Low	Low	NI	Low	Low	Critical
Brooks et al., 2019	**Use of modern contraceptives**	Low	Low	Low	Low	Low	Low	Low	Low

Rosenberg et al., 2018	**Increase family planning service uptake**	Moderate	Low	Low	Low	Low	Low	Low	Moderate
Ahmed et al., 2020	**Use of modern Contraceptive**	Moderate	Low	Low	Low	Low	Low	Low	Moderate
Oberth et al., 2020	**Increase knowledge of modern contraceptives**	Moderate	Moderate	Low	Low	Low	Low	Low	Moderate
Oberth et al., 2020	**Pregnancy**	Moderate	Moderate	Low	Low	Low	Low	Low	Moderate
Almeida et al., 2018	**Sexual health education**	Moderate	Low	Low	Low	Low	Low	Low	Moderate
Gaughran et al., 2014	**Increase family planning knowledge**	Low	Low	Low	Low	Low	Low	Low	Low
Gaughran et al., 2014	**Pregnancy**	Low	Low	Low	Low	Low	Low	Low	Low
Wolf et al., 2017	**Increase contraceptive knowledge**	Moderate	Low	Low	Low	Serious	Low	Moderate	Serious

2.8 SRH INTERVENTIONS IDENTIFIED FROM THE REVIEW

2.8.1 Community-based program intervention

Morgan et al., 2020 used a community-based programme as an intervention in four studies in their article. The programme included peer group sessions with first-time mothers, small group sessions with peer group members' husbands/partners, small group sessions with older women, typically the mothers or mothers-in-law of peer group members, home visits by community health workers, community sensitization, and ongoing family planning service delivery at facilities and mobile outreach (Morgan et al., 2020).

2.8.2 Community health worker intervention

A community health worker, also known as a lay health worker, is a healthcare worker who performs functions related to healthcare delivery and has been trained in some way in the context of an intervention but does not hold a formal professional or para-professional certificate or tertiary education degree (WHO, 2013). In the current review, a study by Brook et al., 2019, assessed the impact of community health worker visits on modern contraception use.

2.8.3 Sexual and reproductive health (SRH) education

Comprehensive SRH education has been reported to be an effective strategy for improving adolescents and young people's reproductive health (Scull et al., 2021). In the current review, four articles (Almeida et al., 2019; Fikree et al., 2018; Gaughran & Asgary, 2014; Wolf et al., 2017) used SRH education as the intervention. Details of the reproductive health education strategies utilized by each study are given in **Table 2** (See Chapter 2 Appendices).

2.8.4 Youth friendly health services

There is evidence that youth friendly health services (YFHS) improve access to, and utilisation of SRH services by adolescents and young adults (Denno et al., 2015; Munea et al., 2020) . In the current review, two studies used YFHS as interventions to increase modern contraceptives knowledge and uptake by adolescents and young people (Oberth et al., 2021; Rosenberg et al., 2018).

2.8.5 Counselling

Counselling, as an intervention, has been shown to improve SRH services utilisation among young people. Counselling can be delivered directly in person, online, or via the telephone, either by medical or nursing staff, or peers in individual or group settings. The counselling interventions may consist of a single component or multiple components delivered in a single session, or in multiple sessions at various time points (Mack et al., 2019). In the present review, two studies, one by Fikree et al, 2017 and one by Lemani et al., 2017, used counselling as an intervention to increase modern family planning services uptake and use among young women. In both studies, counselling interventions consisted of multiple components. For Lemani et al., 2017, the counselling intervention was in the form of couples' family planning counselling with trained community health workers and in Fikree et al., 2017, the intervention was counselling provided by trained YFHS providers coupled with access to contraceptives in the same YFHS unit.

2.8.6 Mobile phone-based interventions (mHealth)

Expansion of mobile phone technology and use in recent years provides an important tool to reach underserved populations in low to middle income countries. Populations with restricted access can be reached despite location and need (Palmer et al., 2020; Pattnaik et al., 2020; Smith et al., 2015). With the increasing popularity of mobile based interventions with young people, they promise to improve SRH services utilisation by adolescents and young women. In the present review one study by Nuwamanya et al., 2020, used an internet based mobile phone application to improve the use of modern contraceptive methods.

2.9 REPRODUCTIVE HEALTH OUTCOME MEASURES

For the purpose of narrative review, and in light of the study's main research objectives, studies were classified into the following outcome measures: increased knowledge/awareness of modern contraceptives; increased modern contraceptive use/uptake; pregnancy; decreased myths and misperceptions of using modern contraception; increased birth spacing intentions and improved sexual abstinence in adolescents.

2.9.1 Use/uptake of modern contraceptives/family planning

Modern contraceptives (the pill, intrauterine devices, injections, the diaphragm, condoms, or implants) utilization was the most reported outcome in the review. All studies that met

the inclusion criteria reported significant increases in modern family planning uptake after implementation of interventions. Morgan et al., 2020, observed that current use of a contraceptive method increased significantly from baseline to endline after controlling for predictors of modern contraceptive use such as PROGRES-Plus factors (age, marital status, and highest education level attained). When compared to baseline, first-time mothers were approximately three times more likely to use a modern family planning method, while male partners were nearly four times more likely. After adjusting for some PROGRESS-Plus factors Nuwamanya et al., 2020, reported that an mHealth intervention resulted in a statistically significant 1.6-fold increase in the odds of contraceptive use compared to standard care in SRH services delivery (Nuwamanya et al., 2020).

Brooks et al., 2019, reported using a regression model that, after controlling for PROGRESS-Plus factors, the odds of current use of modern contraceptive methods were higher among young married women who had been visited by a community health worker in the previous three months compared to those who had not been visited during the same period (adjusted odds ratio = 1.94 [95% CI 1.07-3.51]). Additionally, Brooks and colleagues, 2019 reported that two PROGRESS-Plus factors (increasing parity and type of residence) were also statistically significant and positively associated with current use of modern contraceptives (Brooks et al., 2019). Completion of all Sista2Sista exercises (A YFHS intervention in Zimbabwe) was reported to be associated with a 38.0% increase in the use of a modern contraceptive method (Oberth et al., 2021). Rosenberg et al. (2018) asserted that providing adolescent girls and young women with a YFHS model of service delivery, which included youth focused spaces, young peer educators, youth-friendly health service providers, and integrated services, resulted in significantly higher uptake of modern contraceptives (condoms, hormonal contraception, and dual methods) compared to the standard care group (see **Table 2** in Chapter 2 Appendices, for details). A combination of counselling, YFHS and access to modern contraceptives intervention was statistically significantly associated with increased uptake in modern contraceptives. Morden contraceptives uptake at pre-intervention (0.70) increased to 1.30 for the post-intervention phase (*p- value* <0.005) (Lemani et al., 2017). A study in Malawi by Lemani et al., 2017, reported that young women in a couples counselling intervention were 8% more likely to accept condoms, however this was not significant as the *p-value* was reported to be 0.20. The couples counselling intervention also increased males' modern contraceptives (condoms) uptake (Lemani et al., 2017).

2.9.2 Awareness of modern contraceptive methods/family planning knowledge

Family planning knowledge is defined as any contraceptive method a respondent can spontaneously list or recall as a birth control method (Hutchinson et al., 2018). Three interventions (community-based program, mHealth, SRH education) reported in this review increased the knowledge or awareness of modern contraceptive methods. Community-based programs in a study by Morgan et al., 2020 significantly increased knowledge of modern contraceptive methods among first time mothers from 50% at baseline to 94% at endline (*p-value*<.000, Pearson chi-square), and among male partners from 38% at baseline to 75% at endline (*p-value*<.000, McNemar's test). After adjusting for some PROGRESS-Plus factors, Nuwamanya et al., 2020, reported that an mHealth intervention resulted in a significant increase in modern contraceptives knowledge compared to standard of care-SRH service (Nuwamanya et al., 2020). In a study by Almeida et al., 2019, an SRH education intervention resulted in a significant increase in knowledge of all contraceptive methods (*p-value*< 0.001). Almeida et al., 2019, also reported that married women and those separated or divorced were more likely to use modern contraceptives in both urban and rural areas of Ethiopia compared to women who had never been married. A study by Wolf et al., 2017, also demonstrated that an SRH education intervention significantly increased modern contraceptives knowledge (*p-value*< 0.001). Wolf et al., 2017, also concluded that age had a significant positive effect on participants' ability to retain modern contraceptives knowledge. Education levels, religion, gender, current school attendance and prior sexual activity were reported not to have a statistically significant effect on modern contraceptives knowledge.

2.9.3 Pregnancy

The Sista2Sista program, an YFHS intervention, was found to not reduce the likelihood of falling pregnant among adolescent girls and young women of all ages in Zimbabwe, indicating that no amount of Sista2Sista program exposure was found to influence the likelihood of falling pregnant.

However, a positive impact was noticed for teenage pregnancy among Sista2Sista participants aged 10-19. This was only observed in those who finished the Sista2Sista exercises. Completing the program reduced the chances of teenage pregnancy by 62.0% (Oberth et al., 2021). This agrees with a systematic review by Lopez et al., 2016, who stated that, trials focused on pregnancy prevention had limited effect. School-based SRH interventions are widely accepted as strategies to reduce high-risk sexual behaviour

among adolescents and youth (Mason-Jones et al., 2016). Using a school-based intervention, a study by Gaughran and colleagues., 2014, observed an improvement in general knowledge of teenage pregnancy (Gaughran & Asgary, 2014).

2.9.4 Myths and misperceptions of using modern contraception

A previous study by Morgan et al., 2020, showed that first time mothers and their male partners believed that using contraception damages women's reproductive organs and could create difficulties in conceiving or can even cause permanent sterility after contraception discontinuation. In the present review, two studies attempting to correct this type of misconception were included; one by Fikree et al., 2018 and another by Morgan et al., 2020. Morgan et al., 2020, reported that a community-based intervention significantly decreased the misperceptions that using contraceptives could negatively affect a woman's ability to bear children in the future among first time mothers and their male partners (*p-value*<0.000, Pearson chi-square and *p-value*<0.000, McNemar's test respectively).

2.9.5 Birth spacing intentions

A study by Morgan et al., 2020, delivered a community-based intervention that aimed to encourage a birth spacing gap of 3 years or more between births. At the end of the intervention there was a significant increase of young people who preferred no more children or to wait 3 years or longer (*p-value*<0.000, McNemar's test).

2.9.6 Improvement in adolescent sexual abstinence

Yakubu and colleagues, 2019, used a binary logistic regression model to evaluate the impact of an SRH education intervention on adolescent sexual abstinence. The SRH educational intervention resulted in a significant improvement in sexual abstinence in the intervention group when compared to the control group (OR = 13.89, 95% CI (2.46–78.18, *p-value* <0.003). The educational intervention, which was guided by the Health Belief Model (HBM), significantly improved sexual abstinence among adolescent girls. To exclude possible interference, social class, age, knowledge, intention and HBM constructs at baseline were used as possible confounders of abstinence practice. The HBM and PROGRESS-Plus factors (age, social class, grade, ethnicity and birth order) were found not to be motivators of abstinence practice (*p-value* <0.05) (Yakubu et al., 2019).

2.10 DISCUSSION

The review proposes that a variety of extensive interventions that focus on sexual health education, counselling, promotion, and provision of consistent birth control methods have the capability to avert and manage the detrimental consequences associated with risky sexual behaviour. Enhancing the understanding of sexual and reproductive health among adolescents and promoting the utilization of contraceptives was found to result in a decrease in the prevalence of unplanned pregnancies among adolescents and young females.

The results are consistent with other studies that have examined the usefulness of various interventions for improving young people's sexual and reproductive health. A previous Cochrane review of preventive interventions for unintended pregnancies among adolescents (school-based, community-based, clinic-based, and faith-based) found that a combination of educational and contraceptive measures can reduce the occurrence of unintended pregnancies in this population. Nonetheless, the data given in that study revealed equivocal results in terms of secondary outcomes such as the initiation of sexual activity, contraceptive use, abortion, delivery, and sexually transmitted illnesses (Oringanje et al., 2016). Group-based comprehensive risk reduction has also been presented as an effective strategy to reduce adolescent pregnancy, HIV, and STIs while effectiveness of group-based abstinence education was inconclusive (Chin et al., 2012). Another review on adolescent fertility in LMICs suggests improved knowledge-based indicators in the intervention groups of almost all interventions evaluated; however, it is not clear if such interventions necessarily lead to short- or long-term behavioural change (McQueston et al., 2012; Widman et al., 2016).

As a result, raising awareness about the benefits of contraceptive services and empowering adolescents to make their own contraceptive decisions is critical (Chandra-Mouli et al., 2014). Combining educational programs with youth-friendly services, health centre outreach activities and media campaigns are interventions with supporting evidence (Kesterton & Cabral de Mello, 2010). Activities that combine efforts to increase community support for adolescent sexual and reproductive health with efforts to improve service quality are effective at increasing uptake of sexual and reproductive health services (Denno et al., 2015). Numerous program assessments have revealed service barriers that many teenagers confront, such as providers' judgmental attitudes, a lack of

confidentiality, restricted contraceptive alternatives, and insufficient rules and standards to protect adolescents' rights to information and services (Chandra-Mouli et al., 2014; High Impact Practice in Family Planning, 2015). In terms of official policies, almost one in every five nations restricts access to contraceptive services. Parental consent requirements for minors to access services are among the most common constraints, and they are in place in 9% of the 186 countries with data. Limits based on a minimum age or marital status are in place in 5% of countries (United Nations, 2017). However, even in nations where statutory limits do not exist, teenagers suffer provider prejudice in numerous ways. doctors may refuse to offer hormonal therapies to young individuals due to erroneous beliefs that they may impede a return to fertility, or medical professionals may discriminate against unmarried young people because they believe they should not be sexually active (Solo & Festin, 2019). Recent suggestions on self-care measures, such as self-administered injectables and over-the-counter oral contraceptives may assist teenagers in overcoming some of these systemic hurdles (WHO, 2019).

2.11 LIMITATIONS AND RECOMMENDATIONS

Despite providing a broad overview of the impact of SRH interventions on reproductive health outcomes, the focus on a systematic review limited our ability to examine the impacts of interventions in detail and statistically. Statistical synthesis was not possible due to considerable heterogeneity across the articles and studies included in the review, and the SRH outcomes and interventions reported. To perform a meta-analysis, it is recommended that future reviews should focus on a single SRH outcome and a single intervention.

Despite different PROGRESS-Plus factors being reported to influence the effect of SRH interventions, studies in the review did not include all PROGRESS-Plus factors in their analysis, which might have resulted in over estimation or underestimation of the impact of the interventions. Therefore, it is recommended that future studies be carried out with rigorous designs and longer-term follow-up to use all PROGRESS-Plus factors as control variables to measure the impact of SRH interventions and maximize applicability of results.

2.12 CASE FOR ZIMBABWE

Although the Zimbabwean government has implemented family planning programs, the programs still face some challenges as discussed in chapter one. In response to these challenges faced by young people, Zimbabwe implemented the first national Adolescent Sexual and Reproduction Health (ASRH) strategy during the period 2010–2015. The two main objectives of the strategy were to promote safer SRH practices among adolescents and young people and to increase the availability, accessibility, and use of SRH services among young people aged 10-24 years (MoHCC, 2009; Mangombe et al., 2020; Remez et al., 2014). After chieving these objectives it was envisaged that SRH outcomes such as unmet need, abortion, knowledge of modern contraceptives, use of modern contraceptives and attitudes towards fertility will improve. This theory is depicted in the theory of change diagram based on the WHO framework (see figure 1.10 above).

Furthermore, these challenges have resulted in the current method use reflecting more reliance on SARCs, especially the pill and low uptake of LARCs, despite the high contraceptive discontinuation rates among young unmarried and sexually active women (WHO, 2016; ZimStat, 2015).

Therefore, there was need for research-based evidence that could inform the best use of resources through an evaluation of the impact on SRH outcomes following the implementation of the ASRH strategy (May, 2017).

2.13 CONCLUSION

In conclusion, community-based programs, mHealth, sexual and reproductive health education, counselling, community health workers (CHWs), youth-friendly health services (YFHS), economic support and mass media interventions generally had a positive effect on childbirth spacing, modern contraceptive knowledge, modern contraceptive use, adolescent sexual abstinence, pregnancy and myths and misperceptions of modern contraception. This systematic review could inform administrators, managers, and policymakers on the different SRH interventions to implement in different settings. Due to effectiveness of the practice of medicine and public health interventions supported by mobile devices among young people due to their privacy and ability to reach populations with restricted access to SRH services and the ability of mass media campaigns to target large populations, it is recommended that future

national interventions could include both components. To ensure optimum results, the national family planning program could be carried out under an enabling legal framework that can ensure equity in the access and use of family planning services, especially among adolescents, the age group that has high unmet family planning needs (ZimStat, 2015).

The following Chapter 3 focused on the Zimbabwean setting and investigated, according to the WHO framework and the subsequent theory of change described in Chapter 1, the impact on sexual and reproductive outcomes of the Adolescent Sexual and Reproductive Health program implemented in the country, from 2010 to 2015, targeting the 10-24 years age group.

CHAPTER 3: ANALYSIS OF THE IMPACT OF THE ZIMBABWEAN ADOLESCENT SEXUAL AND REPRODUCTIVE HEALTH STRATEGY ON SEXUAL AND REPRODUCTIVE HEALTH INDICATORS.

3.1 INTRODUCTION

Chapter 2 established that sexual and reproductive health (SRH) interventions implemented in other sub-Saharan African countries had a positive effect on reproductive health outcomes. To address SRH challenges faced by adolescents and young people in Zimbabwe, the government implemented the first national Adolescent Sexual and Reproductive Health (ASRH) strategy during the period 2010–2015. However, the ASRH strategy was implemented with different program intensities across the country's 10 provinces. Consequently, this chapter aims to evaluate the causal impact of ASRH program intensity on reproductive health outcomes such as abortion, modern contraceptive method usage, unmet need, attitude towards fertility and knowledge of modern contraceptive methods among young Zimbabweans.

3.2 BACKGROUND

3.2.1 Zimbabwean sexual and reproductive health (SRH) challenges among teenagers

Young people and adolescents aged 15-24 years make up a big proportion of the population in Africa's developing economies, with approximately 20% of the population aged 15–24 according to the United Nations (United Nations, 2021). Zimbabwe, one of Africa's developing economies, had a population made up of nearly 20% of adolescents and young people aged 15-24 in 2021 (ZimStat, 2022). This age group faces numerous challenges pertaining to their sexual and reproductive health (SRH) which are further compounded by their limited access to SRH information and services (Blum et al., 2015; Hensen et al., 2021; Phiri et al., 2022). Teenage pregnancy and adolescent fertility rate continue to be high at 22% and 100 births per 1,000 women ages 15–19, respectively. Meeting the special needs of this population group is, thus, of paramount importance (WHO, 2016).

Access to quality SRH services plays a vital role in the well-being of young people and can have lifelong health benefits (Mbadu et al., 2018). Adequate SRH service packages prevent and reduce adolescent reproductive health risks and problems (Abdurahman et

al., 2022). Consequently, inadequate SRH services have implications on human and country development; for instance, higher fertility rates among adolescents, unplanned and/or unwanted pregnancies, and maternal deaths (Gutiérrez et al., 2019).

3.2.2 Family planning programs

Many of the 17 Sustainable Development Goals are dependent on improvements in sexual and reproductive health and rights. The health-related SDG targets for 2030 include satisfying people's needs for modern contraception, reducing maternal and neonatal deaths, and ending the HIV epidemic. The SDGs also call for universal health coverage to reach the most disadvantaged populations. These goals align with other global initiatives such as Family Planning 2020 and the UN's Global Strategy for Women's, Children's and Adolescents' Health (WHO, 2015).

Despite family planning increasingly coming under the spotlight in many developing countries during the last three decades, unmet family planning need remains an issue in most of these countries (Sedgh et al., 2016). Levels of unmet need and unintended pregnancies are higher among LMICs, which is a catalyst for higher population growth rates in these countries (Morris & Rushwan, 2015). A recent review reported that improving family planning in LMICs appears to be cost-effective; however, this evidence was not entirely conclusive as the number of studies supporting the narrative were few and of varying quality and outcomes, thus making comparisons difficult (Zakiyah et al., 2016). Using data from Zimbabwe, this study was aimed at generating more comprehensive assessments of the impact of these interventions on SRH outcomes.

3.2.3 Family planning programs in Zimbabwe

A number of family planning programs have been running in Zimbabwe and these aim to reduce teenage pregnancies and unmet need, ultimately reducing maternal and infant mortality. Improving these sexual and reproductive outcomes will also generally improve the nation’s health and social development goals. Hence, the country plans to continuously address family planning program gaps, and strive for integrated family planning service delivery that is able to reach all the country’s regions and age groups, especially young people, who have a greater need for such services. Furthermore, an ideal family planning program ought to have a balanced mix of family planning methods to cater to different preferences. Specifically, access and uptake of long-acting and

permanent family planning methods have been lagging as compared to that of short-acting methods, especially the pill, even though these methods have been shown to be the most cost-effective (ZimStat, 2015; MICS, 2019; Blum, 2016)

Providing essential SRH services is critical to Zimbabwe's economic development and achievement of reproductive health–related Millennium Development Goals (Remez et al., 2014). Despite numerous programs aimed at the transfer of reproductive health information, young Zimbabweans still face unprecedented SRH challenges (Ngwenya, 2016). The Guttmacher Institute reported that in 2011, one-quarter of 15–19-year-old Zimbabwean adolescent girls had started childbearing and one-third of all the births were unplanned, that is, they were either wanted later in life or not at all. Modern contraceptives usage among married adolescents was reported to have declined in urban areas, affected by the country's worst economic crisis in the year 2008. In urban areas, the proportion of married adolescents who wanted to delay having children but were not using a method was reported to have risen from 14% to 28% between 2006 and 2011. Single, sexually active adolescents were reported to have, by far the greatest unmet need, at 62% in 2011, compared with 19% among their married counterparts (Remez et al., 2014).

To solve the SRH challenges faced by young people, Zimbabwe implemented the first national Adolescent Sexual and Reproduction Health (ASRH) strategy during the period 2010–2015 (MoHCC, 2009; Blum et al., 2015). While, subsequently, two ASRH strategy interventions have been implemented in Zimbabwe, there is limited information about their effectiveness in improving SRH outcomes among adolescents and young people in the country (Abdurahman et al., 2022; Blum et al., 2015). With this background, a quasi-experimental study employing the difference-in-differences (DID) approach, and logistic and linear regression models was carried out to evaluate the impact of the Zimbabwean 2010-2015 ASRH strategy on SRH indicators.

3.2.4 The Zimbabwe ASRH strategy 2010-2015

Launched in 2010, the first five-year ASRH strategy sought to address the obstacles mentioned above and in Chapter one by integrating socioeconomic, psychological, and physical factors through a multi-sectoral, hands-on approach involving adolescents and youth at all programming levels. It changed from earlier approaches, which were remedial in nature and non-ASRH specific, to concentrate more on preventive measures for young people who are sexually active and to address the obstacles to service uptake and access.

The method included encouraging teenagers to adopt healthy sexual and reproductive practices, such as postponing or having protected sex, avoiding multiple sexual partners, and regular HIV testing. Other aims of the strategy included increasing access, accessibility and usage of youth-friendly ASRH services, expediting the presence of a policy environment that is supportive of youth-friendly ASRH services and reinforcement of ASRH program coordination and partnerships. The five-year strategy emphasised transforming the risky sexual behaviour prevalent among young people, teaching life skills, giving access to youth-friendly services and bettering policy, advocacy and synchronization (Blum et al., 2015).

The community, health facility and school served as the main contact points for eligible beneficiaries. Community youth-friendly centres were created to educate community members on sexuality, therapy, leisure activities, and condoms. Health facilities provided space for a youth-friendly 'corner' offering voluntary testing, counselling, condoms, and family planning materials. Schools introduced life skills, CSE, and counselling through teachers and peer educators.

Age was the primary determining factor for qualification into the program initiatives, with the targeted age range being from 10 to 24 years. This meant that only individuals between the ages of 10 and 24, specifically adolescents and youths, had access to youth-friendly corners, services, and were the focus of youth-friendly awareness activities conducted through hospitals, schools, and the community. Those who were 25 years and older were not eligible for the ASRH program, but still had the option to utilize regular primary health facilities for their healthcare needs. For the purposes of this study, adolescents were defined as individuals aged between 10 and 19 years, while youth were defined as those between 15 and 24 years, following the definitions provided by the WHO and the Zimbabwean ASRH strategy document (MoHCC, 2009). Furthermore, due to the significant overlap in age between these two groups, the terms "adolescents" and "youth" are used interchangeably throughout the study.

United Nations agencies, the government, international development agencies, international and local non-governmental organisations (NGOs) sponsored numerous ASRH programs between 2011 and 2015. Whilst local NGOs and the Ministry of Health and Child Care (MoHCC) implemented them, the Zimbabwe National Family Planning

Council (ZNFPC), National AIDS Council (NAC) and MoHCC were coordinating all the activities. However, the programs were not implemented with same intensity across the country as shown in Table 3.1 and Figure 3.1.

Figure 3.1: Number of programs per province. ***Source: (Muchabaiwa & Mbonigaba, 2019).***

Manicaland province had the highest number of programs implemented, at fourteen. Eight programs were implemented in Harare and Mashonaland West while 7 programs were implemented in Bulawayo, Masvingo, Matabeleland North, Matabeleland South and Midlands. Mashonaland East and Mashonaland Central had the lease number of programs implemented, at 3 each (Blum et al., 2015)

Table 3.1: Distribution of ASRH programs by province, 2015 data.

Province	**Programs implemented**	**Population density**	**Youth population per program**	**Total fertility rate**	**Teenage pregnancy**
National Level	17	13 061 239	692,595	4.1	23.5
Bulawayo	7	5%	31,565	2.8	11
Harare	8	16.3%	84,333	3.1	20.3
Manicaland	14	13.4%	41,188	4.8	27
Mashonaland Central	3	8.8%	125,151	4.5	30.3

Mashonaland East	3	10.3%	145,255	4.5	25.1
Mashonaland West	8	11.5%	61,966	4.5	23.6
Masvingo	7	11.4%	69,319	4.7	23.3
Matabeleland North	7	5.7%	36,595	4.1	31.1
Matabeleland South	7	5.2%	19,136	4.2	23.1
Midlands	7	12.4%	78,087	4.2	23

Source: Table 1 in (Muchabaiwa & Mbonigaba, 2019).

The highest number of programs were implemented in Manicaland province, while Mashonaland East and Mashonaland Central provinces had the least number, as shown in Table 3.1 and Figure 3.1. Several factors might explain why Manicaland province received the most attention. To start with, the country's adolescent population is concentrated within this province (Gonese et al., 2019). Secondly, sexual activity amongst teenage girls was consistently high, in contrast to decreasing trends reported amongst their male counterparts (Remez et al., 2014). Thirdly, the region leads in terms of fertility rate, at 4.8 against a national average of 4.1, as well as the uppermost teenage pregnancy rate of 27%, juxtaposed against a 23.5% national average (Muchabaiwa & Mbonigaba, 2019). Lastly, a cohort study that was done before the ASRH strategy revealed a trend in which HIV prevalence amongst teenagers in the region rose from 1.2% to 2.23% (Eaton et al., 2013). This difference in program intensity during the implementation of the ASRH strategy is exploited to determine whether higher program intensity resulted in improved ASRH outcomes.

3.3 RESEARCH QUESTIONS

1. What was the impact of the ASRH program intensity on abortion, modern contraceptive use, unmet need, attitude towards fertility and knowledge of modern contraceptive methods among young women in Zimbabwe?
2. What was the impact of ASRH program intensity on modern contraceptive use, attitude towards fertility and knowledge of modern contraceptive methods among young men in Zimbabwe?

3.4 HYPOTHESIS

The null hypothesis is that differences in ASRH program intensity had no bearing on abortion, modern contraceptive methods usage, unmet need for family planning, attitude towards fertility and knowledge of modern contraceptive methods.

3.5 METHODOLOGY

3.5.1 Methods

The present study partially used an econometric approach previously reported by Muchabaiwa and Mbonigaba (2019), to evaluate the impact of the first ASRH strategy on reproductive health outcomes. Furthermore, the current methodology was based upon an econometric approach described by Duflo (Duflo, 2001).

3.5.1.1 Identification strategy/Intention to treat and control groups.

The study aimed to analyse whether high ASRH program intensity is positively correlated with better SRH outcomes. In this analysis, the eligibility criterion was region of residence, whereby ASRH beneficiaries from Manicaland province which received the highest number of programs (n=14), were considered as the intention to treat group; whilst those from Mashonaland Central and Mashonaland East provinces, which received the lowest ASRH programs (n=3), were considered as the control group **(Table 3.2)**. The comparison groups (normally designated as the before and post strategy groups) were young people aged 20-24 years in 2015 (who were aged 15-19 years in 2010) who fully benefitted from the 5-year program and people aged 30-34 years (25-29 years age group in 2010 which was ineligible for the ASRH program but was exposed to normal health services access).

Table 3.2: Distribution and description of ASRH programs in Manicaland, Mashonaland central and Mashonaland East.

Manicaland (14 programs)			
Program	**Program Type/Intervention**	**Implementing Agency**	**Setting**
G.E.N.D.E.R.	BCC, Livelihoods, Life Skills	VSO Zimbabwe	Community
PIRE's Randomized trial on school support	BCC, Livelihoods, Life Skills	PIRE, University of Zimbabwe, Africa University	Secondary School

Join In Circuit (JIC)/HPZ	BCC, Livelihoods, Life Skills	FACT	Community, School
Men to Men Campaign	BCC, Livelihoods, Life Skills	SAYWHAT	Tertiary Institutions
PRAAC	Policy and Advocacy	Plan Zimbabwe	Community
FreshCom	BCC, Livelihoods, Life Skills	SafAIDS, SAYWHAT	Community (media)
WATCH	YFHS	Plan Zimbabwe, UNICEF	Facility
Cash Transfer Cluster RCT	BCC, Livelihoods, Life Skills	Manicaland HIV/STD Prevention Project	Community
Education for Life	BCC, Livelihoods, Life Skills	Youth Alive Zimbabwe	Community
Life Skills and Child Protection Program	BCC, Livelihoods, Life Skills	Youth Alive Zimbabwe	Primary and Secondary Schools
Capacity Development Program	BCC, Livelihoods, Life Skills	Youth Alive Zimbabwe	Community
Girls and Young Women Empowerment	BCC, Livelihoods, Life Skills	Youth Alive Zimbabwe	Community
Integrated Support Program	BCC, Livelihoods, Life Skills		Community, Facility, School
Mashonaland Central (3 programs)			
Program	**Program Type**	**Implementing Agency**	**Setting**
Men to Men Campaign	BCC, Livelihoods, Life Skills	SAYWHAT	Tertiary Institutions
H4+	YFHS	UNFPA	Facility
Integrated Support Program	BCC, Livelihoods, Life Skills		Community, Facility, School
Mashonaland East (3 programs)			
Program	**Program Type**	**Implementing Agency**	**Setting**
G.E.N.D.E.R.	BCC, Livelihoods, Life Skills	VSO Zimbabwe	Community
Support for AIDS orphans and those	BCC, Livelihoods, Life	COSV	Community, School

orphans living in difficult circumstances	Skills		
Integrated Support Program	BCC, Livelihoods, Life Skills		Community, Facility, School

Behavior Change Communication (BCC)

Source: (Blum et al., 2015)

3.5.1.2 Study design and population

The data consisted of the 2015 Zimbabwe Demographic and Health Survey (ZDHS) datasets collected at the end of the ASRH strategy implementation in 2015 (ZWIR72 and ZWMR72 datasets for women and men respectively). The 2015 ZDHS covered 10534 households, wherein interviews were held per household, with a total of 9955 women and 8396 men having been interviewed; and it is the latest available at present. The study sample was limited to 3 provinces: Manicaland, the province which received the highest number of programs (n=14) was the treated group, whilst the two provinces which received the least number of programs (Mashonaland Central and Mashonaland East, n=3 programs each) were treated as the control provinces. The intention to treat age group was 19–24-year-olds and the 30–34-year age group was used as the control group. The study population consisted of sexually active women (n=884), with 326 (36.88%) from Manicaland designated the intention to treat group and 558 (63.12%) from Mashonaland Central and East designated the control group. Similarly, for men the study population consisted of sexually active men (n=669), with 326 from Manicaland province and 343 from Mashonaland Central and East provinces. The design of the ZDHS is independent from the design of the ASRH strategy, thus, eligibility to intention to treat groups and control groups makes the study a quasi-natural experiment.

3.5.1.3 Data variables/Dictionary

The dependent or outcome variables that were assessed in the study were abortion (defined as ever having had a terminated pregnancy according to the DHS variable V228), modern contraceptive method usage (derived from the variable current use by method type [V313 and MV313]), unmet need for family planning (V624), knowledge for modern contraceptives (derived from the variable knowledge of any method [V301 and MV 301]) and attitude towards fertility (defined as desire for more children according to the DHS variables V605 and MV605). Except for abortion which was retained in its original categories (no and yes coded 0 and 1 respectively), outcome variables were recoded (no

and yes coded 0 and 1 respectively) to suit the focus of the study. Unmet need for family planning was recoded as a 'yes' if the respondent reported any of the following: unmet need for spacing, unmet need for limiting, spacing failure, and limiting failure categories, and no otherwise. Modern contraceptive method usage was recoded 'yes' for the modern method category (intrauterine copper device, implants/Norplants, the pill, male condom, female condom, injection, diaphragm, lactational amenorrhea, emergency contraception) and 'no' if the respondent says that they do not use any method, or if they use folkloric methods, and traditional method categories. Similarly, knowledge for modern contraceptive was recoded 'yes' for the following: knows modern method category; and 'no' for: knows no method, knows only folkloric method, and knows only traditional method categories. Finally, desire for more children was recoded 1 for the "wants within 2 years", "wants after 2+ years" and "wants, unsure timing" categories, and 0 otherwise.

The covariates or independent variables were selected using the relevant PROGRESS-Plus factors for both the males and females. These factors were wealth status (V190), type of residence (that is, urban or rural) (V025), highest education level (V106), marital status (V501), religion (V130) and number of living children (V218).

3.5.1.4 Statistical analysis

Relative risk ratios or odd ratios (OR) were used to measure the strength of association between high program intensity and the SRH outcome variables. Linear regression and logistic regression models were both used to determine whether high program intensity had an association with the targeted SRH outcomes. *p-values* <0.05 were considered significant during the analysis. Furthermore, two difference-in-differences models were utilized to investigate possible causal effect of the high ASRH program intensity on the SRH outcomes. These models were the difference-in-differences regression with province and age fixed effects and covariates, and difference-in-differences regression with no covariates. Data curation and analyses was performed using Microsoft Excel and Stata v17 (Stata, College Station, Texas, USA) respectively.

3.5.1.5 Province and age fixed effects

Fixed effects were applied in order to control for province-specific and age-specific attributes that do not vary across time. Fixed effects explored the relationship between predictor and outcome variables within the intention to treat and control provinces. The distinct features of each province could or might not have an impact on the predictor

factors. When employing fixed effects, it is necessary to account for the possibility that anything inside the provinces will affect or skew the predictor or outcome variables. The time-invariant qualities are eliminated by fixed effects, allowing for the evaluation of the predictors' overall impact on the outcome variables.

3.5.1.6 Cluster-robust standard errors (clustered standard errors)

In this current study, clustering at the province level is used since treatment assignment was performed at the level of province. The cluster-robust standard errors will allow for correlation between observations within each province under investigation. The data used is considered to be clustered since there are sub-samples within the data (in the form of 3 different provinces) that could be related to each other.

For instance, because a province's traditions and religious practices are shared by all its provinces, data on one or more variables may be linked within each province. Ordinary standard errors, which presume independence between all observations, will be inaccurate when error components are connected within clusters but independent between clusters.

3.5.2 Patient and public involvement

All data sets in this study were derived from the ZDHS database; no patients were involved in the study design, the outcome measures, data analysis or interpretation of the results. The study was conducted under the original consent provided by participants. Formal approval to access the ZDHS datasets was given by the Demographic and Health Surveys.

3.6 RESULTS

3.6.1 Summary of variables

Table 3.3 shows the distribution of means and standard deviations for overall, treated and control groups for women. Abortion had an overall mean of 0.129±0.335 with a statistically insignificant higher mean in the control group compared to the treated group. Knowledge of modern contraceptive methods had a higher mean: in the control group compared to the treatment group while unmet need for family planning had the lowest mean value of 8.8% in the full sample, with a higher mean in the treatment group: compared to the control group. However, the differences were not statistically significant. The treated group mean of 0.549±0.498 was statistically lower (p=0.006) than the mean for the control group 0.643±0.479 for modern contraceptive method usage.

Table 3.3: Distribution of means and standard deviations for women treated group and control group.

Variable	Overall		Treated		Control		Difference between treatment and control	t-statistics	p-value
	mean	sd	mean	sd	mean	sd			
Abortion	0.129	0.335	0.123	0.329	0.133	0.340	-0.010	0.424	0.672
Modern contraceptive method usage	0.609	0.488	0.549	0.498	0.643	0.479	-0.094	2.780	0.006
Unmet need	0.088	0.284	0.096	0.295	0.084	0.278	0.012	-0.557	0.578
Desire for more children	0.694	0.461	0.699	0.459	0.691	0.462	0.008	-0.250	0.803
Knowledge of modern contraceptive methods	0.992	0.089	0.991	0.096	0.993	0.084	-0.002	0.3287	0.742

Table 3.4 shows the distribution of means and standard deviations for overall, treated group and control group for men. The mean for current use of modern method for males was 0.735±0.441 and for desire for more children was 0.824±0.381. The treated group mean 0.764±0.426 was statistically lower (p=0.038) than the mean for the control group 0.850±0.358 for modern contraceptive method usage. All males knew any modern method of family planning giving a mean of 1.00±0.00 overall and for treated and control groups.

Table 3.4: Distribution of means and standard deviations for men treated group and control group.

Variable	Overall		Treated		Control		Difference between treatment and control	t-statistic	p-value
	mean	sd	mean	sd	mean	sd			
Modern contraceptive method usage	0.735	0.441	0.727	0.446	0.739	0.439	-0.012	0.334	0.738
Desire for more children	0.824	0.381	0.764	0.426	0.850	0.358	-0.086	2.086	0.038
Knowledge of modern contraceptive methods	1.000	0.000	1.000	0.000	1.000	0.000	0.000	-	-

3.6.2 Association between ASRH program intensity and SRH outcomes among young Zimbabweans.

Two logistic regression models and two linear regression models were performed to determine any associations between high program intensity and the SRH outcomes among young Zimbabweans. The results for the linear regression models are shown in **Table 3.5** below and **S1 file and S2 file** (see Chapter 3 Appendices). While the results for the logistic regression models are shown in **Table 3.6** below and **S3 file and S4 file** (see Chapter 3 Appendices).

3.6.2.1 Linear regression results for association of ASRH program with SRH outcomes among women.

Abortion

The linear regression model with age and province fixed effects and standard errors adjusted for 3 clusters in Province (**S1 file Table 1**) showed a 0.034-point decrease in abortion in the intention to treatment group**.** However, the decrease was not statistically significant: p=0.300. The interaction term coefficient was 0 in the linear regression with covariates, fixed effects and standard errors adjusted for 3 clusters in Provinces **(S1 file Table 2).** This implies that ASRH program intensity had no association with abortion.

Modern contraceptive method usage

The interaction coefficient was negative and statistically significant (p<0.05) for the linear regression model with age and province fixed effects and standard errors adjusted for 3 clusters in Province (**S1 file Table 3**). This suggested that there was a 0.054-point decrease in modern contraceptive method usage between treated and control cohorts in the treated province relative to differences in the same cohorts in the control provinces. However, for the linear regression model with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in Province, the 0.050-point decrease in modern contraceptive method usage was not significant at 5% level of significance p=0.064 (**S1 file Table 4)**.

Unmet need for family planning

After adjusting for age and province fixed effects and clustering at province level, the interaction term coefficient (0.016) was positive and statistically not significant, *p*=0.462 (**S1 file Table 5**). Likewise, the logistic regression model with covariates, fixed effects and standard errors adjusted for province clustering, the interaction term coefficient was positive and not significant *p*=0.226 (**S1 Table 6**). This implies that the increase in unmet need for family planning in the intention to treat group reported by the 2 linear regression models was not significant. In conclusion, there was no association between ASRH program intensity and unmet need for family planning.

Desire for more children

The interaction term coefficient was negative and statistically not significant for the 2 linear regression models used in the study **(S1 file Tables 7-8**). This implies that the decrease in desire for more children in the intention to treat group was not significant. Hence, there was no association between ASRH program intensity and desire for more children.

Knowledge of modern contraceptive methods

The interaction term coefficient was positive and not statistically significant for the 2 linear regression models **(S1 file Tables 9-10**) used in the study. This implies that the 0.02-point increase in knowledge of modern contraceptive methods in the treatment group was not significant, as such there was no association between ASRH program intensity and knowledge for modern contraceptive methods.

Table 3.5: Summary linear regression estimates for associations between ASRH program intensity and SRH outcomes.

Gender	Outcome	Coefficient	Robust Standard error	*p*-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Women	**Abortion**					
	Model 1	-0.034	0.024	0.300	-0.139	0.071
	Model 2	0				
	Modern contraceptive method usage					
	Model 1	-0.054	0.004	0.006	-0.072	-0.037
	Model 2	-0.050	0.013	0.064	-0.108	-0.007
	Unmet need for family planning					

	Model 1	0.016	0.018	0.462	-0.061	0.093
	Model 2	0.282	0.106	0.116	-0.173	0.738
	Attitude towards fertility					
	Model 1	-0.073	0.051	0.286	-0.292	0.146
	Model 2	-0.003	0.006	0.627	-0.297	0.228
	Knowledge of modern contraceptive method					
	Model 1	0.022	0.014	0.257	-0.039	0.084
	Model 2	0.024	0.015	0.241	-0.039	0.087
Men	**Modern contraceptive method usage**					
	Model 1	0.042	0.026	0.242	-0.083	0.153
	Model 2	0.041	0.025	0.240	-0.065	0.146
	Attitude towards fertility					
	Model 1	0.023	0.029	0.516	-0.104	0.150
	Model 2	0.027	0.027	0.421	-0.089	0.144
	Knowledge of modern contraceptive method					
	Model 1	-	-	-	-	-
	Model 2	-	-	-	-	-

Negative linear regression coefficients suggests decreased likelihoods.
Positive linear regression coefficients suggests increased likelihoods.
Narrow confidence interval suggests a precise estimate of the association.
p-value< 0.05 indicates the association is significant.
Model 1: Linear regression model with age and province fixed effects and standard errors adjusted for 3 clusters.
Model 2: Linear regression model with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in provinces.

3.6.2.2 Association of ASRH program intensity with SRH outcomes among men.

Modern contraceptive method usage

The interaction term coefficients were not statistically significant for modern contraceptive method usage (**S2 file Table 1-2**) for the two linear regression models utilized (p=0.242 and p=0.240). This implies that there was no association between modern contraceptive method usage and ASRH program intensity.

Attitude towards fertility (Desire for more children)

In the linear regression model with fixed effects and standard errors adjusted for province clustering, the interaction term was positive, implying a 0.023-point increase in desire for more children. However, the increase was not statistically significant (p=0.516) (**S2 Table 3**). Likewise, in the linear regression model with covariates, fixed effects and standard errors adjusted for province clustering; the interaction term was positive and statistically not significant (**S2 Table 4**). This signifies that, according to linear regression, there was no association between ASRH program intensity and desire for more children.

Knowledge of modern contraceptive methods

All the men in the intention to treat and control groups had knowledge of modern contraceptive method hence all the linear regression models were empty.

3.6.2.3 Logistic regression results for association of ASRH program intensity with SRH outcomes among women.

Abortion

The logistic regression with age and province fixed effects and standard errors adjusted for 3 clusters in Province (OR 0.688, 95% CI: 0.393-1.204) (**S3 file Table 1**) and logistic regression with covariates, age, and province fixed effects and standard errors adjusted for 3 clusters in Provinces (OR 0.621, 95% CI: 0.356-1.084) **(S3 file Table 2)** showed that there was reduced risk for abortion in the intention to treat group**.** However, the reduced risk was not statistically significant for the two models (p>0.05). This signals that program intensity was not associated with abortion.

Modern contraceptive method usage

The logistic regression model with fixed effects and standard errors adjusted for 3 clusters in the Province showed that there was a significant (p<0.05) decrease in odds for modern contraceptive method usage (OR 0.818, 95% CI: 0.789-0.848) (**S3 file Table 3**). Likewise, the logistic regression model with covariates, fixed effects and standard errors adjusted for 3 clusters in Provinces showed that there was a significant (p<0.05) decrease in odds for modern contraceptive method usage for the 2 models (OR 0.829, 95% CI: 0.730-0.942) **(S3 file Table 4)**. This suggests that program intensity was negatively associated with modern contraceptive method usage.

Unmet need for family planning

The logistic regression model adjusted for age and province fixed effects and clustering at province level, showed that the interaction term between the period and intervention was not statistically significant, p=0.476 (**S3 file Table 5**). Likewise, the logistic regression model with covariates, fixed effects and standard errors adjusted for province clustering showed that the interaction term was not significant p=0.141 (**S3 Table 6**). This implies that the increased risk of unmet need for family planning in the intention to treat group reported by the 2 models was not significant. In conclusion, there was no association between ASRH program intensity and unmet need for family planning.

Attitude towards fertility (desire for more children)

The logistic regression model with age and province fixed effects and standard errors adjusted for 3 clusters in Province (**S3 file Table 7**) and logistic regression model with covariates, fixed effects and standard errors adjusted for 3 clusters in Provinces **(S3 file Table 8)** showed that there was reduced odds in desire for more children in the intention to treatment group**.** However, the reduced likelihood was not statistically significant for the 2 models (p>0.05). This infers that ASRH program intensity was not associated with attitude towards fertility.

Knowledge of modern contraceptive method

The odds ratio for the interaction term for knowledge of modern methods was 1 for both logistic regression models used in the study **(S3 file Tables 9-10).** This indicates that there was no association between program intensity and knowledge for modern contraceptive method usage.

Table 3.6: Summary logistic regression estimates for associations between high ASRH program intensity and SRH outcomes.

Gender	Outcome	Odds Ratio (OR)	Robust Standard error	*p*-value	95% Confidence Interval	
					Lower Bound	Upper Bound
Women	**Abortion**					
	Model 1	0.689	0.196	0.191	0.393	1.204
	Model 2	0.621	0.176	0.094	0.356	1.084
	Modern contraceptive method usage					
	Model 1	0.818	0.015	0.000	0.789	0.848
	Model 2	0.829	0.537	0.004	0.789	0.848
	Unmet need for family planning					
	Model 1	1.168	0.255	0.476	0.762	1.791
	Model 2	1.297	0.229	0.141	0.917	1.833
	Attitude towards fertility					
	Model 1	0.626	0.151	0.052	0.391	1.003
	Model 2	0.600	0.196	0.18	0.317	1.138
	Knowledge of modern contraceptive method					
	Model 1	1	-	-	-	-
	Model 2	1	-	-	-	-
Men	**Modern contraceptive method usage**					
	Model 1	1.241	0.165	0.104	0.957	1.610
	Model 2	1.192	0.133	0.115	0.9583	1.482
	Attitude towards fertility					
	Model 1	0.122	0.998	0.010	0.025	0.606
	Model 2	0.073	0.076	0.012	0.010	0.559
	Knowledge of modern contraceptive method					
	Model 1	-	-	-	-	-
	Model 2	-	-	-	-	-

OR values > 1suggests increased odds or likelihoods
OR values < 1suggests decreased odds or likelihoods.
OR with a narrow confidence interval suggests a precise estimate of the association
p-value< 0.05 indicates the association is significant.
Model 1: Logistic regression model with age and province fixed effects and standard errors adjusted for 3 clusters.
Model 2: Logistic regression model with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in provinces.

3.6.2.4 Logistic regression results for association of high ASRH program intensity with SRH outcomes among men.

Modern contraceptive method usage

The interaction terms were not statistically significant for modern contraceptive method usage for both the logistic regression models (**S4 file Table 1-2**). This signals that there was no association between ASRH program intensity and modern contraceptive method usage.

Attitude towards fertility (desire for more children)

For the logistic regression model accounting for age and province fixed effects and clustering at the province level, the interaction term was statistically significant (p=0.010) implying decreased likelihood (OR 0.122, 95% CI: 0.246-0.606) in desire for more children in the intention to treatment group (**S4 Table 3**).

Similarly, for the logistic regression model with covariates, fixed effects and standard errors adjusted for province clustering, the interaction term was statistically significant (p<0.012), implying decreased odds (OR 0.073, 95% CI: 0.242-0.862) in desire for more children in the treatment group (**S4 Table 4**).

Knowledge of modern contraceptive methods

All the men in the intervention and control groups had knowledge of modern contraceptive methods, hence all the logistic regression models were empty.

3.7 DIFFERENCE-IN-DIFFERENCES REGRESSION ANALYSIS

Table 3.6 show results of difference-in-differences regression models for estimating the impact measures of high ASRH program intensity on abortion, modern contraceptive method usage, unmet need for family planning, attitude towards fertility and knowledge of modern contraceptive methods among young Zimbabweans. The “Before” panel (**Tables 3.6**) shows estimates of the differences in the outcome, for example, knowledge of modern contraceptive between the intention to treatment group (Manicaland) and control group (Mashonaland Central and Mashonaland East) among 30-34 years old Zimbabweans who did not benefit from the ASRH strategy. The “After” panel shows estimates of the differences in the outcome indicator between the intention to treatment

group and control group among 20–24-year-old young Zimbabweans who were intended to fully benefit from the ASRH strategy. The last row, labelled Diff-in-Diffs, shows the impact estimated, which is equal to the difference in the "After" panel estimates minus the difference in the "Before" panel estimates.

3.7.1 Difference-in-differences estimation results for women

3.7.1.1 Abortion

The difference-in-differences regression model with no covariates showed a negative coefficient of -0.036. This implies that the intention to treatment group had a 0.036-point decrease in abortion relative to the control group. However, the increase was not statistically significant, suggesting that ASRH program intensity had no impact on abortion.

Likewise, the difference-in-differences regression model with age and province fixed effects and the covariates (residence, education, religion, family wealth index, number of living children and marital status) showed that ASRH program intensity had no impact on abortion. The difference-in-differences coefficient changed slightly to -0.038 and remained not statistically significant.

3.7.1.2 Modern contraceptive method usage

The difference-in-differences regression model with no covariates showed a negative coefficient of -0.049. The intention to treatment group had a 0.049-point decrease in modern contraceptive method usage compared to the control group. The decrease, however, was not statistically significant (p=0.471). Accounting for age and province fixed effects and covariates did not improve the difference-in-differences for current modern contraceptive method usage. The difference-in-differences coefficient was -0.052, and statistically not significant. These difference-in-differences results suggest that SRH program intensity had no impact on modern contraceptive method usage.

3.7.1.3 Unmet need for family planning

The difference-in-differences coefficient for unmet need for family planning was 0.017, indicating an increase in unmet need for family planning in the intention to treatment group for the model with no covariates, however, this was statistically not significant. Adding covariates and province and age fixed effects did not improve the effects of high

ASRH program intensity. There was an insignificant 0.023-point increase in unmet need for family planning in the intention to treatment group.

3.7.1.4 Knowledge of modern contraceptive methods

The difference-in-differences coefficient of 0.021 was statistically significant at 10% level showing a positive increase in knowledge of modern method of family planning in the intention to treatment group for the model with no covariates. Similarly, after, accounting for province and age fixed effects and controlling for covariates, there was a 0.022-point increase in knowledge for modern contraceptive methods at 10% level.

3.7.1.5 Attitude towards fertility

In the model with no covariates, the estimated average treatment effect on the intention to treatment group was -0.075, implying that there was a 0.075-point decrease in desire for more children, however this was not statistically significant.

After accounting for province and age fixed effects and the covariates, the difference-in-differences coefficient decreased to -0.070. There was a 0.070-point decrease in desire for more children in the intention to treatment group, however, this was not statistically significant. This implied that ASRH program intensity had no effect on attitude towards fertility.

Table 3.7: Difference-in-differences estimation results.

	Women		**Men**	
	Abortion		**Abortion**	
VARIABLES	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Before (30-34 years age group)				
Control (Mashonaland East and Central)	0.157	-0.050	-	-
Intention to treatment (Manicaland)	0.166	-0.040	-	-
Diff (T-C)	0.008 (0.032)	0.009 (0.034)	-	-
After (20-24) years age group)				
Control (Mashonaland East and Central)	0.104	-0.259	-	-
Intention to treatment (Manicaland)	0.076	-0.288	-	-
Diff (T-C)	-0.028 (0.034)	-0.029 (0.036)	-	-
Diff-in-Diff	**-0.036 (0.037)**	**-0.038 (0.046)**	**-**	**-**
	Modern contraceptive method usage		**Modern contraceptive method usage**	
VARIABLES	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Before (30-34 years age group)				
Control (Mashonaland East and Central)	0.679	0.168	0.743	0.539
Intention to treatment (Manicaland)	0.609	0.078	0.708	0.539
Diff (T-C)	-0.069 (0.047)	-0.090* (0.049)	-0.035 (0.052)	0.000
After (20-24) years age group)				
Control (Mashonaland East and Central)	0.602	0.387	0.736	0.776
Intention to treatment (Manicaland)	0.484	0.245	0.746	0.819
Diff (T-C)	-0.118** (0.049)	-0.143*** (0.051)	0.010 (0.051)	0.043 (0.073)
Diff-in-Diff	-0.049 (0.068)	-0.052 **(0.065)**	0.045 (0.073)	**0.043 (0.073)**
	Unmet need for family planning		**Unmet need for family planning**	
VARIABLES	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Before (30-34 years age group)				
Control (Mashonaland East and Central)	0.074	0.316	-	-
Intention to treatment (Manicaland)	0.077	0.323	-	-
Diff (T-C)	0.003 (0.028)	0.007(0.031)	-	-

After (20-24) years age group)				
Control (Mashonaland East and Central)	0.096	0.339	-	-
Intention to treatment (Manicaland)	0.116	0.369	-	-
Diff (T-C)	0.020 (0.031)	0.030 (0.033)	-	-
Diff-in-Diff	0.017 (0.042)	**0.023 (0.042)**	-	-
	Knowledge of modern contraceptive methods		**Knowledge of modern contraceptive methods**	
VARIABLES	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Before (30-34 years age group)				
Control (Mashonaland East and Central)	1.000	1.015	1.00	1.00
Intention to treatment (Manicaland)	0.988	0.995	1.00	1.00
Diff (T-C)	-0.012 (0.009)	-0.020** (0.009)	0.00	0.00
After (20-24) years age group)				
Control (Mashonaland East and Central)	0.985	0.988	1.00	1.00
Intention to treatment (Manicaland)	0.994	0.990	1.00	1.00
Diff (T-C)	0.009 (0.009)	0.002 (0.010)	0.00	0.00
Diff-in-Diff	**0.021* (0.012)**	**0.022* (0.012)**	**0.00**	**0.00**
	Attitude towards fertility		**Attitude towards fertility**	
VARIABLES	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Before (30-34 years age group)				
Control (Mashonaland East and Central)	0.524	0.618	0.798	0.974
Intention to treatment (Manicaland)	0.562	0.696	0.700	0.974
Diff (T-C)	0.038 (0.041)	0.079* (0.044)	-0.098 (0.047)	0.000
After (20-24) years age group)				
Control (Mashonaland East and Central)	0.884	0.723	0.987	1.047
Intention to treatment (Manicaland)	0.847	0.733	0.939	1.089
Diff (T-C)	-0.037 (0.044)	0.00 (0.046)	-0.048 (0.077)	0.043 (0.091)
Diff-in-Diff	**-0.075 (0.060)**	**-0.070 (0.058)**	**0.050 (0.090)**	**0.043 (0.091)**

Standard errors in parentheses
p<0.01*
p<0.05*
p<0.1*
Model 1: difference-in-difference regression with no covariates. Stata syntax diff outcomevariable, t(Intervention) p(Period)
Model 2: difference-in-difference regression with province and age fixed effects and covariates. Stata syntax diff outcomevariable, t(Intervention) p(Period) cov(covariates).

3.7.2 Difference-in-differences estimation results for men

3.7.2.1 Modern contraceptive method usage

The difference-in-differences model for use of modern methods of family planning with no covariates showed a 0.045-point increase in use of modern method among males. However, the increase was not statistically significant. When age and province fixed effects and covariates were added to the difference in difference, the average treatment effect on the treated group showed a 0.043-point increase in use of modern method of family planning in the treated group. However, the increase was not statistically significant.

3.7.2.2 Attitude towards fertility (desire for more children)

In the difference-in-differences model with no covariates, the average treatment effect on the intention to treatment group was not statistically significant, with an estimate of 0.050. Including covariates and age and province fixed effects in the difference-in-difference model for desire for more children, resulted in 0.043-point increase in desire for more children in the intention to treatment group. However, the increase was not statistically significant, suggesting that high ASRH program intensity had no impact on attitude towards fertility.

3.7.2.3 Knowledge of modern contraceptive methods

All males knew at least one modern method of family planning, so there was no difference between the intention to treatment group and the control group for all the difference-in-difference models for knowledge of modern method of family planning.

3.8 DISCUSSION

Although randomized controlled trials (RCTs) are widely accepted as the gold standard for program impact evaluation (Duflo, 2001), the Zimbabwe ASRH strategy was not implemented with randomisation like most social policies. It is not feasible or ethically permissible to implement a social policy like the ASRH strategy with randomization (Baser, 2006). Therefore, to yield results close to RCTs a difference-in-differences regression model controlled for relevant PROGRESS-Plus factors was implemented in the study. Despite five family planning outcomes being evaluated, high ASRH program intensity had a positive impact only on knowledge of modern contraceptive methods

among young women. Moreover, high ASRH program intensity was positively associated with attitude towards fertility only among men, but no positive associations were observed between high ASRH program intensity and the other outcomes.

Thus, high ASRH program intensity had a negative association with modern contraceptive methods usage. Theoretically, one would expect positive impact through observed improvements in SRH outcomes in the provinces which received more resources in the form of higher program intensity (Manicaland), as compared to those which reported low program intensity (Mashonaland Central and Mashonaland East). Moreover, despite 99.2% women reporting to have knowledge of at least one modern method, only 60.86% were using a modern contraceptive method. This might have been attributed to the 8.82% unmet need in family planning, with all women (n=71) with unmet need reported not to be using any modern contraceptive method. Lack of knowledge on the use and side effects of contraceptives, religious or cultural issues and poor decision making have been documented as contributing factors for the low uptake of modern contraceptives (Darroch et al., 2016; Shoupe, 2016). This lack of impact could also be attributed to legal barriers, for example, the fact that it is prohibited to give condoms to school going youths in Zimbabwe (Bhebhe, 2018), whilst the ASRH strategy was simultaneously targeting the same age group for safer sex and SRH health services. This is despite the fact that 41% of females will have become sexually active before attainment of the legal majority age of 18 (ZimStat, 2015). Barriers such as these are counterproductive and tend to cancel out the strides of CSE, hence this could have led to reduced utilisation of SRH products and services, despite the youth having knowledge of the same. Additionally, despite adequate knowledge, there could be inadequate access in hard-to-reach areas, thus affecting availability of SRH commodities and services, coupled with high transport costs or large distances travelled to reach some health facilities by the targeted recipients (Makoni et al., 2020).

Future ASRH strategies should be formulated in ways that improve modern contraceptive methods access and utilization. Increasing modern contraceptive methods access and usage may alleviate the unmet need for family planning as well as maternal and infant mortality in poor countries (Chikandiwa et al., 2018; Phiri et al., 2023). Increasing access to, and utilization of contraceptives reduces infant and maternal mortality, given that it decreases the risks of unintended/unwanted pregnancies and unsafe abortions, which are

responsible for a large proportion of maternal deaths in countries with high unmet need for family planning (Phiri et al., 2023).

As with women, the percentage of men that reported use of a contraceptive method was lower (73.54%) compared to the 100% who reported knowledge of modern contraceptive methods. This might have been attributed to the misperceptions that family planning is a female's domain due to gender norms and SRH communication geared towards females. Decision-making on contraceptive method usage is a shared responsibility between couples (Chandra-Mouli et al., 2014; Smith, 2020). Furthermore, the fact that men frequently use withdrawal might have resulted in low modern contraceptive usage. This highlights the need for the development and implementation of ASRH strategies that specifically target males to motivate them to use modern methods and dispel the misperceptions that family planning is a woman's domain (Chandra-Mouli et al., 2014; Kabagenyi et al., 2014; Smith, 2020).

The high levels of knowledge of modern contraceptive methods observed in the 2015 ZDHS might have been attributed to the education curricular amendment, which moved to include HIV and life skills beginning in the fourth primary school grade by the Ministry of Education (MoE) in 1993 (Hutchinson et al., 2019; Mason-Jones et al., 2016). Additionally, most adolescents and young people get their information about modern contraceptive methods from the media, mHealth platforms and their peers (Smith, 2020).

Another reason causing lack of impact could be that of inadequate coordination by program implementers, as reported elsewhere by Blum et al., 2015 and Marimo et al., 2015, concerning the Zimbabwean ASRH strategy and by Michielsen et al., 2010, for some interventions in Africa. We can, therefore, deduce that more resources will not necessarily result in improved SRH outcomes, implying the need to do a thorough research on the specific needs of each target demographic and tailoring the composition of interventions accordingly. This endeavour will also have to include research focused on finding the most effective distribution mechanisms. This notion is supported by the Lancet Commission on Adolescent Health and other researchers who opined the implementation of multiple interventions in a complimentary manner to improve SRH outcomes, thereby achieving the SDG3 (Chandra-Mouli et al., 2015; Fatusi, 2016; Patton et al., 2016). As reported by Muchabaiwa and Mbonigaba, 2019, there was no framework

in place for coordinating or monitoring and evaluating the various stakeholders in the implementation of the Zimbabwean ASRH strategy. This could have led to duplication of roles, thereby wasting scarce resources or, worse still, cancellation out of the effect of the overall combination of interventions.

Despite several efforts to promote SRH service usage by young people, studies have reported poor access and utilization of these services among young people living in sub-Saharan Africa (Binu et al., 2018; Makoni et al., 2020; Mutea et al., 2019; Wachamo et al., 2020). Binu and colleagues, 2018, highlighted that there is little information found on the extent to which Ethiopian school-going young people utilize SRH services. Furthermore, a study conducted in Zimbabwe highlighted that young men accessing voluntary medical male circumcision services from peripheral outreach clinics were not getting linked for youth-friendly SRH services, indicating that distance was a potential barrier (Makoni et al., 2020). The fact that ASRH program intensity did not seem to improve abortion, modern contraceptive methods usage, unmet need for family planning, attitude towards fertility and knowledge of modern contraceptives, may have been attributed to limited access and utilization of ASRH services. Elsewhere, it is apparent that although important and necessary, the provision of improved services and new methods is not usually enough to address the issue of unmet need in the society. Evidence has shown that it is equally important to generate demand of services through increasing awareness of the benefits of SRH services and encouraging individuals to utilise them, more so in societies or population groups where there is limited access to correct information concerning contraception. Effective approaches that have been shown to promote demand and usage of modern contraceptive methods include interventions such as social and community mobilisations, mass media campaigns and financial incentive schemes (Belaid et al., 2016; Mwaikambo et al., 2011). Improving the quality of sexual and reproductive health information and services can play a vital role in helping women overcome some of these barriers, by contributing to care that upholds and protects women's rights to voluntary and informed contraceptive choices (Sully et al., 2020).

Like other studies (Oxman et al., 1995; Powell et al., 2019), the study found no clear evidence of increased benefits, as measured by improvement in SRH outcomes, in implementing more programs concurrently per province. While some researchers strongly advocate for the use of multifaceted strategies, the study by Smith et al., 2019,

reported on the success of a single program strategy due to better implementation. Our findings resonate with a recent review aimed at assessing whether multifaceted implementation strategies are more effective than single strategies, which reported no evidence of multifaceted strategies being more effective than single strategies (Lau et al., 2015; Squires et al., 2014). This may indicate that the selection of strategies goes beyond quantity but more importantly, using a tailored approach to select strategies based on having a thorough understanding of context, including barriers and facilitators to implementation (Powell et al., 2019).

3.9 STUDY LIMITATION AND RECOMMENDATIONS

The ASRH strategy was implemented in all provinces throughout the country and the intention to treat group and control group generally received the same interventions of BCC, livelihoods and life skills, policy, and advocacy and YFHS, with different intensity. The implication for this was that there was a lack of a perfect control with total absence of the ASHR strategy implementation. This limitation could be overcome by conducting a pre- and post-test study design. The baseline pre-test data collection will be conducted before the ASRH strategy implementation, followed up with a post-test data collection at the end of the ASRH strategy implementation. Moreover, no interviews were carried out to get some perspective from the participants and establish how they make decisions concerning SRH issues and to get an understanding of their behaviour and attitude towards SRH issues and their interventions.

Studies have reported poor utilisation of ASRH services, with only about 21%–51% of adolescents reported to have access (Makoni et al., 2020). This implies that it is necessary to investigate ASRH strategy utilization and barriers to ASRH services uptake for future success. Studies have reported the effectiveness of mobile phone-based interventions (mHealth) in SRH, (Phiri et al., 2022; Smith et al., 2015). Coupled with the increasing popularity of mHealth amongst young people (Nuwamanya et al., 2020), it is the recommendation of this study to integrate mHealth with future ASRH strategies to improve the uptake. Additionally, intensive group learning coupled with youth friendly SRH services utilized by Makoni et al., 2020, may also be employed to advance the impact of the ASRH strategy on SRH outcomes.

3.10 CONCLUSION

The study aimed to assess the impact of ASRH interventions in Zimbabwe but found no improvement in outcomes. The program did not affect abortion, family planning, contraceptive use, fertility attitudes in women, and knowledge of contraceptives. It also had no impact on men's contraceptive use and fertility attitudes. Moreover, regions with more resources did not show superior outcomes. This implies that improving the coordination and monitoring of the strategy, aligning and enforcing government policies that support sexual and reproductive health rights, and redesigning service delivery methods to target areas of need, including rural areas, may be the keys to better outcomes in future ASRH strategies. This could save resources through offering the same optimum number of ASRH strategy programs across the country's 10 provinces. In Chapter five of this thesis, a theory of change developed from the WHO framework discussed in Chapter one as well as existing literature will be used to further evaluate the impact of the Zimbabwean ASRH strategy.

It was demonstrated in Chapter one of this thesis that the method mix in Zimbabwe is inclined towards the short-acting reversible contraceptives rather than the more effective long-acting reversible contraceptives and their recommendation for use by the WHO and their use in other countries, such as Kenya and the USA. Subsequently, the following chapter (Chapter 4) focuses on investigating the factors that influence the choice of contraceptive among adolescents in Zimbabwe, using long-acting reversible contraceptives as the reference.

CHAPTER 4: FACTORS ASSOCIATED WITH LONG-ACTING REVERSIBLE CONTRACEPTIVES USAGE AMONG SEXUALLY ACTIVE ADOLESCENT GIRLS AND YOUNG WOMEN IN ZIMBABWE.

4.1 INTRODUCTION

In "typical use" circumstances, long-acting reversible contraceptives (LARCs) are more effective than short-acting reversible contraceptives (SARCs) due to their better continuation rates and ease of adherence. Many teenage girls and young women in low- and middle-income countries (LMICs) still rely on SARCs, which need greater user input, despite the many benefits of LARCs and the World Health Organization's (WHO) recommendations. In addition to examining probable causes for the low uptake of LARCs, this chapter intends to examine the socioeconomic and demographic factors that influence LARCs usage among Zimbabwean adolescents and young women.

A theory of change developed from the WHO framework discussed in Chapter one will be used to evaluate the impact of the Zimbabwean ASRH strategy. The framework recognises that individuals have the right to exercise control over their sexuality and sexual/reproductive health without coercion or discrimination, SRH interventions must uphold these human rights. In addition, sexual health needs are dynamic and vary based on individual, cultural, socioeconomic, and other factors. Thus, interventions must be inclusive and responsive to this diversity, implying that freedom of choice of contraceptives should be considered when designing SRH programs. Therefore, evidence on the factors that influence this decision making should be made available to implementors to ensure delivery of services without bias by competent, non-judgmental providers.

4.2 BACKGROUND

The adolescent fertility rate has been on the increase in Zimbabwe (ZimStat, 2015; MICS, 2019), with reports that almost 24% of women aged 20-24 years gave birth before the age of 18. These pregnancies are usually unplanned and result from child marriages, sexual abuse, or risky sexual behaviour. They are also linked to several unfavourable outcomes, including HIV/AIDS, STDs, miscarriages, unsafe abortions, and delivery complications that may set off chronic health problems. The consequences of adolescent pregnancies Zimbabwe include dropping out of school (19.4%), being abandoned by friends (4.9%),

being forced to leave home (57.7%), and marrying at a young age (24.5%) (ZimStat, 2015).

It is, therefore, of vital importance to recognise, understand and pay attention to the SRH care needs of adolescents and young people and minimise unintended pregnancies and their resultant negative effects, including death in worst cases (Darroch et al., 2021). These issues are given attention and focus through the Sustainable Development Goal number 3, target 3.2.

Zimbabwe is one of the African countries to have successful family planning programs and the nation has been able to sustain a modern contraceptive prevalence rate higher than most sub-Saharan African countries. However, unmet need is still a challenge in the country due to a variety of reasons that include a failure to improve the method mix to include LARCs. These challenges have led to high contraceptive discontinuation rates among young unmarried and sexually active women (WHO, 2016). These views were shared in the FP2020's Global Consensus Statement: Expanding contraceptive choice for adolescents and youth to include long-acting reversible contraception – meant to promote access and use of LARCs among adolescents and young women (Family Planning, 2020).

LARCs are 99% effective and rank as the most effective modern contraceptive method, and when compared to the pill and the injection combined, LARCs are 100-fold more successful when used correctly in the first year and therefore reduce the risk of unplanned pregnancies by half (Thompson et al., 2019). It has been shown that about two thirds of adolescents and young women would readily be willing to use LARCs after undergoing comprehensive counselling by healthcare providers (Winner et al., 2012). In other regions of the world, for example in the USA, the use of LARCs has been shown to drastically reduce unintended pregnancies (Shoupe, 2016).

In addition to their ability to regulate fertility for a longer duration of three to five years, LARCs circumvent the challenges of incorrect and inconsistent use that is associated with the pill and other modern contraceptives which are major causes of unintended pregnancies. Due to their long-term nature, LARCs could also reduce the rate of rapid repeat pregnancies and abortions which adolescents and younger women are at higher risk of, since there are no adherence challenges and discontinuation is greatly reduced (Baldwin & Edelman, 2013). Also, it has been reported that LARCs users are relatively

satisfied; their effectiveness is non-user dependent and their use comes with additional benefits such as reduction of menstrual pain and anaemia (Yinger, 2016).

Although LARCs use comes with several advantages, it is often the case that young females below the age of 25 prefer to use SARCs, for example, condoms, pills and injections, because the service providers that they approach offer these methods as a result of what can be termed 'provider bias' (Glinski et al., 2014). Provider bias is described as a situation in which a service provider does not disclose all the necessary contraceptive information or services with regards to some contraceptive methods; a practice which may defy ethical guidelines and usually happens for reasons that are unrelated to the client's medical condition, thus barring informed choice or wider method mix use from happening. Such provider bias is based on concerns about the applicability of a certain method due to the patient's age, marital status and parity, and is more prevalent towards adolescents and younger women (Solo & Festin, 2019). Addressing provider bias is one of the ways in which unfulfilled demand for contraception can be reduced, thereby fulfilling the reproductive aspirations of SRH clients. Workers in the health sector should be encouraged to provide all available information and to give guidance to adolescents and allow them the freedom to choose their preferred method of contraception. This has the potential to enhance client satisfaction and a continuation of the chosen methods (Chandra-Mouli et al., 2014).

Adolescent girls also have some misconceptions concerning LARCs, with regards to their short and longer-term side effects, which they mistakenly believe could have a harmful impact on their future fertility. IUDs are associated with several misconceptions, one of which is the heightened risk of contracting pelvic inflammatory disease in nulliparous users, but no evidence supports this assertion (Stanton et al., 2020). Other prevalent reservations include apprehension of negative side effects such as weight gain and changes in the menstrual cycle, coupled with a delayed reversion to fertility upon cessation of use, especially in the case of implants (Ochako et al., 2015). These misconceptions can be countered through the provision of complete information and counselling about LARCs.

Improving contraceptive usage is a cost effective, high-dividend investment for addressing a high maternal mortality ratio and improving the health and welfare of women, and ultimately a nation (Vitick, 2016). Use of modern contraceptive methods

allows people to attain their desired number of children and determine the spacing of pregnancies (WHO, 2018). While SARCs are highly efficacious methods to prevent pregnancy, they result in significantly higher failure rates in typical use compared to LARCs, and these rates are increased in adolescent girls and young women (McNicholas & Peipert, 2012; Stonehill et al., 2020). The predicted 12-month failure rates among all reproductive age women, including adolescents with typical-use, are 15% for condoms, 8% for oral contraceptive pills and 3% for depo-medroxyprogesterone injectables, while they are less than 1% for LARCs. LARCs also offer non-contraceptive benefits such as reducing menstrual blood flow and dysmenorrhea (Menon et al., 2020).

Shoupe and colleagues provided evidence that increased LARCs uptake drastically reduced unplanned pregnancies and induced abortions in the USA (Shoupe, 2016). Moreover, the World Health Organization and Johns Hopkins Bloomberg School of Public Health/Center for Communication Programs (2022) state that LARC methods are safe and suitable for nearly all women; they recommend that most women can use LARC methods safely and effectively. To add on to that, implants can be used by women who smoke cigarettes, regardless of age or the number of cigarettes smoked, and women living with HIV, whilst IUCD devices can be used by women who have had pelvic inflammatory disease, vaginal infections and HIV clinical disease that is mild or asymptomatic (WHO, 2011). Despite the numerous advantages associated with LARCs usage and the substantial evidence of benefits associated with LARC methods usage, and their recommendation by the WHO, they remain underutilised in sub-Saharan Africa, especially among adolescent girls and young women (Glinski et al., 2014; Kungu et al., 2020; McCoy et al., 2014).

Using data obtained from the Multiple Indicator Cluster Surveys (MICSs) across 20 African countries collected between 2013-2018, Apanga and colleagues, 2020, reported high utilization of SARC methods, with over 74 % utilization, compared to 16 % implants utilization among women of reproductive age (15-49 years) (Apanga et al., 2020). These findings were validated by Boadu, 2022, who reported similar results using data from the Demographic and Health Surveys (DHSs) conducted between 1995 and 2020 across 37 SSA countries. Boadu, 2022, reported high levels of SARC method utilization, with over 72.6% utilization, compared to 19.3% LARC methods utilization among women of reproductive age. Apanga and colleagues further emphasised high utilization (60%) of oral pills in Zimbabwe (Apanga et al., 2020). Adedini et al., 2019, using the Zimbabwe

DHS, reported a low LARCs uptake of 8.51% among women of reproductive ages. The underutilization of LARCs can be attributed to misperceptions about their safety due to early design errors, problems regarding insertion and removal, knowledge and misperceptions about effects on future fertility (Adedini et al., 2019; Itriyeva, 2018). Despite recent evidence suggesting that currently available LARCs methods are safe, easy to use, effective, long lasting, and easily reversible with rapidly restored fertility upon reversal, the rate of LARCs usage remains low among adolescent girls and young people (Adedini et al., 2019).

Extensive research has been undertaken to understand factors influencing the uptake of modern contraceptives among women of reproductive ages (Ngome & Odimegwu, 2014). Socioeconomic, demographic and sexual characteristic factors have been found to be associated with the use of modern contraceptives among women of reproductive age in several sub-Saharan African countries (Adedini et al., 2019; Apanga et al., 2020; Boadu, 2022; Tsegaw et al., 2022). Women in need of contraception may decide against using a method for multiple reasons, including poor geographical or financial access, health concerns or side effects, and low decision-making power (Cavallaro et al., 2020).

To increase LARCs utilization in Zimbabwe, the Ministry of Health and Child Care was funded to augment the supply of LARCs throughout the country at a population-level family planning strategy. Additionally, the adolescent sexual and reproductive health (ASRH) strategies being implemented in Zimbabwe may improve LARC method utilization by levelling the playing field when it comes to access and knowledge of LARCs among adolescent girls and young women (Muchabaiwa & Mbonigaba, 2019).

Since LARC methods are not being utilized as much as the pill in SSA countries, exploring factors that influence contraceptive use may guide interventions aimed at increasing LARCs awareness and promote their use (Toweka et al., 2021). Studies that attempt to establish the factors affecting use of LARCs among adolescents and young women are needed, so that the barriers encountered by potential users are established, and these studies could inform the design of targeted programs which can be used to improve the accessibility, availability and acceptability of the methods among this age group (Adedini et al., 2019). Hence, this chapter sought to determine the proportion of adolescents and young women that are using LARCs and to also examine the impact of socio-economic and demographic factors including type of residence, highest education level, age, economic status, religion, attitude towards fertility, parenthood, and marital

status on LARCs usage among this age group in Zimbabwe. Determining the predictors of LARCs usage among this age group could assist policy makers in the designing of interventions that will focus on these predictors thereby benefiting fully from LARC's potential in decreasing rates of unwanted pregnancies among this susceptible group. Currently there is dearth of information regarding the factors influencing the uptake of LARC methods among adolescent girls and young people in Zimbabwe. This knowledge gap has motivated the carrying out of the study presented in this chapter.

4.3 METHODS

4.3.1 Data sources

For this investigation, ZDHS 2015 data were used. The Zimbabwean government typically conducts the ZDHS, a cross-sectional survey, every five years to track demographic and health indicators such household characteristics, fertility, and mother and child health. In 2015, the ZDHS surveyed 10534 homes; out of them, 9955 women were questioned; these included 2156 (21.7%) teenage girls between the ages of 15 and 19 and 1782 (17.9%) young women between the ages of 20 and 24. All women aged 15 to 24 who were questioned provided data, which were then stored in the SPSS individual women recode files (ZWIR72FL.SAV).

4.3.2 Data variables/Dictionary

The dependent or outcome variable in the study was current method of contraception (V313), which was recoded as 0 if not using any method, 1 if using any LARC (IUCD or implants/Norplants) and 2 if using any SARC method (the pill, male condom, female condom, injection, diaphragm, lactational amenorrhea, emergency contraception). Excluded from any further analysis were abstinence and withdrawal, as these were regarded as traditional methods.

The dependent variable was obtained from two ZDHS questions: *'Are you currently doing something or using any method to delay or avoid getting pregnant?'* and *'Which method are you using?'*

Using guidance from models conducted elsewhere in the literature (Apanga et al., 2020; Boadu, 2022; Tsegaw et al., 2022), independent variables were socioeconomic and demographic factors selected from ZDHS household- and female-level characteristics. The household-level variables were wealth status (V190), and type of residence

(classified as urban dwelling or rural dwelling) (V025), while the female-level variables were respondent's current age (V012), age in 5-year age groups (VO13), highest education level (V106), marital status (V501), religion (V130), number of living children (V218), and desire for children in the future (V605). Some variables were recoded to suit the focus of the study. Religion was recoded as None, Apostolic faith, Pentecostal, Protestant, Roman Catholic, and other (Muslim/Traditional/other Christian/other) (1, 2, 3, 4, 5 and 6 respectively). Marital status was recoded into married or not married from the various categories (living with a partner was considered married), desire for children in the future was coded to those who wanted, undecided or did not want children, and the number of living children was renamed living children and categorised as none (coded 0) and yes (coded 1). Age, residence, wealth index, and education levels were retained in their original categories.

4.3.3 Data analysis

Age was expressed in terms of median and interquartile range (IQR) and 5-year age group frequencies. Descriptive statistic cross tabulations were conducted to establish the descriptive differences in the use of LARCs based on the different independent variables, and Pearson's Chi-Squared test (χ^2) was used to determine any statistical significance in the selected independent variables against LARCs usage. Relative risk ratios or odd ratios (OR) were used to measure the strength of any association between LARCs usage and the independent variables. Multinomial logistic regression models the relationship between a set of independent variables and a nominal dependent variable with at least three groups. Since the dependent variable had three categories (LARCs usage, SARCs usage and non-use); a multinomial logistic regression model was used to determine whether the independent variables had any effect on LARCs usage. Backwards stepwise multinomial logistic regression models were used.

Variables that did not demonstrate a significant association with LARCs usage at p=0.20 level were systematically removed from analysis.

Because LARC use was the study's main result, it served as the regression analysis's reference category. All data were analysed using IBM SPSS Statistics for Windows, version 19.0 (IBM Corp., Armonk, NY, USA), except for the stepwise logistic regression, which was carried out using STATA/Be 17. *p*-values <0.05 were considered significant

during the analysis. Bar graphs were drawn with IBM SPSS. According to the DHS Guide to statistics, sample weights were applied only for descriptive statistics (percentages, means) to adjust for over sampling and under sampling using the provided women's individual sample weight (v005/1000000) (McCurdy et al., 2018).

4.4 RESULTS

4.4.1 Socio-economic and demographic characteristics

The ZDHS recruited a total of 3938 adolescent girls and young women, with 2156 (54.75%) being adolescent girls aged 15-19 years and 1782 (45.25%) being young women aged 20-24. Among the 3938 adolescents and young women 2132 (54.14%) were sexually active and 1806 (45.86%) were not sexually active. The DHS data further demonstrates that 2826 (71.76%) of these women reported that they were not using any method of contraception at the time of the survey. Amongst the users, 1092 (27.73%) used modern methods (see S1 Fig 1 for contraception use distribution) and 10 (0.25%) used traditional methods, 3 (0.08%) used periodic abstinence and 7 (0.18%) used withdrawal). After removal of the non-sexually active group, traditional methods users, infecund women and weighting, the study consisted of 2132 sexually active participants, of which 721 (33.8%) were adolescent girls and 1411 (66.2%) were young women. The median age was 21 (interquartile range 19-23). From the remaining 2132 adolescent girls and young women, 1043 (48.9%) were non-users, 193 (9.1%) were LARCs users and 896 (42%) were SARCs users at the time of the survey, notwithstanding their marital status (Fig 4.1). The socio-economic demographic characteristics of the adolescent girls and young women are provided in Table 4.1.

Table 4.1: Socio-economic and demographic characteristics of sexually active adolescent girls and young women aged 15–24 based on ZDHS 2015.

Variable		Number	Percentage (%)
Age group in 5 years	15-19	721	33.8
	20-24	1411	66.2
Residence	Urban	684	32.1
	Rural	1448	67.9
Education levels	No education	11	0.5
	Primary education	618	29.0
	Secondary education	1436	67.3
	Higher education	67	3.1
Religion	None	132	6.2
	Apostolic sec	955	44.8
	Pentecostal	543	25.5

	Protestant	277	13.0
	Roman catholic	106	5.0
	Other	119	5.6
Wealth Index	Poorest	418	19.6
	Poorer	440	20.6
	Middle	402	18.9
	Richer	496	23.2
	Richest	377	17.7
Living children	None	611	28.7
	One or more children	1521	71.3
Current marital status	Not married	666	31.3
	Married	1466	68.7
Desire for more children	Desire no more	262	12.3
	Undecided	63	3.0
	Desire more children	1807	84.8

Source: ZDHS 2015

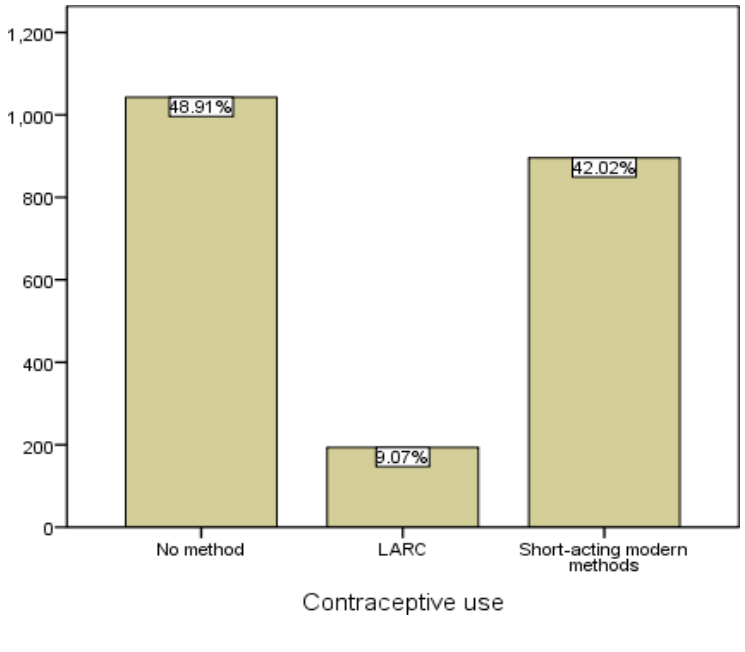

Figure 4.1: Modern contraception use by sexually active adolescent girls and young women aged 15–24 in ZDHS 2015

4.4.2 Contraception use among young Zimbabwean women aged 15-24 in 2015

Cross-tabulations were performed to show any statistical associations between the variables being studied against the three categories of non-use, LARCs usage, and SARCs usage. The results are presented in **Table 4.2** and **Figures S2-S9**. Except for education p=0.642), there were significant associations between the study variables and LARCs

usage (p<0.05). As expected, non-use was highest across all the independent variables followed by SARCs usage, and LARCs usage was the lowest (see **Table 4.2**). LARCs usage was high among young women (20-24) at 11.3%, compared to adolescent girls (15-19) at 4.6%. In the wealth status category, richer women had the largest proportion of LARCs usage at 12.3%. In terms of religion, those from the Pentecostal church constituted the largest proportion of LARCs usage at 12%. As anticipated, LARCs usage was higher among urban dwelling women, at 11.5% compared to rural dwelling women, at 7.9%. Women who did not desire to have more children had the highest proportion of LARCs usage at 20.2%. Similarly, women with children had a higher proportion of LARCs usage (12.5%) compared to women who did not have children (0.5%). Women that were not married had a higher proportion of LARCs usage at 10.9%, compared to married women at 8.3%.

Table 4.2: Contraception use in women aged 15-24 in Zimbabwe in 2015

Variable		Contraceptive use			***p-value***	χ^2
		None	LARC usage	SARC usage		
Age group in 5 years	15-19	456 (63.2%)	33 (4.6%)	232 (32.2%)	0.000	94.942
	20-24	587 (41.6%)	160 (11.3%)	664 (47.1%)		
Residence	Urban	343 (50.1%)	79 (11.5%)	263 (38.4%)	0.007	10.012
	Rural	700 (48.3%)	115 (7.9%)	633 (43.7%)		
Education levels	No education	4 (33.3%)	1 (8.3%)	7 (58.3%)	0.642	4.257
	Primary education	294 (47.6%)	52 (8.4%)	272 (44.0%)		
	Secondary education	714 (49.8%)	136 (9.5%)	585 (40.8%)		
	Higher education	31 (45.6%)	5 (7.4%)	32 (47.1%)		
Religion	None	47 (35.6%)	15 (11.4%)	70 (53.0%)	0.016	21.886
	Apostolic sec	483 (50.5%)	74 (7.7%)	399 (41.7%)		
	Pentecostal	264 (48.7%)	65 (12.0%)	213 (39.3%)		
	Protestant	139 (50.0%)	17 (6.1%)	122 (43.9%)		
	Roman catholic	55 (51.9%)	10 (9.4%)	41 (38.7%)		

	Other	55 (46.2%)	13 (10.9%)	51 (42.9%)		
Wealth Index	Poorest	196 (46.9%)	29 (6.9%)	193 (46.2%)	0.002	24.681
	Poorer	208 (47.3%)	46 (10.5%)	186 (42.3%)		
	Middle	208 (51.7%)	20 (5.0%)	174 (43.3%)		
	Richer	229 (46.3%)	61 (12.3%)	205 (41.4%)		
	Richest	202 (53.6%)	37 (9.8%)	138 (36.6%)		
Living children	None	539 (88.2%)	3 (0.5%)	69 (11.3%)	0.000	5.327E2
	1 or more	504 (33.1%)	191 (12.5%)	827 (54.3%)		
Current marital status	Not married	438 (65.7%)	73 (10.9%)	156 (23.4%)	0.000	1.395E2
	Married	608 (41.4%)	121 (8.2%)	741 (50.4%)		
Desire for more children	Desire no more	120 (45.8%)	53 (20.2%)	89 (34.0%)	0.000	62.156
	Undecided	43 (68.3%)	8 (12.7%)	12 (19.0%)		
	Desire more children	880 (48.7%)	132 (7.3%)	795 (44.0%)		

p-value< 0.05 indicates that there is a statistical relationship between the categorical variables.

4.4.3 Backwards stepwise multinomial logistic regression estimates to determine the factors associated with LARCs.

Variables were fitted into the multinomial regression model with LARCs usage as the reference category for contraceptive use. Reference categories for the independent variables are indicated for each variable.

4.4.3.1 LARCs-usage versus non-use

Age, type of residence, current marital status and attitude towards fertility were not statistically associated with LARCs usage among adolescent girls and young women after running backwards stepwise multinomial logistic regression (*p*-values >0.05, see **Table 4.3** for details). Highest education level, parenthood, being a member of the Apostolic Faith church and highest wealth class status were statistically associated with more LARCs usage among adolescent girls and young women (*p*-values <0.05). Adolescent girls and young women with secondary and primary education had increased odds of not

using any method (OR: 5.033, 95% CI: 2.136-11.852 and OR: 5.799, 95% CI: 2.327–14.453 respectively) hence lower odds of using LARCs than adolescent girls and young women who received tertiary education. Women without living children had increased odds of not using any method of contraception (OR 66.543, 95% CI: 25.784-171.738) and decreased odds of LARCs usage than women with living children. Women of the Apostolic Faith church had increased odds of not using any method of contraception (OR 1.424, 95% CI: 1.018-1.990) and decreased odds of LARCs usage. Women in the poorest and middle wealth class status had increased odds of not using any method (OR 1.766, 95% CI: 1.040-2.702 and OR 1.677 95% CI: 1.272-3.512) compared to women in the highest wealth class status.

4.4.3.2 LARCs-usage versus SARCs usage

Highest education level, type of residence, age and religion were not statistically associated with LARCs usage among adolescent girls and young women (*p*-values >0.05, see **Table 4.3** for details). Current marital status, parenthood and attitude towards fertility were statistically associated with more LARCs usage among adolescent girls and young women (*p*-values <0.05). Unmarrried adolescent girls and young women were associated with decreased odds of SARCs usage (OR 0.399, 95% CI: 0.285-0.558) and increased odds of LARCs usage, compared to married women.

Adolescent girls and young women who did not desire any more children had reduced odds of SARCs usage (OR: 0.448, 95% CI: 0.304-0.660) and increased odds of LARCs usage than those who did desire to have more children. Women with no children had increased odds of SARCs usage (OR: 6.442, 95% CI, 2.276-16.761) and reduced odds of LARCs usage than women with children. Women in the middle wealth class had increased odds of SARCs usage (OR 2.024, 95% CI: 1.230-3.332).

Table 4.3: Stepwise Multinomial Logistic regression model estimates for use of LARCs among sexually active females aged 15–24 Zimbabwe, 2015.

Contraceptive use		***p*-value**	**Odds Ratio (OR)**	95% Confidence Interval	
				Lower Bound	Upper Bound
No method	**Attitude towards fertility**				
	Desire no more children	0.570	0.893	0.606	1.317

	Undecided	0.456	1.367	0.601	3.106
	Desire more children	[Ref]	[Ref]	[Ref]	[Ref]
	Living children				
	Non	0.000	66.543	25.784	171.738
	Yes	[Ref]	[Ref]	[Ref]	[Ref]
	Highest education levels				
	Primary education	0.000	5.799	2.327	14.453
	Secondary education	0.000	5.032	2.13	11.852
	Tertiary education	[Ref]	[Ref]	[Ref]	[Ref]
	Religion				
	Apostolic faith	0.039	1.424	1.018	1.990
	No religion	[Ref]	[Ref]	[Ref]	[Ref]
	Wealth Index				
	Poorest	0.034	1.677	1.040	2.702
	Middle	0.004	2.114	1.272	3.512
	Richest	[Ref]	[Ref]	[Ref]	[Ref]
	Current marital status				
	Not married	0.143	0.775	0.551	1.090
	Married	[Ref]	[Ref]	[Ref]	[Ref]
SARC					
	Attitude towards fertility				
	Desire no more children	0.000	0.448	0.304	0.660
	Undecided	0.086	0.461	0.191	1.115
	Desire more children	[Ref]	[Ref]	[Ref]	[Ref]
	Living children				
	Non	0.000	6.443	2.476	16.767
	Yes	[Ref]	[Ref]	[Ref]	[Ref]
	Education levels				
	Primary education	0.47	1.347	0.593	3.061
	Secondary education	0.665	1.183	0.552	2.535
	Tertiary education	[Ref]	[Ref]	[Ref]	[Ref]
	Religion				
	Apostolic sec	0.897	1.022	0.738	1.414
	No religion	[Ref]	[Ref]	[Ref]	[Ref]
	Wealth Index				
	Poorest	0.067	1.545	0.970	2.459
	Middle	0.006	2.024	1.230	3.332
	Richest	[Ref]	[Ref]	[Ref]	[Ref]
	Current marital status				
	Not married	0.000	0.399	0.285	0.558
	Married	[Ref]	[Ref]	[Ref]	[Ref]

OR values > 1suggests increased odds or likelihoods
OR values < 1suggests decreased odds or likelihoods
OR with a narrow confidence interval suggests a precise estimate of the association

p-value< 0.05 indicates the association is significant
Ref = reference category

4.5 DISCUSSION

The study was focused on LARCs usage vis-à-vis usage of other modern contraceptive methods among adolescents and young women in Zimbabwe. At the cross-tabulation levels it was shown that age, residence, religion, marital status, number of living children, and the desire for more children were the factors that showed statistical significance. According to the regression analysis, education level, type of residence, age and religion were not statistically associated with LARCs usage among adolescent girls and young women. Current marital status, parenthood and attitude towards fertility were statistically associated with more LARCs usage among adolescent girls and young women. Unmarried adolescent girls and young women were associated with decreased odds of SARCs usage (OR 0.399, 95% CI: 0.285-0.558) and increased odds of LARCs usage, compared to married women.

Adolescent girls and young women who wished not to bear more children had reduced odds of SARCs usage and increased odds of LARCs usage than those who desired to have more children. Childless women had increased odds of SARCs usage and reduced odds of LARCs usage than women with children; while women in the middle wealth class had increased odds of SARCs usage.

Low LARCs usage of 9.1% was observed in the present study, compared to SARCs usage of 42% among adolescent girls and young women. These findings are comparable to the findings by Adedini and colleagues (2019), who reported low LARCs usage (8.51%) among Zimbabwean women of reproductive age (Adedini et al., 2019). The findings are congruent with studies conducted in SSA, which reported overall low LARCs usage among women of the reproductive age (Apanga et al., 2020; Boadu, 2022; Tsegaw et al., 2022). Nonetheless, in some SSA countries such as Kenya, the uptake of implants among adolescents and young women has risen to become second most popular contraceptive method after injections, however, use of IUCD still remains low (Kungu et al., 2020).

This study investigated the influence of socioeconomic and demographic factors on LARCs usage in comparison to SARCs usage and non-use among Zimbabwean adolescent girls and young women.

In contrast to other studies, age and type of residence (urban dwelling vs rural dwelling), which have been previously reported to have significant associations with modern contraceptive usage (Adedini et al., 2019; Kungu et al., 2020; Nance et al., 2018; Smith et al., 2017; Stonehill et al., 2020) , were not found to be significant predictors of LARCs usage. In Kenya, age was found to be a predictor of increased LARCs usage, and was reported to be more among the 20–24-year age group. Our results are perhaps unexpected, as the older 20–24-year age group is expected to be more mature and subsequently more sexually active, as they are more likely to be focused on more long-term relationships and marriage, and since the average age of first marriage in Zimbabwe is 20 years (ZimStat, 2015). This is because LARC usage has been associated with a woman's parity and family planning intentions, that is, need for short term delay versus need for long term delay or complete avoidance (Adedini et al., 2019; Kungu et al., 2020).

The non-significant relationship between LARCs usage and type of residence (urban dwelling versus rural dwelling) was perhaps an unexpected finding, as there is normally increased access to LARCs health facilities in urban areas versus rural areas (Stonehill et al., 2020). Interventions such the ASRH strategies that aimed to provide equal access and knowledge to SRH issues among young Zimbabweans and the supply of LARCs throughout the country at a population-level family planning strategy, could have resulted in equal access to LARCs in rural and urban settings (Ministry of Health, 2016). This contrasts with the findings from a Kenyan study, where it was revealed that more LARC users are located in urban areas than in rural areas (Magadi & Curtis, 2003; Adedini et al., 2019).

Being married or living with a partner was associated with increased odds of SARCs usage and reduced odds of LARCs usage among adolescent girls and young women. This was perhaps expected, since married adolescent girls and young women may intend to start bearing children soon and thus might oppose LARCs use, which is long-term and perceived to delay fertility (Adedini et al., 2019; Kungu et al., 2020). Instead, they may choose SARCs that suit their short-term family planning objectives. There was, however, a high proportion of unmarried adolescents and young women, and usage of other modern methods by a significant number within this cluster, which suggests an increased risk of unplanned pregnancies among the same group. This consequently results in a potential for greater LARCs use among this population if adequate knowledge is imparted to both

SARCs users and non-users within the unmarried group. Marital status was concluded to have a negative impact on LARCs usage, which is similar to other studies' findings on young women (de Vargas Nunes Coll et al., 2019).

Women who did not live with any children had increased odds of not using any method and of using SARCs, and decreased odds of LARCs usage, compared to women with children. Studies from other sub-Saharan African countries have reported similar results (Adedini et al., 2019; Bolarinwa et al., 2022). Adedini and colleagues reported that the likelihood of LARCs usage was significantly much higher among multiparous women compared to their childless counterparts. This could be because multiparous women tend to receive family planning education and counselling on LARCs use throughout their pregnancy cycle, thereby increasing their odds of LARCs usage (Bolarinwa et al., 2022). Another possible explanation is that multiparous women could be using LARCs to limit childbearing, as they would have attained their desired number of children. Adolescent girls and young women no longer desiring more children had reduced odds of SARCs usage and increased odds of LARCs usage. This would be expected and is similar to findings by Adedini and colleagues, seeing as LARCs are mostly used for limiting childbearing (Adedini et al., 2019). Moreover, since it has been observed that number of living children has a strong positive influence on LARC use, the fact that the likelihood of using LARCs rose with the increase in the number of children may also advocate that there has been successful integration of family planning/maternal child health programs. This is because when women utilise these services, they encounter more information and services on LARCs and can then entertain meeting their demand for spacing or limiting children. Recent studies have shown the success of integration efforts such as these (Achwoka et al., 2018; Cooper et al., 2017).

Adolescent girls and young women with tertiary education had increased odds of LARCs usage compared to those with secondary and primary education. A plausible explanation for this observation could be that the most educated women have increased access to information on the side effects and benefits of using LARC methods. As such, they are aware of the misconceptions and myths that often serve as a deterrent to LARCs usage (Bolarinwa et al., 2022). This finding contradicts a similar study in Kenya where education was concluded to have no significant influence on LARCs use (Larsson & Stanfors, 2014). Here, it was argued that better information and exposure to contraceptive

services linked to augmented access to education has been overtaken by improved information, better access, and availability for all potential users in the promotion of LARC methods. Therefore, these parameters could also be improved in Zimbabwe and thereby cancel out the influence of education.

The findings concerning the religion variable when LARCs usage is compared to non-use are not surprising, as the Apostolic Faith religion had increased odds of not using any method of contraception, which is consistent with their beliefs and teachings. Conversely, when SARCs usage is compared to LARCs usage, religion was not found as a predictor, implying religious beliefs or teachings will not influence the choice of contraceptive, but will influence the choice of whether to use or not use contraceptives in general. In Zimbabwe, religion is certainly deep-rooted, and these diverse beliefs and practices have an impact on that choice. Other studies have highlighted the impact of Christianity and, more specifically, the lessened chances of LARCs use, and contraceptives in general, among the Apostolic religion (Munyaradzi et al., 2016).

For purposes of satisfying the reproductive health needs of youths, the focus should be on the interventions that specifically place emphasis on neglected demographics such as adolescents and youths, and design programs that are tailor-made for the predictors of LARCs usage in order to increase uptake, and reduce unintended pregnancies among these age groups (Baldwin & Edelman, 2013; Chandra-Mouli et al., 2015).

4.6 STRENGTHS AND LIMITATIONS

This cross-sectional study utilized secondary data from the 2015 ZDHS. There are several advantages of using ZDHS data, including but not limited to, high participant response rates and wider national coverage (Dwomoh et al., 2020). In Zimbabwe, no other survey carried out at the national level collects data on health indicators as comprehensively as the ZDHS. Furthermore, the ZDHS survey design is subject to international standards, with high-quality interviewer training and standardised data collection procedures across 100 countries (Dwomoh et al., 2020; Stuart et al., 2014). This cross-sectional study presents findings that are generalisable and comparable across Zimbabwe. On the other hand, utilizing ZDHS program data sets also has its own caveats. ZDHS data are gathered through in-person interviews, which leaves the data open to social desirability bias, for example, when unmarried adolescent girls are asked whether they are sexually active (Stonehill et al., 2020). Being a secondary data set, important context and country specific

characteristics that may influence LARCs usage in Zimbabwe could not be explored in the study (Adedini et al., 2019). Due to the cross-sectional design employed in the study, only associative effects could be measured, and cannot make causal or temporal inferences (Bolarinwa et al., 2022; Stonehill et al., 2020).

4.7 FUTURE RESEARCH

The large disparities between adolescent girls and young women using LARCs compared to those using SARCs reveal a large untapped potential for LARCs usage. It has been documented that when barriers to the use of LARCs are removed, adolescent girls and young women have progressively chosen the LARCs to prevent pregnancy (Itriyeva, 2018). To improve LARCs utilization other factors that influence LARCs usage, such as: (i) knowledge of these methods; (ii) availability, accessibility, and cost; (iii) LARCs provider attitudes and knowledge; (iv) previous unplanned pregnancy, (v) exposure to mass media and mHealth, (vi) work status, (vii) myths and misperceptions of LARCs, need to be investigated.

4.8 CONCLUSIONS

Although LARC methods are recommended by WHO, current method use in the study reflects a method mix more inclined towards SARCs usage and low LARCs uptake. Although it has been established that LARC usage is rising among adolescents and young women, the rate at which usage is rising remains low. There is, therefore, potential to increase LARC uptake by focusing on the predictors of its use, which have been found herein to be education, wealth class, marital status, parenthood and the number of living children. Having acquired tertiary education, having living children, a desire to cease bearing children altogether and highest wealth class status were associated with increased likelihood of using LARCs. Being married and being a member of the Apostolic Faith church were associated with a decreased likelihood of LARCs usage. As such, policy makers should perhaps focus on the barriers emanating from these factors when investing in SRH interventions and increase LARCs usage in family planning initiatives with the aim of reducing unintended pregnancies among adolescents and young women. Improved access to and utilisation of LARCs among adolescents and young women in Zimbabwe should help in improving SRH outcomes such as unmet need for contraception, teenage pregnancies, unsafe abortions, preventable maternal deaths, and preventable neonatal/infant deaths, and give them better educational opportunities and career advancement potential. However, it is also necessary to investigate cultural factors which

might also be influencing LARCs usage in Zimbabwe. It is also important to note that only barrier methods prevent the transmission of STIs, therefore, we recommend policies to advocate for dual use of barrier methods and LARCs to effectively prevent unintended pregnancies while also providing protection against STIs.

The following chapter summarises the research questions and their findings. Furthermore, the chapter synthesises the various evidence and discusses the possible implications of the findings on policy. Additionally, recommendations on areas to focus on for future studies are given based on the findings and the limitations of the current study methods and data used.

CHAPTER 5: SYNTHESIS

5.1 INTRODUCTION

This Chapter presents a summary of the thesis, reflecting on the general issues and problems identified and why these issues are important. Below are the discussions of findings from the thesis and the implications that these findings have on policy and some recommendations, including for future studies, study limitations and general conclusion. These suggestions may assist policy makers in refining the form and substance of future programs and inform the best use of resources when designing and implementing ASRH programs, for them to be cost-effective whilst achieving the optimum impact on ASRH outcomes.

Chapter one introduced the current study and described the importance of sexual and reproductive healthcare, given that sexual and reproductive health (SRH) problems account for close to 20% of the worldwide disease burden. Evidence has shown that most of this burden is due to unmet needs with respect to family planning services. Chapter two presented a systematic review conducted for the purpose of identifying SRH interventions implemented in sub-Saharan Africa and assessing the impact of these interventions on SRH outcomes. From the review, it was established that interventions that improved SRH outcomes included a combination of educational programs in communities and schools with youth-friendly services, health centres outreach activities and media campaigns (Denno et al., 2015). Furthermore, it was established that bringing awareness of the benefits of modern contraceptives and enabling adolescents to make their own decisions regarding contraceptive services is vital. The review suggests that sexual and reproductive health education, counselling, and contraceptive availability are effective in increasing adolescent knowledge related to sexual health and contraceptives uptake, thereby reducing risky sexual behaviour and the related adverse outcomes (Kesterton & Cabral de Mello, 2010).

The empirical Chapters three and four were dedicated to the determination of the impact of the Zimbabwean ASRH program and the exploration of the possible socioeconomic and demographic factors associated with the utilization of LARCs among adolescents and young people in Zimbabwe. The findings from these two chapters are discussed below.

5.2 IMPACT OF THE ZIMBABWEAN ADOLESCENT SEXUAL AND REPRODUCTIVE HEALTH PROGRAM ON SEXUAL AND REPRODUCTIVE HEALTH INDICATORS.

5.2.1 The Zimbabwe Adolescent Sexual and Reproductive Health (ASRH) Strategy

As discussed previously in this thesis, reducing unwanted pregnancies among adolescents and young people is a crucial public health priority in Zimbabwe where the unmet need for family planning remains high. Unwanted pregnancies can have profound negative consequences for women's health, socioeconomic status, and overall well-being. They are associated with increased risks of maternal morbidity and mortality, unsafe abortions, child malnutrition, and perpetuation of intergenerational cycles of poverty (Darroch et al., 2016; Gipson et al., 2008). In Zimbabwe, a range of interventions through the ASRH strategy, were implemented between 2010 and 2015 across the country, to address the drivers of unwanted pregnancies to improve access to, and use of modern contraceptive methods. These interventions spanned the health, education, and social sectors, employing diverse strategies such as community mobilization, provider training, mass media campaigns, and social and behaviour change communication (SBCC) (Belaid et al., 2016; Denno et al., 2015; Schivone & Blum, 2016).

The theory of change according to the WHO Framework described in Chapter one was utilised to analyse the impact of the ASRH strategy. This framework emphasizes the importance of the social-structural context in shaping sexual and reproductive health outcomes. Prior to the 2010 ASRH strategy, Zimbabwe faced significant challenges in addressing the SRH needs of its adolescent and youth population. High rates of early and unintended pregnancy, unsafe abortion, sexually transmitted infections (STIs), and gender-based violence (GBV) were major public health concerns, exacerbated by limited access to youth-friendly SRH services, comprehensive sexuality education, and social support (Chandra-Mouli et al., 2015; Zirima, 2019). This resulted in high rates of unmet need for family planning, low knowledge of modern contraception, unsafe abortion, and high rate fertility among young people (ZIMSTAT, 2012; Chandra-Mouli et al., 2017).

As the inputs to the theory of change developed for this study according to the WHO framework and literature, the 2010 ASRH strategy, was aimed at improving access to youth-friendly sexual and reproductive health information and services, addressing social

and gender norms that hinder adolescent sexual and reproductive health and strengthening the policy and legal environment (MoHCC, 2009; Patton et al., 2016). Activities carried out in the implementation of the strategy include: expanding adolescent-friendly health services, including contraceptive provision; public awareness campaigns challenging harmful social norms and advocacy for policy and legal reforms, e.g. removing parental consent barriers (Chandra-Mouli, 2015). The envisaged outputs according to the formulated theory of change were: increasing coverage of youth-friendly SRH services; more positive social norms around adolescent sexuality and contraceptive use and some legal/policy changes, e.g. raising age of marriage. Overall, according to this theory of change, after a successful implementation of the strategy, the following outcomes among adolescents and young people were envisaged:

- Increased knowledge of modern contraception methods.
- Reduced unmet need for family planning.
- Increased use of modern contraceptive methods.
- Decreased desire for more children.
- Decreased incidence of unsafe abortion.

5.2.2 The Zimbabwe ASRH Strategy Outcomes

Contrary to the expected outcomes according to the theory of change, despite five family planning outcomes being evaluated, high ASRH program intensity had a positive impact only on knowledge of modern contraceptive methods among young women, but no impact on abortion, modern contraceptive method usage, unmet need for family planning and attitude towards fertility. Moreover, high ASRH program intensity was positively associated with attitude towards fertility only among men, but no positive associations were observed between high ASRH program intensity and the other outcomes. The fact that ASRH program intensity did not seem to improve most of the SRH outcomes may have been attributed to limited utilization of the ASRH services. These findings are contrary to the study's expectations that a higher number of combinations of complimentary interventions would result in more impact and better outcomes. As such, more resources will not necessarily result in better outcomes. Hence, creating demand by increasing awareness of the benefits of ASRH services and contraceptives and encouraging their use could be equally important to ultimately improve ASRH outcomes. As reported in Chapter two, social and community mobilisation, mass media campaigns

and financial incentives schemes are example of interventions that could be employed to achieve demand creation and subsequent use of modern SRH services and contraceptives (Belaid et al., 2016; Mwaikambo et al., 2011).

For women, the regression models for modern contraceptive method usage revealed an unexpected finding, as it was found that high ASRH program intensity was not associated with an increased likelihood of modern contraceptive method usage among women. Reduction in usage could have been due to lack of uptake and unavailability of family planning commodities, or failure to reach healthcare facilities because of distance or transport costs or other barriers, as well as religious or cultural issues and restrictions in decision making (Darroch et al., 2016; Shoupe, 2016).

The study findings contradicted other studies in sub-Saharan Africa, in which it was reported that youth-friendly SRH services intervention increases modern contraceptive methods usage (Oberth et al., 2021; Rosenberg et al., 2018). In the context of Zimbabwe, this lack of impact could be due to gender and power inequalities, as well as lingering harmful social/cultural norms. Although most barriers were removed, prevailing social norms that result in resistance to open discussions of sexuality and contraception remained a barrier (Mashange et al., 2021). Furthermore, high levels of intimate partner violence continued to undermine young women's reproductive autonomy (Duby et al., 2018), in addition to the social/cultural norms, whereby religious and traditional beliefs often viewed the strategy's aims as contradicting cultural values (Manzungu and Nzuma, 2019). As in many other African countries, harmful social and gender norms, such as early and forced marriage, gender-based violence, and the stigmatization of adolescent sexuality, have been persistent barriers to young people's ability to exercise their sexual and reproductive rights in Zimbabwe (Chandra-Mouli et al., 2015; Mutandwa & Zvinavashe, 2019).

5.2.2.1 Improved access to youth-friendly sexual and reproductive health services

One of the primary goals of the 2010 ASRH Strategy was to improve access to high-quality, youth-friendly sexual and reproductive health services. A study conducted by Ngwenya et al. (2022) found that after the implementation of the 2010 ASRH Strategy, the proportion of sexually active adolescents and young people who reported accessing

modern contraceptives increased from 35% to 59%. Similarly, the percentage of young people who reported accessing HIV testing and counselling services increased from 42% to 68% (Nyakudya et al., 2022). Furthermore, the strategy's focus on reaching marginalized groups, such as rural and out-of-school youth, has also contributed to more equitable access to SRH services. A study by Mavhunga et al. (2021) found that the proportion of rural adolescents and young people accessing SRH services increased from 28% to 44% after the implementation of the 2010 strategy. However, based on the findings of this current study, these improvements in service access seem to not have much positive impact on SRH outcomes among adolescents and young people in Zimbabwe.

5.2.2.2 Increased Comprehensive Knowledge and Awareness

Improving knowledge and awareness of modern contraceptive methods was a key objective of the Zimbabwean ASRH strategy. Prior to the strategy's implementation, data from the 2005-06 ZDHS indicated that knowledge of modern contraceptive methods among adolescents and young people was relatively high (ZimStat & ICF International, 2012). However, when it comes to comprehensive knowledge, which includes knowledge of the source, side effects, and proper use of contraceptive methods, the figures were lower. Only 76.2% of women aged 15-19 and 82.1% of those aged 20-24 had comprehensive knowledge of modern contraception (ZimStat & ICF International, 2012). Results from the current study show that knowledge of modern contraceptive methods among adolescents and young people in Zimbabwe has improved. Moreover, the comprehensive knowledge of modern contraception has also reportedly increased, with 87.1% of women aged 15-19 and 91.0% of those aged 20-24 demonstrating comprehensive knowledge (ZimStat & ICF International, 2016). These improvements suggest that the ASRH strategy's focus on comprehensive sexuality education and strengthening provider capacity may have been effective in enhancing adolescents' and young people's knowledge and understanding of modern contraceptive methods (Mapingure et al., 2023), similar to this study’s findings. This is further supported by a study by Mhangara et al. (2021) which found that after the implementation of the 2010 ASRH strategy, the proportion of adolescents and young people who demonstrated comprehensive knowledge about HIV/AIDS and other STIs increased from 41% to 68%. However, challenges remain in ensuring the consistent quality and coverage of CSE

programs across all schools and communities in Zimbabwe (Mutandwa & Zvinavashe, 2019).

5.2.2.3 Unmet Need for Family Planning

Evidence from the study suggests that the ASRH strategy did not have a positive impact on reducing unmet need for family planning among adolescents and young people in Zimbabwe. The strategy's efforts to train healthcare providers, establish youth-friendly corners, and engage community stakeholders helped to address barriers to family planning and improved awareness and access (Denno et al., 2015). However, usage could have been hampered by a variety of reasons such as conflicting policies as discussed in section 5.3 below.

5.2.2.4 Abortion-related Outcomes

The 2010 ASRH strategy in Zimbabwe was also aimed at addressing the sensitive and complex issue of abortion among adolescents and young people. Prior to the strategy's implementation, abortion was a highly contentious and stigmatized topic, with significant legal and social barriers to access. According to the 2005-06 ZDHS, the abortion rate among women aged 15-19 was 12 per 1,000, while for those aged 20-24, it was 23 per 1,000 (ZimStat & ICF International, 2012). The ASRH strategy sought to tackle abortion by emphasising the importance of comprehensive sexuality education, which included information on the legal status of abortion, the risks of unsafe abortion, and the availability of safe abortion services where legally permitted (Starrs et al., 2018). Additionally, the strategy aimed to improve access to post-abortion care and ensure that healthcare providers were trained to deliver these services in a non-judgmental and youth-friendly manner (MoHCC, 2009). However, according to the study findings, there was no positive impact of the ASRH strategy on abortion. It is important to note that the legal and social context surrounding abortion in Zimbabwe remains complex and challenging, whereby abortion remains largely illegal in Zimbabwe and culturally an unacceptable practice. While the ASRH Strategy has made some progress in addressing abortion-related issues, continued efforts to address the broader legal, social, and cultural barriers are necessary to ensure that adolescents and young people can access safe and comprehensive reproductive health services, including safe abortion where legally permitted (MoHCC, 2016).

5.2.2.5 Desired Fertility and Modern Contraceptive Use

The ASRH strategy promoted birth spacing and family planning, which may have influenced fertility preferences. The findings from the study indicate that the strategy may have been successful in shifting adolescent fertility desires towards smaller family sizes (MoHCC, 2016; Starrs et al., 2018). However, as reported earlier, the ASRH strategy did not have positive impact on most of the SRH outcomes, including modern contraceptives usage. Addressing SRH issues requires a nuanced understanding of the complex, interconnected social, cultural, and structural factors that shape access to and use of contraception.

5.3 Policy implications on future Adolescent Sexual Reproductive Health programs in Zimbabwe

High ASRH program intensity had a positive impact only on knowledge of modern contraceptive methods among young women. Increased ASRH program intensity was positively associated with attitude towards fertility only among men, but no positive associations were observed between high ASRH program intensity and the other outcomes among both young women and men. Some researchers such as the Lancet Commission on Adolescent Health have proposed the implementation of multi-pronged interventions for the purposes of complementing one another, with the ultimate goal of improving SRH outcomes (Chandra-Mouli et al., 2015; Fatusi, 2016; Griggs, 2013; Patton et al., 2016). However, similar to other studies' findings (Oxman et al., 1995; Powell et al., 2019), there were no clear patterns found between the number of strategies used and the magnitude of impact on the outcomes measured in the current study. These findings also resonate with a review aimed at assessing whether multifaceted implementation strategies are more effective than single strategies, which reported no evidence of multifaceted strategies being more effective than single strategies (Lau et al., 2015; Squires et al., 2014). This may be indicative of the selection of strategies going beyond quantity, but more importantly, using a tailored approach to select strategies based on having a thorough understanding of context, including barriers and facilitators to implementation (Powell et al., 2019). This view is supported by a study by Smith et al., 2019, which further calls for single program strategies due to their better implementation.

Based on the WHO framework described in Chapter one, this thesis suggests that another reason causing lack of impact could be that of inadequate coordination by program

implementers, as reported elsewhere by Blum et al., 2015 and Marimo et al., 2015, concerning the Zimbabwean ASRH strategy and by Michielsen et al., 2010, for other similar interventions in Africa. It can, therefore, be deduced that more resources will not necessarily result in improved SRH outcomes, implying the need to do thorough research on the specific needs of each target demographic and tailoring the composition of interventions accordingly. This endeavour will also have to include research focused on finding the most effective distribution mechanisms. As reported by Muchabaiwa and Mbonigaba, 2019, there was no framework in place for coordinating or monitoring and evaluating the various stakeholders in the implementation of the Zimbabwean ASRH strategy. This could have led to duplication of roles, thereby wasting scarce resources or, worse still, cancellation out of the effect of the overall combination of interventions (WHO,2017). Additionally, it is necessary to align government policies based on the status quo, where on one end, the ASHR strategy encourages the uptake of contraceptives, while conversely, government policy does not allow for condoms to be distributed in schools (Bhebhe, 2018). Moreso, the restrictions on access to contraceptive services to under 18-year-olds, and requirements for parental consent for minors to receive services act as barriers to uptake of the available services (Mmari and Sabherwal, 2013; Chandra-Mouli et. al., 2014).

According to the WHO framework and the theory of change developed for this study, there are religious, cultural and social norms and other social dynamics that are at play and could have influence on any SRH interventions that may be implemented. The Zimbabwean context is shaped by gender and power dynamics, where women have limited autonomy and decision-making power over their sexual and reproductive lives due to patriarchal gender norms (Dziva and Zaha, 2020). Gender inequities and power imbalances within intimate relationships and broader societal structures are key determinants of contraceptive use and unintended pregnancy in Zimbabwe and the region. Studies have highlighted how traditional gender norms and expectations can limit women's autonomy in decision-making about family planning, there negatively affecting uptake of SRH services (Ngome & Odimegwu, 2014; Yaya et al., 2019). A study by Ndlovu et al. (2021) found that after the implementation of the 2010 ASRH Strategy, the proportion of adolescents and young people who reported feeling confident in their ability to negotiate safer sex practices increased from 52% to 71%. In addition, a study by Nyakudya et al. (2022) found that the proportion of adolescent girls who reported

experiencing gender-based violence decreased from 28% to 19% in the years following the implementation of the 2010 ASRH Strategy. However, it seems these positive gains were not enough to neutralise the opposing effects of these harmful social and cultural norms (Muranda et al. (2022). Therefore, in future more efforts are needed to empower young people, promote gender-equitable norms, and strengthen referral pathways for survivors of gender-based violence. An impact evaluation of a community-based family planning program in Zimbabwe found that interventions empowering women and promoting male involvement were more effective in increasing contraceptive uptake compared to standard service delivery approaches. The program encouraged shared decision-making between partners, challenging the notion that family planning is solely a "women's issue." This suggests that addressing gender inequities and power dynamics within relationships is crucial for the success of family planning interventions. These findings underscore the importance of addressing the links between violence, power dynamics, and reproductive control in family planning interventions (Terefe & Larson, 1993). An impact evaluation of a multi-component intervention in Zimbabwe, which included community mobilization and mass media campaigns, demonstrated the importance of addressing social norms and stigma (Agha & Van Rossem, 2002). The intervention successfully increased contraceptive use and reduced unintended pregnancies by shifting social perceptions and promoting family planning as a socially acceptable behaviour.

Despite several efforts to promote SRH service usage by young people, studies have reported poor utilization of these services among young people living in sub-Saharan Africa (Binu et al., 2018; Makoni et al., 2020; Mutea et al., 2019; Wachamo et al., 2020). The fact that ASRH program intensity did not seem to improve most of the SRH outcomes may have been attributed to limited utilization of ASRH services. Evidence has shown that it is equally important to generate demand of services through increasing awareness of the benefits of SRH services and encouraging individuals to utilise them, more so in societies or population groups where there is limited access to correct information concerning contraception. Improving the quality of SRH health information and services can play a vital role in helping women overcome some of these barriers, by contributing to care that upholds and protects women’s rights to voluntary and informed contraceptive choices (Sully et al., 2020). Healthcare workers ought to be made aware of the youth’s rights to family planning autonomy receive appropriate training on the available services

and family options and their applications and desist from recommending hormonal methods to young people on the basis of unfounded fears that the methods hamper a return to fertility, or providers may discriminate against unmarried young people due to harbouring beliefs that they should not be sexually active (Solo & Festin, 2019). Recent recommendations on self-care interventions, such as self-administered injectables and over-the-counter oral contraceptive pills, (WHO, 2019) could help adolescents overcome some of these systemic barriers, in the case of Zimbabwe.

Sexually and reproductive health autonomy in the country could be suffering from reported high incidences of intimate partner violence and gender-based violence which constrained women's ability to negotiate safe sex (Shamu et al., 2011), and the religious and traditional beliefs where contraception and abortion are often viewed as unacceptable (Essén & Johnsdotter, 2004). Studies have shown that women experiencing IPV are less likely to use contraception and more likely to have unintended pregnancies (Christofides et al., 2014; Raj & McDougal, 2015). Therefore, by adopting a holistic, gender-transformative approach that tackles the underlying social and structural barriers, family planning interventions can contribute to greater reproductive autonomy, improved maternal and child health, and the empowerment of women and girls in Zimbabwe and across the region.

Lastly, little consideration was given to the cost-effectiveness and other economic evaluations of the strategies during their implementation, which makes large-scale investments in YFHS interventions unlikely due to the paucity of strong evidence of their affordability and sustainability. Therefore, a key message from this thesis is the need for the operationalising, measuring, and reporting of implementation outcomes, paying close attention to the late-stage outcomes such as sustainability, penetration, and cost of interventions (Starrs, 2018).

In conclusion, the 2010 Zimbabwean ASRH Strategy generally demonstrated no positive impacts on key sexual and reproductive health outcomes for adolescents and young people. Its effectiveness could have been constrained by the powerful influence of persistent gender inequalities, restrictive social norms, intimate partner violence, and cultural/religious beliefs. These underlying social-structural factors that must be addressed to achieve lasting improvements in sexual and reproductive health (Phiri et al., 2023).

5.4 FACTORS ASSOCIATED WITH LONG-ACTING REVERSIBLE CONTRACEPTIVES (LARCs) USAGE AMONG SEXUALLY ACTIVE ADOLESCENT GIRLS AND YOUNG WOMEN IN ZIMBABWE.

5.4.1 Introduction

In Zimbabwe, pregnancies among adolescents and young people are often unintended, due to child marriage, sexual abuse or risky sexual behaviour (MoHCC, 2016) and are associated with adverse health and social consequences. Use of LARCs among this age group can assist avoid or delay getting pregnant and curtail maternal mortality and the other negative consequences already discussed in this thesis (Darroch et al., 2021). It was established in Chapter one that one of the challenges affecting the Zimbabwean family planning program is huge reliance on SARCs rather than the more effective LARCs, despite their recommendation for use by the WHO and also their increased use in other countries like Kenya and the USA. Therefore, Chapter 4 was dedicated to investigating the influence of socioeconomic and demographic factors such as type of residence, highest education level attained, age, economic status, religion, attitude towards fertility, parenthood, and marital status on LARCs usage among Zimbabwean adolescent girls and young women using. According to the WHO framework, achieving sexual health requires interventions at the individual, interpersonal, community, and structural levels to address the various factors that influence it and that sexual health needs are dynamic and vary based on individual, cultural, socioeconomic, and other factors. This requires interventions to be inclusive and responsive to this diversity. Therefore, findings from this analysis could influence future designs of SRH interventions by considering these socioeconomic and demographic factors that may influence choice of contraceptives among adolescents and young people.

5.4.2 Findings from study of factors influencing LARCs usage

According to the analysis, education, residence, and age were not impactful, and the predictors of LARC usage were found to be wealth, religion, marital status, and the number of living children. Low LARCs usage of 9.1% was observed in the present study, contrasted with SARCs usage of 42% among adolescent girls and young women. Age and type of residence (urban dwelling vs rural dwelling) which have been previously reported to have significant associations with modern contraceptive usage (Adedini et al.,

2019; Kungu et al., 2020; Nance et al., 2018; Smith et al., 2017; Stonehill et al., 2020) were not found to be significant predictors of LARCs usage, which contrasts with other studies' findings. The findings concerning the religion variable when LARCs usage is compared to non-use are not surprising, as the Apostolic Faith religion had increased odds of not using any method of contraception, which is consistent with their beliefs and teachings. Furthermore, increased odds of LARCs use were found amongst adolescent girls and young women with tertiary education, compared to those with only secondary and primary education.

5.4.3 Policy implications based on the findings from the study of factors influencing LARCs usage.

Research has shown that the ideal family planning program ought to have a balanced mix of family planning methods to satisfy different preferences. Access and uptake of LARC methods have been lagging, versus that of SARC methods, especially the pill, despite that these methods have been shown to be the more cost-effective. The study revealed that factors like wealth, religion, parenthood, marital status, and the number of living children were found to be predictors of LARCs usage. Women with primary and secondary education, married women, and members of the Apostolic Faith church demonstrated a lower likelihood of using LARCs.

It is not surprising that the religious beliefs and teachings of the Apostolic Faith church influence the decision to refrain from using any form of contraception. Conversely, when comparing the use of SARCs to LARCs, religion was not found to be a predictor. This suggests that religious beliefs may not directly impact the choice of contraceptive method, but rather influence the decision of whether to use contraceptives at all. In Zimbabwe, where religion holds significant importance, the diverse beliefs and practices have a role in shaping contraceptive choices. Previous studies have also highlighted the influence of Christianity, particularly the Apostolic religion, in reducing the likelihood of LARCs use and overall contraceptive use (Munyaradzi et al., 2016).

Adolescent girls and young women with tertiary education were found to have increased odds of LARCs usage compared to those with primary and secondary education. However, accessing and utilizing LARCs among this demographic in Zimbabwe and sub-Saharan Africa face various challenges, including knowledge and awareness gaps. Many young women lack accurate information about the safety, effectiveness, and availability of LARCs, which leads to their hesitation in utilizing them. It seems that increased

education among young people reduces these knowledge gaps and misconceptions about LARCs, such as fears of infertility or side effects, thereby increasing their acceptance within this group (Chandra-Mouli, 2014).

The significant disparities between adolescent girls and young women using LARCs and those using SARCs reveal sizeable amount of untapped potential for LARCs usage. It has been documented that when barriers to the use of LARCs are removed, adolescent girls and young women have increasingly chosen the LARC methods to prevent pregnancy (Itriyeva, 2018). Given that background, to improve LARCs utilization, policy makers ought to focus on the barriers emanating from these factors when investing in future SRH interventions and increase LARCs usage in family planning initiatives, with the aim of reducing unintended pregnancies among adolescents and young women. For example, sociocultural norms and gender dynamics, as discussed in the theory of change in Chapter one, such as community and familial opposition to young, unmarried women accessing contraception can be a significant barrier (Chandra-Mouli et al., 2014). In addition, gender norms that prioritize fertility and child-bearing over women's reproductive autonomy hinder have been reported to hinder LARC uptake. 2014). These barriers are further worsened by insufficient training and skills among healthcare providers to offer quality LARCs counselling and insertion (Temmerman et al., 2014), and provider biases and attitudes, a scenario whereby some providers may be hesitant to offer LARCs to young, nulliparous women due to personal biases or outdated medical eligibility criteria (Gueye et al., 2015).

According to DHS (2010 to 2015) LARC usage among adolescents and young women is increasing and there are, therefore, opportunities to increase its uptake by implementing SRH interventions that address the socioeconomic and demographic predictors for their use. The key factors that should be considered for the success of such strategies include the use of culturally relevant and aspirational SBCC approaches, the engagement of healthcare providers and community gatekeepers, and a holistic approach that addresses both supply and demand-side barriers to family planning. An example of such a program was the A360 program that was implemented in Ethiopia, Nigeria, and Tanzania between 2016 and 2020, with the aim of increasing the use of modern contraceptive methods among adolescent girls and young women. The intervention components of this program included: developing culturally relevant and aspirational SBCC approaches to promote family planning; strengthening the capacity of healthcare providers to deliver youth-

friendly SRH services and engaging with parents, community leaders, and other gatekeepers to address social and cultural barriers (Denno et al., 2019). By fostering a culture of client-centred care and respect for young women's reproductive autonomy and addressing the multifaceted barriers and implementing evidence-based strategies, LARC usage can be significantly promoted among adolescents and young women in Zimbabwe and across sub-Saharan Africa (Chandra-Mouli et al., 2014).

The results of this thesis reveal implications that may affect existing policies and programs. For example, being married and being a member of the apostolic faith church was associated with a decreased likelihood of LARCs usage. Secondary and primary education had increased odds of not using any method. As such, we recommend policies that specifically target these groups to increase knowledge, access and utilization of LARCs. Furthermore, an excess of 80% of those who did not want children in the future happened to not be using LARCs, and they could therefore be targeted for use of the same, since it provides adequately effective protection from unwanted pregnancies (Dube et al., 2020).

To improve levels of service provision and to guarantee access and availability of services, consistent and refresher training is essential for LARCs service providers, with regards to insertion and removal. The purpose of the training would be to tackle potential provider bias by stressing that LARC methods are not just suitable, but also recommended for women who may be young, unmarried, or nulliparous. However, LARCs do not prevent the transmission of STIs; hence, policies that advocate for the dual use of barrier methods and LARCs to effectively prevent unintended pregnancies and simultaneously provide protection against STIs may be useful (Cates et al., 2002). There is also a need to investigate cultural factors which might also be influencing LARCs usage in Zimbabwe (Chakraborty, 2016).

5.5 GENERAL POLICY IMPLICATIONS

Based on the findings from the thesis as guided by the WHO framework, future ASRH strategies could benefit from circumventing legal, policy, social, cultural and structural hindrances to enable more people to benefit from contraceptive services that are effective. A critical element of such services will be, firstly, to identify and target women who may have concerns about their current method of contraception and who desire to modify those

methods; and secondly, to deliver first-rate counselling which is devoid of stigma, discrimination or coercion to these women to guarantee that their reproductive intents are valued and their sexual health safeguarded (WHO, 2017). It is also crucial to improve the capabilities of doctors, nurses and midwives via training and other forms of professional development, so that they can offer effective family-centred therapy to all women who are in need of it. Additionally, given the increasing use of the private sector in SRH services, there is a crucial need for robust investigations which measure the scope of several methods of engaging with the private sector and the influence they have on population and service coverage, and financial risk protection for the populace in its entirety (Chandra-Mouli, 2014; Cleland, 2012).

Regarding services, access to quality youth-friendly, integrated services, provided by healthcare workers who have been trained to work with adolescents, should be ensured. It is hereby suggested that a multi-component strategy that comprises the promotion of YFHCs in the community, coupled with a formal referral system between the community and the YFHCs should be developed together with community support interventions. The YFHCs services should be integrated into existing reproductive health services at provincial, district and health centre levels (Bearinger et al., 2007). Healthcare workers are also strategically positioned enough to influence policy and to guarantee service provision for those who are in need of it. For instance, healthcare workers can also facilitate processes that ensure that young pregnant women receive timely and tailored prenatal services, in order to cater to their high risk and specific problems of anaemia, malaria, HIV and STIs, coupled with giving them specialised attention during obstetric care, given the fact that they are the most exposed to the probability of complications and death. Improvements in this regard need to be handled cautiously and tactically, especially from political and legal standpoints; and healthcare workers can be advocates for legal abortion, sufficient post-abortion care services for youths in areas where abortion is constrained or where youths cannot easily access legal abortion; provision of contraception for all who have unfulfilled need, and other ASHR initiatives whose direct impact on adolescent health is robust (Morris & Rushwan, 2015).

Furthermore, because of the documented effectiveness of the practice of medicine and public health interventions supported by mobile devices among young people due to their privacy and ability to reach populations with restricted access to SRH services, future interventions that include mHealth as a component are highly recommended to improve

knowledge, access and uptake of SRH services (Nalwanga et al., 2021; Smith et al., 2015). This would necessitate investments in digital infrastructure, user-centred design, and digital literacy (Phiri et al., 2022).

Furthermore, future programs should include poverty reduction and economic empowerment by expanding social protection programs (e.g., cash transfers, school subsidies) to support vulnerable adolescent girls and their families. This could entail investing in vocational training, entrepreneurship programs, and economic opportunities for adolescent girls and young women (Bandiera et. al., 2020).

Deeply entrenched social and cultural norms around adolescent sexuality, gender roles, and family planning pose significant barriers to the acceptance and uptake of interventions. Stigma and taboos surrounding adolescent sexual and reproductive health can limit community engagement and political will for bold policy actions. Thus, future programs should promote gender equity and address harmful norms. This could be achieved by **s**trengthening the enforcement of laws and policies against child marriage, gender-based violence, and discrimination. These future programs could also put measures to engage men and boys as allies in promoting gender equality and challenging harmful masculinity norms and support community-led initiatives to transform social and cultural attitudes around adolescent sexuality and pregnancy. This could be done parallel to the strengthening of adolescent girls' empowerment and agency through investing in programs that build adolescent girls' self-esteem, negotiation skills, and decision-making abilities, and supporting adolescent-led initiatives and youth organizations working on sexual and reproductive health and rights.

A holistic, rights-based, and gender-transformative approach that addresses the interconnected socioeconomic drivers is essential for Zimbabwe to make significant and sustainable progress in reducing high rates of adolescent pregnancy. Meaningful engagement of adolescents, particularly girls, will be crucial in the design and implementation of these interventions. In addition, some traditional and religious leaders may oppose certain interventions, such as comprehensive sexuality education or access to contraception for unmarried adolescents, based on their interpretation of cultural and religious norms. Securing the buy-in and support of these influential community stakeholders is crucial but can be politically and socially challenging. Overcoming these multifaceted challenges will require sustained political commitment, innovative financing mechanisms, capacity building, community engagement, and a long-term, systemic

approach to transforming the social, economic, and cultural landscape for adolescent girls in Zimbabwe.

5.6 STRENGTHS OF THE STUDY

Secondary data from the 2015 ZDHS program was utilised in the determination of factors associated with LARCs usage among sexually active adolescent girls and young women in Zimbabwe. Utilization of ZDHS data like other DHS data has numerous benefits, such as high participants response rates and national coverage (Dwomoh et al., 2020). No other survey carried out at the national level collects data on health indicators as comprehensively as ZDHS does. In addition, the ZDHS survey design is subject to international standards, with high-quality interviewer training and standardised data collection procedures across 100 countries (Dwomoh et al., 2020; Stuart et al., 2014). Similarly, the impact of the 2010-2015 Zimbabwean ASRH strategy program intensity on sexual and reproductive health indicators was assessed using DHS as primary source of data, with several aforementioned advantages including high-quality interviewer training, standardised data collection procedures, and consistent content over time, allowing for comparability across populations and over time (Dwomoh et al., 2020).

5.7 LIMITATIONS

The major limitation for chapter 3 and chapter 4 study designs was associated with the use of ZDHS data sets. ZDHS data is collected through in-person interviews, which leaves the data prone to social desirability bias. For example, when unmarried adolescent girls are asked whether they are sexually active, they may not be willing to disclose the truth for fear of being judged (Stonehill et al., 2020).

For chapter 4, the utilization of ZDHS secondary data sets had additional disadvantages. To start with, important context and country specific characteristics that may influence LARCs usage in Zimbabwe cannot be explored. For example, lack of affordability or availability could affect usage even if people have knowledge about LARCs and are willing to use them. Moreover, the cross-sectional design employed in the study only permitted the measurement of associative effects. The study design used made it impossible to make causal or temporal inferences (Bolarinwa et al., 2022; Stonehill et al., 2020). While causality would ideally be looked for, the information provided in this

thesis adds strength to decision making above and beyond information currently available.

For better estimates measurements of the impact of the ASRH strategy, a pre and post-test study design, possibly through in person interviews to collect primary data, is recommended for future studies. The baseline pre-test will be conducted before the ASRH strategy implementation, followed up with a post-test at the end of the ASRH strategy implementation.

5.8 CONCLUSION

The impact study in Chapter 3 was undertaken with the expectation that the higher intensity of combined sets of ASRH interventions coordinated at a national level in Zimbabwe would result in increased ASRH outcomes. In evaluating the effectiveness of this strategy, the study did not find evidence of improved SRH outcomes in regions with higher program intensity, implying the absence of superior outcomes in regions with more resources. This suggests that the key for better outcomes from future ASRH strategies may lie in redesigning service delivery approaches to target mostly rural areas and harder to reach areas. Based on the outcomes of this thesis, the community workers should perhaps be employed especially in rural areas not reached by other organisations, to educate youths and adolescents in these areas on the importance of accessing SRH rights and utilizing the services so as to discourage cultural barriers from imparting information on sexuality to young people. In addition to improving the strategy's coordination and monitoring, aligning and enforcing government policies that promote sexual and reproductive health rights is also imperative. Studies have reported mobile phone-based interventions (mHealth) to be effective in SRH, hence we recommend integration of mHealth with future ASRH strategies to improve the uptake.

The study in Chapter 4 establishes that LARC use is rising among adolescent girls and young women. This signifies that there is potential to increase its uptake by addressing the predictors of its use, which were identified herein as wealth status, religion, parenthood, marital status, and the number of living children. Barriers based on these factors should be addressed, and investments in quality family planning services should be made so that the high rates of unintended pregnancies may be eliminated, and adolescent girls and young women can have control over their reproductive and life goals.

Hence, more knowledge of LARC and its benefits is needed among this critical segment of the population to stimulate uptake and reduce unwanted pregnancies and their negative impact on this age group in Zimbabwe.

Lastly, perhaps a pre- and post- survey study design to effectively measure the impact of future ASRH strategies on SRH health indicators would be useful in Zimbabwe.

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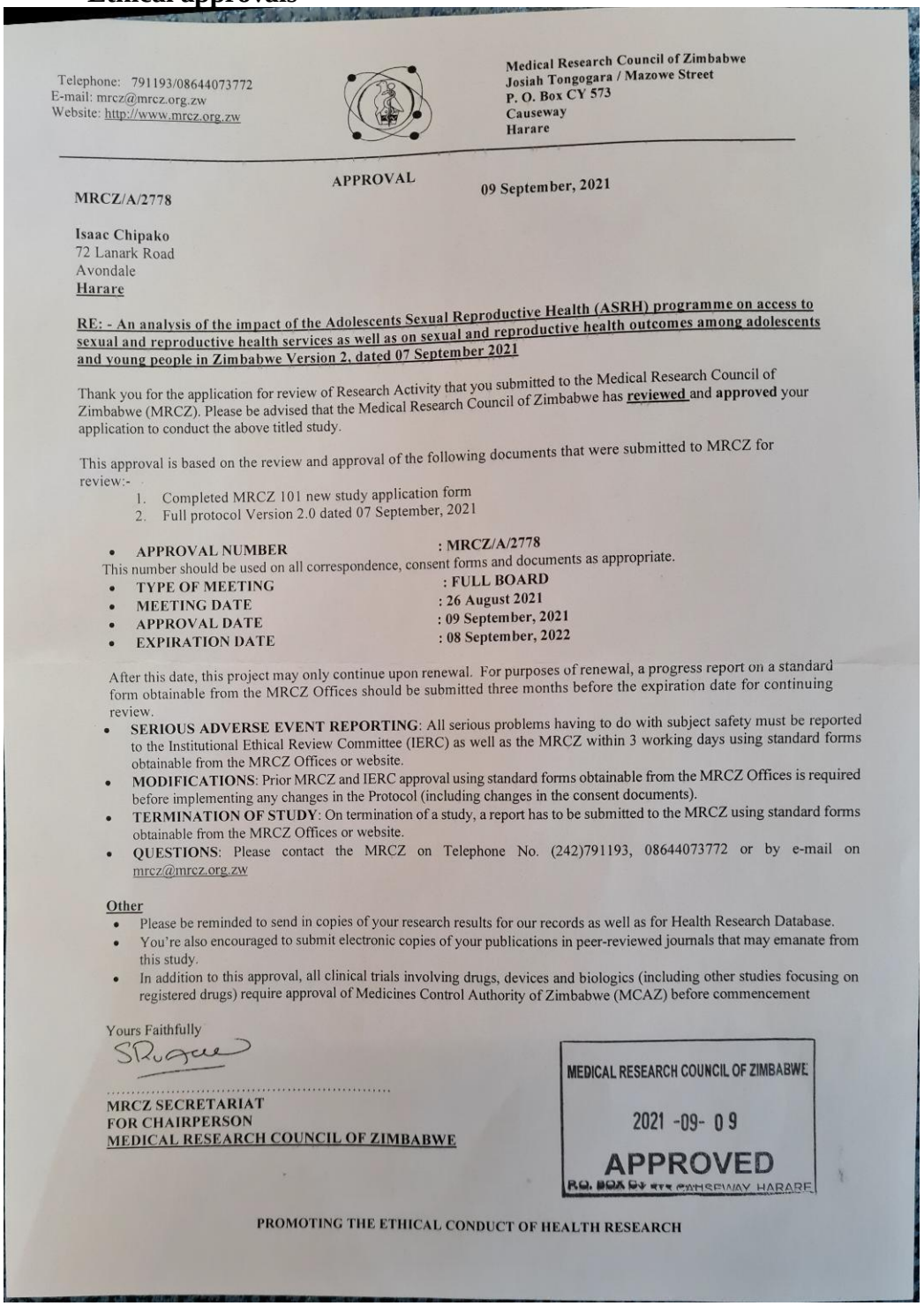
APPENDICES

CHAPTER 1 APPENDICES

Ethical approvals



Telephone: 791193/08644073772
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Medical Research Council of Zimbabwe
Josiah Tongogara / Mazowe Street
P. O. Box CY 573
Causeway
Harare

APPROVAL

09 September, 2021

MRCZ/A/2778

Isaac Chipako
72 Lanark Road
Avondale
Harare

RE: - An analysis of the impact of the Adolescents Sexual Reproductive Health (ASRH) programme on access to sexual and reproductive health services as well as on sexual and reproductive health outcomes among adolescents and young people in Zimbabwe Version 2, dated 07 September 2021

Thank you for the application for review of Research Activity that you submitted to the Medical Research Council of Zimbabwe (MRCZ). Please be advised that the Medical Research Council of Zimbabwe has reviewed and approved your application to conduct the above titled study.

This approval is based on the review and approval of the following documents that were submitted to MRCZ for review:-

1. Completed MRCZ 101 new study application form
2. Full protocol Version 2.0 dated 07 September, 2021

- APPROVAL NUMBER : MRCZ/A/2778

This number should be used on all correspondence, consent forms and documents as appropriate.

- TYPE OF MEETING : FULL BOARD
- MEETING DATE : 26 August 2021
- APPROVAL DATE : 09 September, 2021
- EXPIRATION DATE : 08 September, 2022

After this date, this project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the MRCZ Offices should be submitted three months before the expiration date for continuing review.

- SERIOUS ADVERSE EVENT REPORTING: All serious problems having to do with subject safety must be reported to the Institutional Ethical Review Committee (IERC) as well as the MRCZ within 3 working days using standard forms obtainable from the MRCZ Offices or website.
- MODIFICATIONS: Prior MRCZ and IERC approval using standard forms obtainable from the MRCZ Offices is required before implementing any changes in the Protocol (including changes in the consent documents).
- TERMINATION OF STUDY: On termination of a study, a report has to be submitted to the MRCZ using standard forms obtainable from the MRCZ Offices or website.
- QUESTIONS: Please contact the MRCZ on Telephone No. (242)791193, 08644073772 or by e-mail on mrcz@mrcz.org.zw

Other

- Please be reminded to send in copies of your research results for our records as well as for Health Research Database.
- You're also encouraged to submit electronic copies of your publications in peer-reviewed journals that may emanate from this study.
- In addition to this approval, all clinical trials involving drugs, devices and biologics (including other studies focusing on registered drugs) require approval of Medicines Control Authority of Zimbabwe (MCAZ) before commencement

Yours Faithfully

.....

MRCZ SECRETARIAT
FOR CHAIRPERSON
MEDICAL RESEARCH COUNCIL OF ZIMBABWE

MEDICAL RESEARCH COUNCIL OF ZIMBABWE
2021 -09- 09
APPROVED
P.O. BOX CY 573 CAUSEWAY HARARE

PROMOTING THE ETHICAL CONDUCT OF HEALTH RESEARCH

Applicant: Isaac Chipako
Supervisor: Prof. B. Hollingsworth and Dr S. Singhal
Department: DHR
FHMREC Reference: FHMREC20171

15 July 2021

Re: FHMREC20171
An analysis of the impact of the Adolescents Sexual Reproductive Health (ASRH) programme on access to sexual and reproductive health services as well as sexual and reproductive health outcomes among adolescents and young people in Zimbabwe.

Dear Isaac,

Thank you for submitting your research ethics application for the above project for review by the **Faculty of Health and Medicine Research Ethics Committee (FHMREC)**. The application was recommended for approval by FHMREC, and on behalf of the Chair of the Committee, I can confirm that approval has been granted for this research project.

As principal investigator your responsibilities include:

- ensuring that (where applicable) all the necessary legal and regulatory requirements in order to conduct the research are met, and the necessary licenses and approvals have been obtained;
- reporting any ethics-related issues that occur during the course of the research or arising from the research to the Research Ethics Officer at the email address below (e.g. unforeseen ethical issues, complaints about the conduct of the research, adverse reactions such as extreme distress);
- submitting details of proposed substantive amendments to the protocol to the Research Ethics Officer for approval.

Please contact me if you have any queries or require further information.

Email: fhmresearchsupport@lancaster.ac.uk

Yours sincerely,

Tom Morley,
Research Ethics Officer, Secretary to FHMREC.

Apr 26, 2021

Isaac Chipako
Lancaster University
Zimbabwe
Phone: 00263774357563
Email: ichipak@yahoo.co.uk
Request Date: 04/26/2021

Dear Isaac Chipako:

This is to confirm that you are approved to use the following Survey Datasets for your registered research paper titled: "An analysis of the cost-effectiveness of the contraceptives in use in Zimbabwe and impact of the ASRH programme on reproductive health outcomes":

Zimbabwe

To access the datasets, please login at: https://www.dhsprogram.com/data/dataset_admin/login_main.cfm. The user name is the registered email address, and the password is the one selected during registration.

The IRB-approved procedures for DHS public-use datasets do not in any way allow respondents, households, or sample communities to be identified. There are no names of individuals or household addresses in the data files. The geographic identifiers only go down to the regional level (where regions are typically very large geographical areas encompassing several states/provinces). Each enumeration area (Primary Sampling Unit) has a PSU number in the data file, but the PSU numbers do not have any labels to indicate their names or locations. In surveys that collect GIS coordinates in the field, the coordinates are only for the enumeration area (EA) as a whole, and not for individual households, and the measured coordinates are randomly displaced within a large geographic area so that specific enumeration areas cannot be identified.

The DHS Data may be used only for the purpose of statistical reporting and analysis, and only for your registered research. To use the data for another purpose, a new research project must be registered. All DHS data should be treated as confidential, and no effort should be made to identify any household or individual respondent interviewed in the survey. Also, be aware that re-distribution of any DHS micro-level data, either directly or within any tool/dashboard, is not permitted. Please reference the complete terms of use at: https://dhsprogram.com/Data/terms-of-use.cfm.

The data must not be passed on to other researchers without the written consent of DHS. However, if you have coresearchers registered in your account for this research paper, you are authorized to share the data with them. All data users are required to submit an electronic copy (pdf) of any reports/publications resulting from using the DHS data files to: references@dhsprogram.com.

Sincerely,

Bridgette Wellington

Bridgette Wellington
Data Archivist
The Demographic and Health Surveys (DHS) Program

530 Gaither Road, Suite 500, Rockville, MD 20850 USA +1.301.407.6500 +1.301.407.6501 fax.icf.com

CHAPTER 2 APPENDICES

S1 Table 1: PRISMA-E 2012 reporting guidelines for equity-focused reviews checklist.

Checklist of Items for Reporting Equity-Focused Systematic Reviews				
Section	**Item**	**Standard PRISMA Item**	**Extension for Equity-Focused Reviews**	**Pg #**
Title				
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Identify equity as a focus of the review, if relevant, using the term equity	1
Abstract				
Structured summary	2	2. Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	State research question(s) related to health equity.	2
	2A		Present results of health equity analyses (e.g. subgroup analyses or meta-regression).	
	2B		Describe extent and limits of applicability to disadvantaged populations of interest.	
Introduction				
Rationale	3	Describe the rationale for the review in the context of what is already known.	Describe assumptions about mechanism(s) by which the intervention is assumed to have an impact on health equity.	3
	3A		Provide the logic model/analytical framework, if done, to show the pathways through which the intervention is assumed to affect health equity and how it was developed.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	Describe how disadvantage was defined if used as criterion in the review (e.g. for selecting studies, conducting analyses or judging applicability).	5

	4A		State the research questions being addressed with reference to health equity	
Methods				
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.		6
Eligibility criteria	6	6. Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	Describe the rationale for including particular study designs related to equity research questions.	10
	6A		Describe the rationale for including the outcomes - e.g. how these are relevant to reducing inequity.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	Describe information sources (e.g. health, non-health, and grey literature sources) that were searched that are of specific relevance to address the equity questions of the review.	6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Describe the broad search strategy and terms used to address equity questions of the review.	6 and 7
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).		8
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.		8
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	List and define data items related to equity, where such data were sought (e.g. using PROGRESS-Plus or other criteria, context).	8
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study		10

		or outcome level), and how this information is to be used in any data synthesis.		
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).		N/A
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	Describe methods of synthesizing findings on health inequities (e.g. presenting both relative and absolute differences between groups).	10
Risk of bias across studies	15	15. Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).		N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	Describe methods of additional synthesis approaches related to equity questions, if done, indicating which were pre-specified	N/A
Results				
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.		11
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Present the population characteristics that relate to the equity questions across the relevant PROGRESS-Plus or other factors of interest.	12-20
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).		21-23
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.		N/A
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Present the results of synthesizing findings on inequities (see 14).	N/A
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see		N/A

		Item 15).		
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	Give the results of additional synthesis approaches related to equity objectives, if done, (see 16).	N/A
Discussion				
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).		24-29
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).		30
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	Present extent and limits of applicability to disadvantaged populations of interest and describe the evidence and logic underlying those judgments.	30
	26A		Provide implications for research, practice or policy related to equity where relevant (e.g. types of research needed to address unanswered questions).	
Funding				
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.		31

Table 2: Characteristics of studies included in the systematic review.

Author	Study design	Year	Location (Country)	Sample characteristics	Comparator	Outcome measures	Intervention details	Duration /Length of intervention	Reported equity Characteristic(s)
Morgan (Morgan et al., 2020)	Non RCT (quantitative pre-test-post-test design)	2020	Nigeria	Non-pregnant first-time mothers (mean age 20.6), 63 % were aged 20-24 years and 29 % were aged 15-19 years. 224 participating partners	Pre-intervention	Increase birth spacing intentions	Community-based programs (Peer group sessions with first time mothers; small group sessions with the husbands/partners of peer group members; small group sessions with older women, typically the mothers or mothers-in-law of peer group members; home visits by Community health workers; community sensitization; and ongoing family planning service delivery at facilities and through mobile outreach).	4 months	None
Morgan (Morgan et al., 2020)	Non RCT (quantitative pre-test-post-test design)	2020	Nigeria	Non-pregnant first-time mothers (mean age 20.6), 63 % were aged 20-24 years and 29 % were aged 15-19 years. 224 participating partners	Pre-intervention	Increase knowledge/awareness of modern contraceptive	Community-based programs (Peer group sessions with first time mothers; small group sessions with the husbands/partners of peer group members; small group sessions with older women, typically the mothers or mothers-in-law of peer group members; home visits by Community health workers; community sensitization; and ongoing family planning service delivery at facilities and through mobile outreach).	4 months	None
Morgan (Morgan et al., 2020)	Non RCT (quantitative pre-test-post-test design)	2020	Nigeria	Non-pregnant first-time mothers (mean age 20.6), 63 % were aged 20-24 years and 29 % were aged 15-19 years. 224 participating partners	Pre-intervention	Decrease myths and misperceptions of using modern contraception	Community-based programs (Peer group sessions with first time mothers; small group sessions with the husbands/partners of peer group members; small group sessions with older women, typically the mothers or mothers-in-law of peer group members; home visits by Community health workers; community sensitization; and ongoing family planning service delivery at facilities and through mobile outreach).	4 months	None
Morgan (Morgan et al., 2020)	Non RCT (quantitative pre-test-post-test design)	2020	Nigeria	Non-pregnant first-time mothers (mean age 20.6), 63 % were aged 20-24 years and 29 % were aged 15-19 years. 224 participating partners	Pre-intervention	Increase modern contraception use	Community-based programs (Peer group sessions with first time mothers; small group sessions with the husbands/partners of peer group members; small group sessions with older women, typically the mothers or mothers-in-law of peer group members; home visits by Community health workers; community sensitization; and ongoing family planning service delivery at facilities and through mobile outreach).	4 months	Age (15–19, 20–24, 25–29) Gender Marital status (Never married, living with partner/married, Divorced/separated/widowed) Education levels (Primary Junior Secondary, Secondary, Polytechnic, University) Age of youngest child No. of living children (0, 1, 2)
Brooks (Brooks et al., 2019)	Non RCT (retrospective cross-	2019	Niger	Young married women living in rural areas. Slightly over half (53.3%) of the women in	No intervention (No community	Increase modern	Community health workers visits.	3 months	Age (13 -15, 16 -17, 18-19) Education (No school, Quranic school, Government school)

	sectional study)			the study population were older adolescents (18 to 19 years old) and about half (48.9%) had no formal education.	health worker visits)	contraception use			Parity/number of children (0, 1, 2, 3+) Race/ethnicity/tribe (Zama, Hausa) Occupation Place of residence
Yakubu (Yakubu et al., 2019)	RCT	2019	Ghana	367 adolescent girls between the ages of 13-19 years. 185 in the intervention group and 182 in the control group.	Normal classes.	Improve adolescent sexual abstinence	Sexual Health Education (In addition to normal classes comprehensive sexuality education was delivered to students for 1 month)	3 months	Age (years) (14-16, 17-19) Social class (Lower, Middle, Upper) Ethnicity (Dagombas, Gonjas, Ashantis, Others) Religion (Islam, Christianity)
Nuwamanya (Nuwamanya et al., 2020)	RCT	2020	Uganda	1112 participants between the ages 18-30 years. The median age of participants was 21 years of age, and the majority were female (over 60%), unemployed (over 85%) and Christian (90%). Over 50% were resident in off-campus hostels and in a relationship.	Standard of care-SRH service	Increase contraceptive s knowledge	mHealth (internet based mobile phone app for SRH service).	6 months	Age Gender (Male, Female) Living situation Campus hall, Off-campus hostel Rental home, Own home, Parent/ Guardian home) Residence (Hometown) (Urban, Peri-urban Rural) Marital status (Relationship Single, Cohabiting, Married, Divorced, Widowed) Employment (Employed, Volunteer, Self-employed) Religion (Christian, Muslim, and Others)
Nuwamanya (Nuwamanya et al., 2020)	RCT	2020	Uganda	1112 participants between the ages 18-30 years. The median age of participants was 21 years of age, and the majority were female (over 60%), unemployed (over 85%) and Christian (90%). Over 50% were resident in off-campus hostels and in a relationship.	Standard of care-SRH service	Increase use of modern Contraceptive	mHealth (internet based mobile phone app for SRH service).	6 months	Age Gender (Male, Female) Living situation Campus hall, Off-campus hostel Rental home, Own home, Parent/ Guardian home) Residence (Hometown) (Urban, Peri-urban Rural) Marital status (Relationship Single, Cohabiting, Married, Divorced, Widowed) Employment (Employed, Volunteer, Self-employed) Religion (Christian, Muslim, and Others)
Ahmed (M. Ahmed & Seid, 2020)	Non RCT (Cross sectional study)	2020	Ethiopia	Women who were the age group between 15 and 24 years residing in rural areas (n= 4061) and women who were the age group between	No intervention	Increase use of modern Contraceptive	Mass Media Family Planning Messages (radio, television, newspaper/magazines, and mobile phones).	Cross sectional study	Age (15-19, 20-24) Religion (orthodox, catholic, protestant, Muslim, other) Marital status (single, married, separated, /divorced)

				15 and 24 years residing in the urban area (n= 2340)					Education (no education, primary, secondary, higher) Wealth index (poorest, poorer, middle, richer, richest,) Region Parity/number of children (0, 1-2, 3+)
Oberth (Oberth et al., 2021)	Non RCT	2021	Zimbabwe	The mean age of participants was 15 years. The vast majority (91.17%) were adolescent girls (10–19 years old), with fewer (8.84%) young women (20–24 years old). Participants' education ranged from none to tertiary level. Most (82.41%) were currently in school, while 17.60% were out of school or had never attended	Baseline versus endline	Increase modern contraceptives knowledge	YFHS (Sista2Sista girls-only clubs create safe spaces for supporting and mentoring vulnerable AGYW) and Peer group sexual health education.	12 months	Age (10–14, 15–19, 20–24 years). Region/Province (Harare, Manicaland, Mashonaland Central Mashonaland, East Mashonaland West, Masvingo, Matabeleland North, Matabeleland South, Midlands) Education (Never attended school, out of school, In primary school, In secondary school, In tertiary education) Marital status (Cohabitating Never married, Married Separated, Divorced, Widowed)
Oberth (Oberth et al., 2021)	Non RCT	2021	Zimbabwe	The mean age of participants was 15 years. The vast majority (91.17%) were adolescent girls (10–19 years old), with fewer (8.84%) young women (20–24 years old). Participants' education ranged from none to tertiary level. Most (82.41%) were currently in school, while 17.60% were out of school or had never attended	Baseline versus endline	Pregnancy	YFHS (Sista2Sista girls-only clubs create safe spaces for supporting and mentoring vulnerable AGYW) and Peer group sexual health education.	12 months	Age (10–14, 15–19, 20–24 years). Region/Province (Harare, Manicaland, Mashonaland Central Mashonaland, East Mashonaland West, Masvingo, Matabeleland North, Matabeleland South, Midlands) Education (Never attended school, out of school, In primary school, In secondary school, In tertiary education) Marital status (Cohabitating Never married, Married Separated, Divorced, Widowed)
Fikree (Fikree et al., 2017)	Non RCT (Quasi-experimental)	2017	Ethiopia	20 youth friendly health units	Non-intervention YFHS	Increase contraceptive (LARCs) use	Counselling, YFHS and access to contraceptives (Counselling and access to all contraceptive methods provided by trained LARC YFHS providers in the same YFHS).	8 months	Age (years) (15 – 19, 20 – 24) Marital Status (Married, Living together, Single) Parity (Nulliparous, One Two or more)
Fikree (Fikree et al., 2018)	Non RCT (Quasi-experimental)	2018	Ethiopia	20 youth friendly health units where peer educators referred clients	Non-intervention (One-day family planning refresher training that included LARCs)	Decrease Myths and Misconceptions about LARCs	Sexual Health Education (Proved by trained peer educators at YFHS units.	6 months	Age (years) (10-14, 15 – 19, 20 – 24, 25+) Marital Status (Married, living together, Single, Divorced/separated/widowed) Parity (None, 1-2, 3).

									Education (Primary, Secondary, Technical/Vocational Training, University, Out of school, Others)
Lemani (Lemani, Tang, Kopp, Phiri, Kumvula, Chikosi, Mwale, Rosenberg, et al., 2017)	RCT	2017	Malawi	808 women mostly between 20 and 25 years, median age (22 years) and interquartile range (5 years). Most women were from the rural areas.	Family planning untrained community health workers and routine counselling	Increase modern family planning uptake among young women	Couples counselling and community health works (Family planning trained community health workers and Couples counselling)	6 months	Age (14-19, 20-25, 26-30 years). Education (Never attended school, out of school, In primary school, In secondary school, In tertiary education) Marital status (Not married, Married) Residence (Urban, Rural) Parity (None, 1, 2, 3 children).
Almeida (Almeida, Teixeira, Garcia, Martins, & Ramalho, 2019)	Non RCT (Quasi-experimental	2018	Angola	589 individuals included (mean age of 16.8 ± 2.5 years), 56.7% were males	Baseline versus endline	Increase modern contraceptive knowledge among students	Sexual health education (Lectures with time for questions and answers, group work sessions and individual work)	2 months	Gender (Male, female) Age Marital status (Not married, married or marital)
Rosenberg J (Rosenberg et al., 2018a)	Non RCT	2018	Malawi	Female, 15–24 years old	Standard of Care consisting of vertical HIV testing, family planning, and sexually transmitted infection management in adult-oriented spaces, by providers without extra training.	Increase family planning service uptake	YFHS. Consisting of vertical HIV testing, family planning, and sexually transmitted infection management in in integrated youth-dedicated spaces and staffed by youth-friendly peers and providers.	12 months	Age (year) (15–17, 18–20, 21–24) Marital status (Single, Married, Divorced/widowed) Education level (Primary incomplete, Primary complete) Ever pregnant (No, Yes)
Wolf (Wolf et al., 2017)	Non RCT	2017	Uganda	129 adolescents (ages 15–19)	Pre-intervention	Increase contraceptive knowledge	Reproductive health education (education program was taught as an interactive discussion)	3 weeks	Gender (Male,) Female) Age (Mean age 16.7 years (SD = 1.3)) Marital status (Unmarried) Religion (Catholic, Protestant, Muslim, Born again, Jewish, Orthodox, No Religion) Education levels Grade Level (S1, S2-S3, S4 23, S5-S6)

Gaughran (Gaughran & Asgary, 2014)	Non RCT	2014	Kenya	42 female teenagers average age 16.5 (+/ – 1.31) years	Pre-intervention	Increase family planning knowledge of female teenagers.	Reproductive health education (which included didactic sessions, educational games, and open discussions)	6 weeks	Age (13–15, 16–17, > 18) Education levels (Form 1, Form 2, Form 3)
Gaughran (Gaughran & Asgary, 2014)	Non RCT	2014	Kenya	42 female teenagers average age 16.5 (+/– 1.31) years	Pre-intervention	Pregnancy	Reproductive health education (which included didactic sessions, educational games, and open discussions)	6 weeks	Age (13–15, 16–17, > 18) Education levels (Form 1, Form 2, Form 3)

CHAPTER 3 APPENDICES

S1 file: Linear regression results for association of ASRH program with SRH outcomes among women.

Abortion

Table 1: linear regression results with age and province fixed effects and standard errors adjusted for 3 clusters in provinces for abortion.

	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
Province						
Mashonaland Central	**0.0088571**	**0.0119241**	**0.74**	**0.535**	**-0.0424481**	**0.0601623**
Mashonaland East	**-0.0318986**	**0.0116541**	**-2.74**	**0.112**	**-0.0820423**	**0.018245**
Current age						
21	**0.0920202**	**0.0623513**	**1.48**	**0.278**	**-0.1762559**	**0.3602964**
22	**0.0021538**	**0.0280007**	**0.08**	**0.946**	**-0.1183236**	**0.1226313**
23	**0.0284102**	**0.0500378**	**0.57**	**0.627**	**-0.1868849**	**0.2437053**
24	**0.0415292**	**0.0343762**	**1.21**	**0.350**	**-0.1063795**	**0.1894379**
30	**0.0179452**	**0.0274032**	**0.65**	**0.580**	**-0.0999613**	**0.1358518**
31	**0.0556443**	**0.0080114**	**6.95**	**0.020**	**0.0211741**	**0.0901145**
32	**0.1201413**	**0.0163701**	**7.34**	**0.018**	**0.0497066**	**0.1905761**
33	**0.0765772**	**0.0376401**	**2.03**	**0.179**	**-0.0853749**	**0.2385293**
34	**0.1509473**	**0.070763**	**2.13**	**0.167**	**-0.1535212**	**0.4554157**
Intervention	**0**	**(omitted)**				
Period	**0**	**(omitted)**				
Intervention						
	0	**(omitted)**				
Period						
treated (20-24 age group)	**0**	**(omitted)**				
Intervention#Period						
Treated #						
treated (20-24 age group)	**-0.0339092**	**0.0244413**	**-1.39**	**0.300**	**-0.1390715**	**0.071253**
_cons	**0.0813222**	**0.002935**	**27.71**	**0.001**	**0.0686939**	**0.0939504**

Table 2: linear regression results with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in provinces for abortion.

	Coefficient	Robust std. err.	t	P>|t|	[95% conf.interval]

Province						
Mashonaland Central	**-.0013599**	**.0116452**	**-0.12**	**0.918**	**-.0514649**	**.0487452**
Mashonaland East	**-.0398905**	**.0086427**	**-4.62**	**0.044**	**-.0770772**	**-.0027037**
Currentage						
21	**.0946858**	**.0575806**	**1.64**	**0.242**	**-.1530637**	**.3424352**
22	**.0082287**	**.0312422**	**0.26**	**0.817**	**-.1261957**	**.1426531**
23	**.0550266**	**.0564836**	**0.97**	**0.433**	**-.1880026**	**.2980558**
24	**.0705841**	**.0457437**	**1.54**	**0.263**	**-.1262354**	**.2674035**
30	**.0637544**	**.0367945**	**1.73**	**0.225**	**-.0945598**	**.2220685**
31	**.1025497**	**.0185269**	**5.54**	**0.031**	**.0228349**	**.1822644**
32	**.1790993**	**.0206936**	**8.65**	**0.013**	**.0900621**	**.2681366**
33	**.1422052**	**.029733**	**4.78**	**0.041**	**.0142746**	**.2701358**
34	**.2204246**	**.0584046**	**3.77**	**0.064**	**-.0308701**	**.4717192**
Intervention	**0**	(omitted)				
Period	**0**	(omitted)				
Residence						
Rural	**.1722095**	**.0901291**	**1.91**	**0.196**	**-.2155846**	**.5600037**
Educationlevels						
No education	**.089309**	**.310233**	**0.29**	**0.801**	**-1.245516**	**1.424134**
Primary	**.0709087**	**.0859609**	**0.82**	**0.496**	**-.2989512**	**.4407686**
Secondary	**.0541189**	**.0646039**	**0.84**	**0.490**	**-.2238493**	**.3320871**
Religion						
Traditional	**-.2256325**	**.1598604**	**-1.41**	**0.294**	**-.9134561**	**.4621911**
Roman catholic	**-.2019731**	**.1675406**	**-1.21**	**0.351**	**-.9228422**	**.5188961**
Protestant	**-.0970317**	**.0931833**	**-1.04**	**0.407**	**-.4979673**	**.3039038**
Pentecostal	**-.1470451**	**.1523181**	**-0.97**	**0.436**	**-.802417**	**.5083268**
Apostolic sec	**-.105487**	**.1482239**	**-0.71**	**0.550**	**-.743243**	**.5322689**
Other christian	**-.1708272**	**.1118297**	**-1.53**	**0.266**	**-.6519918**	**.3103374**
Muslim	**-.2329715**	**.2070319**	**-1.13**	**0.377**	**-1.123758**	**.6578151**
WealthIndex						
Poorer	**.0302068**	**.0567192**	**0.53**	**0.648**	**-.2138361**	**.2742497**
Middle	**.0042725**	**.0440104**	**0.10**	**0.932**	**-.185089**	**.1936339**
Richer	**.1391147**	**.0548873**	**2.53**	**0.127**	**-.0970463**	**.3752757**
Richest	**.1575846**	**.0461735**	**3.41**	**0.076**	**-.041084**	**.3562533**
Currentmaritalstatus						
Married	**.0934832**	**.0414021**	**2.26**	**0.153**	**-.0846556**	**.271622**
Living with a partner	**.0674529**	**.0244717**	**2.76**	**0.110**	**-.0378403**	**.1727461**
Widowed	**.0619453**	**.0210721**	**2.94**	**0.099**	**-.0287209**	**.1526114**
Divorced	**.0877362**	**.0215637**	**4.07**	**0.055**	**-.0050449**	**.1805172**
No longer living together/..	**.147652**	**.0507313**	**2.91**	**0.101**	**-.0706271**	**.3659312**
Numberofliving Children	**-.0313187**	**.0100729**	**-3.11**	**0.090**	**-.0746587**	**.0120213**
Intervention Treated	**0**	(omitted)				
Period treated (20-24 age group)	**0**	(omitted)				
Intervention#Period Treated#treated (20-24 age group)	**0**	**(omitted**				
_cons	**0.0403877**	0.02337687	-1.70	0.231	-0.1426563	0.0618808

Modern contraceptive method usage

Table 3: linear regression results with age and province fixed effects and standard errors adjusted for 3 clusters in provinces for modern contraceptive method usage.

	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
Province						
Mashonaland Central	**.081023**	**.0026929**	**30.09**	**0.001**	**.0694365**	**.0926094**
Mashonaland East	**.0575341**	**.0022095**	**26.04**	**0.001**	**.0480274**	**.0670409**
Currentage						
21	**.0764843**	**.0392632**	**1.95**	**0.191**	**-.0924515**	**.2454201**
22	**.1077793**	**.0249699**	**4.32**	**0.050**	**.0003423**	**.2152163**
23	**.0810748**	**.0389779**	**2.08**	**0.173**	**-.0866335**	**.2487831**
24	**.1563718**	**.0412499**	**3.79**	**0.063**	**-.0211122**	**.3338558**
30	**.1919335**	**.0333309**	**5.76**	**0.029**	**.0485224**	**.3353446**
31	**.1823648**	**.0190488**	**9.57**	**0.011**	**.1004042**	**.2643254**
32	**.1163935**	**.085841**	**1.36**	**0.308**	**-.2529505**	**.4857376**
33	**.1995978**	**.0473474**	**4.22**	**0.052**	**-.0041215**	**.403317**
34	**.1179158**	**.0128121**	**9.20**	**0.012**	**.0627899**	**.1730416**
Intervention	**0**	(omitted)				
Period	**0**	(omitted)				
Intervention						
Treated	**0**	(omitted)				
Period						
treated (20-24 age group)	**0**	(omitted)				
Intervention#Period						
Treated #						
treated (20-24 age group)	**-.0542126**	**.0041734**	**-12.99**	**0.006**	**-.0721693**	**-.036256**
_cons	**.4472529**	**.0074351**	**60.15**	**0.000**	**.4152623**	**.4792436**

Table 4: linear regression results with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in provinces for modern contraceptive use.

	Coefficient	Robust std. err.	t	P>|t|	[95% conf.interval]	
Province						
Mashonaland Central	**.0999994**	**.0052033**	**19.22**	**0.003**	**.0776113**	**.1223875**
Mashonaland East	**.0812725**	**.005405**	**15.04**	**0.004**	**.0580167**	**.1045283**
Currentage						
21	**.0241038**	**.0643523**	**0.37**	**0.744**	**-.2527817**	**.3009893**
22	**.0421331**	**.0391039**	**1.08**	**0.394**	**-.1261173**	**.2103835**
23	**-.0158561**	**.0435562**	**-0.36**	**0.751**	**-.2032634**	**.1715511**
24	**.0379421**	**.0193593**	**1.96**	**0.189**	**-.0453544**	**.1212386**
30	**-.034386**	**.0362229**	**-0.95**	**0.443**	**-.1902406**	**.1214686**
31	**-.0823278**	**.0780865**	**-1.05**	**0.402**	**-.418307**	**.2536515**
32	**-.185551**	**.158509**	**-1.17**	**0.362**	**-.8675601**	**.496458**
33	**-.1243664**	**.0191288**	**-6.50**	**0.023**	**-.2066708**	**-.0420619**
34	**-.2153791**	**.0770679**	**-2.79**	**0.108**	**-.5469754**	**.1162173**
Intervention	**0**	(omitted)				
Period	**0**	(omitted)				
Residence						
Rural	**-.0803682**	**.0800073**	**-1.00**	**0.421**	**-.4246118**	**.2638753**
Educationlevels						
No education	**-.0296886**	**.219019**	**-0.14**	**0.905**	**-.9720514**	**.9126741**
Primary	**-.1332513**	**.0947838**	**-1.41**	**0.295**	**-.541073**	**.2745705**
Secondary	**-.0332293**	**.0379306**	**-0.88**	**0.473**	**-.1964317**	**.1299731**
Religion						
Traditional	**-.0058817**	**.0498001**	**-0.12**	**0.917**	**-.2201542**	**.2083908**
Roman catholic	**.0809745**	**.1481061**	**0.55**	**0.639**	**-.5562745**	**.7182236**
Protestant	**.0816532**	**.0672615**	**1.21**	**0.349**	**-.2077498**	**.3710562**
Pentecostal	**.0506867**	**.0354393**	**1.43**	**0.289**	**-.1017965**	**.2031699**
Apostolic sec	**-.0052777**	**.016572**	**-0.32**	**0.780**	**-.0765811**	**.0660257**
Other christian	**-.0437019**	**.0321123**	**-1.36**	**0.307**	**-.1818699**	**.0944661**
Muslim	**-.5350235**	**.1175001**	**-4.55**	**0.045**	**-1.040586**	**-.0294612**
WealthIndex						
Poorer	**.0315515**	**.0209682**	**1.50**	**0.271**	**-.0586676**	**.1217706**
Middle	**.0397532**	**.0175506**	**2.27**	**0.152**	**-.0357609**	**.1152672**
Richer	**.0052679**	**.050119**	**0.11**	**0.926**	**-.2103766**	**.2209125**
Richest	**-.0374433**	**.1003995**	**-0.37**	**0.745**	**-.4694275**	**.3945409**
Currentmaritalstatus						
Married	**.330658**	**.1092406**	**3.03**	**0.094**	**-.1393665**	**.8006825**
Living with a partner	**.3980796**	**.0725961**	**5.48**	**0.032**	**.0857237**	**.7104354**
Widowed	**.1118496**	**.1963202**	**0.57**	**0.626**	**-.7328481**	**.9565472**
Divorced	**.2631018**	**.1217282**	**2.16**	**0.163**	**-.2606526**	**.7868561**
No longer living together/..	**.2389462**	**.1864472**	**1.28**	**0.328**	**-.5632713**	**1.041164**
Numberofliving Children	**.1308311**	**.0376009**	**3.48**	**0.074**	**-.0309525**	**.2926147**
Intervention Treated	**0**	(omitted)				
Period						
treated (20-24 age group)	**0**	(omitted)				
Intervention#Period Treated#treated (20-24 age group)	**-.0504054**	**.0133519**	**-3.78**	**0.064**	**-.1078542**	**.0070434**
_cons	**.1173745**	**.1029578**	**1.14**	**0.372**	**-.3256171**	**.5603662**

Unmet need

Table 5: linear regression results with age and province fixed effects standard errors adjusted for 3 clusters in provinces for unmet need for family planning.

	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
Province						
Mashonaland Central	**-.0004284**	**.0068121**	**-0.06**	**0.956**	**-.0297387**	**.0288818**
Mashonaland East	**-.0071681**	**.0091195**	**-0.79**	**0.514**	**-.0464064**	**.0320701**
Currentage						
21	**-.0470478**	**.0267888**	**-1.76**	**0.221**	**-.1623105**	**.068215**
22	**-.0307295**	**.0523164**	**-0.59**	**0.616**	**-.2558288**	**.1943698**
23	**-.0248197**	**.0421629**	**-0.59**	**0.616**	**-.2062321**	**.1565926**
24	**-.0193641**	**.0551682**	**-0.35**	**0.759**	**-.2567338**	**.2180056**
30	**-.0472918**	**.0197355**	**-2.40**	**0.139**	**-.1322069**	**.0376233**
31	**-.082519**	**.043555**	**-1.89**	**0.199**	**-.2699209**	**.1048828**
32	**-.0138232**	**.073996**	**-0.19**	**0.869**	**-.3322022**	**.3045557**
33	**-.0819249**	**.0285455**	**-2.87**	**0.103**	**-.2047462**	**.0408965**
34	**-.0050513**	**.0631931**	**-0.08**	**0.944**	**-.2769492**	**.2668466**
Intervention	**0**	(omitted)				
Period	**0**	(omitted)				
Intervention						
Treated	**0**	(omitted)				
Period						
treated (20-24 age group)	**0**	(omitted)				
Intervention#Period						
Treated #						
treated (20-24 age group)	**.0160617**	**.0178007**	**0.90**	**0.462**	**-.0605286**	**.0926519**
_cons	**.1237937**	**.0428751**	**2.89**	**0.102**	**-.0606828**	**.3082702**

Stata syntax used: reg Unmetneed Intervention i.Province i.Currentage Period Intervention##Period, robust cluster(Province)

Table 6: linear regression results with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in provinces for unmet need for family planning.

	Coefficient	Robust std. err.	t	P>|t|	[95% conf.interval]	
Province						
Mashonaland Central	**-.0079707**	**.0076217**	**-1.05**	**0.405**	**-.0407642**	.0248229
Mashonaland East	**.0133638**	**.0095838**	**1.39**	**0.298**	**-.0278719**	.0545996
Currentage						
21	**-.0573623**	**.0390359**	**-1.47**	**0.279**	**-.2253201**	.1105956
22	**-.0385407**	**.0613746**	**-0.63**	**0.594**	**-.3026143**	.2255328
23	**-.0340103**	**.0415035**	**-0.82**	**0.499**	**-.2125855**	.1445649
24	**-.0278435**	**.0508165**	**-0.55**	**0.639**	**-.2464894**	.1908024
30	**-.0743798**	**.0352717**	**-2.11**	**0.169**	**-.2261416**	.0773821
31	**-.1022928**	**.0720544**	**-1.42**	**0.292**	**-.4123177**	.2077321
32	**-.0308663**	**.0941975**	**-0.33**	**0.774**	**-.4361653**	.3744327
33	**-.1001359**	**.065373**	**-1.53**	**0.265**	**-.3814134**	.1811415
34	**-.031643**	**.0888161**	**-0.36**	**0.756**	**-.4137879**	.3505018
Intervention	**0**	(omitted)				
Period	**0**	(omitted)				
Residence						
Rural	**-.0294538**	**.0551702**	**-0.53**	**0.647**	**-.2668319**	.2079243
Educationlevels						
No education	**.1928552**	**.2489713**	**0.77**	**0.520**	**-.878382**	1.264092
Primary	**.0343014**	**.063754**	**0.54**	**0.644**	**-.2400098**	.3086125
Secondary	**-.0052923**	**.045164**	**-0.12**	**0.917**	**-.1996171**	.1890326
Religion						
Traditional	**.1229426**	**.1480665**	**0.83**	**0.494**	**-.5141363**	.7600216
Roman catholic	**-.0373669**	**.1012895**	**-0.37**	**0.748**	**-.4731805**	.3984468
Protestant	**-.044266**	**.0595084**	**-0.74**	**0.534**	**-.3003099**	.2117779
Pentecostal	**-.0335326**	**.0836319**	**-0.40**	**0.727**	**-.3933716**	.3263065
Apostolic sec	**-.0069306**	**.0632917**	**-0.11**	**0.923**	**-.2792529**	.2653917
Other christian	**.0381294**	**.0328095**	**1.16**	**0.365**	**-.1030387**	.1792975
Muslim	**-.1326057**	**.1078926**	**-1.23**	**0.344**	**-.5968302**	.3316187
WealthIndex						
Poorer	**-.1168741**	**.0317616**	**-3.68**	**0.067**	**-.2535333**	.0197851
Middle	**-.0998047**	**.017129**	**-5.83**	**0.028**	**-.1735046**	-.0261047
Richer	**-.0864236**	**.040925**	**-2.11**	**0.169**	**-.2625097**	.0896624
Richest	**-.1055319**	**.0688518**	**-1.53**	**0.265**	**-.4017771**	.1907134
Currentmaritalstatus						
Married	**-.0686805**	**.0521042**	**-1.32**	**0.318**	**-.2928666**	.1555057
Living with a partner	**-.0157523**	**.0186075**	**-0.85**	**0.486**	**-.095814**	.0643094
Widowed	**-.1597344**	**.0766554**	**-2.08**	**0.173**	**-.4895559**	.1700871
Divorced	**-.0549857**	**.0653819**	**-0.84**	**0.489**	**-.3363013**	.2263299
No longer living together/..	**-.0947424**	**.0691244**	**-1.37**	**0.304**	**-.3921608**	.202676
Numberoflivingchildren	**.0129563**	**.0127589**	**1.02**	**0.417**	**-.041941**	.0678535
Intervention Treated	**0**	(omitted)				
Period treated (20-24 age group)	**0**	(omitted)				
Intervention#Period Treated#treated (20-24 age	**.0250221**	**.0144678**	**1.73**	**0.226**	**-.0372277**	.087272

group)						
_cons	.2824332	.1058538	2.67	0.116	-.1730189	.7378853

Desire for more children (attitude towards fertility)

Table 7: linear regression results with age and province fixed effects and standard errors adjusted for 3 clusters in provinces for attitude towards fertility.

	Coefficient	Robust std. err.	t	P>|t|	[95% conf.interval]	
Province						
Mashonaland Central	**-.0134074**	**.020697**	**-0.65**	**0.584**	**-.1024595**	**.0756446**
Mashonaland East	**-.0679495**	**.0236055**	**-2.88**	**0.102**	**-.1695158**	**.0336169**
Currentage						
21	**.0358399**	**.0374517**	**0.96**	**0.440**	**-.1253019**	**.1969818**
22	**-.0044619**	**.0434661**	**-0.10**	**0.928**	**-.1914812**	**.1825575**
23	**.0061072**	**.0917978**	**0.07**	**0.953**	**-.388867**	**.4010814**
24	**.0144234**	**.0541742**	**0.27**	**0.815**	**-.2186693**	**.2475162**
30	**-.2302315**	**.06353**	**-3.62**	**0.068**	**-.5035791**	**.043116**
31	**-.3079574**	**.1514697**	**-2.03**	**0.179**	**-.9596787**	**.343764**
32	**-.3473077**	**.0339273**	**-10.24**	**0.009**	**-.4932852**	**-.2013303**
33	**-.4110492**	**.0769573**	**-5.34**	**0.033**	**-.7421697**	**-.0799287**
34	**-.4445918**	**.0830652**	**-5.35**	**0.033**	**-.8019927**	**-.087191**
Intervention Treated	**0**	(omitted)				
Period treated (20-24 age group)	**0**	(omitted)				
Intervention#Period Treated#treated (20-24 age group)	**0.0733287**	**0.0508586**	-1.44	0.286	-0.2921557	0.145984
_cons	**0.9119065**	0.0705238	12.93	0.006	0.608467	1.215346

Table 8: Linear regression results with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in Provinces for attitude towards fertility.

	Coefficient	Robust std. err.	t	P>|t|	[95% conf.interval]	
Province2						
2	**.0044031**	**.0074427**	**0.59**	**0.614**	**-.0276204**	**.0364267**
3	**-.0192335**	**.0173371**	**-1.11**	**0.383**	**-.0938291**	**.0553621**
Currentage						
22	**.1833264**	**.1040272**	**1.76**	**0.220**	**-.2642667**	**.6309195**
23	**.1135871**	**.0853652**	**1.33**	**0.315**	**-.2537095**	**.4808837**
30	**.1692603**	**.0336698**	**5.03**	**0.037**	**.0243908**	**.3141299**
31	**.1139014**	**.106238**	**1.07**	**0.396**	**-.3432039**	**.5710067**
32	**.0799248**	**.1489848**	**0.54**	**0.645**	**-.5611051**	**.7209547**
33	**.0537683**	**.0599949**	**0.90**	**0.465**	**-.2043689**	**.3119054**
34	**.085506**	**.0581161**	**1.47**	**0.279**	**-.1645475**	**.3355596**
Intervention	**0**	(omitted)				
Period	**0**	(omitted)				
Residence2						
Rural	**-.0221059**	**.0336937**	**-0.66**	**0.579**	**-.167078**	**.1228663**
Highesteducationlevel2						

No education	**-.0750715**	**.2020943**	**-0.37**	**0.746**	**-.9446131**	**.7944701**
Primary	**-.1288964**	**.0954811**	**-1.35**	**0.310**	**-.5397183**	**.2819254**
Secondary	**-.1044227**	**.1284979**	**-0.81**	**0.502**	**-.6573047**	**.4484593**
Religion2						
Traditional	**-.1149095**	**.0520144**	**-2.21**	**0.158**	**-.3387093**	**.1088904**
Roman catholic	**-.019057**	**.0988428**	**-0.19**	**0.865**	**-.4443431**	**.4062291**
Protestant	**-.0049179**	**.1016366**	**-0.05**	**0.966**	**-.4422251**	**.4323893**
Pentecostal	**-.0171412**	**.06005**	**-0.29**	**0.802**	**-.2755156**	**.2412333**
Apostolic sec	**.0486513**	**.0762783**	**0.64**	**0.589**	**-.2795478**	**.3768504**
Other christian	**-.0407642**	**.025344**	**-1.61**	**0.249**	**-.1498107**	**.0682824**
Muslim	**.1877519**	**.0968075**	**1.94**	**0.192**	**-.2287769**	**.6042808**
WealthIndex2						
Poorer	**-.0550035**	**.0239326**	**-2.30**	**0.148**	**-.1579772**	**.0479703**
Middle	**-.0092009**	**.0414444**	**-0.22**	**0.845**	**-.1875219**	**.16912**
Richer	**-.0872978**	**.0299293**	**-2.92**	**0.100**	**-.2160731**	**.0414774**
Richest	**-.054664**	**.0330859**	**-1.65**	**0.240**	**-.1970213**	**.0876933**
Currentmarritalstatus2						
Married	**.1182014**	**.0491773**	**2.40**	**0.138**	**-.0933916**	**.3297945**
Living with a partner	**.0194481**	**.0742051**	**0.26**	**0.818**	**-.2998308**	**.3387271**
Widowed	**-.1771202**	**.0576127**	**-3.07**	**0.092**	**-.4250076**	**.0707673**
Divorced	**-.0634371**	**.0565143**	**-1.12**	**0.378**	**-.3065983**	**.1797242**
No longer living together/..	**-.1954351**	**.0896326**	**-2.18**	**0.161**	**-.581093**	**.1902228**
Numberoflivingchildren	**-.1368945**	**.0196515**	**-6.97**	**0.020**	**-.2214482**	**-.0523408**
Intervention Treated	**0**	(omitted)				
Period Treated (20-24 age group)	**0**	(omitted)				
Intervention#Period Treated#Treated (20-24 age group)	**-.0034623**	**.0060957**	**-0.57**	**0.627**	**-.0296899**	**.0227652**
_cons	**.926463**	**.0323707**	**28.62**	**0.001**	**.787183**	**1.065743**

Knowledge of modern contraceptive method

Table 9: Linear regression results with age and province fixed effects and standard errors adjusted for 3 clusters in Provinces for knowledge of modern contraceptive method.

Knowledgeofmoderncontrac~n	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
Province						
Mashonaland Central	**.0191437**	**.0062114**	**3.08**	**0.091**	**-.0075819**	**.0458694**
Mashonaland East	**.0037136**	**.0066303**	**0.56**	**0.632**	**-.0248143**	**.0322415**
Currentage						
21	**-.0020518**	**.0024936**	**-0.82**	**0.497**	**-.012781**	**.0086774**
22	**-.0257415**	**.0121895**	**-2.11**	**0.169**	**-.0781888**	**.0267059**
23	**.0120242**	**.0122989**	**0.98**	**0.431**	**-.0408938**	**.0649423**
24	**.0113174**	**.0117261**	**0.97**	**0.436**	**-.039136**	**.0617708**
30	**.0210011**	**.0156641**	**1.34**	**0.312**	**-.0463961**	**.0883983**

31	**.0071749**	**.0187053**	**0.38**	**0.738**	**-.0733074**	**.0876571**
32	**.0105893**	**.016841**	**0.63**	**0.594**	**-.0618717**	**.0830503**
33	**.0208053**	**.0159323**	**1.31**	**0.322**	**-.0477458**	**.0893563**
34	**.0183216**	**.0164335**	**1.11**	**0.381**	**-.052386**	**.0890291**
Intervention	**0**	(omitted)				
Period	**0**	(omitted)				
Intervention						
Treated	**0**	(omitted)				
Period						
treated (20-24 age group)	**0**	(omitted)				
Intervention#Period						
Treated #						
treated (20-24 age group)	**.0223339**	**.0142267**	**1.57**	**0.257**	**-.0388785**	**.0835463**
_cons	**.9722944**	**.0158451**	**61.36**	**0.000**	**.9041185**	**1.04047**

Table 10: Linear regression results with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in Provinces for knowledge of modern contraceptive method.

	Coefficient	Robust std. err.	t	P>|t|	[95% conf.interval]	
Province						
Mashonaland Central	**.0203682**	**.0068549**	**2.97**	**0.097**	**-.009126**	**.0498625**
Mashonaland East	**.001893**	**.0051271**	**0.37**	**0.747**	**-.0201673**	**.0239532**
Currentage						
21	**-.003699**	**.0049515**	**-0.75**	**0.533**	**-.0250036**	**.0176056**
22	**-.0250854**	**.0105915**	**-2.37**	**0.141**	**-.0706569**	**.0204862**
23	**.0135668**	**.0087369**	**1.55**	**0.261**	**-.0240251**	**.0511586**
24	**.0123493**	**.0076623**	**1.61**	**0.248**	**-.0206189**	**.0453174**
30	**.0293883**	**.0195504**	**1.50**	**0.272**	**-.0547303**	**.1135068**
31	**.0140613**	**.0131019**	**1.07**	**0.395**	**-.0423118**	**.0704344**
32	**.0175507**	**.0151446**	**1.16**	**0.366**	**-.0476112**	**.0827127**
33	**.0261285**	**.0225595**	**1.16**	**0.366**	**-.0709371**	**.1231941**
34	**.0275677**	**.0271456**	**1.02**	**0.417**	**-.0892303**	**.1443657**
Intervention	**0**	(omitted)				
Period	**0**	(omitted)				
Residence						
Rural	**.002441**	**.0150509**	**0.16**	**0.886**	**-.0623176**	**.0671997**
Educationlevels						
No education	**.0019223**	**.0139086**	**0.14**	**0.903**	**-.0579215**	**.0617661**
Primary	**-.0107468**	**.0108279**	**-0.99**	**0.426**	**-.0573353**	**.0358417**
Secondary	**.007941**	**.0063962**	**1.24**	**0.340**	**-.0195798**	**.0354619**
Religion						
Traditional	**.0049856**	**.0064763**	**0.77**	**0.522**	**-.0228797**	**.0328509**
Roman catholic	**-.0007972**	**.0021744**	**-0.37**	**0.749**	**-.010153**	**.0085587**

Protestant	**-.0020353**	**.0045287**	**-0.45**	**0.697**	**-.0215205**	**.01745**
Pentecostal	**.0001547**	**.004537**	**0.03**	**0.976**	**-.0193667**	**.019676**
Apostolic sec	**-.0161735**	**.0118192**	**-1.37**	**0.305**	**-.0670274**	**.0346804**
Other Christian	**-.0098052**	**.0083395**	**-1.18**	**0.361**	**-.0456873**	**.026077**
Muslim	**.0099917**	**.0090667**	**1.10**	**0.385**	**-.0290192**	**.0490026**
WealthIndex						
Poorer	**-.0025863**	**.011944**	**-0.22**	**0.849**	**-.0539769**	**.0488044**
Middle	**-.0117334**	**.00584**	**-2.01**	**0.182**	**-.0368608**	**.0133941**
Richer	**-.0177662**	**.0243595**	**-0.73**	**0.542**	**-.1225768**	**.0870444**
Richest	**-.0108257**	**.0260844**	**-0.42**	**0.718**	**-.1230577**	**.1014064**
Currentmaritalstatus						
Married	**-.0072198**	**.0166081**	**-0.43**	**0.706**	**-.0786787**	**.0642391**
Living with a partner	**-.0011441**	**.0094643**	**-0.12**	**0.915**	**-.0418657**	**.0395776**
Widowed	**.0047653**	**.0219579**	**0.22**	**0.848**	**-.0897118**	**.0992425**
Divorced	**.0008783**	**.0119158**	**0.07**	**0.948**	**-.0503911**	**.0521477**
No longer living together/..	**.0031649**	**.0126738**	**0.25**	**0.826**	**-.0513662**	**.0576961**
Numberoflivingchilden	**-.0034636**	**.009835**	**-0.35**	**0.758**	**-.0457803**	**.0388532**
Intervention Treated	**0**	(omitted)				
Period treated (20-24 age group)	**0**	(omitted)				
Intervention#Period Treated #treated (20-24 age group)	**.0241665**	**.0146589**	**1.65**	**0.241**	**-.0389059**	**.0872388**
_cons	**.9952697**	**.0220161**	**45.21**	**0.000**	**.9005421**	**1.089997**

S2 file: Linear regression results for association of ASRH program with SRH outcomes among men.

Modern contraceptive method usage

Table 1: Linear regression results with age and province fixed effects and standard errors adjusted for 3 clusters in Provinces for modern contraceptive method usage.

Use of modern method 2	Coef.	Robust Std. Err.	t	P > | t |	[95% Conf. Interval]	
Region 2						
2	**.0296684**	**.0132065**	**2.25**	**0.154**	**-.0271548**	**.0864915**
3	**.0381436**	**.0122813**	**3.11**	**0.090**	**-.0146988**	**.0909859**
Currentage						
21	**-.1170914**	**.0756614**	**-1.55**	**0.262**	**-.4426361**	**.2084533**
22	**-.1194247**	**.100026**	**-1.19**	**0.355**	**-.5498017**	**.3109523**
23	**-.0877238**	**.0261152**	**-3.36**	**0.078**	**-.2000883**	**.0246406**
24	**-.0330226**	**.0519715**	**-0.64**	**0.590**	**-.2566378**	**.1905925**
30	**-.059899**	**.0502678**	**-1.19**	**0.356**	**-.2761838**	**.1563858**
31	**-.0031168**	**.0522553**	**-0.06**	**0.958**	**-.2279533**	**.2217197**
32	**-.0826864**	**.0085398**	**-9.68**	**0.010**	**-.1194302**	**-.0459425**
33	**-.0738957**	**.0827685**	**-0.89**	**0.466**	**-.4300198**	**.2822285**
34	**-.1286777**	**.0415474**	**-3.10**	**0.090**	**-.3074419**	**.0500865**
Intervention	**0**	**(omitted)**				
Period	**0**	**(omitted)**				

Intervention						
Treated	**0**	**(omitted)**				
Period						
Treatment (20-24 age group)	**0**	**(omitted)**				
Intervention#Period						
Treated#Treatment (20-24 age group)	**.0422887**	**.0256939**	**1.65**	**0.242**	**-.0682631**	**.1528406**
_cons	**.7754427**	**.0296706**	**26.14**	**0.001**	**.6477802**	**.9031052**

Table 2: Linear regression results with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in Provinces for modern contraceptive method usage.

	Coefficient	Robust std. err.	t	P>|t|	[95% conf.interval]	
Region2						
2	**.0723334**	**.0132978**	**5.44**	**0.032**	**.0151176**	**.1295492**
3	**.0600387**	**.0128539**	**4.67**	**0.043**	**.004733**	**.1153443**
Currentage						
21	**-.0890263**	**.1113705**	**-0.80**	**0.508**	**-.5682147**	**.3901622**
22	**-.0540931**	**.0577538**	**-0.94**	**0.448**	**-.3025878**	**.1944016**
23	**-.0252552**	**.0657101**	**-0.38**	**0.738**	**-.3079829**	**.2574724**
24	**.0011718**	**.0522289**	**0.02**	**0.984**	**-.2235511**	**.2258947**
30	**-.0192621**	**.0840523**	**-0.23**	**0.840**	**-.38091**	**.3423858**
31	**.0389438**	**.0236518**	**1.65**	**0.241**	**-.0628218**	**.1407093**
32	**-.0476558**	**.035161**	**-1.36**	**0.308**	**-.1989416**	**.10363**
33	**-.1112391**	**.1059526**	**-1.05**	**0.404**	**-.5671163**	**.3446381**
34	**-.1634003**	**.1064329**	**-1.54**	**0.264**	**-.621344**	**.2945433**
Intervention	**0**	(omitted)				
Period	**0**	(omitted)				
Residence2						
Rural	**.0555594**	**.0461297**	**1.20**	**0.352**	**-.1429206**	**.2540394**
Educationlevels2						
No education	**.2118153**	**.067146**	**3.15**	**0.088**	**-.0770908**	**.5007213**
Primary	**-.0200688**	**.0583335**	**-0.34**	**0.764**	**-.2710577**	**.23092**
Secondary	**-.0204133**	**.1007722**	**-0.20**	**0.858**	**-.4540008**	**.4131743**
Religion2						
Traditional	**-.0635508**	**.0203888**	**-3.12**	**0.089**	**-.1512765**	**.024175**
Roman catholic	**.1039452**	**.0317512**	**3.27**	**0.082**	**-.032669**	**.2405595**
Protestant	**-.0232399**	**.0550109**	**-0.42**	**0.714**	**-.2599326**	**.2134528**
Pentecostal	**-.0372656**	**.0450004**	**-0.83**	**0.495**	**-.2308866**	**.1563554**
Apostolic sec	**-.0951554**	**.0692105**	**-1.37**	**0.303**	**-.3929441**	**.2026333**

Other christian	**-.0087011**	**.1372165**	**-0.06**	**0.955**	**-.599096**	**.5816938**
Muslim	**-.0130603**	**.2178681**	**-0.06**	**0.958**	**-.950471**	**.9243504**
Other	**-.5350899**	**.0272939**	**-19.60**	**0.003**	**-.652526**	**-.4176538**
WealthIndex2						
Poorest	**-.1186086**	**.0396008**	**-3.00**	**0.096**	**-.2889969**	**.0517796**
Poorer	**-.107701**	**.0218321**	**-4.93**	**0.039**	**-.2016369**	**-.013765**
Middle	**-.1476125**	**.0457343**	**-3.23**	**0.084**	**-.3443911**	**.0491662**
Richer	**-.0238096**	**.0716753**	**-0.33**	**0.771**	**-.3322036**	**.2845844**
Currentmaritalstatus2						
Married	**-.3209331**	**.0444623**	**-7.22**	**0.019**	**-.512239**	**-.1296271**
Living with a partner	**-.1695174**	**.0834725**	**-2.03**	**0.179**	**-.5286706**	**.1896359**
Widowed	**-.2076175**	**.2769916**	**-0.75**	**0.532**	**-1.399416**	**.9841814**
Divorced	**-.1872475**	**.0710629**	**-2.63**	**0.119**	**-.4930066**	**.1185116**
No longer living together/..	**-.3224764**	**.030618**	**-10.53**	**0.009**	**-.4542152**	**-.1907376**
Numberoflivingchildren2	**.0980678**	**.0268964**	**3.65**	**0.068**	**-.0176578**	**.2137935**
Intervention Treated	**0**	(omitted)				
Period Treated	**0**	(omitted)				
Intervention#Period Treated#Treated	**.0405812**	**.024536**	**1.65**	**0.240**	**-.0649888**	**.1461512**
_cons	**.9163513**	**.0759473**	**12.07**	**0.007**	**.5895766**	**1.243126**

Desire for more children (attitude towards fertility)

Table 3: Linear regression results with age and province fixed effects and standard errors adjusted for 3 clusters in Provinces for attitude towards fertility.

	Coef.	Robust Std. Err.	t	P> | t |	[95% Conf. Interval]	
Region 2						
2	**.1139387**	**.0024303**	**46.88**	**0.000**	**.1034819**	**.1243956**
3	**.0534635**	**.0016434**	**32.53**	**0.001**	**.0463924**	**.0605347**
Currentage						
21	**.1214761**	**.0600093**	**2.02**	**0.180**	**-.1367229**	**.3796752**
22	**.076077**	**.0852278**	**0.89**	**0.466**	**-.2906286**	**.4427825**
23	**.1280795**	**.058642**	**2.18**	**0.161**	**-.1242367**	**.3803957**
24	**.0878951**	**.0689852**	**1.27**	**0.331**	**-.2089242**	**.3847143**
30	**-.0594414**	**.0919074**	**-0.65**	**0.584**	**-.454887**	**.3360042**
31	**.0011277**	**.138941**	**0.01**	**0.994**	**-.5966871**	**.5989424**
32	**-.0958454**	**.061285**	**-1.56**	**0.258**	**-.3595336**	**.1678429**
33	**-.1968184**	**.071145**	**-2.77**	**0.110**	**-.5029306**	**.1092938**
34	**-.1741511**	**.1617002**	**-1.08**	**0.394**	**-.8698909**	**.5215886**
Intervention	**0**	**(omitted)**				
Period	**0**	**(omitted)**				
Intervention						
Treated	**0**	**(omitted)**				
Period						
Treatment (20-24 age group)	**0**	**(omitted)**				

Intervention#Period						
Treated#Treatment (20-24 age group)	**0.229965**	**0.294147**	**0.78**	**0.516**	**-.1035647**	**.1495576**
_cons	**0.8132981**	**0.90359**	**9.00**	**0.012**	**.4245146**	**1.202081**

Table 4: Linear regression results with covariates, fixed effects and standard errors adjusted for 3 clusters in Provinces for attitude towards fertility.

	Coefficient	Robust std. err.	t	P>|t|	[95% conf.interval]	
Region2						
2	**.0770221**	**.0155314**	**4.96**	**0.038**	**.0101958**	**.1438484**
3	**.0375091**	**.0045438**	**8.25**	**0.014**	**.0179586**	**.0570596**
Currentage						
21	**.0722745**	**.0923797**	**0.78**	**0.516**	**-.3252034**	**.4697524**
22	**.0319801**	**.118705**	**0.27**	**0.813**	**-.4787665**	**.5427267**
23	**.1352612**	**.0680203**	**1.99**	**0.185**	**-.1574065**	**.4279289**
24	**.1091237**	**.0726947**	**1.50**	**0.272**	**-.2036562**	**.4219037**
30	**-.0295723**	**.0842912**	**-0.35**	**0.759**	**-.3922482**	**.3331037**
31	**.0461863**	**.1308684**	**0.35**	**0.758**	**-.5168949**	**.6092674**
32	**-.032708**	**.0707187**	**-0.46**	**0.689**	**-.3369859**	**.2715699**
33	**-.1304341**	**.1012969**	**-1.29**	**0.327**	**-.5662793**	**.305411**
34	**-.0852254**	**.1367054**	**-0.62**	**0.597**	**-.6734211**	**.5029704**
Intervention	**0**	(omitted)				
Period	**0**	(omitted)				
Residence2						
Rural	**.1615077**	**.0297554**	**5.43**	**0.032**	**.0334805**	**.2895349**
Educationlevels2						
Primary	**.0558525**	**.0978294**	**0.57**	**0.626**	**-.3650735**	**.4767784**
Secondary	**.0536629**	**.0770723**	**0.70**	**0.558**	**-.2779523**	**.3852781**
Religion2						
Traditional	**.1297681**	**.0312402**	**4.15**	**0.053**	**-.0046478**	**.264184**
Roman catholic	**-.0556659**	**.0307922**	**-1.81**	**0.212**	**-.188154**	**.0768222**
Protestant	**-.0131341**	**.0176602**	**-0.74**	**0.535**	**-.0891198**	**.0628517**
Pentecostal	**.0759032**	**.0166997**	**4.55**	**0.045**	**.0040502**	**.1477562**
Apostolic sec	**.1424833**	**.0424786**	**3.35**	**0.079**	**-.0402876**	**.3252541**
Other christian	**.0432553**	**.1076157**	**0.40**	**0.727**	**-.4197778**	**.5062884**
Muslim	**.2573378**	**.1270676**	**2.03**	**0.180**	**-.2893899**	**.8040654**
WealthIndex2						
Poorest	**-.1061356**	**.0798645**	**-1.33**	**0.315**	**-.4497648**	**.2374936**
Poorer	**-.0881339**	**.097355**	**-0.91**	**0.461**	**-.5070188**	**.330751**
Middle	**-.1096403**	**.0757672**	**-1.45**	**0.285**	**-.4356404**	**.2163597**
Richer	**-.0565642**	**.078988**	**-0.72**	**0.548**	**-.396422**	**.2832936**
Currentmaritalstatus2						
Living with a partner	**-.3396775**	**.2851957**	**-1.19**	**0.356**	**-1.566775**	**.8874204**
Numberoflivingchildren2	**-.0362532**	**.0316464**	**-1.15**	**0.371**	**-.1724167**	**.0999104**
Intervention Treated	**0**	(omitted)				
Period Treated	**0**	(omitted)				

Intervention#Period Treated#Treated	**.027197**	**.0271059**	**1.00**	**0.421**	**-.0894301**	**.1438241**
_cons	**.7149862**	**.1877007**	**3.81**	**0.063**	**-.0926246**	**1.522597**

S3 file: Logistic regression results for association of ASRH program with SRH outcomes among women.

Abortion

Table 1: Logistic regression results with age and province fixed effects and standard errors adjusted for 3 clusters in Provinces for abortion.

	Odds ratio	Robust std. err.	z	P>|z|	[95% conf.	interval]
Province						
Mashonaland Central	**1.083015**	**.1183364**	**0.73**	**0.465**	**.8742336**	**1.341657**
Mashonaland East	**.7467581**	**.0824521**	**-2.64**	**0.008**	**.601445**	**.9271798**
Currentage						
21	**2.732798**	**.9934407**	**2.77**	**0.006**	**1.340214**	**5.572379**
22	**1.02219**	**.4813826**	**0.05**	**0.963**	**.4061377**	**2.572706**
23	**1.501631**	**.9763608**	**0.63**	**0.532**	**.4198672**	**5.370499**
24	**1.750336**	**.7250299**	**1.35**	**0.177**	**.7772023**	**3.94193**
30	**1.344373**	**.4783442**	**0.83**	**0.406**	**.6693481**	**2.700148**
31	**1.985099**	**.0682466**	**19.94**	**0.000**	**1.855745**	**2.12347**
32	**3.200089**	**.1737922**	**21.42**	**0.000**	**2.876965**	**3.559505**
33	**2.364061**	**.6223214**	**3.27**	**0.001**	**1.411193**	**3.960328**
34	**3.829257**	**1.860306**	**2.76**	**0.006**	**1.477709**	**9.922932**
Intervention	**1**	(omitted)				
Period	**1**	(omitted)				
Intervention						
Treated	**1**	(omitted)				
Period						
treated (20-24 age group)	**1**	(omitted)				
Intervention#Period						
Treated #						
treated (20-24 age group)	**.6883245**	**.1964281**	**-1.31**	**0.191**	**.3934456**	**1.204209**
_cons	**.0795292**	**.0074174**	**-27.14**	**0.000**	**.0662427**	**.0954805**

Table 2: Logistic regression results with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in Provinces for abortion.

	Odds ratio	Robust std. err.	z	P>|z|	[95% conf.interval]	
Province						
Mashonaland Central	**1.012905**	**.0859772**	**0.15**	**0.880**	**.8576635**	**1.196245**
Mashonaland East	**.6675118**	**.0431639**	**-6.25**	**0.000**	**.5880536**	**.7577063**
Currentage						
21	**2.856639**	**1.145342**	**2.62**	**0.009**	**1.30189**	**6.268109**
22	**1.181728**	**.5125329**	**0.38**	**0.700**	**.5050551**	**2.765007**
23	**1.908746**	**1.300159**	**0.95**	**0.343**	**.5022789**	**7.253563**
24	**2.162012**	**1.102236**	**1.51**	**0.130**	**.7959743**	**5.87242**
30	**1.974898**	**.7212173**	**1.86**	**0.062**	**.9653673**	**4.040144**
31	**2.953821**	**.3320105**	**9.64**	**0.000**	**2.369785**	**3.681795**
32	**5.496432**	**.3645328**	**25.69**	**0.000**	**4.826449**	**6.259419**
33	**4.139546**	**.8835552**	**6.66**	**0.000**	**2.724395**	**6.289778**
34	**7.233405**	**2.797887**	**5.12**	**0.000**	**3.3892**	**15.4379**
Intervention	**1**	(omitted)				
Period	**1**	(omitted)				
Residence						
Rural	**4.218956**	**2.530522**	**2.40**	**0.016**	**1.302135**	**13.66955**
Educationlevels						
No education	**2.476716**	**5.718178**	**0.39**	**0.694**	**.0268314**	**228.617**
Primary	**2.13798**	**1.84704**	**0.88**	**0.379**	**.3932195**	**11.62444**
Secondary	**1.884123**	**1.299035**	**0.92**	**0.358**	**.4877937**	**7.2775**
Religion						
Traditional	**1**	(empty)				
Roman catholic	**.1488821**	**.2205365**	**-1.29**	**0.199**	**.0081653**	**2.714643**
Protestant	**.4999367**	**.2430353**	**-1.43**	**0.154**	**.1928052**	**1.296318**
Pentecostal	**.3120271**	**.2877908**	**-1.26**	**0.207**	**.0511808**	**1.902295**
Apostolic sec	**.4863377**	**.4273407**	**-0.82**	**0.412**	**.086895**	**2.721957**
Other christian	**.2497556**	**.1147377**	**-3.02**	**0.003**	**.1015017**	**.6145498**
Muslim	**1**	(empty)				
WealthIndex						
Poorer	**1.325362**	**.6647876**	**0.56**	**0.574**	**.4958851**	**3.542324**
Middle	**1**	**.4190941**	**0.00**	**1.000**	**.4398116**	**2.273702**
Richer	**2.781362**	**.6413681**	**4.44**	**0.000**	**1.770006**	**4.370592**
Richest	**3.662329**	**.8383741**	**5.67**	**0.000**	**2.338308**	**5.73605**
Currentmaritalstatus						
Never in union	**1**	(empty)				
Married	**.5997311**	**.2959022**	**-1.04**	**0.300**	**.2280242**	**1.577365**
Living with a partner	**.4703864**	**.1724563**	**-2.06**	**0.040**	**.2292881**	**.9650017**
Widowed	**.4564889**	**.2391062**	**-1.50**	**0.134**	**.1635219**	**1.274338**
Divorced	**.5762381**	**.2861299**	**-1.11**	**0.267**	**.2177406**	**1.524981**
No longer living together/..	**1**	(omitted)				
Numberofliving children	**.7579078**	**.0502914**	**-4.18**	**0.000**	**.6654792**	**.8631739**
Intervention Treated	**1**	(omitted)				
Period treated (20-24 age group)	**1**	(omitted)				
Intervention#Period Treated#treated (20-24 age group)	**.6213766**	**.1762925**	**-1.68**	**0.094**	**.3563347**	**1.083557**
_cons	**.0492799**	**.0427514**	**-3.47**	**0.001**	**.0089998**	**.2698393**

Modern contraceptive method usage

Table 3: Logistic regression results with age and province fixed effects and standard errors adjusted for 3 Provinces for modern contraceptive method usage.

Moderncontraceptionuse	Odds ratio	Robust Std. Err	|z	P> | z |	[95% conf. interval]	
Province						
Mashonaland Central	**1.428662**	**.0179423**	**28.41**	**0.000**	**1.393925**	**1.464265**
Mashonaland East	**1.28841**	**.0111988**	**29.15**	**0.000**	**1.266647**	**1.310547**
Currentage						
21	**1.364468**	**.2199828**	**1.93**	**0.054**	**.9947878**	**1.871527**
22	**1.554101**	**.1629431**	**4.21**	**0.000**	**1.265416**	**1.908646**
23	**1.391623**	**.2217573**	**2.07**	**0.038**	**1.018313**	**1.901787**
24	**1.909181**	**.3406769**	**3.62**	**0.000**	**1.345729**	**2.708549**
30	**2.260622**	**.3375012**	**5.46**	**0.000**	**1.687125**	**3.029066**
31	**2.165663**	**.2005052**	**8.35**	**0.000**	**1.806274**	**2.59656**
32	**1.621633**	**.5780894**	**1.36**	**0.175**	**.8063266**	**3.261342**
33	**2.34284**	**.502337**	**3.97**	**0.000**	**1.538981**	**3.56658**
34	**1.630407**	**.0912947**	**8.73**	**0.000**	**1.460942**	**1.819529**
Intervention	**1**	**(omitted)**				
Period	**1**	**(omitted)**				
Intervention						
Treated	**1**	**(omitted)**				
Period Treated (20-24 age group)	**1**	**(omitted)**				
Intervention#Period						
Treated #						
Treated (20-24 age group)	**.8177803**	**.0149375**	**-11.01**	**0.000**	**.7890212**	**.8475876**
_cons	**.7888804**	**.0233101**	**-8.03**	**0.000**	**.7444913**	**.8359162**

Table 4: Logistic regression results with covariates, fixed effects and standard errors adjusted for 3 clusters in Provinces for modern contraceptive method usage.

	Odds ratio	Robust std. err.	z	P>|z|	[95% conf.	interval]
Province						
Mashonaland Central	**1.637619**	**.0886628**	**9.11**	**0.000**	**1.472746**	**1.82095**
Mashonaland East	**1.501173**	**.0720066**	**8.47**	**0.000**	**1.366474**	**1.649151**
Currentage						
21	**1.107278**	**.3179269**	**0.35**	**0.723**	**.6307472**	**1.943827**
22	**1.174198**	**.2375858**	**0.79**	**0.427**	**.7897876**	**1.745711**
23	**.8833215**	**.2155672**	**-0.51**	**0.611**	**.5475077**	**1.425107**
24	**1.127579**	**.0902225**	**1.50**	**0.133**	**.9639144**	**1.319031**
30	**.8282639**	**.1455205**	**-1.07**	**0.284**	**.5869733**	**1.168743**
31	**.6546119**	**.2663319**	**-1.04**	**0.298**	**.2948958**	**1.453112**
32	**.3904185**	**.310727**	**-1.18**	**0.237**	**.0820492**	**1.857746**
33	**.5419265**	**.057242**	**-5.80**	**0.000**	**.440586**	**.6665766**
34	**.3290136**	**.1545479**	**-2.37**	**0.018**	**.1310322**	**.8261324**
Intervention	**1**	(omitted)				
Period	**1**	(omitted)				
Residence						
Rural	**.6634611**	**.2280358**	**-1.19**	**0.233**	**.3382611**	**1.301304**
Educationlevels						
No education	**.7942362**	**.9152904**	**-0.20**	**0.842**	**.0829873**	**7.601299**
Primary	**.5129672**	**.2564986**	**-1.34**	**0.182**	**.1925147**	**1.366832**
Secondary	**.8402468**	**.1620364**	**-0.90**	**0.367**	**.5757817**	**1.226185**
Religion						
Traditional	**.9840552**	**.2499898**	**-0.06**	**0.950**	**.5981084**	**1.619045**
Roman catholic	**1.49828**	**1.103914**	**0.55**	**0.583**	**.3535399**	**6.349621**
Protestant	**1.52732**	**.4931686**	**1.31**	**0.190**	**.8111079**	**2.87595**
Pentecostal	**1.29423**	**.2267464**	**1.47**	**0.141**	**.9180846**	**1.824485**
Apostolic sec	**.9975048**	**.0505414**	**-0.05**	**0.961**	**.9032052**	**1.10165**
Other christian	**.85825**	**.08342**	**-1.57**	**0.116**	**.7093799**	**1.038362**
Muslim	**1**	(empty)				
WealthIndex						
Poorer	**1.156035**	**.1404404**	**1.19**	**0.233**	**.9110939**	**1.466827**
Middle	**1.199872**	**.1039432**	**2.10**	**0.035**	**1.012503**	**1.421914**
Richer	**1.00689**	**.2103635**	**0.03**	**0.974**	**.6685681**	**1.516417**
Richest	**.794559**	**.3480393**	**-0.53**	**0.600**	**.3367253**	**1.874893**
Currentmaritalstatus						
Married	**4.644508**	**2.757114**	**2.59**	**0.010**	**1.450915**	**14.86748**
Living with a partner	**6.535969**	**2.264685**	**5.42**	**0.000**	**3.314152**	**12.88984**
Widowed	**1.676092**	**1.696695**	**0.51**	**0.610**	**.2304801**	**12.18884**
Divorced	**3.452355**	**2.200584**	**1.94**	**0.052**	**.989798**	**12.0416**
No longer living together/..	**2.90633**	**2.664611**	**1.16**	**0.245**	**.4818789**	**17.52879**
Numberoflivingchildren	**1.940023**	**.4404739**	**2.92**	**0.004**	**1.243212**	**3.027391**
Intervention Treated	**1**	(omitted)				
Period treated (20-24 age group)	**1**	(omitted)				
Intervention#Period Treated #treated (20-24 age group)	**.8291818**	**.0538874**	**-2.88**	**0.004**	**.7300143**	**.9418206**
_cons	**.1603563**	**.0952291**	**-3.08**	**0.002**	**.0500717**	**.5135467**

Note: **_cons** estimates baseline odds.

Unmet need for family planning

Table 5: Logistic regression results with age and province fixed effects and standard errors adjusted for 3 Provinces for unmet need for family planning.

	Odds ratio	Robust std. err.	z	P>|z|	[95% conf.	interval]
Province						
Mashonaland Central	**.9882239**	**.0945582**	**-0.12**	**0.901**	**.8192343**	**1.192072**
Mashonaland East	**.9038226**	**.1145902**	**-0.80**	**0.425**	**.7049601**	**1.158782**
Currentage						
21	**.5957098**	**.2124136**	**-1.45**	**0.146**	**.2961556**	**1.198256**
22	**.7329771**	**.3769893**	**-0.60**	**0.546**	**.2674824**	**2.008564**
23	**.781838**	**.3222243**	**-0.60**	**0.550**	**.3485822**	**1.753591**
24	**.8282221**	**.442829**	**-0.35**	**0.724**	**.2904232**	**2.361905**
30	**.5825931**	**.0745855**	**-4.22**	**0.000**	**.4533063**	**.7487537**
31	**.2949386**	**.1424959**	**-2.53**	**0.011**	**.1144153**	**.7602897**
32	**.8770857**	**.6397424**	**-0.18**	**0.857**	**.2099808**	**3.663571**
33	**.2996442**	**.0326808**	**-11.05**	**0.000**	**.2419743**	**.3710587**
34	**.9571131**	**.5849487**	**-0.07**	**0.943**	**.2888972**	**3.170904**
Intervention	**1**	(omitted)				
Period	**1**	(omitted)				
Intervention						
Treated	**1**	(omitted)				
Period						
treated (20-24 age group)	**1**	(omitted)				
Intervention#Period						
Treated #						
treated (20-24 age group)	**1.168057**	**.2545955**	**0.71**	**0.476**	**.7619593**	**1.79059**
_cons	**.1422241**	**.0603396**	**-4.60**	**0.000**	**.061922**	**.3266641**

Note: **_cons** estimates baseline odds.

Table 6: Logistic regression results with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in Provinces for unmet need for family planning.

	Odds ratio	Robust std. err.	z	P>|z|	[95% conf.interval]	
Province						
Mashonaland Central	**.8956865**	**.069927**	**-1.41**	**0.158**	**.7686029**	1.043783
Mashonaland East	**1.142615**	**.1111048**	**1.37**	**0.170**	**.9443465**	1.38251
Currentage						
21	**.4817809**	**.2609225**	**-1.35**	**0.178**	**.1666696**	1.392652
22	**.631857**	**.4051555**	**-0.72**	**0.474**	**.1798111**	2.220348
23	**.6560111**	**.2623309**	**-1.05**	**0.292**	**.2995891**	1.436469
24	**.6812701**	**.3413691**	**-0.77**	**0.444**	**.2551534**	1.819019
30	**.3702644**	**.1115812**	**-3.30**	**0.001**	**.2051151**	.6683842
31	**.1879248**	**.1936429**	**-1.62**	**0.105**	**.0249392**	1.416073
32	**.6279673**	**.7074556**	**-0.41**	**0.680**	**.0690224**	5.713259
33	**.2005162**	**.1513428**	**-2.13**	**0.033**	**.0456764**	.880253
34	**.5661185**	**.6121352**	**-0.53**	**0.599**	**.0680011**	4.713011
Intervention	**1**	(omitted)				
Period	**1**	(omitted)				
Residence						
Rural	**.6223504**	**.6036441**	**-0.49**	**0.625**	**.0929862**	4.165351
Educationlevels						
No education	**11.87871**	**16.97352**	**1.73**	**0.083**	**.7219133**	195.4579
Primary	**1.519151**	**1.619734**	**0.39**	**0.695**	**.1879496**	12.27894
Secondary	**.9640809**	**.799849**	**-0.04**	**0.965**	**.1896334**	4.90131
Religion						
Traditional	**3.108225**	**3.550512**	**0.99**	**0.321**	**.3312751**	29.16327
Roman catholic	**.5572408**	**.6458801**	**-0.50**	**0.614**	**.0574701**	5.403108
Protestant	**.3865118**	**.187787**	**-1.96**	**0.050**	**.149144**	1.001658
Pentecostal	**.5838079**	**.5018556**	**-0.63**	**0.531**	**.108282**	3.14763
Apostolic sec	**.8705078**	**.4520167**	**-0.27**	**0.789**	**.314616**	2.408599
Other christian	**1.509478**	**.3088058**	**2.01**	**0.044**	**1.010857**	2.254051
Muslim	**1**	(empty)				
WealthIndex						
Poorer	**.2844174**	**.09966**	**-3.59**	**0.000**	**.1431181**	.5652203
Middle	**.3533571**	**.0410234**	**-8.96**	**0.000**	**.2814444**	.4436446
Richer	**.4250607**	**.3170792**	**-1.15**	**0.251**	**.0985115**	1.834066
Richest	**.3446096**	**.38251**	**-0.96**	**0.337**	**.03913**	3.034902
Currentmaritalstatus						
Married	**.4448289**	**.2109231**	**-1.71**	**0.088**	**.1756231**	1.12669
Living with a partner	**.9235726**	**.1835527**	**-0.40**	**0.689**	**.6256068**	1.363454
Widowed	**1**	(empty)				
Divorced	**.5319485**	**.3643006**	**-0.92**	**0.357**	**.1389732**	2.036142
No longer living together/..	**.2462483**	**.3311387**	**-1.04**	**0.297**	**.0176495**	3.435687
Numberoflivingchildren	**1.214691**	**.2349995**	**1.01**	**0.315**	**.8313593**	1.774774
Intervention						
Treated	**1**	(omitted)				
Period						
treated (20-24 age group)	**1**	(omitted)				
Intervention#Period						
Treated #treated (20-24 age group)	**1.296651**	**.2289975**	**1.47**	**0.141**	**.9172658**	1.832953

_cons	.8165245	1.170301	-0.14	0.888	.0492001	13.55103

Note: **_cons** estimates baseline odds.

Desire for more children (attitude towards fertility)

Table 7: Logistic regression results with age and province fixed effects and standard errors adjusted for 3 Provinces for attitude towards fertility.

	Odds ratio	Robust std. err.	z	P>|z|	[95% conf.	interval]
Province						
Mashonaland Central	**.9826462**	**.0409977**	**-0.42**	**0.675**	**.9054899**	**1.066377**
Mashonaland East	**.7222966**	**.0495384**	**-4.74**	**0.000**	**.631446**	**.8262185**
Currentage						
21	**1.424349**	**.5128202**	**0.98**	**0.326**	**.703317**	**2.884573**
22	**.965342**	**.3459549**	**-0.10**	**0.922**	**.4782241**	**1.948637**
23	**1.052724**	**.8179249**	**0.07**	**0.947**	**.2295963**	**4.826856**
24	**1.141838**	**.5372191**	**0.28**	**0.778**	**.4540735**	**2.87133**
30	**.2605873**	**.1119845**	**-3.13**	**0.002**	**.1122429**	**.6049894**
31	**.1861025**	**.1464376**	**-2.14**	**0.033**	**.0398081**	**.8700279**
32	**.1583509**	**.044706**	**-6.53**	**0.000**	**.0910557**	**.2753809**
33	**.1230435**	**.0633273**	**-4.07**	**0.000**	**.0448712**	**.3374041**
34	**.1064447**	**.0496663**	**-4.80**	**0.000**	**.042654**	**.2656368**
Intervention	**1**	(omitted)				
Period	**1**	(omitted)				
Intervention						
Treated	**1**	(omitted)				
Period						
treated (20-24 age group)	**1**	(omitted)				
Intervention#Period						
Treated #						
treated (20-24 age group)	**.6260784**	**.1506833**	**-1.95**	**0.052**	**.390628**	**1.003446**
_cons	**8.194728**	**3.792067**	**4.55**	**0.000**	**3.308609**	**20.29661**

Note: **_cons** estimates baseline odds.

Table 8: Logistic regression results with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in Provinces for attitude towards fertility.

	Odds ratio	Robust std. err.	z	P>|z|	[95% conf.	interval]
Province						
Mashonaland Central	**.8437035**	**.1028023**	**-1.39**	**0.163**	**.6644678**	**1.071287**
Mashonaland East	**.6413414**	**.0991224**	**-2.87**	**0.004**	**.4737312**	**.8682535**
Currentage						
21	**1.618854**	**.795042**	**0.98**	**0.327**	**.6182596**	**4.238818**
22	**1.14081**	**.5758126**	**0.26**	**0.794**	**.4242069**	**3.067955**

23	**1.588164**	**1.406538**	**0.52**	**0.601**	**.2799232**	**9.010558**
24	**1.647647**	**.7475709**	**1.10**	**0.271**	**.6771064**	**4.009328**
30	**.5858376**	**.419495**	**-0.75**	**0.455**	**.1439679**	**2.383904**
31	**.5311279**	**.4265233**	**-0.79**	**0.431**	**.1100627**	**2.563056**
32	**.473853**	**.1942254**	**-1.82**	**0.068**	**.2122016**	**1.058129**
33	**.3839597**	**.2597901**	**-1.41**	**0.157**	**.1019427**	**1.446156**
34	**.3525695**	**.1929498**	**-1.90**	**0.057**	**.1206174**	**1.030575**
Intervention	**1**	(omitted)				
Period	**1**	(omitted)				
Residence						
Rural	**1.76928**	**.4705637**	**2.15**	**0.032**	**1.050529**	**2.979785**
Educationlevels						
No education	**.3060626**	**.9584703**	**-0.38**	**0.705**	**.000661**	**141.7247**
Primary	**.5310649**	**.3473867**	**-0.97**	**0.333**	**.1473497**	**1.914018**
Secondary	**.4617684**	**.3058045**	**-1.17**	**0.243**	**.1261011**	**1.690945**
Religion						
Traditional	**.5064484**	**.3809764**	**-0.90**	**0.366**	**.1159359**	**2.212343**
Roman catholic	**1.000073**	**1.233233**	**0.00**	**1.000**	**.089203**	**11.21203**
Protestant	**.533192**	**.3407096**	**-0.98**	**0.325**	**.1523933**	**1.865526**
Pentecostal	**.5758062**	**.3896544**	**-0.82**	**0.415**	**.1528477**	**2.169171**
Apostolic sec	**.8220559**	**.3316366**	**-0.49**	**0.627**	**.3728264**	**1.812575**
Other christian	**.8808577**	**1.323464**	**-0.08**	**0.933**	**.0463446**	**16.74219**
Muslim	**1**	(empty)				
WealthIndex						
Poorer	**1.182701**	**.5162019**	**0.38**	**0.701**	**.5027588**	**2.782214**
Middle	**.8325388**	**.3827584**	**-0.40**	**0.690**	**.3381162**	**2.049949**
Richer	**.7929321**	**.1850698**	**-0.99**	**0.320**	**.501841**	**1.25287**
Richest	**1.087858**	**.5715797**	**0.16**	**0.873**	**.3884504**	**3.046551**
Currentmaritalstatus						
Married	**2.948338**	**1.443919**	**2.21**	**0.027**	**1.129041**	**7.699185**
Living with a partner	**4.349111**	**2.110738**	**3.03**	**0.002**	**1.679926**	**11.25929**
Widowed	**.5940698**	**.1703789**	**-1.82**	**0.069**	**.3386205**	**1.042225**
Divorced	**1.310148**	**.6939967**	**0.51**	**0.610**	**.4639075**	**3.700063**
No longer living together/..	**.6671444**	**.8191636**	**-0.33**	**0.742**	**.0601255**	**7.402542**
Numberoflivingchildren	**.5257049**	**.0794365**	**-4.26**	**0.000**	**.3909501**	**.7069076**

Intervention						
Treated	**1**	(omitted)				
Period						
treated (20-24 age group)	**1**	(omitted)				
Intervention#Period						
Treated #						
treated (20-24 age group)	**.6007777**	**.1959265**	**-1.56**	**0.118**	**.3170433**	**1.138437**
_cons	**16.458**	**24.87134**	**1.85**	**0.064**	**.8512184**	**318.2095**

Note: **_cons** estimates baseline odds

Knowledge of modern contraceptives

Table 9: Logistic regression results with age and province fixed effects standard errors adjusted for 3 Provinces for knowledge of modern contraceptive methods.

	Odds ratio	Robust std. err.	z	P>|z|	[95% conf.	interval]
Province						
Mashonaland Central	**1**	(empty)				
Mashonaland East	**.166054**	**.0126673**	**-23.54**	**0.000**	**.1429935**	**.1928336**
Currentage						
21	**.7973733**	**.004452**	**-40.56**	**0.000**	**.7886952**	**.8061469**
22	**.2896645**	**.1546341**	**-2.32**	**0.020**	**.1017398**	**.8247066**
23	**1**	(empty)				
24	**1**	(empty)				
30	**1**	(empty)				
31	**.1402056**	**.0525131**	**-5.25**	**0.000**	**.0672904**	**.2921309**
32	**.224329**	**.084021**	**-3.99**	**0.000**	**.1076647**	**.4674095**
33	**1**	(empty)				
34	**1**	(empty)				
Intervention	**1**	(omitted)				
Period	**1**	(omitted)				
Intervention						
Treated	**1**	(omitted)				
Period						
treated (20-24 age group)	**1**	(omitted)				
Intervention#Period						
Control #						
Control (30-34 age group)	**1**	(empty)				
Treated #						
treated (20-24 age group)	**1**	(omitted)				
_cons	**178.3096**	**66.78472**	**13.84**	**0.000**	**85.57806**	**371.5239**

Note: **_cons** estimates baseline odds. (Std. err. adjusted for **2** clusters in **Province**)

Table 10: Logistic regression results with covariates, age and province fixed effects and standard errors adjusted for 3 clusters in Provinces for knowledge of modern contraceptive methods.

	Odds ratio	Robust std. err.	z	P>|z|	[95% conf.	interval]
Province						
Mashonaland Central	**1**	(empty)				

Mashonaland East	.0665029	.0831787	-2.17	0.030	.0057306	.7717616
Currentage						
21	.6551469	.1844243	-1.50	0.133	.3773331	1.137503
22	1.096569	.4083007	0.25	0.804	.5285626	2.27497
23	1	(empty)				
24	1	(empty)				
30	1	(empty)				
31	.2907686	.8067999	-0.45	0.656	.0012639	66.8943
32	.5992572	1.934239	-0.16	0.874	.0010719	335.0118
33	1	(empty)				
34	1	(empty)				
Intervention	1	(omitted)				
Period	1	(omitted)				
Residence						
Rural	.6557236	.3725059	-0.74	0.458	.215361	1.996524
Educationlevels						
No education	1	(empty)				
Primary	.0483722	.0527543	-2.78	0.005	.0057054	.4101174
Secondary	1	(omitted)				
Higher	1	(empty)				
Religion						
Traditional	1	(empty)				
Roman catholic	1	(empty)				
Protestant	1	(empty)				
Pentecostal	1	(empty)				
Apostolic sec	1	(omitted)				
Other christian	1	(empty)				
Muslim	1	(empty)				
None	1	(empty)				
WealthIndex						
Poorer	.3585823	.0991682	-3.71	0.000	.2085373	.6165863
Middle	.33243	.2351445	-1.56	0.119	.0831003	1.329835
Richer	.0283992	.0700034	-1.44	0.149	.0002265	3.5604
Richest	1	(empty)				
Currentmaritalstatus						
Never in union	1	(empty)				
Married	1	(omitted)				
Living with a partner Widowed Divorced No longer living together/..	1 1 1 1	(empty) (empty) (empty) (empty)				
Numberoflivingchildren	.4948432	.8412725	-0.41	0.679	.0176749	13.85407
Intervention Treated	1	(omitted)				
Period treated (20-24 age group)	1	(omitted)				

Intervention#Period Control # Control (30-34 age group) Treated # treated (20-24 age group)	**1** **1**	(empty) (omitted)				
_cons	**9064.74**	**54313.79**	**1.52**	**0.128**	**.0719707**	**1.14e+09**

Note: **_cons** estimates baseline odds.

S4 file: Logistic regression results for association of ASRH program with SRH outcomes among men.

Modern contraceptive use.

Table 1: Logistic regression results with standard errors adjusted for 3 Provinces modern contraceptive method usage.

Useofmodernmethod2	Odds Ratio	Robust Std. Err.	|z	P> | z |	[95% Conf. Interval]	
Region2						
2	**1.161178**	**.0794779**	**2.18**	**0.029**	**1.015401**	**1.327884**
3	**1.21415**	**.077529**	**3.04**	**0.002**	**1.07132**	**1.376022**
Currentage						
21	**.5275097**	**.1975736**	**-1.71**	**0.088**	**.2531753**	**1.099106**
22	**.5218932**	**.2351029**	**-1.44**	**0.149**	**.2158399**	**1.261919**
23	**.6082554**	**.0941795**	**-3.21**	**0.001**	**.4490449**	**.8239145**
24	**.8167145**	**.2529133**	**-0.65**	**0.513**	**.4451202**	**1.498522**
30	**.7022139**	**.178855**	**-1.39**	**0.165**	**.4262526**	**1.156836**
31	**.9682222**	**.3287749**	**-0.10**	**0.924**	**.4976641**	**1.883709**
32	**.6263796**	**.0128048**	**-22.88**	**0.000**	**.6017788**	**.6519861**
33	**.6539439**	**.2856611**	**-0.97**	**0.331**	**.2777869**	**1.539463**
34	**.5031595**	**.093896**	**-3.68**	**0.000**	**.3490282**	**.7252553**
Intervention	**1**	**(omitted)**				
Period	**1**	**(omitted)**				
Intervention						
Treated	**1**	**(omitted)**				
Period						
Treatment (20-24 age group)	**1**	**(omitted)**				
Intervention#Period						
Treated#Treatment (20-24 age group)	**1.241017**	**.164724**	**1.63**	**0.104**	**.9567426**	**1.609757**
_cons	**3.586102**	**.6208833**	**7.38**	**0.000**	**2.554166**	**5.034963**

Table 2: logistic regression results with covariates, fixed effects and standard errors adjusted for 3 clusters in Provinces for modern contraceptive method usage.

	Odds ratio	Robust std.err.	z	P>|z|	[95% conf.interval]	
Region2						
2	**1.419549**	**.1000989**	**4.97**	**0.000**	**1.236312**	**1.629943**
3	**1.369777**	**.059311**	**7.27**	**0.000**	**1.258326**	**1.4911**
Currentage						
21	**.6062965**	**.3692339**	**-0.82**	**0.411**	**.1837826**	**2.000165**
22	**.777564**	**.2249206**	**-0.87**	**0.384**	**.4410775**	**1.370747**
23	**.8622708**	**.2768875**	**-0.46**	**0.644**	**.4595266**	**1.617993**
24	**1.003458**	**.3113885**	**0.01**	**0.991**	**.5462078**	**1.843487**
30	**.8262708**	**.3770326**	**-0.42**	**0.676**	**.3378421**	**2.020836**
31	**1.144983**	**.105193**	**1.47**	**0.141**	**.9563051**	**1.370886**
32	**.6859484**	**.1761786**	**-1.47**	**0.142**	**.4146383**	**1.134785**
33	**.4879937**	**.2748853**	**-1.27**	**0.203**	**.1617838**	**1.471951**
34	**.366957**	**.2124905**	**-1.73**	**0.083**	**.1179553**	**1.141597**
Intervention	**1**	(omitted)				
Period	**1**	(omitted)				
Residence2						
Rural	**1.437397**	**.4549971**	**1.15**	**0.252**	**.7729216**	**2.673118**
Educationlevels2						
No education	**1**	(empty)				
Primary	**.9105255**	**.3562033**	**-0.24**	**0.811**	**.4229575**	**1.960142**
Secondary	**.8947447**	**.5324688**	**-0.19**	**0.852**	**.278704**	**2.872467**
Religion2						
Traditional	**.676651**	**.0290281**	**-9.10**	**0.000**	**.6220832**	**.7360053**
Roman catholic	**2.05966**	**.7549023**	**1.97**	**0.049**	**1.004187**	**4.224508**
Protestant	**.9154516**	**.3289206**	**-0.25**	**0.806**	**.4526888**	**1.851275**
Pentecostal	**.8107729**	**.2168163**	**-0.78**	**0.433**	**.4800335**	**1.369389**
Apostolic sec	**.5821882**	**.2081327**	**-1.51**	**0.130**	**.2889071**	**1.17319**
Other christian	**.9101452**	**.6635686**	**-0.13**	**0.897**	**.2180302**	**3.799309**
Muslim	**.979243**	**1.176094**	**-0.02**	**0.986**	**.0930203**	**10.30869**
Other	**1**	(empty)				
WealthIndex2						
Poorest	**.4844458**	**.0671617**	**-5.23**	**0.000**	**.3691797**	**.6357005**
Poorer	**.5055025**	**.0919919**	**-3.75**	**0.000**	**.3538512**	**.7221476**
Middle	**.4004622**	**.1215423**	**-3.02**	**0.003**	**.2209111**	**.7259481**
Richer	**.838244**	**.373321**	**-0.40**	**0.692**	**.3501697**	**2.006607**
Currentmaritalstatus2						
Married	**.1722139**	**.0477515**	**-6.34**	**0.000**	**.1000108**	**.2965443**
Living with a partner	**.413581**	**.2737656**	**-1.33**	**0.182**	**.1130099**	**1.513577**
Widowed	**.342912**	**.5383156**	**-0.68**	**0.495**	**.0158101**	**7.437545**
Divorced	**.3726838**	**.1137887**	**-3.23**	**0.001**	**.2048565**	**.6780025**
No longer living together/..	**.1790119**	**.0386017**	**-7.98**	**0.000**	**.1173089**	**.27317**
Numberoflivingchildren2	**1.766084**	**.3476439**	**2.89**	**0.004**	**1.200762**	**2.59756**
Intervention						
Treated	**1**	(omitted)				
Period						
Treated	**1**	(omitted)				
Intervention#Period						
Treated#Treated	**1.191917**	**.1326416**	**1.58**	**0.115**	**.9583424**	**1.48242**
_cons	**9.178015**	**4.625496**	**4.40**	**0.000**	**3.417936**	**24.64527**

Note: **_cons** estimates baseline odds.

Desire for more children (Attitude towards fertility)

Table 3: Logistic regression results with standard errors adjusted for 3 Provinces for attitude towards fertility.

|	Odds Ratio	Robust Std. Err.	z	P> | z |	[95% Conf. Interval]	
Region2						
2	**2.039627**	**0.987379**	**14.72**	**0.000**	**1.855002**	**2.242628**
3	**1.229444**	**0.655549**	**3.87**	**0.000**	**1.107444**	**1.364883**
Currentage						
21	**1**	**(empty)**				
22	**4.493901**	**8.286894**	**0.81**	**0.415**	**.1210546**	**166.8268**
23	**1**	**(empty)**				
24	**9.900999**	**15.3868**	**1.48**	**0.140**	**.4708211**	**208.2103**
30	**.3418936**	**.5090626**	**-0.72**	**0.471**	**.0184712**	**6.328312**
31	**.566789**	**1.090272**	**-0.30**	**0.768**	**.0130634**	**24.59166**
32	**.2706858**	**.3573607**	**-0.99**	**0.322**	**.0203566**	**3.599366**
33	**.160389**	**.2178435**	**-1.35**	**0.178**	**.0111958**	**2.2977**
34	**.176113**	**.3146204**	**-0.97**	**0.331**	**.0053106**	**5.840321**
Intervention	**1**	**(omitted)**				
Period	**1**	**(omitted)**				
Intervention Treated	**1**	**(omitted)**				
Period Treatment (20-24 age group)	**1**	**(omitted)**				
Intervention#Period						
Treated#Treatment (20-24 age group)	**.1221785**	**0.998286**	**-2.57**	**0.010**	**0.246321**	**.6060206**
_cons	**9.422505**	**13.90906**	**1.52**	**0.129**	**.5219904**	**170.0866**

Table 4: logistic regression results with covariates, fixed effects and standard errors adjusted for 3 clusters in Provinces for attitude towards fertility.

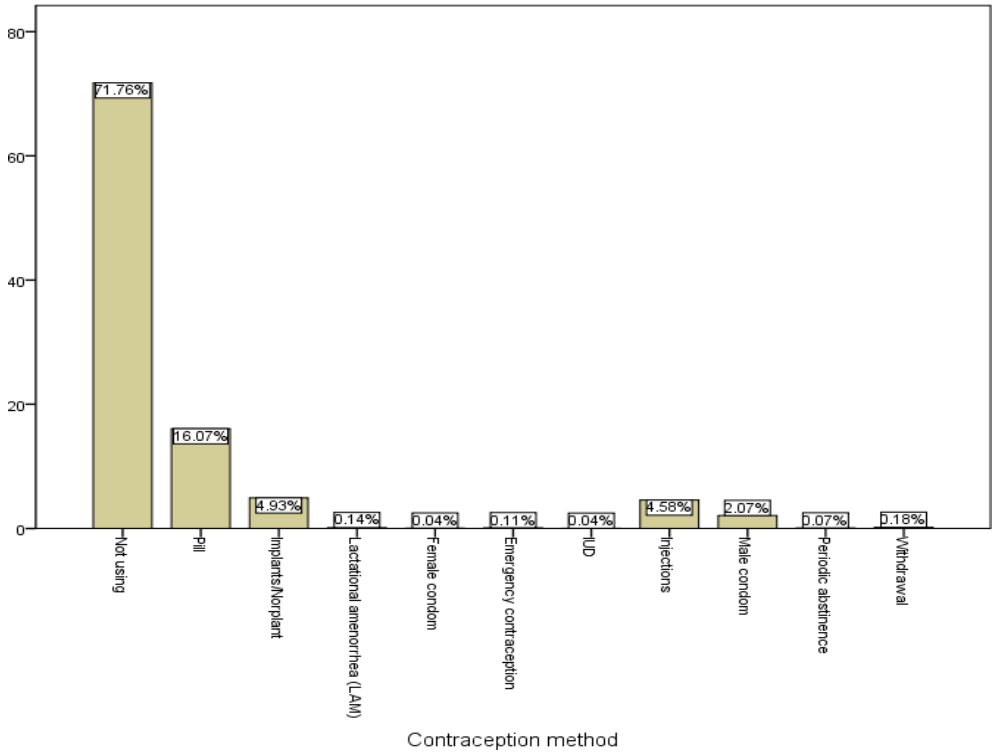
Desireformorechildren2	Odds ratio	Robust std. err.	z	P>|z|	[95% conf.	interval]
Region2						
2	**1.582009**	**.1748745**	**4.15**	**0.000**	**1.273848**	**1.964718**
3	**1.189855**	**.0945146**	**2.19**	**0.029**	**1.01831**	**1.390299**
Currentage						
21	**1**	(empty)				
22	**3.580982**	**7.307396**	**0.63**	**0.532**	**.065619**	**195.4225**
23	**1**	(empty)				
24	**29.9963**	**23.49833**	**4.34**	**0.000**	**6.46038**	**139.2763**
30	**.1957322**	**.4469408**	**-0.71**	**0.475**	**.0022285**	**17.1918**
31	**.3896362**	**.9854921**	**-0.37**	**0.709**	**.00274**	**55.40787**
32	**.1999764**	**.4295223**	**-0.75**	**0.454**	**.0029697**	**13.46619**
33	**.1141359**	**.2644771**	**-0.94**	**0.349**	**.0012162**	**10.71116**
34	**.1507522**	**.367423**	**-**	**0.438**	**.0012696**	**17.90057**

			0.78			
Intervention	**1**	(omitted)				
Period	**1**	(omitted)				
Residence2						
Rural	**3.276613**	**1.031516**	**3.77**	**0.000**	**1.767897**	**6.072859**
Educationlevels2						
Primary	**1.206664**	**.7839793**	**0.29**	**0.772**	**.3377179**	**4.311405**
Secondary	**1.137019**	**.4433026**	**0.33**	**0.742**	**.5295412**	**2.44138**
Religion2						
Traditional	**4.253073**	**4.730524**	**1.30**	**0.193**	**.4807788**	**37.62361**
Roman catholic	**.6751079**	**.1073991**	**-2.47**	**0.014**	**.4942655**	**.9221171**
Protestant	**.9214386**	**.0935377**	**-0.81**	**0.420**	**.7551942**	**1.124279**
Pentecostal	**1.80507**	**.1485691**	**7.18**	**0.000**	**1.536153**	**2.121063**
Apostolic sec	**3.40272**	**1.536462**	**2.71**	**0.007**	**1.404349**	**8.244747**
Other christian	**1.386304**	**1.029769**	**0.44**	**0.660**	**.323275**	**5.944904**
Muslim	**1**	(empty)				
WealthIndex2						
Poorest	**.599127**	**.4454135**	**-0.69**	**0.491**	**.1395416**	**2.572374**
Poorer	**.6145295**	**.4013346**	**-0.75**	**0.456**	**.1708612**	**2.210254**
Middle	**.4127709**	**.2257097**	**-1.62**	**0.106**	**.1413378**	**1.205479**
Richer	**.8224356**	**.4144132**	**-0.39**	**0.698**	**.3063332**	**2.208055**
Currentmaritalstatus2						
Living with a partner	**.0326447**	**.0624713**	**-1.79**	**0.074**	**.0007672**	**1.389108**
Numberoflivingchildren2	**.7641954**	**.17055**	**-1.21**	**0.228**	**.4934426**	**1.18351**
Intervention						
Treated	**1**	(omitted)				
Period						
Treated	**1**	(omitted)				
Intervention#Period						
Treated#Treated	**.0731901**	**.0758943**	**-2.52**	**0.012**	**.0095896**	**.5586041**
_cons	**11.6035**	**26.85698**	**1.06**	**0.290**	**.1242891**	**1083.291**

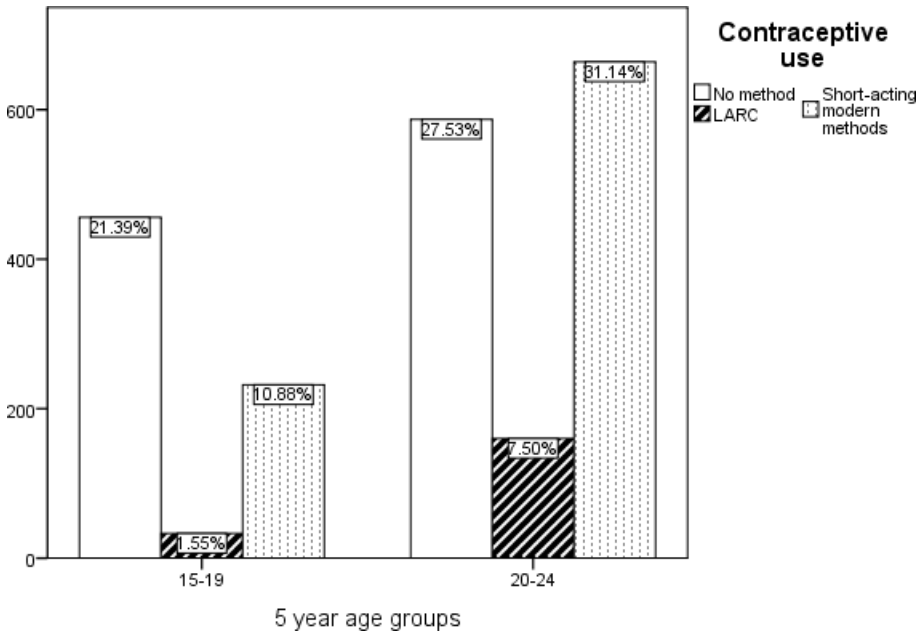
Note: **_cons** estimates baseline odds.

- **CHAPTER 4 APPENDICES**

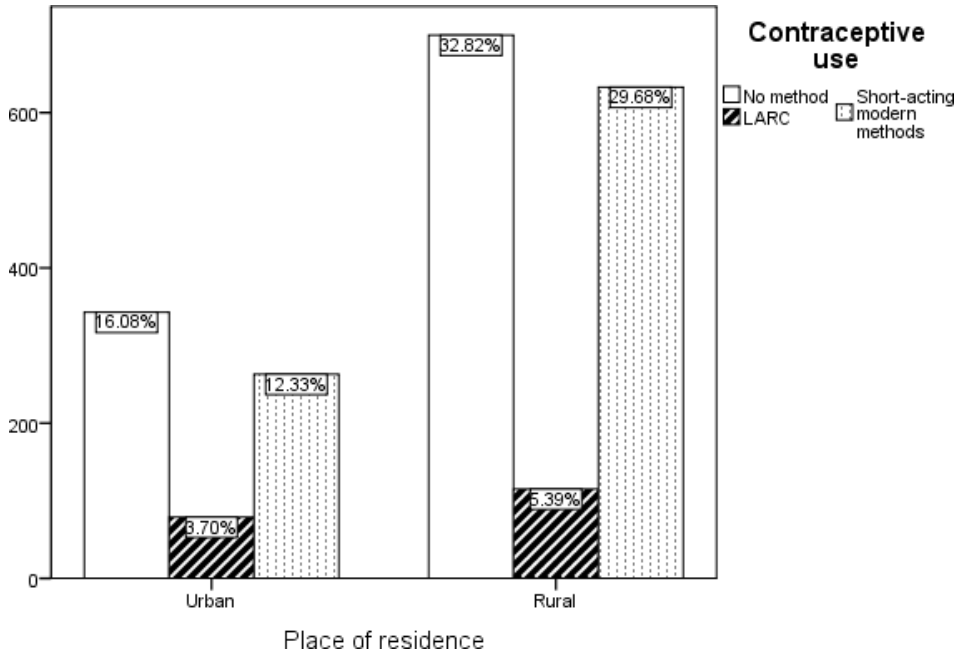
S 1 Fig: Distribution contraception methods used by women aged 15–24 in Zimbabwe.



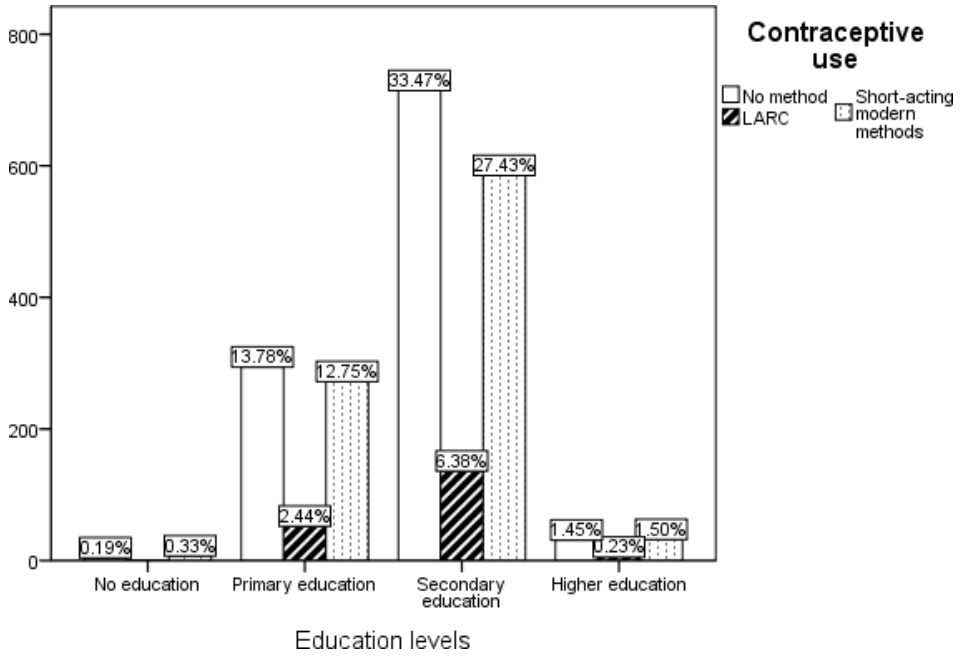
S2 Fig: Contraception use by age.



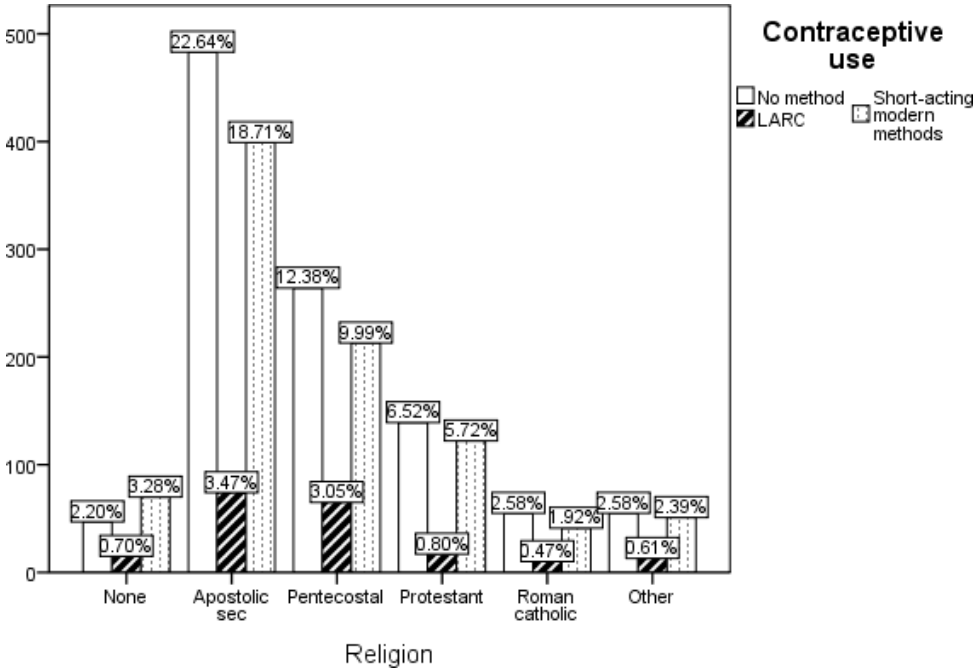
S3 Fig: Contraception use by place of residence.



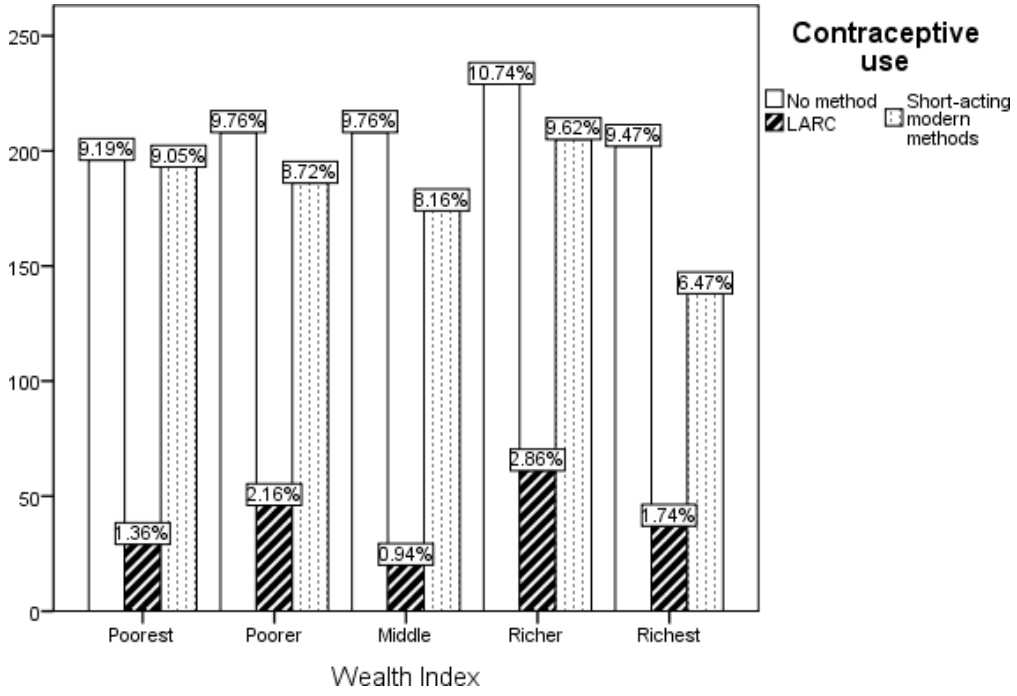
S4 Fig: Contraception use by highest education level.



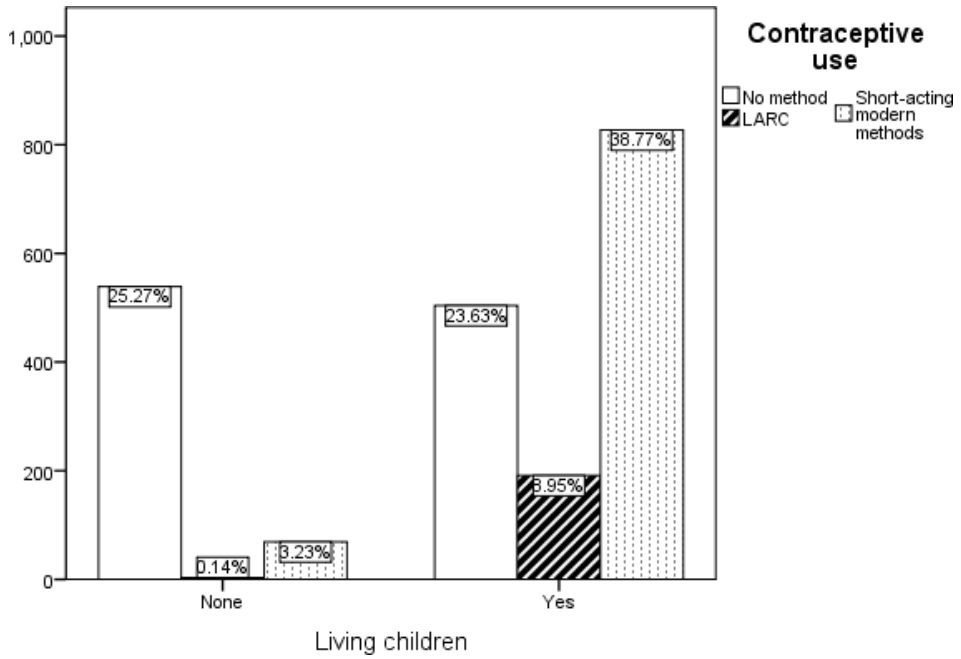
S5 Fig: Contraception use by religion.



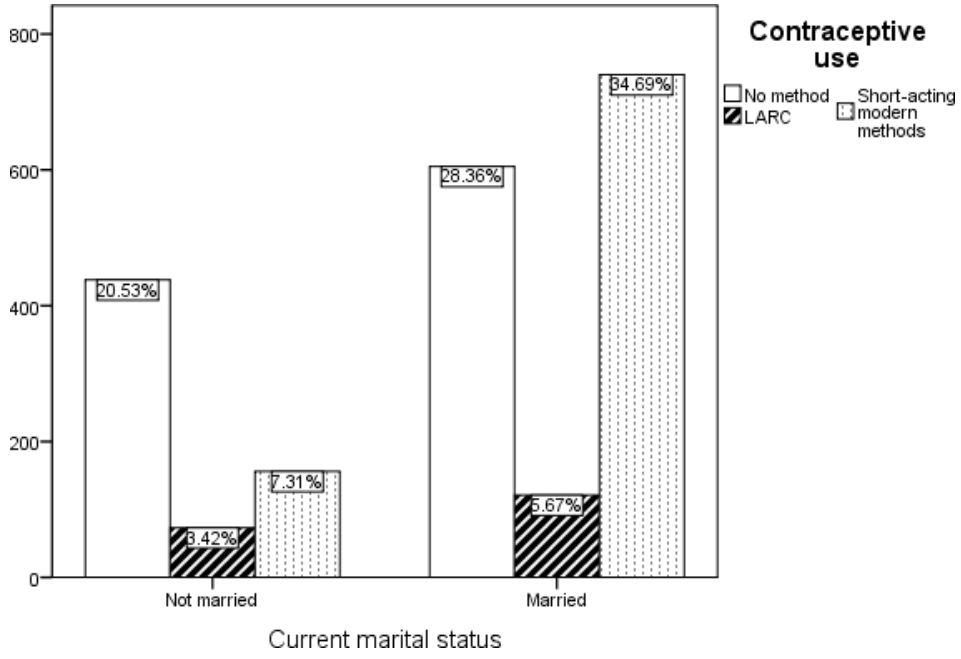
S6 Fig: Contraception use by wealth status.



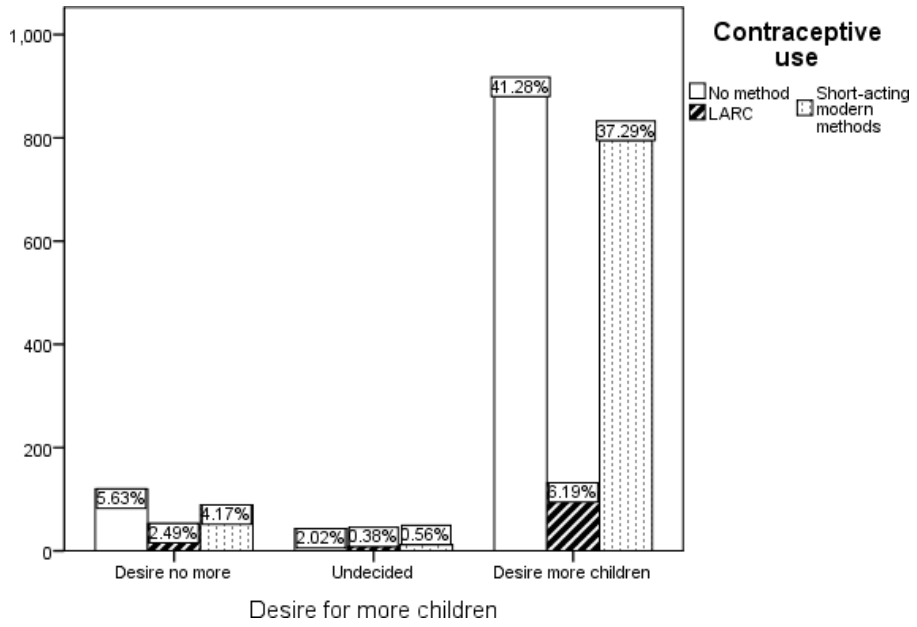
S7 Fig: Contraception use grouped living children.



S8 Fig: Contraception use grouped by current marital status.



S9 Fig: Contraception use grouped by desire for more children.



LIST OF ABBREVIATIONS

Adolescent Sexual and Reproductive Health	ASRH
Demographic and Health Surveys	DHS
Difference-in-Differences	DID
enumeration areas	EAs
Intra-uterine contraceptive device	IUCD
Long-acting reversible contraceptive	LARC
Low and medium – income countries	L-MICs
Ministry of Health and Child Care (MoHCC)	MoHCC
Multiple Indicator Cluster Surveys	MICs
Non-governmental organizations	NGOs
Sexual and Reproductive Health	SRH
Sexually transmitted infections	STIs
Short-acting reversible contraceptive	SARC
sub-Saharan Africa	SSA
World Health Organization	WHO
Zimbabwe Demographic and Health Survey	ZDHS
Mobile phone-based interventions	mHealth
Behaviour Change Communication	BCC
Youth friendly health services	YFHS