The Effects of the Pill, Injectables and Male Condom on Fertility in Urban Zambia: Evidence from the ZDHS 1992-2014

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DECLARATION

I, **MWEWA E. KASONDE** hereby declare that this dissertation; represents my work, has not previously been submitted for a degree at this or any other University and does not incorporate any published work or material from another dissertation.

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This dissertation of **MWEWA E. KASONDE** is approved as fulfilling part of the requirements for the award of the degree of Master of Arts in Population Studies at the University of Zambia.

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ABSTRACT

Fertility rate has declined in Zambia especially in urban areas. Contraceptive use has increased with the pill, injectables and male condom being the most widely used methods between 1992 and 2014. However, there is no evidence which clearly shows whether the use of these contraceptive methods has contributed to fertility reduction. Therefore, this study aimed at examining whether the pill, injectables, and male condom have contributed to reduction in children ever born (CEB) among urban women in Zambia. It also aimed at determining the demographic and socio-economic pathways in which these methods work to affect CEB. The study was undertaken to help fill the gap in knowledge on how use of these contraceptive methods have each influenced fertility in Zambia. A method identified as having contributed more significantly to fertility reduction in urban Zambia would affect policy; reducing costs in family planning services and in helping to focus provision of contraceptive methods especially rural areas where fertility is high.

The Zambia Demographic and Health Survey (ZDHS) datasets of 1992, 1996, 2001-2, 2007 and 2013-14 and Stata 12.0 were used for the analysis. Descriptive analysis; bivariate and multivariate analysis using Poisson regression, producing Incidence Rate Ratios of CEB among women associated with contraceptive use by ZDHS year. The sample included urban women who reported using the pill, male condom, and injectables. Women who have never used any contraceptive method were a reference category.

Findings from bivariate and multivariate analysis of CEB indicate that women using these contraceptive methods were associated with relatively more children than women who have never used any contraceptive method with similar education level, employment status, age, marital status and age at birth of first child. Women with secondary and tertiary education and were using the pill or male condom or injectables were associated with having significantly fewer children.

The findings of this study have shown that the use of the pill, injectables, and male condom is associated with a minimal effect in reducing CEB among urban women. The use of contraceptive methods combined with secondary or tertiary education is associated with a reduction in CEB to women significantly. This is because women with tertiary education are likely to be more knowledgeable about the availability accessibility and of contraceptive methods. Further, these women are more likely to use contraceptive methods correctly and consistently, hence are able to limit the number of children.

In conclusion, this study has found that fertility reduction in urban areas cannot be associated with increased use of the pill, injectables and male condom but other socio-demographic factors such as secondary or tertiary education combined with contraceptive use. Recommendations from the findings of this study include; providing an enabling environment for the attainment of tertiary education by women is vital if low levels of fertility are to be achieved. Further studies should be conducted in order to determine why women prefer these contraceptive methods and to fully understand how each method is influencing fertility level in Zambia.

One main limitation of this study is that, the cross-sectional nature of survey data makes determining causality between the dependent and independent variables impossible but only association.

DEDICATION

To my late sister Lombe C. Kasonde (M.H.S.R.I.P) who always advised me to work hard regardless of the situation.

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LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AIRR	Adjusted Incidence Rate Ratio
CEB	Children Ever Born
CM	Contraceptive Methods
CPR	Contraceptive Prevalence Rate
CSO	Central Statistical Office
DHS	Demographic and Health Survey
FP	Family Planning
GRZ	Government of the Republic of Zambia
HIV	Human Immune-deficiency Virus
IRR	Incidence Rate Ratio
IUD	Intra Uterine Device
MoFNP	Ministry of Finance and National Planning
MoH	Ministry of Health
PPAZ	Planned Parenthood Association of Zambia
RH	Reproductive Health
SFH	Society for Family Health
SSA	Sub-Saharan Africa
STI	Sexually Transmitted Infection
TFR	Total Fertility Rate
UN	United Nations
UNDP	United Nations Development Programme
USA	United States of America
ZDHS	Zambia Demographic and Health Survey

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CHAPTER ONE
BACKGROUND

This section gives a history of contraceptive use and methods used by women in Zambia. It also provides details on how contraceptive use and change in socio-economic characteristics of women have influenced fertility rates in different regions of the world.

1.1. Introduction

Fertility rate has declined over the past 20 years in Zambia; with urban fertility declining more than rural fertility. Urban women are on average having three children less than women in rural areas (2013-14 ZDHS). The contraceptive prevalence rate (CPR), a percentage measure of women of the reproductive age, currently married or in a union and are using contraceptive methods has also increased (15 per cent in 1992 to 49 per cent in 2013-14, (1992, 2013-14 ZDHS). Table 1.1 shows that the commonest methods of contraception used by women in Zambia include: the pill, injectables and the male condom and the percentage of women using these methods have increased over the years. For example, the percentage of women using the injectables increased from 0.1 per cent in 1992 to 19.3 per cent in 2013-14 (2013-14 ZDHS). The pill, injectables and male condom hereinafter collectively referred to as contraceptive methods (CM).

Similarly, not only are these CMs common and widely used in Zambia but also in other parts of the world. The United Nations Population Facts (2013) reports that the pill, injectables and male condom were the commonly used methods of contraception in Africa and Europe in 1990 and 2011. In Asia and North America, the Intrauterine Device (IUD) and female sterilisation were the two commonly used contraceptive methods. The world over, female sterilisation and IUD were the two commonly used methods in 1990 and 2011 (Ibid).

Fertility has declined in many parts of the world. This decline has been attributed to changes in the social, economic and the demographic characteristics of women. Among the changes that have occurred is the increased use of contraceptive methods by women. In addition, the use of these contraceptives, especially increased use of modern methods which are more effective, have played a role in reducing the world's total fertility rate (Guengant, (2007) in UNDP 2009 Policy

Brief). This is because contraceptive information, access to, correct and consistent use of a method is able to allow a woman or a couple to decide on the number of children they would want to have and their spacing.[1]

Studies have shown that the use of contraceptive methods to space pregnancies can increase child survival and improve a mother's health and consequently reduce the number of children that a woman will ever have in her lifetime as well as reducing the lifetime risk of maternal mortality (United Nations Population Division Policy Brief 2009/1). This, in turn, reduces fertility because as child survivorship increases, women tend to have fewer children.

Contraceptive prevalence rate (CPR) has increased tremendously in the past 50 years. In the 1960s, the CPR was 14 per cent and increased to about 63 per cent in 2014. The world's fertility rate has also declined from 5.0 children in the 1950s to 2.5 in 2013 (World Population Data Sheet, 2009 and 2014).

The use of modern contraceptive methods has been influential in contributing to fertility decline in many parts of the world. Thailand, for example, is one country from Asia that has had success in its family planning programme and fertility decline. This success has been attributed to having had an extensive FP exercise with efforts from both the government and the private sector. This led to CPR increasing from 14.4 per cent in 1970 to 79.2 per cent in 2000, with almost all women of the reproductive age stating the use of modern methods of contraception (Family Planning Fact Sheet 2003-Thailand). The methods of contraception commonly used were oral contraception, female sterilisation and injectables. In addition, this study also shows that the decline in TFR from 6.3 children in 1967 to below replacement level of 1.7 children in 2003 was due to increased use of these contraceptive methods (Ibid). Other factors for the decline in fertility have been the changes in role of the children and women as well as improvements in the status of women (Guest and Chamratrithirong, 1992).

[1] http://www.who.int/

Europe has been a beneficiary of fertility decline due to contraceptive use. European women have the lowest fertility rates in the world. Spain, Italy, Portugal and Germany have fertility rates below replacement level (less than 2.1 children). Spain, for example, experienced rapid fertility decline from 2.9 children in 1970 to 1.3 children in 2013 (World Population Data Sheet, 2014). Studies show that the most frequently used contraceptive methods were the withdrawal and rhythm method and these contributed to the decline in fertility (Nishioka, 2003; Ulrich, 2001).

Other contributing factors to fertility decline in Europe included: an increase in the average age at first marriage and the birth of first child delayed by three to four years; insufficient housing which made young men and women reluctant to move out of their parents' homes to start their own families. Furthermore, traditionally fixed gender roles had their influence on low fertility in Europe. For example, in spite of increased female participation in the labour force, married women were still expected to keep a balance between household chores and employment, making women more likely to postpone childbirth (Nishioka, 2003).

In recent years, studies have found that there has been an increase in the use of modern contraceptive methods by European women. Notwithstanding all these variations in methods of contraception used, fertility rates have declined significantly in most European countries to replacement levels (World Population Data Sheet, 2014).

Sub-Saharan Africa (SSA) has had its share of fertility decline. However, the pace of decline is not at the same rate as other regions in the world. Fertility rates in most SSA countries are still at more than 5 children per woman. Additionally, contraceptive use is relatively low compared to other regions in the world.

In the sub-region, Botswana's TFR has declined more (from 7.1 in 1981 to 3.2 in 2006) compared to other SSA countries. Mills, Leburu, Chowdhury et al. (2010) have attributed this decline in fertility to a strong family planning programme which had been integrated with maternal and child health services as well as with sexually transmitted infection and human immune-deficiency virus (STI/HIV) service provision. The integration of family planning (FP) programme with other health services increased knowledge about contraceptives and use among women; with the pill, injectables, and male condom being the commonly used contraceptive methods. Other factors for fertility decline in Botswana are; increase in the age of women at birth

of first child, prolonged breastfeeding, increase in the number of females attaining education and participation in the labour force as well as increased child survival (Ibid). This shows that demand for more children among African women is gradually declining as they acquire more education and become contributors to economic productivity of their country.

The use of modern contraceptives methods in Zambia dates back to the early 1960s when modern family planning services were offered only in a few hospitals situated in the most highly urbanized areas of the country like Lusaka, Kitwe and Ndola (Van den Borne, Tweedie and Morgan, 1996). The provision of FP services has been a priority of the Zambian government and is highlighted in the Revised Sixth National Development Plan (MoFNP 2014 cited in 2013-14 ZDHS). Family planning is also an essential component of the National Health Strategic Plan 2013-2016 of Zambia (MoH, 2011 cited in 2013-14 ZDHS). These efforts can be seen in the launch of the 1989 Population Policy and 2006 Family Planning Guidelines. One priority included in the policy was on the need to keep fertility rates at the same pace as economic growth and this was to be achieved through provision of FP services and promote use. Further, one strategy of the 2006 Family Planning Guidelines emphasises on the need for integration and management of FP services with other sexual and reproductive health (SRH) services. This is to avoid unnecessary duplication of efforts and to maximise on the limited the resources. [2]All these are among efforts aimed at helping couples to decide the number of children they would want to have as well as determine their spacing.

In support of FP, the the Family Planning and Welfare Association of Zambia (FPWAZ) was formed in 1972 and later changed its name to Planned Parenthood Association of Zambia (PPAZ) in 1979 (Van den Borne, Tweedie and Morgan, 1996). The initial focus of PPAZ was in promoting of FP services and has contributed to raising awareness about contraceptives and their use. Over the years, the association has evolved as a major service provider and advocacy body, with significant input into government policy on SRH issues.[3] To date the association has over 200 Community Based Distributors (CBDs) spread in various parts of the country.[4] The CBDs

[2] http://www.advancingpartners.org
[3] http://ippf.org/about-us/member-associations/zambia
[4] Ibid

have played an important role in distributing and making readily available the condoms and supplies of pills to men and women of the reproductive ages in underserved communities (MoH, 2006 in 2014 ZDHS). The social marketing strategy by Society for Family Health (SFH) has also made a significant contribution in raising awareness about FP and distribution of contraceptives such as the Maximum condoms (which contributed roughly to one-third of the market share of condoms distributed) and an oral contraceptive called Safe Plan (The ACQUIRE Project, 2005).

Further, the coming of the HIV/AIDS epidemic as a global health problem has contributed to an increase in knowledge and use of the male condom in Zambia. This is because, sexual and reproductive health messages did not only provide people with information on how to make decisions on delaying pregnancy or stopping child birth but also on the need to prevent STI infections (2006 Zambia Planning Guidelines and Protocols). Therefore, FP methods such as condoms were being encouraged and promoted not only as a contraceptive method but also in STI infection prevention. Additionally, FP messages have been focussing on dual protection where if a woman or couple preferred to use hormonal methods (e.g. pills), they were also being encouraged to also use condoms.

Through various educational campaigns and messaging by government and non-governmental organisations, awareness raising has been achieved and knowledge of contraceptive methods among women aged 15-49 years in Zambia has increased to about 98 per cent in 2013-14. Similarly, an increase in contraceptive use among women has been observed over the past 20 years, from 15 per cent in 1992 to 49 per cent in 2013-14 (1992 ZDHS, 2013-14 ZDHS). And there has been a corresponding decline in fertility especially in urban areas. Contraceptive use is relatively high in urban areas compared to rural areas. According to the 2013-14 ZDHS results, most Zambian women use the pill, male condom and injectables and the percentage of women using these methods have similarly increased. For example, table 1.1 show that the percentage of married women using the pill increased from 4.3 per cent in 1992 to 11.8 per cent in 2013-14 and the use of injectables also increased from 0.1 per cent in 1992 to 19.3 per cent in 2013-14.

Some of the reasons why women prefer to use these CM include; injectables such as Depo Provera are attractive to women in that they only need to get a repeat injection once in every three months. Further, compared to the use of the male condom, a woman does not need to

negotiate with her partner to use injectables on every act of sexual intercourse (Ashraf. et al., 2009). Injectables have also been viewed to be attractive for women who do not want to reveal to their partner or any other person that they are using contraceptives. This is highlighted by Ashraf et al. (2009) in an experimental study about household bargaining on use of contraceptive methods among women in Lusaka's Chawama peri-urban area. The study established that women who received contraceptive vouchers in the absence of their husband's knowledge were more likely to use contraceptives and choose injectables than their peers who received vouchers in the presence of their husband.

The male condom is preferred due to its convenience in that unlike the female condom it is worn only a few minutes before sexual intercourse. Women may prefer to use the pills because one does not need daily supervision from medical personnel. Further, the pills and male condoms are also readily available in most health facilities and are also available in most drug stores and supermarkets nationwide.

Table 1.1: Percent distribution of married women by current contraceptive method used, ZDHS 1992-2014

Method	**1992**	**1996**	**2001-2**	**2007**	**2013-14**
Any method	15.2	25.9	34.2	40.8	49.0
Any modern method	8.9	14.4	22.6	32.7	44.8
Pill	4.3	7.2	11.9	11.0	11.8
IUD	0.5	0.4	0.1	0.1	1.2
Injectables	0.1	1.0	4.5	8.5	19.3
Implants	na	na	0.3	0.4	5.5
Male condom	1.8	3.5	3.8	4.7	4.0
Female condom	na	na	0.0	0.1	0.1
Female sterilisation	2.1	2.0	2.0	1.9	1.9
Lactational amenorrhea (LAM)	na	na	2.7	6.2	0.8
Any traditional method	6.3	11.5	8.9	8.1	4.3
Rhythm/periodic abstinence	0.9	1.9	1.1	1.2	0.7
Withdrawal	3	4.5	5.1	5.6	3.2
Other	2.2	5.2	2.7	1.3	0.4
n	4,457	4,902	4,692	4,402	9,859

***Source**: 2013-14 ZDHS Report* *na - not applicable (there was no data collected for this survey year)*

In the past 20 years, the TFR in Zambia has declined, with an average of 5.3 children per woman in 2013-14 from 6.5 children in 1992. Notwithstanding this fact, fertility decline has been more pronounced in urban areas than in rural areas, from 5.8 to 3.7 and 7.1 to 6.3 in 1992 and 2013-14

for urban and rural areas respectively (1992 ZDHS, 2013-14 ZDHS). Seemingly, the increase in the use of contraceptive methods has had a profound effect on fertility.

In spite of these observations, it is not documented or stated in the literature and otherwise as to whether urban fertility has reduced due to increase in the use of the pill, injectables or male condom. Using children ever born (CEB) as a measure of fertility, this study endeavoured to investigate the role of pill, injectables and male condom to urban fertility reduction in Zambia. Long term permanent and reversible contraceptive methods such as implants, IUDs, female sterilisation and so on have been excluded from this study as there are few proportions of women in Zambia using these methods (table 1.1). Further, some studies have shown that women may choose long term permanent methods after they have already had the desired number of children and would not want to have any more children (Pathak, Feeney and Luther, 1998).

CEB consists of information on all children born alive to a woman (lifetime fertility) up to the survey date, regardless of whether these children are still alive or not. The advantage of using CEB for this analysis is that it represents the actual childbearing experience of a real age cohort of women and reflects their past as well as the current fertility behaviour (United Nations; Manual X, 1983).

1.2. Statement of the Problem

Contraceptive use among women of childbearing age improves the health of the mother and children when used to limit and space births. This in turn has potential to reduce fertility because as child survivorship increases, women tend to have fewer children. For example, the use of methods such as the pill, injectables and male condoms have helped couples limit the number of children that they want to have and this has contributed to the decline in fertility rates of many countries (Pathak, Feeney and Luther, 1998).

There have been efforts in Zambia to improve the socio-economic status of women by curbing early child bearing and thus reduce fertility. One such effort has been the provision of free family planning services to help couples space and have children when they are ready.

During the course of the past 20 or so years, the Government of the Republic of Zambia has put in place programmes aimed at helping women (couples) to limit births and also increase spacing.

In the same vein, contraceptive provision has increased with the most widely used methods being the pill, injectables and male condom. There has also been a corresponding decline in urban fertility especially (5.8 children in 1992 to 3.7 children in 2013-14). Studies have shown that the use of contraceptive methods can be associated with the observed fertility reduction. However, there is no clear evidence as to what contraceptive method has contributed to this fertility reduction.

Due to this lacuna, this study sought to examine the contribution of the three commonly used methods of contraception (pill, injectables, and male condom) to fertility reduction among urban women in Zambia.

1.3. Rationale for the Study

Fertility analysis in a country is important because it helps to determine fertility levels, patterns and trends as well as the factors behind it. This information is useful for socio-economic planning, monitoring and evaluating of programmes related to fertility and population development (2010 Census of Population and Housing).

One factor that has been cited in the literature as having an influence on fertility of a population is the use of contraceptives and the type of method used by married and sexually active women of the reproductive age group. Knowledge, access and use of contraceptive methods among women has increased steadily in Zambia, more specifically, the percentage of women using the pill, injectables, and male condom have increased. For example, the percentage of women using injectables increased from 1.5 per cent in 1992 to 13.8 per cent in 2013-14. Fertility rate among urban women has also declined during the same period (2013-14 ZDHS). For this reason, this study aimed at examining whether the pill, injectables, and male condom have contributed to reduction in CEB among urban women in Zambia.

The rationale for undertaking this study was to help fill the gap in knowledge of how the use of each of these CMs has influenced fertility level in Zambia. Further, the method identified as having contributed more significantly to reduction in urban fertility in Zambia would affect policy, reduce costs of family planning services and help to focus the provision of contraceptive methods more especially in rural areas since fertility is still high.

1.4. Research Objectives, Questions and Hypotheses

This section presents the research objectives, questions and hypotheses developed in order to help direct the study.

1.4.1. General Objective

To examine the role of the pill, injectables, and male condom to urban fertility reduction in Zambia: for the period 1992 to 2014.

1.4.2. Specific Objectives

i. To investigate whether the pill, injectables, and male condom have contributed to reduction in CEB among urban women in Zambia.
ii. To investigate the relationship between the pill, injectables, male condom and CEB among urban women in Zambia.
iii. To determine the demographic and socio-economic factors through which the CMs work to affect reduction in CEB among urban women in Zambia.

1.4.3. Research Questions

i. Can urban fertility reduction in Zambia be attributed to the three most widely used methods of contraception?
ii. Which amongst the three most widely used contraceptive methods has played a more significant role in fertility reduction?
iii. What demographic and socio-economic factors do these CMs operate through to contribute to reduction in CEB among urban women?

1.4.4. Research Hypotheses

i. Women using the pill are more likely to have fewer children than women who have not used any contraceptive method.
ii. Women using the injectables are more likely to have fewer children than women who have not used any contraceptive method.

iii. Women using the male condom are more likely to have fewer children than women who have not used any contraceptive method.

iv. Women with secondary/tertiary education and using contraceptive methods are more likely to have fewer children than women with no education.

CHAPTER TWO

LITERATURE REVIEW, THEORETICAL AND CONCEPTUAL FRAMEWORK

2.1. Literature Review

This chapter looks at studies that researchers have conducted in different countries over the past fifty years on how knowledge, contraceptive access and use have influenced fertility. These studies have found that, the increase in contraceptive use among women has contributed to decline in fertility rate in many countries while in others there has been minimal change. These studies have also established that, contraceptive use may impact fertility differently depending on a society and the level of socio-economic development.

Contraceptive use, education and fertility decline in North America

In North America, fertility has declined with the United States of America (USA)'s fertility rate declining from 2.5 children in 1970 to 1.9 children in 2013 (World Population Data Sheet 2014). This decline in USA fertility has been attributed to increased use of modern methods of contraception; with the pill, female sterilisation and male condom being the most consistently used methods by women of reproductive age (15 to 44 years) (Scommegna, 2012). Decline in USA fertility has also been attributed to increase in the number of females attending and achieving higher education and becoming income earners. This study also found that education of women affects the timing of age at first marriage and first birth by delaying both. This then reduces fertility since educated women are more likely to have increased knowledge, access and use of contraceptives and view having children as an economic cost rather than a benefit (Jacobson and Mather, 2011).

Other studies, however, show that, half of all pregnancies in the USA are unintended and most pregnancies among contraceptive users are caused by inconsistent or incorrect use and not by failure of a method being used (Scommegna, 2012). This evidence suggests that contraceptive methods are effective in reducing unwanted pregnancies hence fertility when used correctly and consistently, which most of the women are not doing. In spite of contraceptives being attributed to as factors of fertility decline, there is no categorical evidence of how births are abated due to usage of particular method of contraception.

El Salvador is another country in America which has benefited from fertility reduction due to contraceptive use. Findings of a family planning survey conducted in El Salvador in 2008 by the Ministry of Health on methods of contraceptive use and fertility decline shows that the fertility had dropped by 60 per cent in 30 years, from 6.3 lifetime births in the mid-1970s to 2.5 births in the period 2003-2008 (Ministerio de Salud El Salvador et al. in Kent, 2010). A further analysis of the family planning survey data was done, which aimed at establishing whether the increase in contraceptive prevalence rate from 47 per cent in 1988 to 73 per cent in 2008 had led to the observed fertility decline in El Salvador. Kent (2010) found that this long-term reduction in fertility was due to increase in the use of family planning methods, with much decline having been initiated by female sterilisation. However, this study did not clearly state how much reduction in fertility could be attributed to female sterilisation method.

IEC, contraceptive use and fertility decline in Asia

Asia, like Africa has grappled with high fertility; however, this is declining in Taiwan. Taiwan's fertility rate has declined from 3.9 in 1970 to 1.1 children per woman in 2013 and is among countries in the world with the lowest TFR (World Population Data Sheet 2014). An analysis was conducted in Taiwan by Sun (2001) to assess the impact of a family planning program (implemented from 1964 to 1990), contraceptive use and reduction in fertility. Findings of these analyses show that, universal provision of family planning services was effective and provision of low-cost contraceptive methods to eligible couples had enabled the fast increase in contraceptive use among Taiwanese women. This had been assisted by intensive family planning education and which helped couples to reduce fertility to the ideal number of children. However, this study did not specify what method of contraception had led to the decline in Taiwan's fertility. The knowledge, attitude and practice (KAP) surveys conducted by the Taiwan Provincial Institute of Family Planning (cited in Sun, 2001) found that the ideal number of children decreased from 4.0 in 1965 to 2.4 in 1992 and this was related to the information, education and communication (IEC**)** campaigns on family planning that had been carried out between 1967 and 1971.

Another country in Asia where fertility has declined due to contraceptive use is in India. Female sterilisation is the main method of contraception used by Indian women, with more than 75 per

cent of women reporting having been sterilised. The National Family Health Survey (NFHS) data of 1998 was used to analyse the relative effects of female sterilisation and temporary methods of contraception on fertility. The study found that female sterilisation was responsible for reducing India's fertility to 3.4 children per woman. However, in terms of reducing fertility further, Pathak, Feeney and Luther (1998) found that the method might not be as effective as it had been in the past. This is because sterilisation is irreversible and Indian women were only able to choose it after they already had an average of four children or desired number of children. On the relationship between temporary methods and fertility level, the study further found that, the increased use of temporary methods by Indian women to stop childbearing has the potential to significantly accelerate decline in TFR to lower levels (Pathak, Feeney and Luther, 1998). This is because the use of temporary methods of contraception, enable women to decide when to have children and how many.

Contraceptive use and fertility decline in Europe

Europe has also experienced fertility decline due to contraceptive use. Further, fertility rates among women in this part of the world are among the lowest in the world. Albania's fertility has also declined to below replacement level (less than 2.1) in spite of the communist government's ban of modern contraception and abortion (Kent, 2010). This is because large families were favoured and nearly all young women would be married and had at least one child by the time they were aged 30. An analysis was conducted to determine the factors behind the decline in fertility from nearly 7 children per woman in 1960 to about 3 children in 1990. It was found that this decline in fertility was as a result of rapid expansion of jobs and women's education as well as improvements in child health and mortality (Falkingham and Gjonca in Kent 2010). It was also found that fertility continued to decline and this decline was achieved by relying on withdrawal and other less effective traditional family planning methods (Ibid). A Demographic and Health Survey (DHS) in 2008-09 found that 58 per cent of married Albanian women relied on withdrawal method to prevent pregnancy; only 11 per cent used the male condoms or oral contraceptives (2008-09 Albania Demographic and Health Survey).

Contraceptive use, education and fertility decline in Africa

Fertility in sub-Saharan Africa (SSA) has also declined though the pace of decline is slow when compared to other regions of the world. However, within SSA there are some countries that are experiencing fertility decline. In Ethiopia, for example, TFR declined by about one child between 1990 and 2005. Similarly, contraceptive use also tripled from 5.0 per cent in 1990 to 15.0 per cent in 2005 (Portner, Christiaensen and Beegle, 2011). Common methods of contraception used were the injectables and oral contraceptives (Central Statistical Authority [Ethiopia] and ORC Macro 2006). An analysis was conducted using Ethiopia's 1994 census data and health facility surveys to determine the effect of family planning methods on CEB among women without education. The study found that access to family planning methods reduced the number of CEB to women without education and this reduction was more pronounced among women younger than 20 and older than 30 (Portner, Christiaensen and Beegle, 2011). The findings of this study led to a conclusion that access to family planning methods reduced unwanted fertility more especially for older women in Ethiopia (Ibid). This study has shown that Ethiopia's fertility has declined due to increase in contraceptive use; nevertheless, it does not specify what method of contraceptive has contributed to this reduction in fertility. Additionally, this study only focussed on women with no education and yet it could have been useful to know fertility decline among women of all levels of education.

In Malawi, the TFR is observed to have declined by one birth per woman, from 6.7 children in 1992 to 5.7 children in 2010. During the same period, contraceptive prevalence rate had increased from 7.4 per cent in 1992 to 42.2 per cent in 2010 with increase in the percentage of women using the injectables (Chintsanya, Madise and Bailey, 2012). Using data from the Malawi DHS of 2000, 2004 and 2010, an analysis was conducted to determine the factors influencing fertility decline. The Bongaarts and Potter (1983) fertility model was applied to examine the relative contribution of each proximate determinant of fertility to observed fertility reduction. Findings show that, increase in age at first marriage was an important factor for fertility decline in 1992 whilst an increase in education level of women had contributed to fertility decline in Malawi between 2000 and 2010. With regard to contraceptive use, the study found that women were mainly using the injection method for spacing of births rather than for limiting (Chintsanya, Madise and Bailey, 2012). In this case, women were using contraceptives

to postpone child birth and not to limit the number of children. Similarly, these results suggest that the injection method did not have an influence on fertility reduction in spite of increased use.

Contraceptive use and fertility decline in Zambia

Zambia is not short of studies on contraceptive use and influence on fertility. For example, a study by Letamo and Letamo (2001-2002) determined the influence of the proximate determinants on TFR. Using the 1992 and 1996 DHS data from Zambia, Botswana and Zimbabwe respectively, Letamo and Letamo employed the Bongaarts model in the analysis of factors influencing fertility decline in these countries. Findings show that, the inhibiting effect of contraception on fertility in Zambia was 13 per cent in 1992 and 21 per cent in 1996. The findings of this study were attributed to the low percentage of women using modern contraceptive methods. However, it is worth noting that this study and model used focuses on overall contraceptive use by married women to determine its influence on fertility level. Further, the model did not single out specific methods of contraception to determine their contribution to fertility decline in the country.

Additionally, other studies conducted in Zambia have mostly focused on fertility and contraceptive use differentials by various demographic and socio-economic characteristics of women. For example, women with tertiary education have an average of 3.0 children compared to women with no education who are having an average of 7.2 children in their lifetime (2013-14 ZDHS). Furthermore, contraceptive use has been observed to increase as the level of education of women increases, and relatively higher among women with tertiary education than among women with no education.

The above literature has given an overview of how access and use of contraceptives has contributed to fertility decline in many countries of the world. The review has also provided some lessons of how certain contraceptive methods have a potential to reduce fertility and others have a potential to stall the rate of decline. Nonetheless, the literature does not specifically isolate methods of contraception and what contributions they make towards fertility decline or put it succinctly, the number of births reduced that can be attributed to each method of contraception such as the pill, female sterilisation, injectables, and male condoms. It is with this gap in knowledge that this study sought to examine whether the use of the pill, injectables and

male condom have contributed to urban fertility reduction in Zambia. These methods have been chosen as they are the ones that most Zambian women of the reproductive age group are using to either space births or limit children. Further, there also been an increase in the percentage of women using these contraceptive methods over the past 20 years.

2.2. Theoretical and Conceptual Framework

2.2.1. Davis and Blake (1956) Analytical Fertility Framework

In order to understand how the use of contraceptive methods such as the pill, injectables and male condom have influenced fertility in urban Zambia, the study used the analytical fertility framework developed by Kingsley Davis and Judith Blake in 1956.

The Davis and Blake Analytical Fertility Framework has been used in many studies to explain the immediate or direct factors that influence fertility levels and how these are affected by the socio-economic and cultural factors. In this framework, Davis and Blake (1956) identified 11 variables known as Intermediate Fertility Variables, as the biological and behavioural factors (direct factors) of women through which the socio-economic and demographic factors that affect fertility have been observed to operate through.

In order to understand fertility levels in a population, the 11 variables of the framework have been collapsed under three headings: factors that affect exposure to sexual intercourse such as the proportion of women of the reproductive age (15-49 years) who are married and engage in sexual intercourse regularly; factors that affect a woman's exposure to conception such as the use or non-use of contraceptive methods and induced abortion; and factors affecting exposure to gestation and successful parturition (natural marital fertility factors).

Using the Davis and Blake variables relating to the use and non-use of contraceptive; this study aimed at investigating the role of the pill, injectables, and male condom to fertility reduction in urban Zambia. Therefore, this study did not focus on the entire Davis and Blake analytical fertility framework. In addition, the main tenet of the theory is to limit fertility analysis to married women. This is because the onset of marriage in many societies begins reproduction for women and also determines their length of exposure to childbearing. Furthermore, married women are likely to have more children as compared to those who are single. Nevertheless, the

analysis of CEB in this study considered all women in urban areas regardless of their marital status but who were using the pill, injectables and the male condom. This is because the beginning of sexual unions exposes any woman to the risk of getting pregnant regardless of her marital status and thus influences fertility in a population.

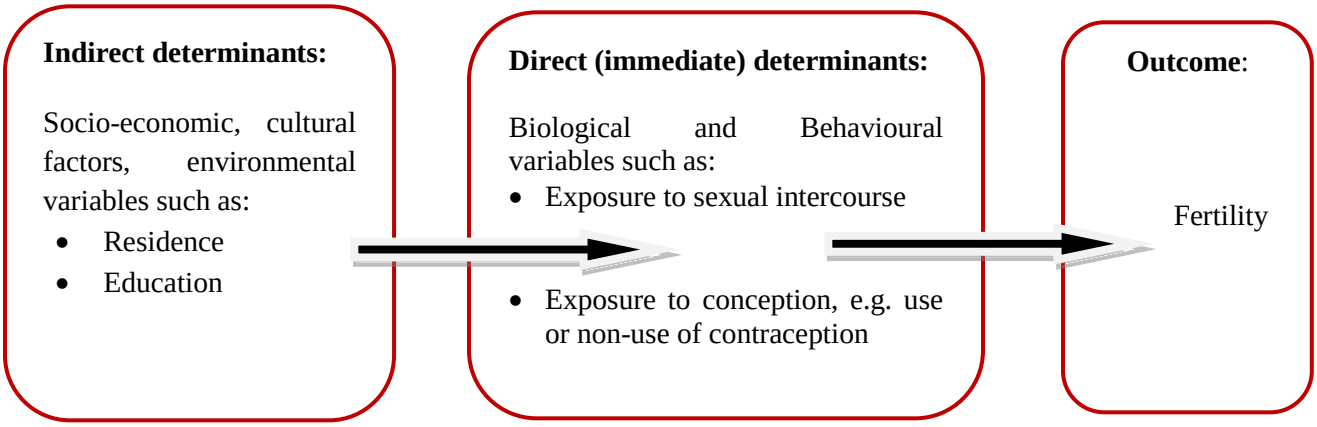
The Davis and Blake (1956) suggest that the risk of getting pregnant depends on the use or non-use of contraceptive methods and thereby affecting the level of fertility. The use of modern contraceptive methods among other socio-economic development has been observed to have contributed to fertility decline in both the developed and developing countries. This is because contraceptive use is able to help a woman limit and/or space the number of pregnancies and as more children survive to older ages, couples tend to have fewer children and this in the long run reduces fertility (United Nations, 1973).

The Davis and Blake analytical fertility framework provides this study with impetus and interpreting power to appreciate how contraceptive methods (the pill, injectables and male condom) affect fertility in urban Zambia. It also helps to understand how the socio-economic and demographic characteristics (background/explanatory variables) of women explain differentials in use of the pill, injectables and male condom among women and how these have influenced children ever born.

2.2.2. Davis and Blake Conceptual Framework

The Davis and Blake (1956) analytical fertility framework provides an explanation of how the socio-economic and cultural factors (indirect determinants) influence the direct (immediate) determinants of fertility in understanding the fertility level of a given population. The framework is summarised in figure 2.1:

Figure 2.1: Conceptual framework on how use of contraceptive methods affects CEB



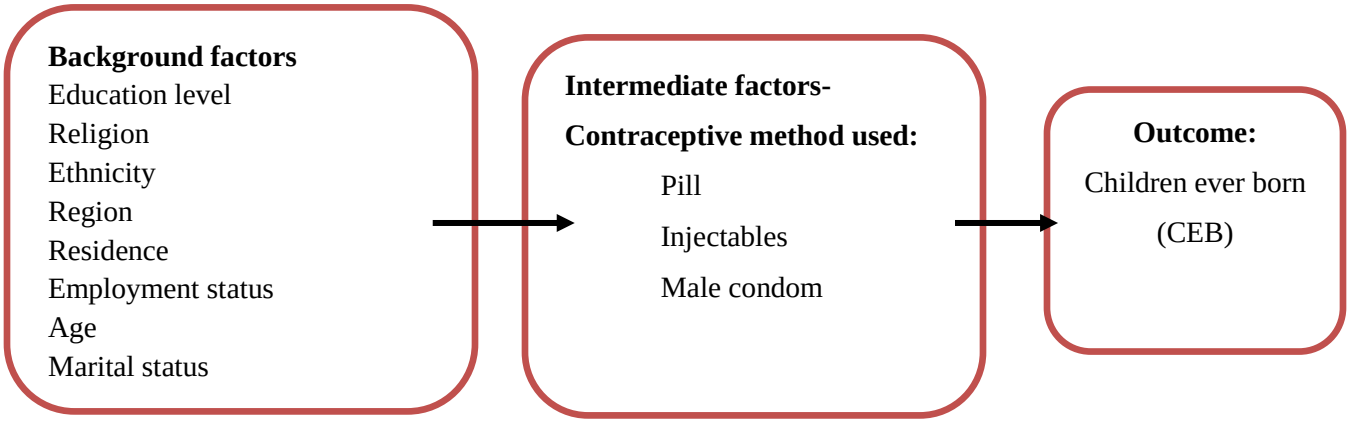
***Source**: Davis and Blake (1956) Analytical Fertility Framework*

Based on the Davis and Blake (1956) analytical fertility framework, the following conceptual framework was developed for the study to help explain how the pill, injectables and male condom have influenced children ever born among urban women in Zambia from 1992 to 2014.

2.2.3. Current Study Conceptual Framework

The conceptual framework in figure 2.2 shows how the different variables interact to influence fertility. The figure shows that background variables (education level, age etc.) influence the independent variable (contraceptive method used) which then operates through the proximate determinants of fertility and hence affect the number of children ever born to women.

Figure 2.2.: Conceptual framework on how use of contraceptive methods affects CEB



***Source**: Adapted from the Davis and Blake (1956) Analytical Fertility Framework*

2.3. Operational definitions of variables

This section presents operational definitions of the dependent variable and independent variables used in this study.

Table 2.1: Operational definition of Dependent and Independent Variables

VARIABLE	QUESTION	RESPONSES	SCALE OF MEASUREMENT
DEPENDENT VARIABLE			
Children ever born	Is derived from a series of questions on birth history of a woman such as: the number of sons and daughters currently living with her, the number of sons and daughters living elsewhere, and the number of sons and daughters who were born alive but later died.	0, 1, 2, 3, ….15	Ordinal
INDEPENDENT VARIABLES			
Age	How old were you on your last birthday?	15,16, 17, 18, …49	Ordinal
Ethnicity	What tribe do you belong to?	Bemba, Tonga, Lozi, etc	Nominal
Province/Region	Area where a woman resides.	Central Copperbelt Eastern Luapula Lusaka Muchinga Northern North-Western Southern Western	Nominal
Religion	What is your religion?	Catholic Protestant Muslim Other No religion	Nominal
Education	Have you ever attended school? What is the highest level you have attended?	No education Primary Secondary Higher	Nominal
Employment	Whether a woman had done any work in the 12 months prior to the survey?	Yes No	Nominal
Marital status	Whether a woman has ever been married/lived with someone as if married?	Yes, currently married Yes, living with a man Widowed Separated Divorced No, not in union (never married)	Nominal
Contraceptive method used	Whether or not a woman was currently doing something or using any method to delay or avoid getting pregnant. And if using, which method.	Female sterilization Pill Injectables Male condom Female condom Standard days, etc.	Nominal
Age at birth of first child	Age of a woman at birth of her first child	15, 16, 17, etc.	Ordinal

CHAPTER THREE
STUDY METHODOLOGY

This chapter describes the methodology employed to achieve the objectives of this study. It includes: a description of the research design, data sources and justification; target population and sample, inclusion/exclusion criteria of sample and description of variables. It also includes details of the data analysis procedure applying the Poisson regression model and strategies employed in model building.

3.1. Research Design

The study employed a non-intervention and descriptive research design; non-intervention study since no manipulation was applied to the target population. The study was also descriptive in nature since it only sought to examine how the use of the pill, injectables and male condom have contributed to reduction in urban fertility (CEB) in Zambia, from 1992 to 2013-14.

3.2. Data Source

The study used secondary data from the Zambia Demographic and Health Surveys (ZDHS) conducted in 1992, 1996, 2001-2, 2007 and 2013-14. The ZDHS is among the activities under the Measure DHS Program and has since 1992 been able to produce data on socio-economic and demographic aspects of the population in Zambia. Data is collected from men and women aged 15-59 and 15-49 years respectively; using two different questionnaires. For this study, the women's dataset was used and this includes data such as: reproductive history, fertility preferences, knowledge, access and use of contraceptives, breast-feeding practices, and maternal health service utilisation, nutrition of women and children, and child mortality. This information provides a good source of data that is relevant for this study.

3.2.1. Justification on use of the ZDHS

The ZDHS provides a good source of data for this study because the sample size is nationally representative. Therefore, findings of this study can be generalised to the entire population of urban women. Furthermore, the ZDHS applies comprehensive consistency checks and data quality methodologies that make the data of high quality.

The women's dataset contains information on CEB to women up to the survey date; demographic and socio-economic factors as well as the proximate determinants of fertility. These factors include; employment status, education level age, marital status, age at first marriage, age at birth of first child, marital duration and methods of contraception used. In addition, since the findings of the study would be able to inform policy on provision of contraceptive methods, the DHS provides an adequate sample size and data to warrant such an investigation.

3.3. Description of the Target Population and Sample

All the ZDHS samples are nationally representative samples of women who are in the reproductive age group (15-49 years) and, therefore, provide good estimates of data on CEB and the factors that might be influencing it. The target population for the study was women in the age group 15-49 years throughout all the ZDHS conducted in previous years. The sample for the study was all women who reported residing in urban areas of Zambia. Furthermore, the sample focused on all urban women who were sexually active regardless of their marital status and who reported ever using of the pill, male condom and injectables and those who have never used any method (were treated as a reference category). Urban women were chosen because this is where fertility has declined more and contraceptive use is high, therefore, this would help to examine if the use of the pill, injectables and male condom have contributed to fertility reduction.

3.3.1. Sample Inclusion/Exclusion Criteria

Women residing in urban areas and reported using the pill, injectables and male condom were included in the study sample. Women who have never used any method of contraceptive were also included in the sample and treated as a reference. Women using contraceptive methods such as; female condoms, implants, and female sterilisation, withdrawal, and so on, were excluded from the study sample. These methods were excluded because there were fewer proportions of women using these contraceptive methods. Furthermore, women reporting use of contraceptives but never had sexual intercourse were all excluded from the study sample. This is because onset of sexual activity exposes any women to the risk of conception, which these women are not

exposed to. In order to measure properly, the variable CEB, the sample only included women who have ever had a child.

3.3.2. Study Sample Size

The 1992, 1996, 2001, 2007 and 2013-14 ZDHS samples had 3,358, 3,001, 2,551, 3,178 and 7,871 urban women respectively. Of these samples, only 1,184, in 1992; and 975 in 1996; 870 in 2002; 1,056 in 2007 and 3,231 met the described criteria for inclusion into the current study.

3.4. Data Analysis

Analysis of data in this study was done using the statistical software Stata 12.0. Data was thoroughly assessed before any analysis was conducted. This involved ensuring that all datasets for the different survey years had uniform variables to be used for analysis. In addition, recoding of variables was done according to the definition of the researcher and to ensure that all survey years had the same variable coding. All missing and inconsistent cases were excluded from the sample and analysis. Survey weights were then applied in order to make an inference of the results to the entire urban women population.

The analysis of the data involved two stages. Firstly, descriptive statistics were conducted to determine the percentage distribution of urban women in the study sample. Secondly, Bivariate and multivariate analysis was conducted using Poisson regression to determine the Incidence Rate Ratios of CEB associated with contraceptive use. Bivariate analysis was performed to determine the association between CEB and the main independent variable (method of contraception used) and on women's demographic and socio-economic characteristics respectively. Multivariate analysis was also conducted using Poisson regression in order to determine how the interaction of all the independent variables have influenced CEB among urban women in Zambia; stepwise regression method was used in model building. Tables and charts were used to facilitate the presentation of study findings.

3.4.1. Description of Variables

This section gives a description of how variables in this study were created to facilitate the analysis. The dependent variable CEB is count data and was given by 0, 1, 2, 3, 4, 5, 6... 16. The background variables were: age of women categorised as; 15-24 (treated as a reference category), 25-34 and 35-49. The education level variable had four categories: no education, primary education, secondary education and tertiary education. In all the regression analyses, women with no education were treated as a reference category. The three religion dummies were; Catholic (reference category), Protestants and Others (combining Muslims and unknown religion). Employment status of women was categorised as not employed and employed.

Region (province) variable was coded into 3 categories using the fertility levels and patterns over the past 20 years. These categories were: Region 1 (Copperbelt and Lusaka) and was treated as a reference, Region 2 (Southern, Western and Central) and Region 3 (Eastern, Northern, Luapula, Muchinga, and North-Western). Ethnicity shows grouping of women by similar language spoken and was categorised into six, namely; Bemba (reference category), Tonga, Barotse, Nyanja speaking, North-westerner, other groups.

The main independent variable was the method of contraception used and was categorised as not using (were treated as a reference category), pill, injectables, and male condom. The proximate determinant marital status had three outcomes; never married, married and formerly married; the never married women were treated as a reference category. Age at birth of first child had three categories; <15 years, 15-19 years and 20+ years; with women who had a first child at <15 years used as a reference category.

3.4.2. Poisson Regression Model

Poisson regression was used to measure the influence of the pill, male condom and injectables on children ever born. The use of Poisson regression was influenced by three distinct characteristics embedded in the outcome variable CEB. Firstly, CEB is a count data (i.e. 0, 1, 2, 3 ...16); secondly, it has non-negative values and; thirdly, the distribution of CEB is likely to be skewed in one direction. Hence, the use of linear regression models might not be appropriate for such data as these often result in inefficient, inconsistent and biased estimates of the regression

parameters (Long, 1997). In this regression, the probability of a count data such as CEB is determined by a Poisson distribution and the mean of the distribution is a function of the independent variables (Ibid, 2001). In this model, it is assumed that the mean and variance have to be similar, though this might not be the case with actual CEB data.

Studies show that Poisson regression can be used if there is not much evidence of overdispersion (variance>mean) or under-dispersion (variance<mean) in CEB data. The alternative is to use Negative binomial regression. In this study, CEB data was assessed and there were not a lot of differences in the regression coefficients of the two models, hence analysis settled for Poisson regression.

The Poisson Regression model is given by:

$$\ln(\mu) = \alpha+\beta_1 X_1 + \beta_1 X_2 + \ldots \beta_k X_k$$

where:

$\ln(\mu)_i$, log of mean count (e.g., log of mean number of children ever born to i^{th}woman)

α , $\beta_1,\beta_2 + \ldots \beta_k$ are the Poisson Regression coefficients

X_1, $X_2 + \ldots X_k$ are the independent variables (characteristics of the women such as education, age, marital status)

In this study, results of the Poisson Regression of children ever born have been interpreted using Incidence Rate Ratio (IRR). The incident rate, r_i for the *i*th observation is given by:

$$ri = e^{\beta 1X1+\cdots+\beta i(Xi+1)+\cdots+\beta nXn}i$$

where: *e* is the exponentiated coefficient; and

Therefore, the incidence rate ratio is given by:

$$IRR = \frac{e^{\beta 1X1+\cdots+\beta i(Xi+1)+\cdots+\beta nXni}}{e^{\beta 1X1+\cdots+\beta iXi+\cdots+\beta nXn}i}$$

For categorical variables, the interpretation of IRR is as follows:

i. IRR less than 1 means women in a particular category of a variable had fewer children than women in the reference group.
ii. IRR more than 1 means women in a particular category of a variable had more children than women in the reference group.
iii. IRR equal to 1 means there are no differences in the observed number of children ever born to women in a particular category of a variable and women in the reference group.

3.4.3. Modeling Strategy

The modeling strategy firstly involved grouping variables into four categories as follows: the study had one outcome variable, CEB; one main independent (main effect) variable: contraceptive method used (pill, injectables and male condom); forced predictors (ethnicity, region, religion, age, education, employment status), potential confounders (marital status and age at birth of first child). The modeling strategy was to build a model in which the main independent variable was always there. The first model had CEB with the main effect variable (CM used). Secondly; all the forced predictors of CEB were added into one model with the main effect variable. Thirdly, was to build models of CEB in which the main independent variable and forced predictors were there and then adjusting for each potential confounder one at a time. This was done in order to determine the influence of the main effect variable (method of contraception used) on CEB when interacted with socio-economic and demographic determinants of fertility. With this aim, the following models were developed:

1. $ln(\text{mean CEB}) = \alpha + \text{contraceptive methods}$
2. $ln(\text{mean CEB}) = \alpha + \beta_1 \text{contraceptive methods} + \beta_2 \text{religion} + \beta_3 \text{ethnicity} + \beta_4 \text{education} + \beta_5 \text{employment status} + \beta_6 \text{age}$
3. $ln(\text{mean CEB}) = \alpha + \beta_1 \text{contraceptive methods} + \beta_2 \text{religion} + \beta_3 \text{ethnicity} + \beta_4 \text{education} + \beta_5 \text{employment status} + \beta_6 \text{age} + \beta_7 \text{marital status}$
4. $ln(\text{mean CEB}) = \alpha + \beta_1 \text{contraceptive methods} + \beta_2 \text{religion} + \beta_3 \text{ethnicity} + \beta_4 \text{education} + \beta_5 \text{employment status} + \beta_6 \text{age} + \beta_7 \text{marital status} + + \beta_8 \text{age at first births}$

3.5. Limitations of the Study

The use of secondary data at times yields challenges, especially where analysis is conducted for different survey years and results have to be compared and a conclusion on the study topic made. This required that the same variables are used. Therefore, the major limitations of this study were: the variable the number of children a woman had at first use of contraceptive methods could not be used as the variable was not found in the ZDHS 2013-14 dataset. Additionally, wealth index which might have an influence on children ever born could not be used in the analysis as the ZDHS datasets before 2001-2 did not have this variable in the dataset.

Further, the cross-sectional nature of DHS data does not enable to determine causality between the dependent and independent variables but only association which this study has been able to do. The quantitative nature of the DHS dataset provides no reasons as to why women prefer using these various contraceptive methods (the pill, injectables and male condom) instead of other methods which can only be assumed.

3.6. Ethical Consideration

Permission was sought from Measure DHS and approval was given to use the ZDHS female datasets for 1992 to 2014 specifically for use in analysis for this study and has not been used for any other purpose.

CHAPTER FOUR
STUDY FINDINGS

This chapter presents findings of the study. It is divided into the following sections: percentage distribution of women in the urban sample by demographic and socio-economic characteristics and proximate determinants; bivariate and multivariate analysis results of CEB among women are also presented and interpreted using the Incidence Rate Ratio (IRR). The study sought to examine whether the pill, injectables, and male condom have contributed to fertility reduction in urban Zambia.

4.1. Demographic and Socio-economic Characteristics of Urban Women in Zambia

This section presents percentage distribution of urban women in the study sample aged 15-49 years who were using the pill, injectables, male condom and women who have not used any contraceptive methods by demographic and socio-economic characteristics.

Results in Table 4.1 show that most women in the study were in the age groups 25-34 followed by women aged 15-24. Most women were from region 1 (Lusaka and Copperbelt) and almost half were from the Bemba ethnic grouping. By religion, most women in the study were Protestants with 66.6 per cent in 1992 and 81.1 per cent in 2014. Regarding the highest level of education attained, most women had primary education. Women with tertiary education were fewer, ranging from 2.1 per cent in 1992 to 9.2 per cent in 2014. Slightly over half of the women were not working in the 12 months prior to the survey.

Table 4.1: Percent distribution of urban women by demographic and socio-economic characteristics, 1992-2014

		1992	1996	2002	2007	2014
Variable	**Category**	Percentage				
Age group	15-24	38.9	37.3	33.2	28.3	26.7
	25-34	38.8	38.3	44.0	44.4	42.6
	35-49	22.4	24.3	22.7	27.3	30.7
Region	Region 1	73.3	70.3	72.8	64.5	65.7
	Region 2	17.4	16.0	14.3	18.0	18.0
	Region 3	9.3	13.7	12.9	17.5	16.3
Ethnic grouping	Bemba	45.5	46.3	48.9	49.4	46.6
	Tonga	13.8	11.3	12.8	10.6	12.0
	North-westerner	9.3	6.4	7.3	6.2	8.0
	Barotse	5.3	6.7	6.2	5.9	5.5
	Nyanja	23.1	25.8	22.8	24.9	25.2
	Other	3.0	3.7	2.0	3.1	2.7
Religion	Catholic	31.4	25.8	21.6	21.1	17.4
	Protestant	66.6	73.3	77.8	77.7	81.1
	Other	1.9	0.9	0.6	1.2	1.5
Education level	No education	10.4	8.4	4.7	4.4	4.3
	Primary	61.4	55.0	49.1	43.6	37.3
	Secondary	26.1	31.7	40.5	42.9	49.2
	Higher	2.1	4.9	5.6	9.1	9.2
Working status	No	48.6	50.5	48.7	47.8	47.5
	Yes	51.4	49.5	51.3	52.2	52.5
n		**1,184**	**975**	**870**	**1,056**	**3,231**

***Source**: Calculated using the 1992, 1996, 2001-2, 2007 and 2013-14 ZDHS Datasets*

Table 4.2 shows percentage distribution of women by marital status and age of a woman at birth of her first child. In all the years under study (1992 to 2014), findings in table 4.2 show that about two-thirds of urban women were married. Results in figure 4.2 show that age at birth of a first child for most women was 15-19 years, with over 50.0 per cent in all survey years. Results also show that few women had given birth before 15 years.

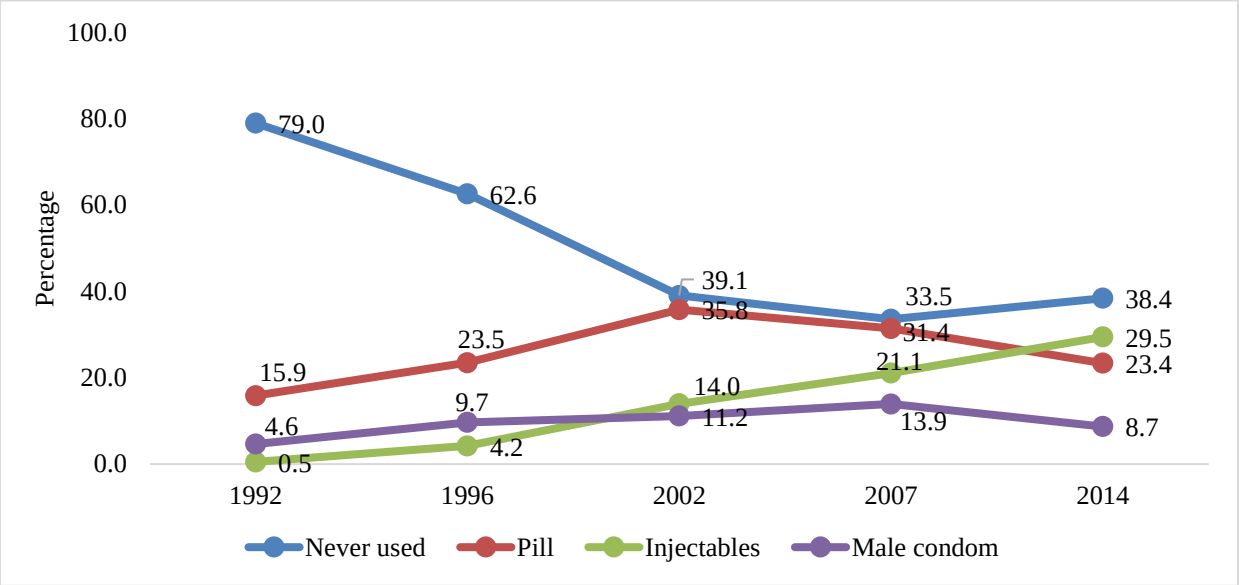
Table 4.2: Percent distribution of urban women by marital status and age at birth of first child, 1992-2014

Variable	Category	1992	1996	2002	2007	2014
		Percentage				
Marital status	Never married	12.0	9.4	10.7	11.2	13.8
	Currently married	73.5	72.1	74.2	74.1	71.2
	Formerly married	14.5	18.5	15.0	14.6	15.0
Age at birth of first child	<15	7.7	4.9	5.1	4.9	3.5
	15-19	69.3	65.5	64.5	57.9	58.0
	20+	23.1	29.6	30.4	37.2	38.5
Method of contraception	Never used	79.0	62.6	39.1	33.5	38.4
	Pill	15.9	23.5	35.8	31.4	23.4
	Injectables	0.5	4.2	14	21.1	29.5
	Male condom	4.6	9.7	11.2	13.9	8.7
n		**1,184**	**975**	**870**	**1,056**	**3,231**

***Source**: Calculated using the 1992, 1996, 2001-2, 2007 and 2013-14 ZDHS Datasets*

Figure 4.1 shows the percentage distribution of urban women in the study by contraceptive use. Results show that the pill was used by 15.9 per cent of women in 1992, had its peak in 2002 (35.8 per cent) and reduced to 23.4 per cent in 2014. It can also be observed from Figure 4.1 that there has been a steady increase in the per cent of women using the injection method, from 0.5 per cent in 1992 to 29.5 per cent in 2014. The use of male condom increased from 4.6 per cent in 1992, had its peak in 2007 (13.9 per cent) and dropped to 8.7 per cent in 2014. Figure 4.1 also shows that the per cent of urban women who have never used any contraceptive methods has dropped from 79.0 per cent in 1992 to 38.4 per cent in 2014.

Figure 4.1: Percent distribution of use of the pill, injectables and male condom among urban women in Zambia by year



***Source**: Calculated using the 1992, 1996, 2001-2, 2007 and 2013-14 ZDHS Datasets*

4.2.1. Bivariate Association: CEB by Type of Contraception Method, Socio-economic and Demographic Factors

This section presents results of the bivariate association between CEB and type of contraceptive method used and by socio-economic as well as demographic factors. Findings in Table 4.3 show that older women (25-34 and 35-49 years) had significantly more children than younger women aged 15-24 years. There were no significant differences in number of children born to women residing in Region 1 (Copperbelt and Lusaka) and Region 2 (Southern, Western and Central). Furthermore, for survey years 1996 and 2014, women in Region 3 (Eastern, Northern, Luapula, Muchinga, and North-Western) had relatively more children compared to women in Region 1. However, results for 2007 were not statically significant. Women whose ethnic grouping was North-westerner and Barotse were likely to have fewer children than women whose ethnic grouping was Bemba (reference category).

Table 4.3 also shows that women whose religious affiliation was Protestant were likely to have fewer children than women with Catholic affiliation; however, findings show that were no statistically significant differences in the number of children ever born to women of different religious affiliations except for 2007. Women with primary, secondary and higher education had

significantly fewer children compared to women with no education. The currently employed women had significantly more children compared to the unemployed.

Table 4.3: IRR of CEB by socio-economic and demographic variables, 1992-2014

Variable		1992	1996	2002	2007	2014
		IRR	IRR	IRR	IRR	IRR
Age group	15-24 (RC)					
	25-34	2.409*	1.959*	2.221*	1.951*	2.061*
	35-49	4.003*	3.545*	3.939*	3.459*	3.375*
Region	Region 1 (RC)					
	Region 2	0.993	1.034	0.975	0.988	1.051
	Region 3	0.975	1.145*	1.105*	1.084	1.178*
Ethnic grouping	Bemba (RC)					
	Tonga	0.977	0.797*	1.021	0.905	0.915*
	North-westerner	0.932	0.882	1.076	0.937	0.979
	Barotse	0.957	0.831*	0.875	0.836*	0.855*
	Nyanja	0.952	0.980	1.037	0.943	0.937*
	Other	0.961	0.948	0.797	0.976	0.936
Religion	Catholic (RC)					
	Protestant	1.017	0.962	0.944	0.909*	0.966
	Other	1.053	1.034	0.896	1.219	0.995
Education level	No education (RC)					
	Primary	0.761*	0.860*	0.799*	0.825*	0.874*
	Secondary	0.576*	0.574*	0.623*	0.585*	0.538*
	Higher	0.662*	0.614*	0.523*	0.524*	0.499*
Working status	Not employed (RC)					
	Employed	1.172*	1.242*	1.165*	1.173*	1.329*

**Significant at p<0.05; IRR: Incidence Rate Ratio; CI: RC: Reference Category*
***Source**: Calculated using the 1992, 1996, 2001-2, 2007 and 2013-14 ZDHS Datasets*

Table 4.4 shows results on the IRR of CEB by women's marital status, method of contraception used and age at birth of first child. Among women of various marital statuses, ever-married women had significantly more children than women who were never married. Table 4.4 also shows that women who had their first child after age 15 had significantly fewer children than women who had their first child before the age of 15 years. Results also show that, women using the pill and injectables had relatively more children compared with women who have never used any contraceptive method. Women who were using the male condom had fewer children for

survey years 1992 to 2007, however, these results were not statistically significant. This shows that the differences in the number of children born to these women were due to chance.

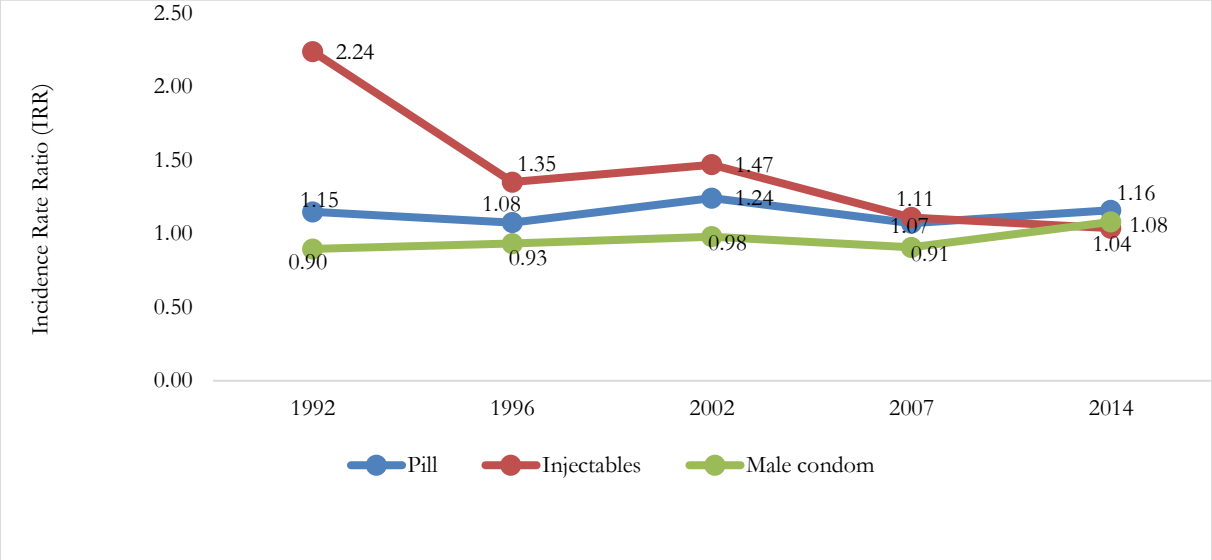
Table 4.4: IRR of CEB by proximate variables, 1992-2014

Variable		1992	1996	2002	2007	2014
		IRR	IRR	IRR	IRR	IRR
Marital status	Never married (RC)					
	Currently married	3.173*	2.900*	3.161*	3.067*	2.708*
	Formerly married	2.622*	2.443*	2.999*	2.905*	2.647*
Age at birth of first child	<15 (RC)					
	15-19	0.698*	0.789*	0.791*	0.870	0.837*
	20+	0.575*	0.612*	0.584*	0.698*	0.657*
Method of contraception	Never used (RC)					
	Pill	1.149*	1.076	1.243*	1.072	1.160*
	Injectables	2.239*	1.352*	1.470*	1.111	1.038
	Male condom	0.897	0.934	0.980	0.907	1.081*

**Significant at p<0.05; IRR: Incidence Rate Ratio; CI: RC: Reference Category*
***Source**: Calculated using the 1992, 1996, 2001-2, 2007 and 2013-14 ZDHS Datasets*

Figure 4.2 amplifies the information observed in Table 4.3 but tries to provide a trend in IRR of the CEB by CM among urban women in Zambia. The figure shows that there is a steady decline in the number of children born to women using the injectables over the years, from 2.2.4 children in 1992 to 1.04 children in 2014. Among women using the pill, the number of children slightly reduces from 1.15 in 1992 to 1.08 in 1996 but increases to 1.24 in 2002; and dropped to 1.07 and increases to 1.16 children in 2007 and 2014 respectively. Similarly, the number of children born to women using the male condom increases to 0.93 in 1996 from 0.90 in 1992 but it steadily rises in 2002 (IRR: 0.98), reduces to 0.91 in 2007 and increases to 1.04 in 2014 which shows that these women had relatively more children. This shows that there are fluctuations in the number of children born to women using the pill and the male condom and the direction of the relationship over the years is not clear.

Figure 4.2: IRR of CEB by the pill, male condom and injectables



***Source**: 1992, 1996, 2001-2, 2007 and 2013-14 ZDHS Datasets*

4.2.2. Multivariate Results: CEB, Type of Contraceptive Method, Socio-economic and Demographic Characteristics

This section shows multivariate results for the years of study in question; 1992 to 2013-14. Results shown in this section are for the final model (Model 4) and the Adjusted Incidence Rate Ratio (AIRR) of CEB is adjusted for contraceptive methods (pill, injectables and male condom), region, ethnicity, religion, working status, education level, age, employment status, marital status and age at birth of first child.

In Model 4 of Table 4.5, the AIRR of CEB by women using the pill, male condom and injectables shows that these women had relatively more children than women who have never used any contraceptive method. However, the results for 2007 and 2014, there were no significant differences in the number of children born to women who were using the male condom and women not using any method.

Results also show that there were no statistically significant differences in the number of children ever born to women residing in various regions (Region 1, Region 2 and Region 3), except for Region 3 in 1996 and 2014. Further, while there seem to be fewer children born to women with

Tonga, North-westerner, Barotse, Nyanja ethnicity in comparison to women from Bemba ethnic grouping; these results were not statistically significant.

Table 4.5 also shows that women with secondary and tertiary education had significantly fewer children than women who had no education. However, for women with primary education compared to those with no education, there were no statistically significant differences in the number of children born to these women for survey years 1992, 1996 and 2002. There were no statistically significant differences in the number of children ever born to currently employed women and the not employed women.

Women who were currently married and formerly married were likely to have more children than the never married women. Results show that women who had their first child at 20 years and more were associated with having fewer children as compared to women who had their first child at less than 20 years.

Table 4.5: AIRR of CEB by socio-economic, demographic and proximate variables, 1992-2014

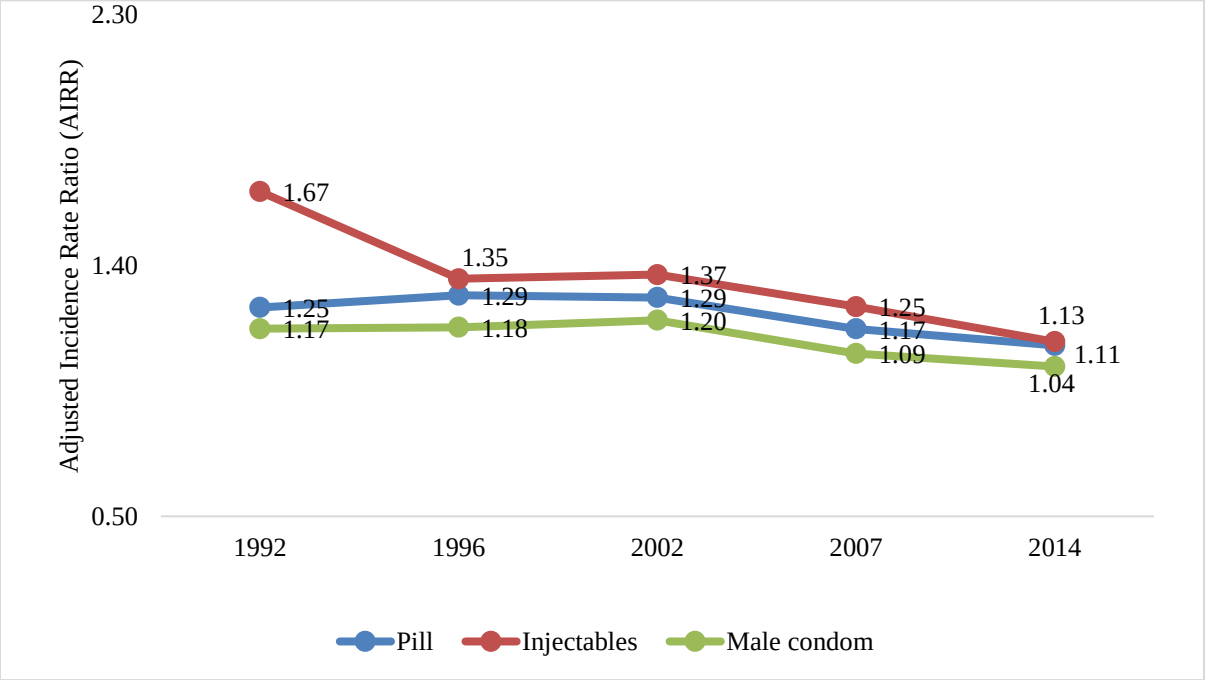
Variable	Category	1992 AIRR [95% CI]	1996 AIRR [95% CI]	2002 AIRR [95% CI]	2007 AIRR [95% CI]	2014 AIRR [95% CI]
	Never used (RC)					
Contraceptive method	Pill	1.250***	1.294***	1.286***	1.173***	1.114***
		[1.145,1.365]	[1.181,1.418]	[1.165,1.419]	[1.068,1.287]	[1.054,1.179]
	Injectables	1.666***	1.353***	1.368***	1.253***	1.127***
		[1.242,2.235]	[1.145,1.599]	[1.216,1.540]	[1.136,1.381]	[1.071,1.186]
	Male condom	1.174	1.179*	1.204*	1.085	1.038
		[0.998,1.381]	[1.035,1.343]	[1.043,1.389]	[0.964,1.221]	[0.961,1.120]
Region	Region 1 (RC)					
	Region 2	0.975	1.063	1.072	1.047	1.038
		[0.892,1.066]	[0.963,1.174]	[0.965,1.192]	[0.951,1.152]	[0.978,1.102]
	Region 3	0.996	1.109*	1.077	1.081	1.161***
		[0.894,1.110]	[1.011,1.216]	[0.974,1.191]	[0.995,1.175]	[1.106,1.219]
Ethnicity	Bemba (RC)					
	Tonga	0.908	0.934	0.977	0.944	1.010
		[0.823,1.003]	[0.819,1.065]	[0.864,1.105]	[0.832,1.071]	[0.936,1.089]
	North-westerner	0.975	0.919	1.057	1.001	0.970
		[0.870,1.092]	[0.798,1.059]	[0.924,1.210]	[0.888,1.129]	[0.911,1.032]
	Barotse	0.860	1.007	0.908	1.020	0.988
		[0.739,1.002]	[0.863,1.176]	[0.764,1.078]	[0.887,1.174]	[0.904,1.081]
	Nyanja	0.963	0.950	1.003	0.966	0.920**
		[0.891,1.042]	[0.869,1.038]	[0.911,1.105]	[0.883,1.056]	[0.873,0.969]
	Other	0.837	0.887	1.106	1.105	0.975
		[0.692,1.012]	[0.731,1.077]	[0.798,1.535]	[0.878,1.390]	[0.844,1.126]
Religion	Catholic (RC)					
	Protestant	1.035	0.984	0.950	0.948	1.013
		[0.966,1.108]	[0.908,1.068]	[0.866,1.042]	[0.871,1.031]	[0.960,1.069]
	Other	1.017	0.853	0.892	1.150	0.908
		[0.811,1.276]	[0.579,1.256]	[0.532,1.495]	[0.806,1.641]	[0.756,1.091]
Education level	No education (RC)					
	Primary	0.950	0.947	0.952	0.846*	0.922*
		[0.865,1.044]	[0.841,1.066]	[0.813,1.116]	[0.737,0.970]	[0.853,0.997]
	Secondary	0.785***	0.755***	0.832*	0.734***	0.739***
		[0.699,0.881]	[0.657,0.868]	[0.703,0.985]	[0.636,0.846]	[0.681,0.801]
	Higher	0.604***	0.577***	0.673**	0.596***	0.626***
		[0.470,0.775]	[0.461,0.722]	[0.523,0.865]	[0.489,0.727]	[0.559,0.699]
Working status	Not working (RC)					
	Working status	1.016	1.030	0.967	0.942	1.055*
		[0.953,1.083]	[0.956,1.109]	[0.894,1.046]	[0.877,1.012]	[1.011,1.101]
Age	15-24 (RC)					
	25-34	2.220***	1.961***	2.125***	1.879***	1.900***
		[2.024,2.434]	[1.769,2.173]	[1.891,2.389]	[1.686,2.093]	[1.775,2.033]
	35-49	3.696***	3.443***	3.841***	3.332***	3.092***
		[3.357,4.070]	[3.102,3.821]	[3.402,4.336]	[2.979,3.728]	[2.883,3.316]
Marital Status	Never married (RC)					
	Married	1.598***	1.539***	1.610***	1.765***	1.521***
		[1.358,1.880]	[1.263,1.875]	[1.307,1.982]	[1.493,2.088]	[1.393,1.661]
	Formerly married	1.258*	1.245*	1.412**	1.548***	1.281***
		[1.051,1.505]	[1.008,1.537]	[1.130,1.764]	[1.288,1.861]	[1.162,1.413]
Age at birth of first child	<15 (RC)					
	15-19	0.942	0.929	0.913	0.934	0.876**
		[0.851,1.043]	[0.806,1.071]	[0.783,1.063]	[0.806,1.081]	[0.799,0.959]
	20+	0.687***	0.679***	0.634***	0.681***	0.655***
		[0.611,0.773]	[0.580,0.795]	[0.536,0.750]	[0.583,0.794]	[0.595,0.721]
	n	1,184	975	870	1,056	3,231

Significant at: p<0.05, ** p<0.01, *** p<0.001; AIRR: Adjusted Incidence rate ratio; CI-Confidence Interval; RC: Reference Category*

***Source**: Calculated using the 1992, 1996, 2001-2, 2007 and 2013-14 ZDHS Datasets*

Figure 4.3 shows an amplified data of multivariate Model 4 but depicts a trend in AIRR of CM by the effect on CEB for all the survey years. The figure indicates that women using the pill, injectables, and male condom were associated with relatively more children than women who have never used any contraceptive methods. However, the number of children born to these urban women declined over the years. It is interesting to note that, there is a steady decline in the number of children born to women using the injectables. This shows that there is potential for the injectables method to contribute to fertility decline in years to come. While there seem to be a decline in the number of children ever born to women using the pill and injectables, there are fluctuations in the number of children ever born from low to high from one survey year to the other.

Figure 4.3: AIRR of CEB by the pill, male condom and injectables



***Source**: Calculated using the 1992, 1996, 2001-2, 2007 and 2013-14 ZDHS Datasets*

CHAPTER FIVE
DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

Contraceptive use in Zambia has increased over the past 20 years with the pill, injectables, and male condom being the main methods consistently used by women. Fertility has also declined in Zambia especially in urban areas. Therefore, this study aimed at examining whether the pill, injectables, and male condom have contributed to a reduction in urban fertility in Zambia. The study also sought to investigate the relationship between each of these CMs and CEB among urban women in Zambia. Additionally, the research hypotheses for the study were that urban women using either the pill, injectables, or male condom were likely to have fewer children ever born than women who have never used any contraceptive method. The study sought to answer the following research questions: Can urban fertility reduction in Zambia be associated with the three most widely used methods of contraception? If so, which amongst the three methods has played a more significant role? What demographic and socio-economic factors do these CMs operate through to contribute to reduction in CEB among urban women?

Findings of the study have shown that; urban women using the pill, injectables and male condom had more children ever born. This shows that the use of the pill, injectables and male condom have had minimal contribution to the reduction in CEB among urban women in Zambia. Furthermore, with regards to the relationship of the pill, injectables, male condom and CEB, the study shows that women using these methods had relatively more children. For the 2007 and 2014 survey years, results also show that there were no statistically significant differences in the number of CEB to women using the male condom and women who have never used any method of contraception. The study also found that; women with secondary or tertiary education and those women who had their first child at 20+ years and were using either the pill, injectables, or male condom were associated with significantly fewer children.

5.2. Discussion of Findings

5.2.1. Effect of the Pill, Injectables and Male Condom on CEB

The study found that urban women in Zambia using the pill and injectables had relatively more children for all survey years (1992 to 2013-14) at both bivariate and multivariate analysis level. However, results also show that there were no statistically significant differences in the number of children born to women using the male condom and women not using any contraceptive method in 1992, 2007 and 2014. This means that the difference in the number of children between the two groups of women was due to chance.

The findings of the study conflict with the research hypotheses which states that women using either the pill, injectables, or male condom were likely to have fewer children ever born than women who have never used any contraceptive method. One possible explanation could be that urban women in Zambia are more likely to have been using these contraceptives for spacing of births rather than for limiting children. While there may not be specific examples in Zambia, a study conducted using the 1992 Malawi DHS found that increased use of the injection method by women, did not contribute to fertility decline. This study led to the conclusion that Malawian women were mainly using the injection method to space their births and not to limit the number of children (Chintsanya, Madise, and Bailey, 2012).

Further, these findings can be attributed to incorrect and inconsistent use of contraceptive methods such as forgetfulness especially the pill which a woman has to take daily. This makes the use of this contraceptive method to be ineffective in preventing pregnancy and in reducing the number of children that women are having. While no specific study was found in Zambia to support this finding, this can be explained with a study conducted in the USA on the factors contributing to fertility decline and contraceptive use. It was found that unwanted pregnancies among contraceptive users in the USA was due to the inconsistent and incorrect use of methods by women and not by the failure of a method being used (Scommegna, 2012).

5.2.2. Relationship of the Pill, Injectables, Male Condom and CEB

Results of the study for the analysis of CEB among urban women in Zambia have also shown that women using the pill, male condom and injectables had relatively more children ever born than women with similar socio-economic and demographic characteristics who have never used any contraceptive method. This shows that fertility reduction in urban Zambia may not be associated with the increased use of these contraceptive methods by women. Therefore, it is more likely that urban women are using the injectables for their convenience because one has to get a repeat injection once in every three months in the case of Depo-Provera; which most women (93 per cent) in Zambia using injectables reported to use (2013-14 ZDHS).

The use of injectables also reduces the time that the women would spend going to the health centres or clinics and stand in long queues to access contraceptive methods. This argument is backed up by findings of Ashraf et al (2009) in an experimental study on household decision-making and fertility in Zambia using Chawama clinic as a case study. The study found that one of the factors cited as contributing to women's inability to access and use contraceptives in Zambia were long waiting queues in order to be attended to, as the peri-urban clinic was at times often congested with patients seeking different health services. Therefore, this might make the injectables and pill more convenient contraceptive methods to use as they do not require frequent visits to the health centres or clinic. Further, Ashraf et al (2009) also found that, the injectables were preferred by women who did not want their husbands/partners to know that were using any contraceptive methods as they were easy to conceal. In line with the forgoing, the study had found that, women who received contraceptive vouchers were in the presence of their husbands were less likely to use injectables compared with women who had received these vouchers alone.

5.2.3. Demographic and socio-economic pathways for the Pill, Injectables, Male Condom and effect on CEB

It can be noted from the findings of this study that CMs alone are inefficient to explain fertility reduction among urban women in Zambia. However, the socio-economic and demographic variables explain a reduction in fertility. For example, the number of children born to women using the pill, injectables, and male condom reduced among urban when adjusted for education

level, age, marital status and age at birth of first child. This shows that these methods of contraception are influenced by demographic and socio-economic factors to affect fertility level in Zambia. This is line with the conceptual framework developed for this study from the Davis and Blake (1956) analytical fertility framework, which shows that variables such as education level, marital status and age at birth of first child of a woman also operate through her use of contraceptive methods to influence fertility level.

The study has also found that women with secondary or tertiary education had significantly fewer children compared to women with no education with similar age, ethnic grouping, region, working status, religion, marital status and age at birth of first child. These findings are in line with other studies that have found that education of a woman has a negative relationship with fertility. This is because education enables women to become knowledgeable about contraceptives, access and use (Sackey, 2005; Lam and Duryea, 1999; Schultz, 1973; 1974; 1997; 2008; Mason, 1986). A study in Albania, for example, found that decline in fertility from about 7 children in 1960 to about 3 children in 1990 was as a result of increased women's education, increased use of contraceptive methods and rapid expansion of jobs (Kent, 2010). Therefore, having an extra child is seen as a cost rather than as a benefit for an educated and working woman. This is because having a child comes with responsibilities and would require giving up a developing a professional career which some women might not be willing to forgo. This makes educated women more likely to use contraceptives and reduce the number of children that they have.

Furthermore, a study conducted about the decline in US fertility found that education level of women had contributed to the observed decline in fertility. According to the findings of this study, as more women attended and completed higher levels of education, this affected the timing of first marriage and birth, by typically delaying both (Jacobson and Mather, 2011). Among long-term factors for fertility decline cited were societal changes, such as; delayed sexual activity, an increase in contraceptive access and use with most women using the pill, female sterilisation and male condom (Ibid).

Furthermore, the analysis of CEB among urban women in Zambia found that older women (35-49 years) had relatively more children than younger women aged 15-24 years. This is because, in

spite of using contraceptives, older women were more likely to have been in the child bearing years longer than the younger women. This can also be explained by a low mean age (less than 20 years) at first marriage among women in Zambia (Fagbamigbe and Adebowale, 2014). Findings also show that currently and formerly married women had more children than the never married with similar socio-economic and demographic characteristics.

Regarding age at birth of child and children ever born, the study found that women who had their first child at 20 years and more and were using either the pill or injectables or male condom had fewer children than women who had a first child at ages less than 20 years. This is because early childbearing is associated with more years in child bearing and hence such women are likely to have more children born (CSO, 2010). Further, these women are more likely to have little or no education, inadequate knowledge about contraceptives, access, and use, may lack financial and material independence and therefore contribute less to decision making on the desired number of children or family size. All these factors coupled with many others make women who have children at a younger age to have more children as also evidenced by this study (Teklu, Sebhatu, and Gebreselassie, 2013).

5.3 Conclusion

Fertility in urban areas in Zambia is low and use of contraceptive methods is high. There has been an increase in the percentage of women using the pill, injectables, and male condom and fertility decline in urban areas. Findings of this study have shown that there is no correlation between the use of these CMs and fertility reduction in urban areas. This indicates that the use of these CMs has had minimal effect in contributing to a reduction in fertility among urban women in Zambia. Therefore, the research hypotheses that urban women using either the pill, injectables, or male condom were likely to have fewer children ever born than women who have never used any contraceptive method have been rejected.

Some possible reasons for these findings could be that women are using these contraceptive methods for spacing of births rather than for limiting the number of children. This because a woman uses a contraceptive method to either delay getting pregnant (child spacing) or stop child birth. Additionally, women might be using the injectables for their convenience, for instance, the use of Depo-Provera requires that a woman gets a repeat injection after 3 months. Injections may

also be preferred especially by women who do not want their partner or other people to know that they are using a contraceptive method. The pill is also convenient for women because, in as much as there are issues of forgetfulness since it has to be taken daily, it does not require the attention of medical personnel to be available for a woman to take. Furthermore, the male condom is preferred because it is readily available in many stores country wide and is worn only a few minutes before an act of sexual intercourse compared with the female condom which has to be worn, for instance eight hours before sexual intercourse.

Findings of the study have also shown that the use of CMs with tertiary education reduces the number of CEB to women when adjusted for education level, age, employment status, region, ethnicity, religion, marital status and age at birth of first child. This shows that these factors affect one another to influence fertility level in among urban women in Zambia. Furthermore, findings of this study have shown those women with; secondary or tertiary education and those who had their first child at 20 and more years and using the pill, injectables or male condom had relatively fewer children in all surveys. This is because women with education are likely to be more knowledgeable about contraceptives, have access to and use these methods correctly and consistently. In addition, educated women are more likely to view having more children as a cost as compared with being a benefit. Therefore, these women are more likely to use contraceptives to limit the number of children.

From the findings of this study, it can be concluded that the reduction in fertility among urban women in Zambia cannot be associated with the increased use of the pill, injectables, and male condom but interaction with other demographic and socio-economic factors.

5.4 Recommendations

From the findings of this study, the following are the recommendations:

- There is need to continue providing an enabling environment for the attainment of tertiary education by women, which is essential if low levels of fertility are to be achieved. This is because, with increased education level, women will have adequate knowledge about contraceptive methods, access as well as use. Further, education will

enable women to weigh the cost of having an additional child, hence contribute to low fertility.

- Qualitative studies should be conducted to investigate the reasons why women are using the different contraceptive methods, whether it is for limiting the number of children or for spacing the births.
- Further research such as cohort longitudinal are needed to determine how various contraceptive methods are influencing fertility in Zambia.

  There is need for continued promotion of the correct and consistent use of contraceptive methods. Whether women want to use these methods for either limiting or spacing of children, more sensitisation needs to be done on how these contraceptives methods work effectively.

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APPENDICES

Appendix 1: AIRR of CEB by socio-economic, demographic and proximate variables, 1992

Variable	Category	Model 1 IRR [95% CI]	Model 2 AIRR [95% CI]	Model 3 AIRR [95% CI]	Model 4 AIRR [95% CI]
Contraceptive method	Never used (RC)				
	Pill	1.149*** [1.061,1.245]	1.294*** [1.185,1.413]	1.258*** [1.152,1.374]	1.250*** [1.145,1.365]
	Injectables	2.239*** [1.673,2.995]	1.661*** [1.239,2.227]	1.556** [1.160,2.087]	1.666*** [1.242,2.235]
	Male condom	0.897 [0.769,1.047]	1.159 [0.986,1.362]	1.116 [0.949,1.312]	1.174 [0.998,1.381]
Region	Region 1 (RC)				
	Region 2		0.968 [0.885,1.059]	0.975 [0.891,1.066]	0.975 [0.892,1.066]
	Region 3		1.003 [0.900,1.117]	1.001 [0.899,1.115]	0.996 [0.894,1.110]
Ethnicity	Bemba (RC)				
	Tonga		0.908 [0.822,1.003]	0.916 [0.830,1.012]	0.908 [0.823,1.003]
	North-westerner		0.964 [0.861,1.080]	0.981 [0.876,1.099]	0.975 [0.870,1.092]
	Barotse		0.852* [0.731,0.992]	0.863 [0.741,1.004]	0.860 [0.739,1.002]
	Nyanja		0.949 [0.877,1.026]	0.950 [0.878,1.027]	0.963 [0.891,1.042]
	Other		0.852 [0.705,1.030]	0.831 [0.688,1.005]	0.837 [0.692,1.012]
Religion	Catholic (RC)				
	Protestant		1.044 [0.975,1.117]	1.047 [0.978,1.121]	1.035 [0.966,1.108]
	Other		1.029 [0.821,1.291]	1.036 [0.826,1.299]	1.017 [0.811,1.276]
Education level	No education (RC)				
	Primary		0.975 [0.889,1.071]	0.959 [0.873,1.052]	0.950 [0.865,1.044]
	Secondary		0.761*** [0.679,0.854]	0.765*** [0.683,0.858]	0.785*** [0.699,0.881]
	Higher		0.518*** [0.405,0.663]	0.521*** [0.407,0.667]	0.604*** [0.470,0.775]
Working status	Not working (RC)				
	Working status		0.994 [0.932,1.059]	1.023 [0.960,1.091]	1.016 [0.953,1.083]
Age	15-24 (RC)				
	25-34		2.377*** [2.177,2.594]	2.176*** [1.985,2.385]	2.220*** [2.024,2.434]
	35-49		3.995*** [3.650,4.373]	3.631*** [3.300,3.995]	3.696*** [3.357,4.070]
Marital Status	Never married (RC)				
	Married			1.591*** [1.353,1.871]	1.598*** [1.358,1.880]
	Formerly married			1.262* [1.055,1.510]	1.258* [1.051,1.505]
Age at birth of first child	<15 (RC)				
	15-19				0.942 [0.851,1.043]
	20+				0.687*** [0.611,0.773]
	n	1184	1184	1184	1184

Significant at:* p<0.05, ** p<0.01, *** p<0.001; AIRR: Adjusted Incidence rate ratio; CI-Confidence Interval; RC: Reference Category

Source: 1992, ZDHS Dataset

Appendix 2: AIRR of CEB by socio-economic, demographic and proximate variables, 1996

Variable	Category	Model 1 IRR [95% CI]	Model 2 AIRR [95% CI]	Model 3 AIRR [95% CI]	Model 4 AIRR [95% CI]
Contraceptive method	Never used (RC)				
	Pill	1.076	1.356***	1.275***	1.294***
		[0.991,1.169]	[1.240,1.483]	[1.163,1.397]	[1.181,1.418]
	Injectables	1.352***	1.461***	1.367***	1.353***
		[1.153,1.584]	[1.238,1.725]	[1.156,1.615]	[1.145,1.599]
	Male condom	0.934	1.183*	1.139*	1.179*
		[0.824,1.058]	[1.040,1.347]	[1.001,1.297]	[1.035,1.343]
Region	Region 1 (RC)				
	Region 2		1.044	1.065	1.063
			[0.946,1.153]	[0.965,1.176]	[0.963,1.174]
	Region 3		1.132**	1.118*	1.109*
			[1.032,1.241]	[1.020,1.226]	[1.011,1.216]
Ethnicity	Bemba (RC)				
	Tonga		0.890	0.913	0.934
			[0.781,1.015]	[0.800,1.041]	[0.819,1.065]
	North-westerner		0.923	0.931	0.919
			[0.800,1.063]	[0.808,1.073]	[0.798,1.059]
	Barotse		0.965	0.983	1.007
			[0.827,1.125]	[0.843,1.147]	[0.863,1.176]
	Nyanja		0.951	0.953	0.950
			[0.871,1.040]	[0.872,1.042]	[0.869,1.038]
	Other		0.903	0.871	0.887
			[0.744,1.096]	[0.717,1.058]	[0.731,1.077]
Religion	Catholic (RC)				
	Protestant		1.001	0.996	0.984
			[0.923,1.085]	[0.919,1.080]	[0.908,1.068]
	Other		0.836	0.817	0.853
			[0.568,1.231]	[0.555,1.203]	[0.579,1.256]
Education level	No education (RC)				
	Primary		0.973	0.973	0.947
			[0.864,1.095]	[0.864,1.096]	[0.841,1.066]
	Secondary		0.706***	0.729***	0.755***
			[0.615,0.811]	[0.634,0.838]	[0.657,0.868]
	Higher		0.464***	0.493***	0.577***
			[0.372,0.578]	[0.395,0.615]	[0.461,0.722]
Working status	Not working (RC)				
	Working status		1.006	1.034	1.030
			[0.934,1.083]	[0.960,1.114]	[0.956,1.109]
Age	15-24 (RC)				
	25-34		1.937***	1.847***	1.961***
			[1.752,2.141]	[1.669,2.045]	[1.769,2.173]
	35-49		3.486***	3.319***	3.443***
			[3.151,3.855]	[2.993,3.680]	[3.102,3.821]
Marital Status	Never married (RC)				
	Married			1.544***	1.539***
				[1.268,1.880]	[1.263,1.875]
	Formerly married			1.231	1.245*
				[0.998,1.519]	[1.008,1.537]
Age at birth of first child	<15 (RC)				
	15-19				0.929
					[0.806,1.071]
	20+				0.679***
					[0.580,0.795]
	n	975	975	975	975

Significant at:* p<0.05, ** p<0.01, *** p<0.001; AIRR: Adjusted Incidence rate ratio; CI-Confidence Interval; RC: Reference Category

Source: 1996 ZDHS Dataset

Appendix 3: AIRR of CEB by socio-economic, demographic and proximate variables, 2001-2

Variable	Category	Model 1 IRR [95% CI]	Model 2 AIRR [95% CI]	Model 3 AIRR [95% CI]	Model 4 AIRR [95% CI]
Contraceptive method	Never used (RC)				
	Pill	1.243*** [1.140,1.356]	1.428*** [1.302,1.567]	1.326*** [1.202,1.463]	1.286*** [1.165,1.419]
	Injectables	1.470*** [1.317,1.640]	1.560*** [1.392,1.748]	1.464*** [1.302,1.646]	1.368*** [1.216,1.540]
	Male condom	0.980 [0.856,1.121]	1.218** [1.057,1.403]	1.181* [1.024,1.362]	1.204* [1.043,1.389]
Region	Region 1 (RC)				
	Region 2		1.066 [0.960,1.185]	1.067 [0.960,1.185]	1.072 [0.965,1.192]
	Region 3		1.067 [0.966,1.180]	1.076 [0.973,1.189]	1.077 [0.974,1.191]
Ethnicity	Bemba (RC)				
	Tonga		1.012 [0.895,1.143]	1.012 [0.895,1.144]	0.977 [0.864,1.105]
	North-westerner		1.081 [0.945,1.236]	1.086 [0.950,1.242]	1.057 [0.924,1.210]
	Barotse		0.872 [0.734,1.035]	0.879 [0.740,1.044]	0.908 [0.764,1.078]
	Nyanja		1.013 [0.920,1.115]	1.011 [0.919,1.113]	1.003 [0.911,1.105]
	Other		1.018 [0.734,1.410]	1.035 [0.747,1.435]	1.106 [0.798,1.535]
Religion	Catholic (RC)				
	Protestant		0.945 [0.862,1.036]	0.947 [0.864,1.039]	0.950 [0.866,1.042]
	Other		0.792 [0.473,1.327]	0.84 [0.501,1.407]	0.892 [0.532,1.495]
Education level	No education (RC)				
	Primary		0.937 [0.800,1.097]	0.936 [0.799,1.096]	0.952 [0.813,1.116]
	Secondary		0.756** [0.639,0.893]	0.766** [0.648,0.905]	0.832* [0.703,0.985]
	Higher		0.533*** [0.417,0.680]	0.543*** [0.425,0.694]	0.673** [0.523,0.865]
Working status	Not working (RC)				
	Working status		0.957 [0.885,1.035]	0.961 [0.888,1.039]	0.967 [0.894,1.046]
Age	15-24 (RC)				
	25-34		2.121*** [1.894,2.375]	1.991*** [1.774,2.236]	2.125*** [1.891,2.389]
	35-49		3.917*** [3.488,4.398]	3.628*** [3.218,4.090]	3.841*** [3.402,4.336]
Marital Status	Never married (RC)				
	Married			1.629*** [1.323,2.005]	1.610*** [1.307,1.982]
	Formerly married			1.464*** [1.173,1.828]	1.412** [1.130,1.764]
Age at birth of first child	<15 (RC)				
	15-19				0.913 [0.783,1.063]
	20+				0.634*** [0.536,0.750]
	n	870	870	870	870

Significant at:* p<0.05, ** p<0.01, *** p<0.001; AIRR: Adjusted Incidence rate ratio; CI-Confidence Interval; RC: Reference Category
Source: 2001-2 ZDHS Dataset

Appendix 4: AIRR of CEB by socio-economic, demographic and proximate variables, 2007

Variable	Category	Model 1 IRR [95% CI]	Model 2 AIRR [95% CI]	Model 3 AIRR [95% CI]	Model 4 AIRR [95% CI]
Contraceptive method	Never used (RC)				
	Pill	1.072	1.287***	1.184***	1.173***
		[0.985,1.166]	[1.177,1.406]	[1.079,1.299]	[1.068,1.287]
	Injectables	1.111*	1.353***	1.260***	1.253***
		[1.016,1.216]	[1.231,1.487]	[1.144,1.389]	[1.136,1.381]
	Male condom	0.907	1.112	1.079	1.085
		[0.811,1.013]	[0.988,1.251]	[0.958,1.214]	[0.964,1.221]
Region	Region 1 (RC)				
	Region 2		1.044	1.058	1.047
			[0.948,1.149]	[0.962,1.165]	[0.951,1.152]
	Region 3		1.096*	1.096*	1.081
			[1.009,1.191]	[1.009,1.191]	[0.995,1.175]
Ethnicity	Bemba (RC)				
	Tonga		0.930	0.939	0.944
			[0.820,1.055]	[0.828,1.065]	[0.832,1.071]
	North-westerner		0.953	0.991	1.001
			[0.846,1.074]	[0.879,1.116]	[0.888,1.129]
	Barotse		0.979	1.003	1.020
			[0.851,1.127]	[0.872,1.153]	[0.887,1.174]
	Nyanja		0.936	0.933	0.966
			[0.857,1.023]	[0.854,1.019]	[0.883,1.056]
	Other		1.126	1.092	1.105
			[0.895,1.417]	[0.868,1.375]	[0.878,1.390]
Religion	Catholic (RC)				
	Protestant		0.955	0.935	0.948
			[0.878,1.039]	[0.859,1.017]	[0.871,1.031]
	Other		1.081	1.063	1.150
			[0.758,1.543]	[0.744,1.518]	[0.806,1.641]
Education level	No education (RC)				
	Primary		0.868*	0.880	0.846*
			[0.758,0.993]	[0.768,1.007]	[0.737,0.970]
	Secondary		0.689***	0.722***	0.734***
			[0.599,0.792]	[0.628,0.831]	[0.636,0.846]
	Higher		0.488***	0.521***	0.596***
			[0.403,0.592]	[0.429,0.632]	[0.489,0.727]
Working status	Not working (RC)				
	Working status		0.936	0.940	0.942
			[0.872,1.006]	[0.875,1.010]	[0.877,1.012]
Age	15-24 (RC)				
	25-34		1.934***	1.779***	1.879***
			[1.740,2.148]	[1.599,1.981]	[1.686,2.093]
	35-49		3.529***	3.128***	3.332***
			[3.171,3.927]	[2.799,3.496]	[2.979,3.728]
Marital Status	Never married (RC)				
	Married			1.778***	1.765***
				[1.505,2.100]	[1.493,2.088]
	Formerly married			1.578***	1.548***
				[1.314,1.895]	[1.288,1.861]
Age at birth of first child	<15 (RC)				
	15-19				0.934
					[0.806,1.081]
	20+				0.681***
					[0.583,0.794]
	n	1,056	1,056	1,056	1,056

Significant at:* p<0.05, ** p<0.01, *** p<0.001; AIRR: Adjusted Incidence rate ratio; CI-Confidence Interval; RC: Reference Category
Source: 2007 ZDHS Dataset

Appendix 5: AIRR of CEB by socio-economic, demographic and proximate variables, 2014

Variable	Category	Model 1 IRR [95% CI]	Model 2 AIRR [95% CI]	Model 3 AIRR [95% CI]	Model 4 AIRR [95% CI]
Contraceptive method	Never used (RC)				
	Pill	1.160***	1.224***	1.127***	1.114***
		[1.101,1.222]	[1.160,1.292]	[1.066,1.192]	[1.054,1.179]
	Injectables	1.038	1.234***	1.145***	1.127***
		[0.990,1.088]	[1.175,1.296]	[1.088,1.204]	[1.071,1.186]
	Male condom	1.081*	1.099*	1.035	1.038
		[1.003,1.164]	[1.018,1.185]	[0.959,1.118]	[0.961,1.120]
Region	Region 1 (RC)				
	Region 2		1.044	1.055	1.038
			[0.984,1.108]	[0.994,1.119]	[0.978,1.102]
	Region 3		1.177***	1.178***	1.161***
			[1.121,1.235]	[1.122,1.236]	[1.106,1.219]
Ethnicity	Bemba (RC)				
	Tonga		0.999	1.008	1.010
			[0.926,1.077]	[0.935,1.087]	[0.936,1.089]
	North-westerner		0.949	0.976	0.970
			[0.892,1.009]	[0.917,1.038]	[0.911,1.032]
	Barotse		0.953	0.999	0.988
			[0.871,1.041]	[0.913,1.092]	[0.904,1.081]
	Nyanja		0.913***	0.924**	0.920**
			[0.867,0.962]	[0.877,0.973]	[0.873,0.969]
	Other		0.967	0.966	0.975
			[0.837,1.117]	[0.836,1.116]	[0.844,1.126]
Religion	Catholic (RC)				
	Protestant		1.018	1.008	1.013
			[0.965,1.074]	[0.955,1.063]	[0.960,1.069]
	Other		0.897	0.874	0.908
			[0.747,1.078]	[0.727,1.050]	[0.756,1.091]
Education level	No education (RC)				
	Primary		0.909*	0.908*	0.922*
			[0.841,0.982]	[0.840,0.982]	[0.853,0.997]
	Secondary		0.670***	0.692***	0.739***
			[0.618,0.726]	[0.639,0.750]	[0.681,0.801]
	Higher		0.511***	0.529***	0.626***
			[0.459,0.570]	[0.475,0.590]	[0.559,0.699]
Working status	Not working (RC)				
	Working status		1.049*	1.062**	1.055*
			[1.006,1.095]	[1.018,1.108]	[1.011,1.101]
Age	15-24 (RC)				
	25-34		1.956***	1.778***	1.900***
			[1.834,2.086]	[1.663,1.901]	[1.775,2.033]
	35-49		3.206***	2.877***	3.092***
			[3.004,3.421]	[2.685,3.082]	[2.883,3.316]
Marital Status	Never married (RC)				
	Married			1.556***	1.521***
				[1.425,1.698]	[1.393,1.661]
	Formerly married			1.322***	1.281***
				[1.199,1.457]	[1.162,1.413]
Age at birth of first child	<15 (RC)				
	15-19				0.876**
					[0.799,0.959]
	20+				0.655***
					[0.595,0.721]
	n	3,231	3,231	3,231	3,231

Significant at:* p<0.05, ** p<0.01, *** p<0.001; AIRR: Adjusted Incidence rate ratio; CI-Confidence Interval; RC: Reference Category

Source: 2013-14 ZDHS Dataset

Appendix 6a: Measures of Fit for Poisson of CEB

	1992			1996		
	Model 4	**Model 1**	**Difference**	**Model 4**	**Model 1**	**Difference**
Model:	Poisson	Poisson		Poisson	Poisson	
N:	1184	1184	0	975	975	0
Log-Lik Intercept Only	-2761.3	-2761.3	0	-2212.759	-2212.759	0
Log-Lik Full Model	-2095.434	-2743.079	647.645	-1721.747	-2204.196	482.449
D	4190.869(1161)	5486.159(1180)	1295.290(19)	3443.493(952)	4408.392(971)	964.898(19)
LR	1331.730(22)	36.440(3)	1295.290(19)	982.025(22)	17.126(3)	964.898(19)
Prob > LR	0	0	0	0	0.001	0
McFadden's R2	0.241	0.007	0.235	0.222	0.004	0.218
McFadden's Adj R2	0.233	0.005	0.228	0.212	0.002	0.209
ML (Cox-Snell) R2	0.675	0.03	0.645	0.635	0.017	0.617
Cragg-Uhler(Nagelkerke)	0.682	0.031	0.651	0.642	0.018	0.624
AIC	3.578	4.64	-1.062	3.579	4.53	-0.951
AIC*n	4236.869	5494.159	-1257.29	3489.493	4416.392	-926.898
BIC	-4025.126	-2864.293	-1160.834	-3108.587	-2274.455	-834.132
BIC'	-1176.044	-15.21	-1160.834	-830.611	3.521	-834.132
BIC used by Stata	4353.632	5514.465	-1160.834	3601.789	4435.921	-834.132
AIC used by Stata	4236.869	5494.159	-1257.29	3489.493	4416.392	-926.898
	2002			**2007**		
	Model 4	**Model 1**	**Difference**	**Model 4**	**Model 1**	**Difference**
Model:	Poisson	Poisson		Poisson	Poisson	
N:	870	870	0	1056	1056	0
Log-Lik Intercept Only	-1908.857	-1908.857	0	-2288.658	-2288.658	0
Log-Lik Full Model	-1462.815	-1878.848	416.033	-1815.275	-2281.436	466.161
D	2925.630(847)	3757.696(866)	832.066(19)	3630.551(1033)	4562.873(1052)	932.322(19)
LR	892.085(22)	60.019(3)	832.066(19)	946.766(22)	14.444(3)	932.322(19)
Prob > LR	0	0	0	0	0.002	0
McFadden's R2	0.234	0.016	0.218	0.207	0.003	0.204
McFadden's Adj R2	0.222	0.014	0.208	0.197	0.001	0.195
ML (Cox-Snell) R2	0.641	0.067	0.575	0.592	0.014	0.578
Cragg-Uhler(Nagelkerke)	0.649	0.067	0.582	0.6	0.014	0.586
AIC	3.416	4.328	-0.913	3.482	4.328	-0.847
AIC*n	2971.63	3765.696	-794.066	3676.551	4570.873	-894.322
BIC	-2807.284	-2103.819	-703.465	-3561.447	-2761.407	-800.04
BIC'	-743.178	-39.713	-703.465	-793.596	6.443	-800.04
BIC used by Stata	3081.305	3784.77	-703.465	3790.682	4590.722	-800.04
AIC used by Stata	2971.63	3765.696	-794.066	3676.551	4570.873	-894.322

Appendix 6b: Measures of Fit for Poisson of CEB

	2014		
	Model 4	**Model 1**	**Difference**
Model:	Poisson	Poisson	
N:	3231	3231	0
Log-Lik Intercept Only	-6713.439	-6713.439	0
Log-Lik Full Model	-5373.286	-6697.712	1324.425
D	10746.573(3208)	13395.424(3227)	2648.851(19)
LR	2680.305(22)	31.454(3)	2648.851(19)
Prob > LR	0	0	0
McFadden's R2	0.2	0.002	0.197
McFadden's Adj R2	0.196	0.002	0.194
ML (Cox-Snell) R2	0.564	0.01	0.554
Cragg-Uhler(Nagelkerke)	0.573	0.01	0.563
AIC	3.34	4.148	-0.808
AIC*n	10792.573	13403.424	-2610.851
BIC	-15175.822	-12680.502	-2495.32
BIC'	-2502.533	-7.212	-2495.32
BIC used by Stata	10932.425	13427.746	-2495.32
AIC used by Stata	10792.573	13403.424	-2610.851

In this study, Fitstat was used as a measures of fit for Poisson of children ever born data for each survey year. The choice of the final model adopted in this study was done by comparing the Bayesian Information Criterion (BIC) of the first and last model. The model with a lower BIC was chosen as explained below;

1. 1992-Difference of 1160.834 in BIC' provides very strong support for current model, Model 4 than Model 1.
2. 1996-Difference of 834.132 in BIC' provides very strong support for current mode, Model 4 than Model l.
3. 2002- Difference of 703.465 in BIC' provides very strong support for current model, Model 4 than Model 1.
4. 2007- Difference of 800.040 in BIC' provides very strong support for current model, Model 4 than Model 1.
5. 2014- Difference of 2495.320 in BIC' provides very strong support for current model, Model 4 than Model 1.