

EXPLAINING HIGH FERTILITY IN THE NORTH EASTERN REGION OF KENYA

By

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REG NO: Q50/68968/2013

**A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF ARTS
(POPULATION STUDIES) AT POPULATION STUDIES AND RESEARCH INSTITUTE**

UNIVERSITY OF NAIROBI

NOVEMBER 2015

DECLARATION

I hereby declare that this research project is my original work and has not been presented for a degree in any other university.

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DEDICATION

I wish to dedicate this work to Michael Kimani; my late grandfather who taught me the value of hard work and endurance. His love for education was unequalled and his encouragement during my primary education was relentless. His memories propel me to be a better person every day.

ACKNOWLEDGEMENTS

First, I want to thank God for granting me the strength and perfect health during the period I was writing this project.

Second, I wish to thank the entire population Studies and Research Institute (PSRI) especially my supervisors Professor Murungaru Kimani and Dr. Andrew Mutuku for their guidance and patience during the writing of this project.

I also wish to thank my employer, HelpAge International not only for the financial support but also allowing me time off to sit for exams and to attend to project matters.

A special thank you to all my classmates who have been of great support throughout my study period.

To my entire family especially my parents; Mr. and Mrs. Mungai as well as Mbute Mbiyu for their consistent encouragement and prayers. I wish to say a big thank you.

ABSTRACT

The objective of this study was to explain the persistently high fertility in North Eastern region of Kenya. Total fertility rate (TFR) in this region has been on the rise as fertility falls in the rest of the country. For example, TFR was 5.9 and 6.4 births per woman during the Kenya Demographic and Health Survey (KDHS) of 2008/09 and 2013/14 respectively against the national TFR of 4.6 and 3.4 during the KDHS of 2008/09 and 2013/14 respectively. The government target of 2.6 children per woman by 2030 cannot be realized if fertility continues to increase in this region. This study thus was carried out in order to establish the effects of some of the selected social-economic, social-cultural, demographic and proximate determinants of fertility in the region.

The study utilized secondary data from the KDHS 2008/09 with a study population of 606 women of reproductive age (15-49) in the North Eastern region. Poisson regression model was the main method of analysis. The dependent variable was CEB while the independent variables that were considered for analysis were classified into social-economic, social-cultural and proximate factors. Social-economic factors included wealth index, level of education and type of residence. Religion and marital status were the only social cultural and demographic factors respectively that were included. Proximate factors included marital status, ever use of contraceptives, infant mortality and desired fertility.

Descriptive statistics indicate that majority of the women live in the rural areas, had no formal education, were poor and only 3 percent have ever used a form of modern contraception. The results from multi-variate analysis demonstrate that fertility is significantly associated with education, marital status, child mortality and desire for more children.

From the findings, education seems to be the most significant factor that is causing high fertility in North Eastern Kenya. It is therefore recommended that programmes and policies to improve school enrolment and keeping girls in school be implemented more robustly. Some of these could be having more schools considering the vastness of the region or establishing boarding schools considering the nomadic lifestyles of the population there.

LIST OF FIGURES

Figure 1: Conceptual framework to explain high fertility in North Eastern Kenya.....	17
Figure 2: Operational framework to explain high fertility in North Eastern Kenya	18
Figure 3: Graph showing how well the poisson regression model fits	28

LIST OF TABLES

Table 4.1 Descriptive frequencies of the study population in Northern region of Kenya	26
Table 4.2 Results of bivariate poisson regression analysis	29
Table 4.3 Results of multivariate poisson regression analysis of background factors only.....	34
Table 4.4 Results of multivariate poisson regression analysis of the background and proximate factors..	35

TABLE OF CONTENTS

DECLARATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENTS	iv
ABSTRACT.....	v
LIST OF FIGURES	vii
LIST OF TABLES	viii
CHAPTER ONE: INTRODUCTION.....	1
1.1 Background of the Study	1
1.2 Problem Statement.....	2
1.3 Research Questions.....	3
1.4 Objectives of the study.....	4
1.5 Justification of the study.....	4
1.6 Scope and limitations of the study.....	5
CHAPTER TWO: LIRETATURE REVIEW.....	5
2.1 Introduction.....	7
2.2. Theoretical Perspectives of Determinants of Fertility	7
2.3 Review of Empirical Studies Explaining High Fertility	9

2.4 Conceptual and Operational Framework to Understand Fertility In Northern Kenya.....	14
2.5 Operational Hypotheses	18
CHAPTER THREE: DATA AND METHODS	19
3.1 Introduction.....	19
3.2 Data Source	19
3.3 Methods of Analysis	20
3.4 The dependent and independent variables	22
3.4.1 Dependent Variable	22
3.4.2 Independent Variables	22
CHAPTER FOUR: EXPLAINING FERTILITY IN THE NORTH EASTERN REGION OF KENYA.....	25
4.1 Introduction.....	25
4.2 Background characteristics of study population	25
4.3 Explaining Fertility in North Eastern Region of Kenya	27
CHAPTER FIVE:	37
5.1 Introduction.....	37
5.2 Summary	37
5.3 Conclusion	38
5.4 Recommendations.....	39

5.4.1 Recommendations for further research 39

References 41

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Kenya's fertility has been undergoing through a transition since the late 1970s. The total fertility rate (TFR) in Kenya which was 8.2 births in 1977/78 per woman has declined to 3.9 births per woman according to the 2013/2014 KDHS. However, fertility has remained high in the North Eastern region of Kenya. For instance, TFR in North Eastern was 5.9 births per woman and 6.4 births per woman in 2008/09 and 2013/14 respectively (KNBS and ICF Macro, 2010 and 2014). The reasons for high fertility have been provided in literature: In the African context, the family structure is a major determinant. As Makinwa (2001) noted, African households have an upward wealth flow where wealth flows from children to parents making parents to give birth to many children as future investment. Lineage has a direct bearing on the demand for children because it creates durability and perpetuity of a family. Thus a family has to ensure that fertility remains higher than mortality so as to protect its lineage. Polygyny also raises fertility as wives try to compete so as to please the husband (Makinwa 2001). Unmet need for contraception is also another factor that has been associated with high fertility. Ndahindwa et al., 2014 noted that ever married or cohabitating women with unmet need for contraception are more likely to have more children. High fertility has also been linked to a rise in age at first marriage and first birth (Onoja and Osayomore, 2012; Bongaarts, 1982; Dube Jara et al., 2014). High levels of under-five mortality have also been linked to high fertility as parents tend to have more children as insurance against death (Dube Jara et al., 2014, Onoja and Osayomore, 2012). Education has also been linked to fertility by several scholars (Ndahindwa et al 2014, Onoja and Osayomore, 2012). Although there are several previous studies which have focused on explaining high fertility in

other settings, little is known on the causes for high fertility in North Eastern region of Kenya. Some of those studies anchored their explanations for high fertility on social cultural factors- Odile and McNicoll (1987), others like Dow and Werner (1983) identified perceptions of family planning as reasons behind high fertility in Kenya. This study thus focused on addressing this gap.

1.2 Problem Statement

From the past KDHS studies, it is evident that fertility rates have been falling in Kenya (KNBS and ICF Macro, 1978, 1989, 1993 and 1998, 2003, 2010, 2014). However, fertility in the North has remained high at 5.9 and 6.4 births per woman during the KDHS of 2008/09 and 2013/14 (KNBS and ICF Macro, 2010 and 2014).

Previous studies that have focused on explaining high fertility in Kenya have attributed it to several factors: social-economic, social-cultural and proximate factors. Some of the proximate factors that have been cited in different literature include high infant and child mortality (Blacker, 2002; Angeles, 2010; Bongaarts & Casterlin, 1990), contraceptive use (Makinwa-Adebusoye, 2001; Blacker, 2002; Dow et al 1994), rise in age at first marriage (Blacker, 2002) and shortened birth spacing (Njogu & Castro, 1991). Social-cultural factors have also been studied to explain high fertility (Makinwa 2001 and Caldwell 1990). Early marriages and early sexual debuts which are associated with culture have been used to explain high fertility. Higher fertility levels have been reported for women who married in their teens and an increase in the average age at marriage had been reported to have adverse effect on high fertility (Onoja and Osayomore 2012). Of importance also is family structures and patterns. As Caldwell 1990, Odile and McNicoll 1987 and Makinwa 2001 observed, there is existence of lineage and polygyny

which promote large families. Religion is another important social cultural factor as cited by other similar studies. As Caldwell 1990, puts it, “high fertility was not only a divine reward but evidence of the right behavior. Literature has also identified social economic factors as important in explaining fertility (Onoja et al. 2012 and Caldwell 1990). Income and wealth have been useful social economic variables in explaining fertility. Where wealth tend to flow from children to parents, families tend to have more children (Caldwell 1976). Specifically, it was found that poorer women were more likely than their rich counterparts to be at risk of high fertility (Onoja et al 2012). Women’s education (Westoff & Cross 2006), nucleation of families (Dow et al. 1994) and reduction in the value of child labour (Odile and McNicoll 1987) are important explanations of fertility.

Although the above studies have been conducted to explain high fertility in Kenya and other countries, these explanations have not been tested to explain high fertility in North Eastern region. This study thus sought to test these explanations and find out if they are consistent with explanations for high fertility elsewhere.

1.3 Research Questions

Arising from the statement of the problem above, the study addressed the question of the role of social-economic, social-cultural, demographic and proximate factors in explaining the high fertility observed in North Eastern. Specifically the researcher addressed the following questions:

- i. What is the role of social-economic factors in explaining high fertility in North Eastern Kenya?
- ii. How do social-cultural factors explain high fertility in North Eastern Kenya?
- iii. What are the proximate factors that explain high fertility in North Eastern Kenya?

1.4 Objectives of the study

The general objective of the study was to explain high fertility in North Eastern Kenya.

The specific objectives were:

- i. To determine the effect of social-economic factors on fertility in North Eastern Kenya
- ii. To establish the effect of social-cultural factors on fertility in North Eastern Kenya
- iii. To determine the effect of proximate factors on fertility in North Eastern Kenya

1.5 Justification of the study

The study has two implications: first it contributes to our understanding of the causes of high fertility and second it has some implications for policy. There has been efforts by the Kenya government in the last three decades to reduce fertility. This decline has been witnessed with fertility falling nationally but remaining high in North Eastern Kenya. Although Kenya's Population Policy for National Development has set targets for key demographic indicators such as reduction of total fertility from 4.6 in 2009 to 2.6 by 2030 and a further reduction to 2.1 by 2050 (NCPD 2012), the high fertility in the Northern Region of the country will mask the average national figures. Since this study sought to explain the observed high fertility rates in the Northern region of Kenya, the information generated by this study will be crucial in assisting policy makers and planners make informed decisions on the steps they should take so as to deal with the high fertility in the region.

This study is also important since it has highlighted what causes the high fertility levels and what the government can do in terms of policies, programmes and strategies to ensure that fertility

levels are contained. In addition, the study has helped us to understand which of the factors are more important in determining fertility and which ones are not.

1.6 Scope and limitations of the study

This study used secondary data from 2008/2009 Kenya Demographic Health Survey, a national-level probability sample survey. The study focused on the North Eastern province of Kenya. Compared with the other provinces, fewer households and clusters were surveyed in North Eastern province because of its sparse population. With a small sample of 606 women, some of the selected factors could not be tested because they had large missing observations. Including them would have further reduced an already small sample size. There was also a deliberate attempt to over-sample urban areas so as to get sufficient households for analysis by KNBS due to the sparse population in North Eastern. This could have led to sampling errors. The study also focused on the responses of women of child bearing age (15-49 years) as administered from the woman questionnaire. Some literature indicates that use of contraceptives is dependent on approval of the husbands (Dow and Werner, 1983). However, this study only focused on women's responses on questions about fertility preferences. Depending exclusively on data collected from women may make the study lose out on the perceptions of men on family planning which is an important aspect of looking at uptake of family planning. The findings of the study were also influenced by data quality. Fertility surveys especially in the developing countries have been noted to have several types of errors. Some of these errors relate to respondent's age as reported on the individual questionnaire. Ages and birth histories of mothers and their children in Sub-saharan Africa is subject to approximation especially due to lack of vital registration documents (Pullum, 2006). Moreover, there is deficiency of data in the number of infants and young children through under-enumeration which limits estimation of infant/child

mortality. Memory lapse among women is also common especially in regard to the number of children who have died. This is more common among older women who experienced death of their children when they were younger. Analysis of desire for more children is also challenged by inconsistencies among the responses that women provide. Many women will report an inflated ideal number of children because they are reluctant to state a number that is smaller than her current number of children.

CHAPTER TWO: LIRETATURE REVIEW

2.1 Introduction

This section reviewed the literature on studies which have been undertaken on the explanations of high fertility. It discussed the theoretical framework within which fertility transition is understood, emerging issues that have been identified by other studies which include social-economic and social-cultural and proximate factors that determine fertility. It also provides the conceptual and operational frameworks that guided the study.

2.2. Theoretical Perspectives of Determinants of Fertility

Fertility transition in Kenya can be best understood within the demographic transition theory. Demographic transition refers to the transition from high birth and death rates to low birth and death rates as a country develops from a pre-industrial to an industrialized economic system. In the first stage of demographic transition, pre-industrial society, death rates and birth rates are high and roughly in balance. All human populations are believed to have had this balance until the late 18th century, when this balance ended in Western Europe. Because both rates are approximately in balance, population growth is typically very slow in stage one. This stage was characterised by a traditional family structure which also caused the high fertility levels being experienced then. According to Caldwell 1976, there is a direct link between family structure and fertility. Caldwell argues that there are only two major forms of family structure, differing principally in the direction of wealth flows among generations. In 'primitive' and 'traditional' societies, net wealth flows are primarily upward from younger to older generations. In these kind of societies, the economically rational decision is to have as many surviving children as possible (within the constraints imposed by biology), because each additional child adds positively to a

parent's wealth, security in old age, and social and political well-being. Thus high fertility in the early stages of the demographic transition is the consequence of high desired family size. Couples want many children to assist with family enterprises such as farming and for security in old age. According to Mbacke (1994), sub Saharan Africa societies have set up an efficient system that strives to promote high fertility that encompass practices like early marriages, polygamy, rapid remarriage of widows. In addition, high child mortality leads parents to have additional children to protect against loss or to replace losses (Bongaarts and Casterline, 2012).

Fertility decline occurs once rising levels of urbanization and education, changes in the economy, and declining mortality lead parents to desire a smaller number of births. To implement these desires, parents rely on contraception or abortion, and family planning programs in many countries accelerate their adoption (Notestein 1945; Easterlin 1975, 1978; Lee and Bulatao, 1983). This theory is thus widely accepted as a broad outline of the forces that shape fertility transitions and is consistent with much empirical evidence (Bryant, 2007). As countries develop, fertility generally falls and there is a strong inverse correlation between development indicators and fertility in contemporary societies with Africa characterized by relatively low levels of social and economic development and, accordingly, high fertility (Bongaarts and Casterline, 2012).

More literature examines the determinants of high fertility from both a macro-level and a micro-level perspective. These factors work within a framework which is illustrated later in this study to show how they link to determine fertility.

2.3 Review of Empirical Studies Explaining High Fertility

Ndahindwa et al., (2014) conducted a study in Rwanda to establish determinants of fertility in Rwanda in the context of a fertility transition. The study used the demographic transition theory to underpin the shifts in Rwanda's demographic transition. The main outcome, level of fertility, was defined as the total number of children ever born to women in the childbearing period (15–49 years). The predictor variables were mainly the proximate determinants of fertility; current marital status, age at first cohabitation, age at first sexual intercourse, age at first birth, use of contraceptives and socio-demographic variables that may predict fertility in Rwanda.

The results showed that in ever married/cohabitating women, high fertility was significantly associated with the following variables: unmet need for contraception. This may be because women who have had several children want to space or limit births, though it could also be that women with a current unmet need for family planning are those who had mistimed or unplanned pregnancies in the past leading to a larger number of births than women whose contraceptive needs had been met over time. The women's desire for children is also an important variable that was explained by this study. Among ever married/cohabitated women, those who desired more children had more children. The causality of this relationship was not clear due to rationalization bias, that is, a woman reports an inflated ideal number of children because she is reluctant to state a number that is smaller than her current number of children. Low fertility in ever married/cohabitating women was associated with women's education. Through school, educated women receive more messages about delayed sexual debut and delayed marriage, and the values of spaced and limited births, than girls who drop out of school. Educated young women also have increased social power to control their reproductive decisions, access to different types of partners than less educated women, increased exposure to mass media, and more opportunities

for professional growth. Education also leads to delayed sexual debut, shortens a woman's reproductive life and hence lower fertility. On the other hand, women whose first sexual debut was earlier tended to have higher fertility. Households with higher wealth quintiles were found to have smaller families as compared with families which had lower wealth quintiles.

Onoja and Osayomore, (2002) conducted a study in Nigeria: "modeling the determinants of fertility among women of childbearing age in Nigeria". The intentions were to identify which determinants were more pertinent to the level of fertility in the country. The variables studied were current marital status; polygyny (having more than one wife at the same time); age at first marriage; age at first sexual intercourse; recent sexual activity; postpartum amenorrhea, abstinence and insusceptibility; age at first birth as well as use of contraceptives and selected socio demographic variables found to significantly impact the level of fertility elsewhere and whose predictive capability they wanted to examine on the level of fertility in Nigeria. Due to the count nature of the dependent variable, the authors used a generalized linear model (Poisson regression model) and a (natural) log link function to explore to what extent do fertility determinants affects the level of fertility among women of childbearing age in Nigeria.

It was found that a part from religion, all the selected social demographic characteristics considered did not only possess individual predictive capability, but also strongly associated with the level of fertility even when the proximate determinants of fertility were adjusted for. It was also found that women whose husbands live (dwell) with them in the same house were found to be at risk of high fertility than those whose husbands live elsewhere. This is because marriage or cohabitation increases ones risk of sexual exposure. It was also found that women in the rural areas were more likely to give birth to more children than those in the urban areas. Women with low level of education were found to be more likely to have more children than women who had

tertiary education. Both personal and household wealth index were also found to influence level of fertility. Specifically, it was found that poorer women were more likely than their rich counterparts to be at risk of high fertility.

Dube Jara et al., (2013) carried out a study in Ethiopia to determine causes of high fertility status among married women in Gilgel Gibe Field Research Center. The number of children ever born (CEB) alive was the dependent variable. Independent variables included social-economic and demographic, reproductive, biological, sexual behaviour, and under-five mortality.

The educational status of women showed that those women who had no education had three times as many children as their educated counterparts with at least secondary education. It was found that monthly income of the family had a significant association with the fertility status of women in the study area. The history of under-five mortality among the interviewed women was also found to have an association with their fertility status. As the number of under-five children who had died increased, there appeared to be an increasing trend in the number of children ever born alive due to the insurance and replacement effect. Women who experienced under five deaths were 1.91 times more likely to have a high fertility status as compared to mothers who had not experienced under five deaths (Dube Jara et al., 2012). Poor child survival is a usual characteristic of high fertility countries. Since the potential supply of children in the Easterlin framework refers to the number of children surviving to adulthood, it is clear that supply varies inversely with the level of mortality. There is recorded evidence that high child mortality leads to mothers having more children as “insurance” against death. The number of children desired before marriage indicated a significant association in the fertility status of women. Ever use of contraceptives was not found to have a significant effect on fertility status of women because

there was no such a great variation in use of contraceptives among the high and low fertile women.

In 1990, John C. Caldwell and Pat Caldwell wrote a paper to explain high fertility in sub-Saharan Africa. They explained high fertility in Africa from a social-cultural perspective. They noted that African family planning programs have failed in large part not for lack of supply but for lack of demand. In 1973, for example, they found that of the entire population of Ibadan City, Nigeria, only one married woman in eighty, older than 40 years had deliberately and successfully limited family size to less than six live births. According to Caldwell, social and family patterns that have developed over millennia in response to conditions in the region are the primary causes of high fertility in sub-Saharan Africa.

Women are important in the African social system not only because they bear children but also because they do most of the agricultural work. It does not, however, usually lead to the obsessive concern about premarital and extramarital chastity or to the distinction between legitimate and illegitimate children that is found in Mediterranean and South Asian societies. In Africa the obsession is focused on fertility. Polygamous unions, familial structures are thus seen to contribute to this demand for children hence high fertility in Africa.

In a study, 'perceptions of family planning among Kenyan women' by Dow and Werner (1983), there are some factors that are associated with uptake of family planning services. The first important association was knowledge of family planning and fertility. According to Dow and Werner, 1983, there were no fertility differentials among those women with knowledge of contraceptive use and those without such knowledge. However, the authors caution that it is probably because application of family planning information was relatively brief and new at the

time compared with time available for reproductive behaviour. Second emerging issue was contraceptive practice; an important finding that was made in Kenya by Dow and Werner 1983 is that even those women who had knowledge on contraceptive use, just a fraction was actually using contraceptives. The study also identified another issue of constraint to greater use of contraception. Isolation from FPP services, personnel and methods are a great obstacle to greater use. Thus the proximity of a clinic is critical in determining whether a woman will visit or not. This aspect will be important in determining whether the long distances that patients and clients have to cover in order to see a clinician is a significant determinant. The costs; direct and indirect of use of family planning is also identified as hindrance to utilisation of these services. Lack of money to access the services ranging from bus fare and money to purchase contraceptives is a great hindrance to access. Indirect costs are even more important because most of them are anchored on myths and misinformation. Social barriers (for example husbands, in-laws) and fear of health side-effects predominate in some societies (Casterline et al., 1997).

In a paper, 'social cultural factors affecting fertility in Africa', Makinwa (1994), explained high fertility in African countries from a social-cultural and social-economic view. She found through inter-analysis of sub-Saharan Africa national level survey data that parents' perceived upward wealth flows was prevalent in high fertility contexts. In areas where poverty levels were higher, women tended to give birth to more children as compared to the areas with higher wealthy quintiles. She concludes by saying that overall, women's disadvantage by lack of education, legal rights and inheritance rights reinforces a culture that places very great value on high fertility in African societies.

In summary, from the above literature, high fertility has been explained by many proximate, social-economic, social-cultural determinants. The literature reviewed showed that the scholars

had identified the determinants of fertility as falling in either proximate, socio-economic or socio-cultural categories. There were however inconsistencies in some of the literature in regard to the factors affecting fertility; for example, religion as a determinant was found to be significant in other studies (Ushie et al., 2011; Caldwell, 1987) while it was not in others (Onoja and Osayomore, 2002 and Ndahindwa et al., 2014). Education, marital status, experience of infant/child mortality and desire for more children were found to be significant determinants of fertility in all the literature reviewed.

2.4 Conceptual and Operational Framework to Understand Fertility In Northern Kenya

The conceptual framework used in this study was adapted from the Bongaarts model of 1978. Bongaarts adapted his model from Kingsley Davis and Judith Blake (Davis, 1956) who elaborated a framework of the factors affecting fertility that recognized both indirect and direct determinants of fertility. They outlined that the factors affecting fertility can be classified into two groups: background variables and intermediate or proximate variables. The background factors include cultural, psychological, economic, social, health, and environmental factors. In this study, these will be considered as providing the basic explanations. The proximate determinants are those factors that have a direct effect on fertility within which these basic explanations operate. The background factors operate through the proximate determinants to influence fertility; they do not influence fertility directly. However, their framework did not receive full acceptance in demographic circles. Therefore in 1978, Bongaarts developed these ideas into a framework for analyzing the proximate determinants of fertility (Bongaarts, 1978) that explained the fertility-inhibiting effects of the key direct determinants. Although Bongaarts acknowledged the Davis and Blake model, he stated that in addition to the social-economic factors influencing fertility, the specific mechanisms through which these factors operate should

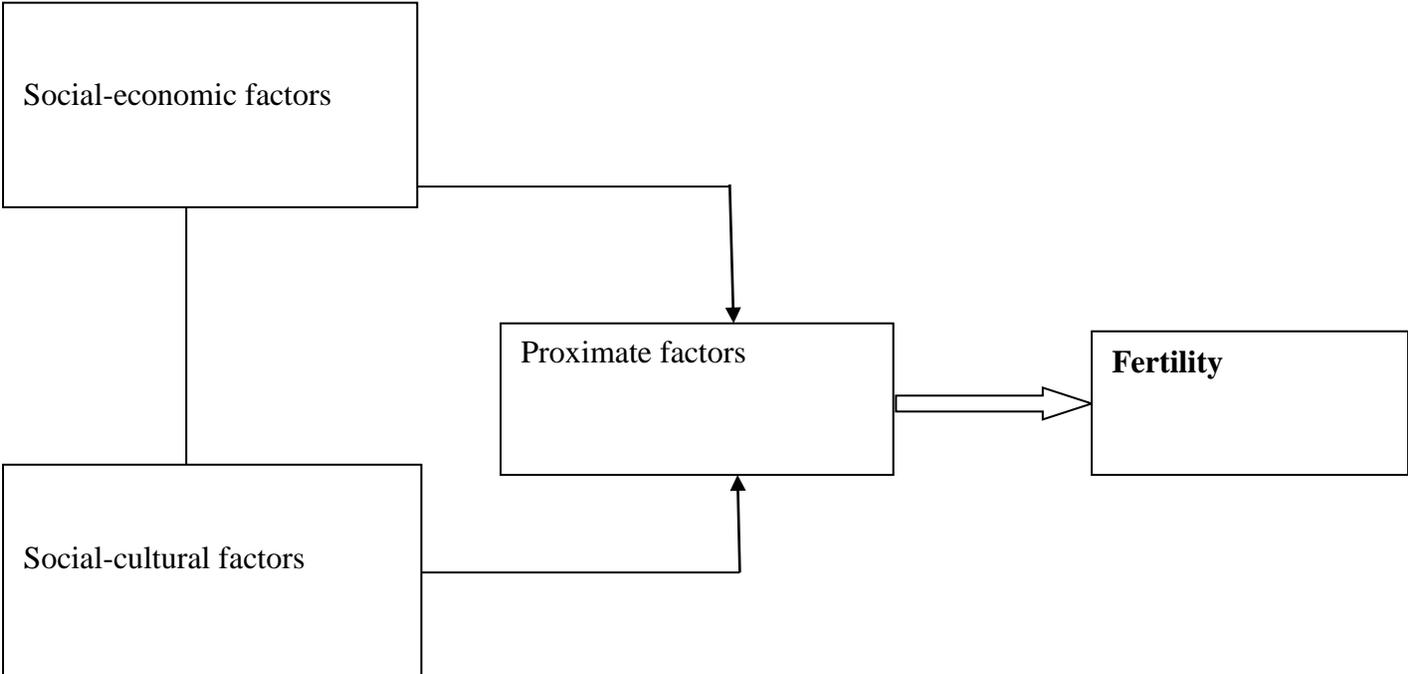
be identified. For example, the level of education of women is a social-economic indicator that is frequently found to be negatively related to fertility. A comprehensive analysis may show that among educated women, marriage is relatively late or the use of contraception more frequent, thus clarifying the relationship between education and fertility. In general, the biological and behavioral factors through which social-economic, cultural, and environmental variables affect fertility are called intermediate fertility variables. These intermediate fertility variables directly influence fertility. Thus if an intermediate fertility variable, for instance the prevalence of contraception changes, then fertility also changes while this is not necessarily the case for an indirect determinant such as income or education.

According to the literature reviewed, social-economic, social-cultural and proximate factors may be conceptualized as factors that determine fertility levels in North Eastern region. On one hand, it is anticipated that social-economic and social-cultural factors like wealth index, education and religion have an indirect influence on fertility. For example in societies where wealth flows from children to parents (rural societies), there is a tendency for parents to have more children as a form of security for their old age. Education is anticipated to raise a woman's permanent income through earning, tilting her optimal fertility choices towards fewer off-springs of higher quality. Education may improve a woman's knowledge of, and ability to process information regarding fertility options and healthy pregnancy behaviour. The social-economic and social-cultural factors can also be seen to be acting through proximate factors to influence fertility. This is from the assumption that a woman's social-economic and social-cultural characteristics determine other factors (proximate); marital status, ever use of contraceptives, infant mortality and desired fertility which directly affect fertility. For example, education of a woman determines her knowledge of and access to health services. Therefore, women with more education are more

likely to access and use modern contraceptive methods, and this is likely to influence their fertility. Marriage is assumed to increase exposure to sexual activity hence high fertility while high infant and child mortality are associated with high fertility as more children are born as ‘insurance’.

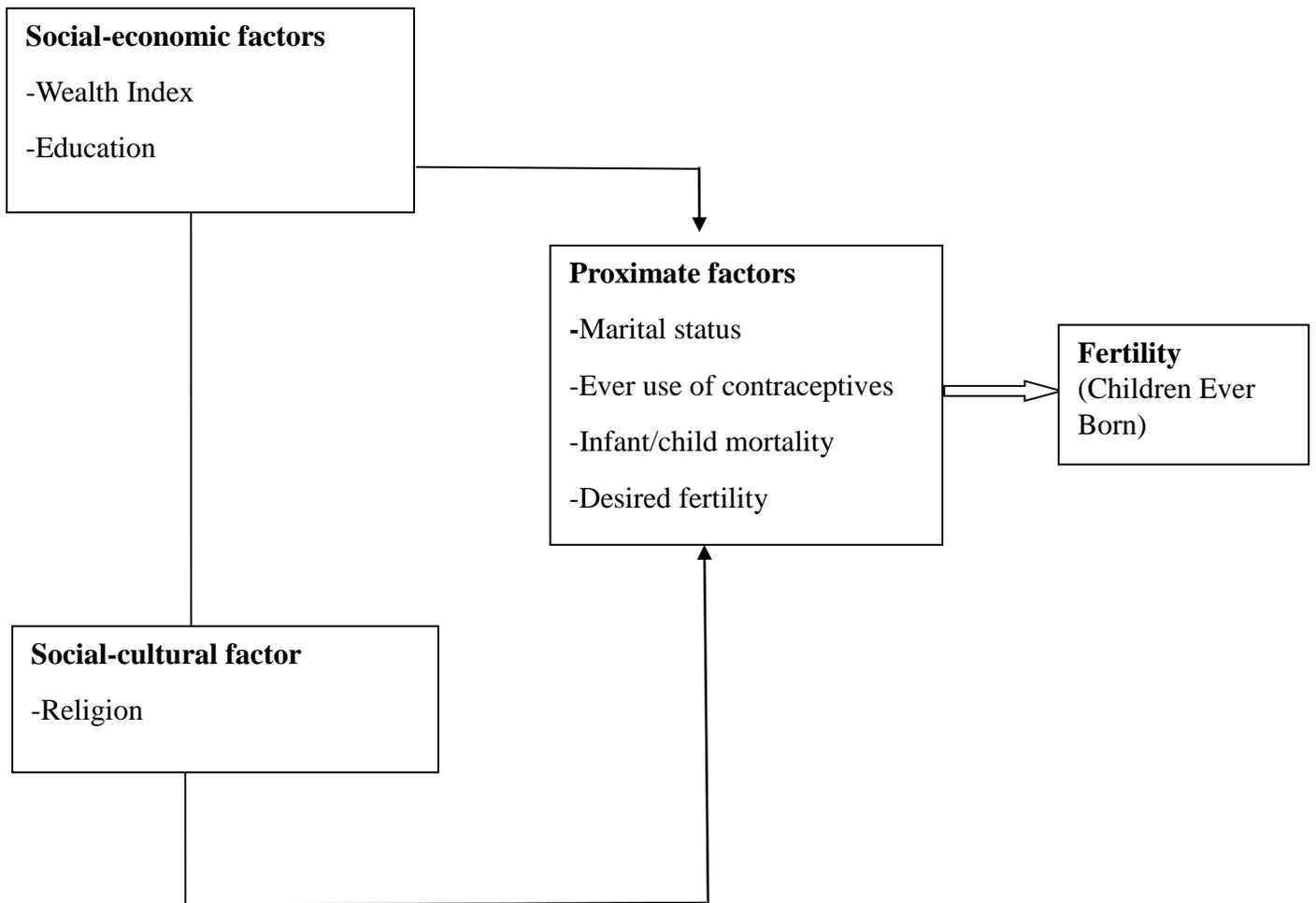
Below are a conceptual framework and an operational framework adapted for this study. Although the framework is adapted from the Bongaarts model (1978), some of the variables as operationalized by the researcher are not similar to how Bongaarts operationalized them. The categorization of the variables was majorly informed by the studied literature.

Figure 1: Conceptual framework to explain high fertility in North Eastern Kenya



Source: Adapted from Bongaarts (1978)

Figure 2: Operational framework to explain high fertility in North Eastern Kenya



Source: Adapted from Bongaarts (1978)

2.5 Operational Hypotheses

The hypotheses was that women who were less educated and those who are poor are more likely to have high fertility. I also hypothesised that women who are married, those who have never used modern contraception, those who have recorded infant and child deaths and those who desired more children were more likely to have high fertility measured as children ever born.

CHAPTER THREE: DATA AND METHODS

3.1 Introduction

This chapter presents the source of data and the methods of data analysis. The source of data is discussed first and thereafter the methods of data analysis are described.

3.2 Data Source

This study utilised secondary data obtained from the 2008-09 Kenya Demographic and Health Survey (KDHS), a nationally representative sample survey of 8,444 women aged 15 to 49 and 3,465 men aged 15 to 54 selected from 400 sample points (clusters) throughout Kenya. It was conducted by the Kenya National Bureau of Statistics (KNBS) in 2008/09. The KDHS is designed to provide data to monitor the population and health situation in Kenya.

Sampled households in North Eastern were 675 and the sample size for women was 608. This study used data from the woman questionnaire which contained questions on variables that the researcher wanted to investigate. They included: marital status, age at first marriage, age at first sexual debut, age at first birth, ever use of contraceptives, infant/child mortality, desired fertility, wealth index, type of earnings, education, type of residence, religion, type of family/polygyny.

These thirteen variables had been set for analysis, unfortunately, some of them consisted of many missing observations. Consequently, five variables i.e. type of earnings, polygyny, age at first sexual debut, age at first marriage and age at first birth were deleted from the modelling processes because of the missing observations recorded. If included, these variables would have reduced an already small sample. The final sample size that was modeled was 606.

3.3 Methods of Analysis

The study utilised descriptive statistics and poisson regression model was the main method of analysis. Descriptive statistics were used to describe the characteristics of the selected variables while poisson regression analyses were adopted to assess how the predictor variables influenced the level of fertility (defined by the number of children ever born by women of childbearing age-15-49 years) in North Eastern region. Poisson regression model has some weaknesses and analysis of data was done in cognisance of these shortcomings. One of the shortcomings is over-dispersion. Over-dispersion occurs because the mean and variance components of poisson are related and depend on the same parameter that is being predicted through the independent variables. In the Poisson distribution, the mean is assumed to be equal to the variance. However, most actual distributions have a high degree of skewness, much more than are assumed by the Poisson distribution. Also, poisson regression requires large samples for the results to be more valid. Due to the sparse population of Northern region, the sample was relatively small compared to other regions. Independence of observations is sometimes not true as is assumed in poisson distribution since some of them influence each other. The methods of analysis are described below.

Poisson regression model was used to model the determinants of fertility due to the count nature of the dependent variable, that is, children ever born (CEB) as has been done in other studies; Onoja and Osayomore, 2002 and Ndahindwa et al., 2004). The number of children ever born to a particular woman is a measure of her lifetime fertility experienced up to the moment at which the data are collected (United Nations, 2013). The unit of analysis was an individual woman. The modeling process involved four steps; first, the fit of the model was tested by running an intercept-only model with CEB as the dependent variable and logarithm of the current age of the

women as the offset variable. Second, the predictive ability of each variable was assessed using bivariate analysis. The third step involves a multiple poisson regression model fitted with all background variables run in the first model regardless of whether they were found to be significant or not and the fourth step involved fitting both background and proximate factors in one model.

Poisson regression is one of the robust models for the analysis of discrete data that are based on the assumption that the dependent variable (CEB) is distributed as poisson, and its logarithm (\ln) is a linear function of the independent variables. The current age of women is considered as the time at which observation for the number of children ever born was made on the *i*th woman. Since this differs across women, the offset variable is set to \ln of the current age of the woman.

In the modeling processes, the reference category was assumed to be the category with low level of fertility in order to study the likelihood of having high level of fertility in the population. The predictive capability of the selected individual social-economic, social-cultural and proximate determinants of fertility were tested using the Wald Chi-square statistics ($P < .005$). Incidence Rate Ratio (IRR) with 95 percent Confidence Interval (CI) was used to assess the association of the selected social-economic, social-cultural and the proximate determinants with fertility. The equation of the model was:

$$\ln(\lambda_i) = \beta_0 + \sum_{j=1}^p \beta_j X_{ji} + \ln t_i$$

Let Y_i denote the number of children ever born by a woman *i* of childbearing age and t_i denote the observation time for the *i*th woman. Let λ_i denote the mean rate of children per unit time so that the mean number of children for the *i*th woman is given by $\lambda_i t_i$.

X_{ji} is the j^{th} characteristic (predictor variable) of the i^{th} woman, B_0 is an intercept term, B_j represent measures of effects of the predictor variables and \ln_{ti} is an offset variable.

3.4 The dependent and independent variables

3.4.1 Dependent Variable

The dependent variable in this study is Children Ever Born (CEB). In the KDHS woman's questionnaire, respondents are asked the total live births they have had during their lifetime.

3.4.2 Independent Variables

Social-economic factors

Education

This variable measures the highest level of schooling that the respondent has attained. The variable was categorized into three groups namely: 'No education', 'Primary', and 'Secondary and higher'. The reference category is 'secondary and higher'. Women who have no education are expected to have higher fertility.

Type of place of residence:

This variable categorizes the respondent by whether they live in rural or urban areas. The reference category is 'urban'. Respondents in rural areas are expected to have higher fertility.

Wealth Index

The wealth index is a background characteristic that is used as a proxy for the long-term standard of living of the household. There are three levels of wealth index; 'rich', 'middle' and 'poor'.

The reference category is 'rich'. Respondents who are considered 'poor' are expected to have higher fertility.

Social-cultural factors

Religion

This variable identified the respondent's religious affiliation. It is grouped into Muslims and non-Muslims. The classification into these two categories is because the other categories had very few respondents. The reference category is 'non-Muslim'. Muslim women are expected to have higher fertility.

Proximate factors

Marital status

This variable helps in identifying differentials in exposure status to sexual intercourse. It is categorised into: 'currently married' and 'not currently married'. The reference category was 'not currently married'. Women who are who are married are expected to have higher fertility due to exposure to coital activity and higher risk of pregnancy.

Contraceptive use

The variable measures if the respondent has ever used modern contraceptives or never used a method of contraceptive. Use of contraceptives has a direct effect on fertility as women are able to either delay or avoid births. Women who do not use contraceptives are expected to have higher fertility and thus the reference category was 'used modern'.

Infant and child mortality

Infant and child mortality rates are regarded as indices that reflect the levels of poverty and deprivation of a population. They are two of the indicators used to monitor child health. It is the probability of dying between the first and fifth birthday. It was categorised into experience or not of death of a child. Where these rates are high, fertility has been observed to be high as parents get more children as insurance. Non-experience of death of a child was thus used as the reference category.

Desired Fertility

This variable indicates future child bearing intentions. It is measured as desire for more children and is coded as: ‘wants more children’ or ‘wants no more children’. The reference category is “wants more children”. Women who have a desire to have more children are expected to have higher fertility.

CHAPTER FOUR: EXPLAINING HIGH FERTILITY IN THE NORTH EASTERN REGION OF KENYA

4.1 Introduction

This chapter discusses results of the study showing how selected social-economic, social-cultural and proximate variables explain high fertility in North Eastern Kenya. First it explains the background characteristics of the respondents and then continues to outline and discuss the bivariate and multi-variate results of the analysis.

4.2 Background characteristics of study population

The description of background characteristics of the study sample are presented in table 4.1. The results show that out of a total of 606 women, majority (76 percent) live in the rural areas while 24 percent live in urban areas. A majority of these women (76 percent) had no formal education; only 9 percent had at least secondary level of education. Distribution by wealth quintile show that 73 percent were poor and 6 percent were middle while 21 percent were rich. Ninety-eight percent of the women were professing Muslims while only 2 percent were non-Muslims. Majority of the respondents (70 percent) were married or living together while 30 percent were not currently married. Only 3 percent of the respondents have ever used a form of modern contraception against 97.5 percent who have never used any form of contraception. Evidence of high child mortality is high as reflected by results in the table. These results show that most families (82 percent) had experienced at least one child death. Moreover, 82 percent of the women had expressed desire for more children while only 18 percent did not desire more children.

Table 4.1 Descriptive frequencies of the study population in Northern region of Kenya

Variable	Frequency	Percent
Social-economic variables		
Education		
No education	465	76.5
Primary	88	14.5
Sec and Higher	55	9
Residence		
Urban	148	24.5
Rural	460	75.7
Wealth Index		
Poor	441	72.5
Middle	40	6.6
Rich	127	20.9
Social-cultural variables		
Religion		
Non-Muslim	13	2.1
Muslim	593	97.9
Proximate variables		
Marital Status		
Currently married	424	69.7
Not currently married	184	30.3
Contraceptive Use		
Never used	590	97.0
Used modern	18	3.0
Child Mortality		
Experienced death of child	501	82.4
No experience of death of child	107	17.6
Desired Fertility		
Wants more children	497	81.7
Wants no more children	111	18.3
Total	606	100.0

Source: Analysis 2008/09 KDHS

4.3 Explaining High Fertility in North Eastern Region of Kenya

This section presents results of poisson regression modeling carried out to establish factors responsible for high fertility experienced in the northern region of the country. The modeling process involved four steps. First, the fit of the model was tested. Second, the predictive ability of each variable was assessed using a bivariate analyses in which poisson regression models were fitted for each independent variable against the dependent variable; CEB. The third step involved a multiple poisson regression model fitted with all background variables which were included in the first model regardless of whether they were found to be significant or not and the fourth model consisted of a multiple poisson model with both the background and proximate factors combined. While considering CEB as a measure of fertility, the current age of women is considered as the time at which observation for the number of children ever born was made on the *ith* woman. Since this differs across women, the offset variable was set to the natural logarithm of the current age of the woman. The results of the bivariate and multivariate analysis are presented in table 4.2 and 4.3.respectively.

Inorder to find out if the model was a good fit, three graphs were fitted; expected mean CEB (intercept-only model), observed mean CEB and linear regression mean CEB. The observed mean CEB was computed by dividing the total number of children born by the women, by the number of the women while the expected mean CEB curve was obtained by fitting an intercept-only model with the dependent variable (CEB) and the natural logarithm of age (offset variable). The linear graph was obtained by fitting CEB against age of the woman in a linear regression model. From the graphs, it is clear that the poisson model predicts the observed counts better than the linear regression model. This is because the observed and expected graphs are more similar compared to the observed vs. linear graphs.

Figure 3: Graph showing how well the poisson regression model fits

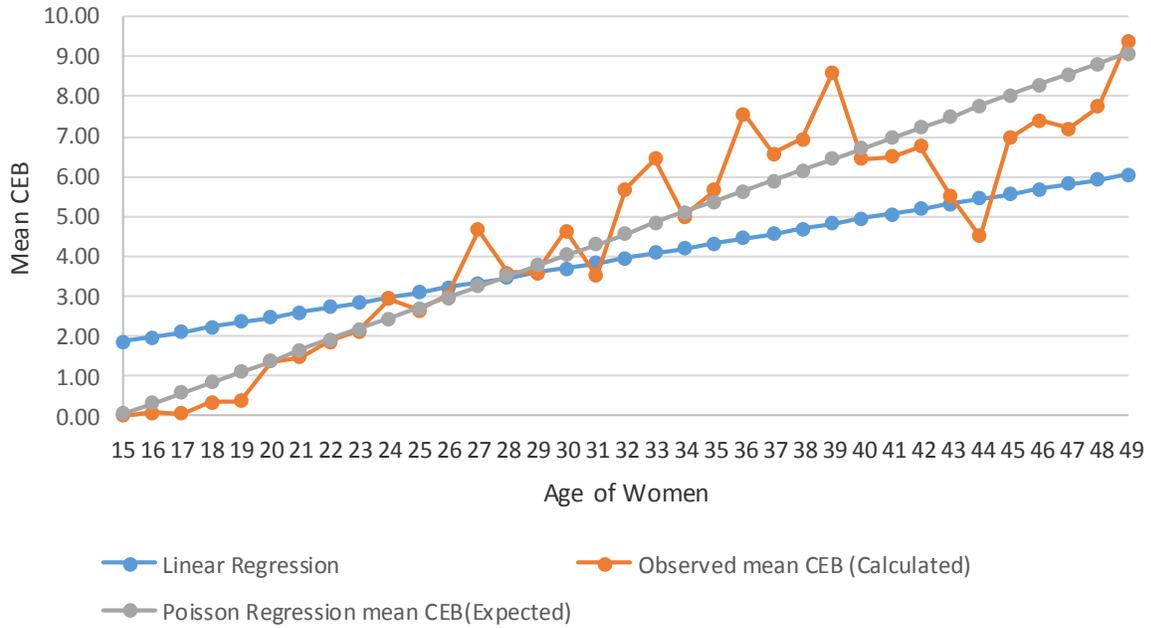


Table 4.2 Results of bivariate poisson regression analysis

Variable	Exp(β)	S.E(β)	P-value
Social-Economic Variables			
Residence Urban(Ref) Rural	1.426**	.0826	.001
Wealth Index Rich(Ref) Middle Poor	.708** .649**	.1594 .0926	.030 .001
Education Sec and higher(Ref) Primary No education	2.017 4.009**	.2706 .2330	.009 .001
Social-cultural Variables			
Religion Non-Muslims(Ref) Muslims	2.420**	.3841	.021
Proximate Factors			
Marital Status Not currently married(Ref) Currently married	3.584**	.1684	.001
Contraceptive Use Using Modern(Ref) Never used	.970	.0566	.587
Infant/Child mortality No experience of child mortality(Ref) Experience of child mortality	1.747**	.0476	.001
Desired Fertility Wants no more children(Ref) Wants more children	1.057	.0740	.457

*P**<0.05*

Source: Analysis 2008/09 KDHS

In model two (bi-variate analysis), all the considered variables were significant except contraceptive use and desired fertility. The results show that place of residence is significantly

associated with children ever born. Women who live in rural areas had 1.426 times as many children as those who live in urban areas. Wealth index was significantly associated with fertility. Women who are considered poor had 0.649 times less children compared to those who are considered rich while those who are considered middle class had 0.708 times less children compared to women from households classified as poor. These results are not consistent with theory and empirical findings as the poor are expected to have more children to act as insurance. The results also show that education level is significantly associated with children ever born. Women who had not attended school had 4.01 times as many children than those who had secondary and higher level of education while those with primary level of education had 2.02 times as many children than those with secondary and higher level of education. Religion was found to be a significant explanation for fertility. Women of Islam faith had 2.42 times as many children ever born compared to women professing non- Muslim faith. Marital status was also found to be significant. Women who were currently married had 3.584 times more children compared to those who were not currently married. This finding is also consistent with theory and empirical findings as marriage is seen to increase the risk of exposure to pregnancy due to increased chances of sexual encounter. Onoja and Osayomore (2002) had similar findings in Nigeria. Women who had experienced child loss had 1.75 times as many children as those who had never experienced death of a child.

In the third model, only the background variables were included (Table 4.3) and only education was found to be significant. The results show that the level of education is significantly associated with fertility. Women who had no education had 3.71 times as many children as those who had secondary and higher education while those with primary education had 1.96 times as many children as those with secondary and higher education.

In the fourth model, all variables (background and proximate) were included (Table 4.4). The results show that level of education is highly significantly associated with fertility. Women who had no education, and those who had primary level education respectively had 2.49, 1.71, times as many children compared to those who had secondary and higher education. This conforms to past studies that have found that the level of education is likely to influence the fertility levels of women. Onoja and Osayomore (2002) and Ndahindwa et al., (2014) conducted a study in Nigeria and Rwanda respectively and found out that women with low levels of education were more likely to have more children than those women who had tertiary education. Theoretically, a woman's education is associated with higher income, delayed sexual debut, delayed marriage and consumption of family planning messages. Educated women also have increased social power to control their reproductive decisions, increased exposure to mass media, and more opportunities for professional growth (Basu, 2002).

Contraceptive use was found to be significantly associated with children ever born. However, use of modern contraception was not associated with lower fertility with women who were not using modern contraception having 0.86 less children compared to the ones who were using modern contraception. The reason for the unexpected finding could be due to the fact that majority of the women who were interviewed (97 percent) did not use contraceptives as compared to only 3 percent who were using a modern form of contraception. Although this finding is contrary to most findings, it's consistent with a study conducted in Rwanda by Ndahindwa et al., (2014) who found that unmet need for contraception was associated with lower fertility among the never married women.

Marital status was also found to be a significant determinant of fertility. Women who are currently married had 2.98 times more children ever born than those who were not currently

married. This finding is consistent with theoretical and empirical explanations. This is because it increases their chances of sexual intercourse hence higher chances of becoming pregnant. Empirical studies have linked marital status with fertility such as Onoja and Osayomore (2002) and Dube Jara et al., (2013) who found that women who were legally married or living with a spouse had higher fertility than their single counterparts in Nigeria and Ethiopia respectively.

It was also found out that history of child mortality is a significant determinant of fertility. Women who had ever experienced death of an infant/child had 1.39 times as many children compared to those who have never experienced death of a child. This study is in line with the demographic transition theory; a society where there is high mortality from disease and natural calamities, fertility tends to be high. According to Bongaarts and Casterline (2012), high child mortality leads parents to have additional children to protect against loss or to replace losses. A similar study conducted in Ethiopia by Dube Jara et al., (2013) also found out that those mothers who had experienced death of a child having 1.91 higher fertility than mothers who had never experienced under five deaths.

The study also demonstrates that desire for fertility has a significant relationship with fertility; women who had expressed desire for more children had 1.20 times as many children compared to those women who did not desire more children. This is consistent with a study conducted in Rwanda by Ndahindwa et al., (2014) and in Ethiopia by Jara et al., (2013) where fertility was 1.22 times higher among women who wanted 5 or more children compared to women who wanted 0 to 2 children in Rwanda and 2.68 higher in Ethiopia among those women who had desire for more children than those who did not desire more children. This desire for children could be influenced by many factors among them being; provision of farm labour as well as prestige and status (Odile and McNicoll, 1987), and as a source of wealth (Caldwell, 1976).

Area of residence, wealth index and religion were found not to possess any significant association with fertility. The most probable explanation for the insignificance of the area of residence is that there is very slight difference between a rural place and an urban place in the North Eastern region. Both areas are marked with poor infrastructure and low social economic development. In relation to religion, majority of the respondents (97.5 percent) were Muslims which makes religion become an insignificant factor. In a region where a majority of the populace is poor, making a distinction between a “rich” and “poor” person could be a daunting task because the difference in terms of wealth proxies between them could be one goat which in real sense doesn't make one a wealthier person hence the insignificance.

Table 4.3 Results of multivariate poisson regression analysis of background factors only

Variable	Exp(β)	S.E(β)	P-value
Social-Economic Variables			
Residence Urban(Ref)			
Rural	1.031	.1299	.812
Wealth Index Rich(Ref)	.794	.1553	.137
Middle			
Poor	.929	.1468	.617
Education Sec and higher(Ref)			
Primary	1.964**	.2752	.014
No education	3.707**	.2480	.001
Social-cultural Variables			
Religion Non-Muslims(Ref)			
Muslims	1.099	.3567	.792

*P**<0.05 Likelihood Ratio Chi-Square=136.555, df=6, sig=0.001*

Source: Analysis 2008/09 KDHS

Table 4.4 Results of multivariate poisson regression analysis of the background and proximate factors

Variable	Exp(β)	S.E(β)	P-value
Social-Economic Variables			
Residence Urban(Ref) Rural	.945	.1301	.663
Wealth Index Rich(Ref) Middle Poor	.832 .952	.1559 .1503	.237 .743
Education Sec and higher(Ref) Primary No education	1.710** 2.491**	.2272 .2233	.018 .001
Social-cultural Variables			
Religion Non-Muslims(Ref) Muslims	1.192	.2740	.521
Proximate Factors			
Marital Status Not currently married(Ref) Currently married	2.979**	.1527	.001
Contraceptive Use Using Modern(Ref) Never used	.863**	.0483	.002
Infant/Child mortality No experience of child mortality(Ref) Experience of child mortality	1.389**	.0503	.001
Desired Fertility Want no more children(Ref) Want more children	1.200**	.0593	.002

*P**<0.05, Likelihood Ratio Chi-Square=499.892, df =10, Sig=0.001*

Source: Analysis 2008/09 KDHS

From the above findings, it is evident that level of education, experience of infant/child mortality, marital status and desire for more children are significant factors in explaining fertility in North Eastern. These results are consistent with theoretical explanations. For instance, desire for more children is evident in the early stages of the demographic transition. Couples want many children to assist with family enterprises such as farming and for security in old age, Cheihk and Mbacke (1994). Also, relationship between child mortality and fertility is consistent with theory; high child mortality leads parents to have additional children to protect against loss or to replace losses, Bongaarts and Casterline, (2012). Marriage is also linked to high fertility due to frequent exposure to intercourse, Bongaarts (1978). As a social-economic indicator, education is significant explanation for fertility in North Eastern. According to Bongaarts and Casterline (2012), low levels of social and economic development have a close association with high fertility.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study, conclusion and recommendations for further research and policy. The recommendations are based on study findings.

5.2 Summary

The general objective of the study was to explain high fertility in North Eastern Region of Kenya. Selected social-economic, social-cultural and proximate factors were tested to find out if they could explain fertility in Northern Eastern Kenya. The study utilised secondary data obtained from the 2008/09 Kenya Demographic and Health Survey (KDHS) carried out by the Kenya National Bureau of Statistics (KNBS) and a sample of 606 women of reproductive age 15-49 were studied. Poisson regression analysis was adopted to assess how the predictor variables influence the level of fertility (defined by the number of children ever born by women of childbearing age 15-49 years) in North Eastern region. This method of analysis was used to model the determinants of fertility due to the count nature of the dependent variable, that is, children ever born (CEB). Among the selected variables, level of education, marital status, child mortality and desire for more children were found to possess a significant relationship with fertility. Women with low level of education were found to be more likely to have more children than women who had secondary and higher education. Those women who were currently married or living with a spouse were more likely to have higher fertility than those who were currently not living with a spouse. Women who had expressed desire for more children had more children as compared to those who did not desire more children. It was also found that women

who had experienced death of a child had higher fertility as compared to those who had not experienced death of a child.

5.3 Conclusion

The study was able to achieve two of its objectives; how socio-economic factors affect fertility and how proximate factors affect fertility in North Eastern Kenya. None of the social cultural factors modeled in the multivariate analysis was found to be significant in explaining fertility. One of the most important social economic factors, level of education was seen to be a significant variable in explaining the high fertility. Women with no education were found to have higher fertility than their counterparts who had primary and secondary education. Moreover, the proximate factors marital status, experience of child mortality and desire for more children were found to increase levels of fertility among the women. According to Bongaarts and Casterline (2012), high child mortality leads parents to have additional children to protect against loss or to replace losses. In regard to desired fertility, it has a positive relationship with fertility and has been linked by Westoff, 2010 with high fertility.

In conclusion, it is evident that low education level is the main factor responsible for the high fertility in the North Eastern region of Kenya. Women's education is associated with exposure to the mass media. Mass media propagates 'modern' lifestyles which in most cases translates into smaller families (Basu, 2002). Use of contraceptives have also been linked to education among women (Dow and Werner, 1983 and Teresa, 1995). Education serves as a "source of knowledge and cognitive skills; as a resource that enhances economic opportunities and social mobility; and as a socialization process that shapes attitudes, values and aspirations", Teresa, 1995. Education

also keeps girls in school for longer thus reducing their desired fertility. All these are enablers of low fertility.

5.4 Recommendations

5.4.1 Recommendations for further research

Future researchers should further explore the relationship between education and the high fertility levels considering that it has emerged to be the most significant explanation for high fertility. Shedding light on this multi-faced relationship would increase our understanding of this relationship and what can be done to improve the situation. Considering the remarkable low levels of infrastructural development in North Eastern, it would add value if future researchers would illuminate further on causes of child mortality and its relationship with high fertility.

5.4.2. Recommendations for Policy

From the findings, it is clear that there is need for urgent enrollment of girls in schools considering that about 76% of the respondents had no education. From the findings, women with no education had more children than those with primary and higher levels of education. Programmes to increase admissions of girls and to encourage them to stay in school should be intensified so as to ensure that as many women study upto the highest levels possible. Although there are efforts by the Government to provide free primary education in all public schools, there seems to be low numbers of women who have finished primary school. This could be to schools being far, early marriages of girls making them to drop off from school early or lack of incentives to study. With nomadic lifestyles being common in North Eastern, boarding schools would be a good starting point. Moreover, programmes and policies to reduce child mortality should be implemented more robustly especially where they are unavailable because it is evident

that those mothers who had experienced loss of a child had much higher fertility than those who had not experienced death of a child. The current 'beyond zero' programme is a good starting point but there is need for more of such programmes. These policies and programmes will contribute to lowering fertility levels which are evidently high.

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