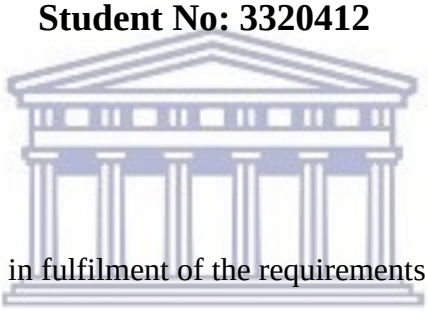
Proximate determinants of fertility and contraceptive use among currently married women in Ethiopia

By

Yishak Abraham Lailulo

Student No: 3320412



A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in Population Studies in the Department of Statistics and Population Studies, Faculty of Natural Sciences, University of the Western Cape

Supervised by

Prof A Sathiya Susuman

April 2017

DECLARATION

I declare that **Proximate determinants of fertility and contraceptive use among currently married women in Ethiopia** is my own work, that it has not been submitted before for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Yishak Abraham Lailulo April 2017

Signed:…….

Dedication

To My father Abraham Lailulo Funamo and

To My mother Mulunesh Taito Chofore

Acknowledgement

First of all, I would like to give honour and praise to almighty God for his numerous supports for in order to accomplish my research successfully.

The completion of this thesis would not have been easy without the assist and support of a number of individuals - without whom I may not have attained the goals of this research. I would like to extent my sincerely thanks, in particular, to the following peoples for their valuable support throughout the course of this academic journey.

I am gratefully to acknowledge the enthusiastic supervision offered by Professor A Sathiya Susuman. All the way through my study, he provided encouragement, sound advice, lots of good ideas and his concern. I thank you, for many hours of commitment and excellent consultation services. I am pleasure working with you and thank you for many hours of commitment, guidance and excellent consultation services me on this journey. My thesis would never have been accomplished before the scheduled time without your wise guidance and faithful support.

I am grateful to staff members and postgraduate students at the Department of Statistics and Population Studies, Faculty of Science, University of the Western Cape for their generous assistance.

Many institutions and individuals have contributed to the success of this study. The list is long and I wish to acknowledge them all. I am especially grateful to the Measures DHS for they provided data for this study. I gratefully acknowledge the financial support from DAAD (German Academic exchange service) in Region Scholarship Programme - African Institute for Mathematical through a PhD research fellowship. My sincere thanks are due to Rhobot Church in Cape Town and in particular to Pastor Bekele Dobochi for his faithful and spiritual support he has done for me since I started to study at UWC. I am especially grateful to Fikreyohans Assfaw, PhD student in Mathematics Department Mathematics, Faculty of Science, University of the Western Cape, who helped me a lot during my research, I will never forget your support and encouragement throughout my doctoral research. I am also thankful acknowledge Dr Mulugeta Dinbaba, who provided regular advice and motivation for my academic endeavours. I warmly thank Emuye (Ebeni)(Bachelor of Science student in construction Technology and Management) at Hawass University, Ethiopia for her helpful advice, inspiration and pleasant help. Sincere thanks go to all my colleagues in the Ph.D. room: Innocent Karangwa, Judith Donang, Wilson, Eldude and Justin for being supportive and kind.

Last, but not least, I am deeply indebted to my parents for everything they have done for me. They have taught me how to work hard and persist through all of my struggles. Without their support and sacrifices, it would not have been possible to complete this study. I would like to thank my father and mother who raised me with love, and supported me to achieve my entire dreams.

Table of contents

List of tables

Chapter III

Chapter IV

CHAPTER V

CHAPTER VI

CHAPTER VII

List of figures

CHAPTER V
Chapter IV

Chapter VI

Chapter VI

CHAPTER I

Introduction

1.1 Background

Fertility is one of the elements in population dynamics that has significant contribution towards changing population size and structure over time. In Ethiopia, fertility dropped only slightly between 2000 and 2005, from 5.5 children per woman to 5.4, and then decreased further to 4.8 children in 2011(CSA, 2012). Although a slight decreasing trend has shown from year to year, it is still high as compared to developed nations (Tewodros,2011). The age at which childbearing begins is an important factor in the overall level of fertility as well as of the health and well-being of the mother and the child (CSA, 2012).In 2008, of the 1.4 billion women in the developing world of reproductive age (15-49 years), more than 570 women die per 100,000 live births, and 70 percent of them die due to totally avoidable reasons (World Bank,2010). These women live in countries where their status is poor to extremely poor, and these conditions threaten their health in many ways. Sedgh, Hussain, Bankole, and Singh (2007) found that wherever fertility is high, maternal and infant and child mortality rates are high. In addition to these, high fertility and shorter birth intervals affect the survival chance of children and the health status of mothers. Demographic and Health Surveys (DHS) data from 18 developing countries in Asia, Latin America, Africa, and the Middle East showed that a birth interval of threeyears increases the survival status of under-five children (Rutstein, 2003). Moreover, a similar survey of 52 developing countries found that markedly short birth intervals have a negative effect on pregnancy outcomes, increased morbidity in pregnancy, and increased infant and child mortality (Rutstein,2005). Setty-Venugopal and Upadhyay (2002) have documented that, in Sub-Saharan Africa, about 60% of women deliver the next child before the index child celebrates his/her third birthday, and almost a quarter before the second birth day.

According to Bogaart (1987), determining factors affecting fertility are broadly classified into proximate (direct) and distal (indirect) factors. Indirect determinants are socioeconomic, cultural, and environmental (e.g., education, labor,andurban residence) - those elements that, if changed, would causally result in a change in overall fertility levels, all else being equal.

John Bongaarts (1978, 1982) adapted this framework by collapsing the 11 variables into seven quantifiable "direct determinants" of fertility: age of marriage, contraceptive use (and effectiveness), postpartum insusceptibility (comprising postpartum abstinence and/or lactational amenorrhea), induced abortion, fecundability (or frequency of intercourse), intrauterine mortality, and primary sterility.

The first four of these determinants are considered the "major" ones – i.e., they have been shown to vary over time and, together, account for nearly 96% of the variation in fertility. These are index of marriage (C_m), index of contraception (C_c), index of postpartum insusceptibility (including lactational amenorrhea and postpartum abstinence) (C_i), and index of abortion (C_a).

What causes high fertility in Ethiopia?

Early age at first marriage, desire for more children and extremely low contraceptive use are some of the major reasons behind such a high fertility rate (Kinfu, 2001; Gibson and Mace, 2002).

1.1.1 Direct determinants of fertility

According to Mekonnen and Work (2011), a study conducted in Ethiopia found that women who marry early in life may have an increased risk of having many children, in particular, if they started childbirth before the age of 20 years. In African countries (example Nigeria), women as young as 14 years have given birth or are in marriage unions and at the risk of pregnancy and childbirth (Ushie, 2009). This is because culture and religion have a significantly positive influence on the age of entry in marriage unions and fertility levels (Lutz, 2002). Early marriage increases the number of reproductive years in marriage, thereby increasing one's exposure to the risk of conception. For example, high fertility as a result of early marriage was observed in Peru (Bongaarts ,2005). Consequently, the age at one's first marriage is indicative of the time of entry to marital life and thus regular exposure to the risk of child bearing (Islam, 2009).In Ethiopia, being one of the developing countries where subsistence agriculture is the major economic activity, families often prefer large number of children since they are considered an economic asset rather than responsibilities. In rural areas, parents therefore want to have a large number of children to get assistance in farming activities (Bairagi, 2001). In traditional societies, children are also expected to build up the level of familial relations, which lead not only to economic benefits but also physical

protection. Similarly, in many countries in sub-Saharan Africa, particularly in Ethiopia, traditional norms and values favour high fertility. As a study in Ghana shows, "the value of the index of contraception (Cc) has declined from 0.87 to 0.78 over the ten-year period. This decline signals an increasing role for contraception in fertility reduction." (Blanc and Gray, 2000).The index of contraception shows a declining trend, indicating an increasing effect on fertility in Ethiopia (Teklu, Sebhatu and Gebreselassie, 2013). Oyedokun (2007) found that many potential users choose not to use more reliable methods due to misperceptions and concern about health-related risks. More comprehensively, a study in Vietnam showed that factors related to contraceptive use include age, education, household wealth, ethnicity, number of living children, sex of living children, region, and place of residence (Teerawichitchainan & Amin, 2010; Thang & Huong, 2003).

Similarly, Shah et al. (2001) found that women's age, parity, educational level, and residence in urban areas were significantly and positively associated with contraceptive use. Chacko (2001) documented that among married women, in four villages in rural West Bengal, India, factors that most influence a woman's use of contraception include her age, the number of living sons she has, and her religious affiliation. In addition to this, religion is one of the major factors influencing contraceptive use in Ethiopia (CSA, 2000). Thang and Huong (2003) found women living in urban areas were both more likely to use contraception and to use a modern method than rural women. Education, attitude, and children ever born were also found to be significant socio-economic and demographic factors that influence husbands' knowledge and use of contraception (Oyedokun, 2007). Moreover, women's education is statistically significant with contraceptive use (Okezie et al., 2010; Ojakaa, 2008). A study found that numbers of women not using contraception were higher among women with a primary education than among women with no education, but the numbers then decreased among women with secondary or higher education. Further, they recognized that a husband's education is more likely to increase a woman's use of any contraceptive method. Likewise, educated women tend to marry later, have fewer children, and use contraception (Caldwell & Caldwell, 2003). As a result, they are supposed to have closer marital ties with their husbands or partners compared to non-educated women. The more the women and their husbands are educated, the more likely they are to use contraceptives (kebede, 2006). Juan Schoemaker (2005) found that wealthier women were more likely to approve of family planning and to use modern contraceptives than poor women. He also found that the number of living children had a strong relationship with contraceptive use in Indonesia.

Numerous studies found that fertility behaviour and place of residence are directly linked (Mturi and Hinde, 2001; Findley, 2005). Yang (2003) found that educational level, economic status, and proportion of women working had a directly negative effect on a community's fertility level, although these effects varied with place of residence. The educated women in a community will have effectively lower the fertility rate in that community(Kraudal, 2000). Education is therefore widely held to be a key determinant of fertility (Leon, 2004). Education raises a woman's permanent income through earnings, giving her optimal fertility choices, which typically results in fewer offspring of higher quality-of-life (Bollen et al., 2001). Education may thus improve an individual's knowledge of, and ability to process, information regarding fertility options and healthy pregnancy behaviour (Carr et al., 2006).

The number of children ever born is also related to the husband's education. The 2008 NDHS shows that women whose husbands had only primary education had almost twice as many children as those whose husbands had tertiary education. The survey also found that non-working women had an average of 2.9 children, as compared to 2.8 among women working in the modern sector and 3.7 children among those working in the traditional sector. A number of studies showed that working women tended to have fewer children than non-working women (Adair, Guilkey, Bisgrove and Gultiano, 2002; Engelhardt, KogelandPrskawetz, 2004). Costello and Casterline (2002) found that households with higher incomes tended to have a lower demand for children. In the present analysis, the number of child ever born ranges from 2.2 among the richest to 4.0 among the poorest.

Early beginning of first birth reduces the quality of life because of responsibilities of motherhood and childcare. Mosammat and Mohammad (2013) found early entry into motherhood increases the reproductive period and subsequently fertility. Birth interval is the length of time between two successive live births (CSA, 2012). The length of the birth interval is dependent on the duration of each component, with the postpartum amenorrhea and the menstruating intervals having greater variability in their duration than the other (Dibaba, 2008]. Empirical evidence from many different cultural settings has identified several correlates of birth intervals, including breast feeding, contraceptive use, and maternal education (Norton, 2005; Vidya and Ushma, 2002; Yohannes, Wondafrash, Abera and Girma, 2011). Numerous studies have acknowledged that contraceptive use is significant factor of birth interval (Youssef, 2005). Gizachew, Berihun and Tadesse (2013) found that

women who were not using any contraceptive method were about 4 times more likely to have a successive birth as compared to contraceptive users. Women who breastfed their child for 7-12 months were 6 times more likely to give birth following the index child. Studies done at the southern region of Ethiopia and Mozambique (Yohannes, Wondafrash, Abera and Girma, 2011; Saumya, John and Ian, 2006) showed similar findings. The positive relationship between the duration of breastfeeding and length of birth interval is studied from the experience of many countries (Clegg, 2011; Rao, Townsend and Askew, 2006).

The number and the sex of surviving children also play a role in determining child spacing (Setty-Venugopal, Upadhyay, 2002; Awang, 2003). Birth interval is also affected by the difference in the age of the mother, in which younger women had short birth intervals more often than older ones; this finding is similar across studies conducted in different places (Saumya, John and Ian, 2006; Vidya and Ushma, 2002). On the other hand, older mothers tend to have longer subsequent intervals (Setty-Venugopal, V and U.D. Upadhyay, 2002). Similar to the pattern observed in the Ethiopian demographic and health survey, 2005 (CSA, 2006), the median number of months increase as the mother's age increases. Moreover, as the mother's age becomes older and older, the proportion of mothers who practice short birth intervals decreases, and those who practice longer birth interval increases. Saumya, John and Ian (2006) have documented those urban-rural disparities, with rural women less likely than urban women to have intervals over five years. In 51 of 55 countries surveyed by the DHS, women who live in rural areas were more likely than women in urban areas to have birth intervals shorter than 3 years (Vidya and Ushma, 2002). Dissanyake (2000) has found that place of residence is also likely to have an important impact on the length of birth interval. Moreover, in many settings, couples who practice postpartum abstinence have additional benefits if the duration of abstinence exceeds that of postpartum amenorrhea (Dissanyake, 2000). Furthermore, education is considered to be one of the most important socioeconomic factors influencing birth interval, through its impact on one or more of the bio-behavioural variables (Saumya, John and Ian, 2006). Likewise, Setty-Venugopal and Upadhyay (2002) found women's education and employment opportunities to be important determinants in child spacing.

1.1.2 Ethiopia's fertility situation

Ethiopia, the second most populous country in Africa, has a total population of more than 80 million with an annual population growth rate of 2.6% (CSA, 2007). Its population has increased nearly sevenfold from 11.8 million at the beginning of the 20th century (Planning and Programming Department, 2007). Uncontrolled fertility has negatively influenced the socioeconomic, demographic, and environmental development of the country (Ezra, 2001). The total fertility rate (TFR) was 4.8 children per woman, which is substantially higher among rural women than among urban women, where rural women give birth to nearly three more children during their reproductive years than urban women (5.5 and 2.61), and under-five mortality rates are 88 per 1000 live births (CSA, 2012).

1.2 Significance of the study

The Ethiopian government considered the increasing contraceptive prevalence rate among married women to reduce the total fertility rate. One of the goals in the policy is to increase the contraceptive prevalence to 44% among married women by 2015 (Ringheim et al., 2009). The Ethiopian government also made other plans related to the population growth, most notably the 2005-2010 Plan for Accelerated and Sustained Development to End Poverty. This plan is considered the important to reduce poverty because a reduced population growth may result in reducing "population pressure on the land, low incomes in rural areas, and youth unemployment in urban areas" (Ringheim et al., 2009). Alayu(2008) recommended that the total fertility rate (TFR) in Ethiopia should be reduced to 4 lifetime births per woman by 2010 and the gap between boys' and girls' education be closed.

The Ethiopian government, along with international organizations, has done its best to reduce rapid population growth by educating family planning and providing contraceptives. Despite these efforts, there is still a higher fertility rate than what is considered an ideal rate of 4.0 per woman. Ethiopia is a mainly rural and young society, with 84 percent of Ethiopians still living in rural areas (Ringheim, Teller, and Sines, 2009). The reasons why the interventions have not worked are likely correlated with what kinds of views and experiences people have. Unfortunately, previous studies have not sufficiently focused on the socio cultural, socioeconomic, and demographic backgrounds of women as related to fertility across the low, high, and medium fertility regions. This study also aims to help reproductive health program planners and policymakers comprehend numerous factors influencing fertility in order to support in the implementation of a reproductive health program that will decrease fertility

1.3 Objectives

1.3.1. General objectives:

The objective of this study is to compare the trends and the levels in some determinants of fertility and contraceptive use in Ethiopia between EDHS2005 and EDHS2011.

1.3.2 Specific objectives:

- To examines the relative contribution of each index for the reduction of fertility.
- To compare the effects of determinants on modern contraceptive use between 2005 and 2011.
- To examines the relationship between women religious involvement and fertility in Ethiopia.
- To investigates the relationship between age at first marriage to first birth interval and its associated factors in Ethiopia.

1.4. Hypothesis

- Hypothesis 1: The increasing contraceptive method use decreased total fertility rate if other three indices of proximate determinants (C_i, C_m and Ca) are fixed or decreasing.
- Hypothesis 2: An increase in a mother's socioeconomic status increased in her marriage to first birth interval, decreased the sex preference, increased the age at marriage, and increased the use of contraceptive methods. As the result, fertility decrease.

1.5 Reader's orientation

In line with the regulations of the University of the Western Cape, this thesis is structured into nine chapters. Overall, the chapters attempt to address the overall aim of the study, however, each chapter address a specific objective of the thesis. The majority of the parts in this thesis are based on original peer reviewed articles submitted in various accredited journal publication as listed below.

The thesis is organized as follows:

- ✓ Chapter 1: explain Introduction the introduction of the thesis
- ✓ Chapter 2 provides an overview of the data and methods. The results are presented in 4 Chapters:
- ✓ Chapter 3: Proximate Determinants of Fertility in Ethiopia: Comparative analysis of the 2005 and 2011 DHS**. Journal of Asian and African Studies (Accepted).**
- ✓ Chapter 4: Determinants of modern contraceptive use in Ethiopia: based on EDHS 2005 and 2011 **(Submitted in Genus).**
- ✓ Chapter 5: Religion and Fertility in Ethiopia **(Submitted to African Population Studies)**
- ✓ Chapter 6: Factors associated with age at first marriage to first birth interval in Ethiopia: Using Survival analysis**(Submitted to International Perspectives on Sexual and Reproductive Health)**
- ✓ Chapter 7: Age-specific fertility rate (35–49) and fertility behaviour among currently married women in Ethiopia**(Submitted in the journal of Iranian Journal of Public Health).**
- ✓ Chapter 8, I discuss the results of the study and
- ✓ Chapter 9 draw the study's conclusions and policy implication.

1.6 References

Adair L, Guilkey D, Bisgrove E and Gultiano S (2002).Effect of Childbearing on Filipino Women's Work Hours and Earnings. Journal of Population Economics, 15(4): 625-645.

Awang H (2003). Determinant of waiting time to third pregnancy using censored linear regression. *Journal of Biosocial science,* 35:59-70.

Ayanaw A (2008). Proximate determinants of birth interval length in Amhara region: the case of Fagita Lekoma district, Awi- zone. Addis Ababa ,Ethiopia.

Bairagi R (2001). Effects of sex preference on contraceptive use, abortion and fertility in matlab, Bangladesh. *International Family Planning Perspectives,* 27 (3), 137-143.

Blanc A and Gray S (2000). Greater Than Expected Fertility Decline in Ghana: An Examination of the Evidence.

Bollen KA, Glanville JL, Stecklov G (2001). Socioeconomic Status and Class in Studies of Fertility and Health in Developing Countries. *Annual Review Sociology, 27(1): 153-185.*

BongaartsJ(1978). A Framework for Analyzing the Proximate Determinants of Fertility. Population *and Development Review, 4(1): 105-132.*

Bongaarts J (1982). The Fertility-Inhibiting Effects of the Intermediate Fertility Variables. Studies in Family Planning, 13(6/7): 179-189.

BongaartsJ(2005). The causes of stalling fertility transitions. *Studies in Family Planning, 37 (1), 1-16.*

Caldwell JC and Caldwell P (2003).The fertility transition in sub-Sahara African. In the department of Social development fertility: current South African issues of poverty, HIV/AIDS youth seminars proceeding. Pretoria: HRSC.

Central Statistical Agency [Ethiopia] and ICF International: Ethiopia Demographic and Health Survey 2011. Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Agency and ICF International; 2012.

Central Statistical Authority (CSA) and United Nations Population Fund (UNFPA), *Ethiopia, Summary and Statistical Report of the 2007 Population and Housing Census*. *Population Census Commission* (Addis Ababa, Ethiopia: UNFPA, 2008).

Carr DL, Pan WK, Bilsborrow RE (2006). Declining Fertility on the Frontier: The Ecuadorian Amazon. *Population and Environment, 28(1), 17-39.*

Chacko E (2001). Women's use of contraception in rural India: a village-level study. Health and Place, 2001; 7(3): 197-208.

Clegg EL (2001). Starting, spacing and stopping in the reproductive histories of outer Hebridian families. *Journal of Biosocial Sciences* 2001; 33:405-526.

Costello MP and Casterline JB (2002). Fertility Decline in the Philippines: Current Status, FutureProspects. In Completing the Fertility Transition. New York: Population Bulletin of the United Nations. *Economic and Social Affairs Division, 479-486.*

DibabaY(2008): Factors influencing women's intention to limit childbearing in Oromia. Ethiopian Journal of Health Development, 22(3):28–33.

Dissanyake L (2000). The influence of child mortality and breastfeeding on inter live birth interval in SriLankan. *Journal of Family Welfare,* 46 (1):229-239.

EngelhardtHKogel T and Prskawetz A (2004). Fertility and Women's Employment Reconsidered: A Macro-Level Time Series Analysis for Developed Countries, 1960-2000. Population *Studies, 58(1): 109-120.*

Ezra M (2001). Demographic responses to environmental stress in drought and famine prone areas of Northern Ethiopia. *International Journal of population Geography, 7:259-279.*

Findley SE (2005). A Suggested Framework for analysis of Urban-Rural Fertility Differentials with an Illustration of the Tanzanian case. *Population and Environment, 3(2-4): 237-261.*

Gibson M, Mace R (2002). Labour Saving Technology and Fertility Increase in Rural Africa. *Current Anthropology, 43: 213-222.*

Hinde and Mturi (2001). Fertility levels, a trend and differential in sub-Saharan Africa in the 1980's and 1990's. *Studies Family Planning.26:1-25.*

Islam S (2009). "Differential Determinants of Birth Spacing Since Marriage to First Live Birth in Rural Bangladesh" . Pertanika *Journal of Social Science and Humanities 17, (1): 1-6.*

Kebede Y (2oo6). Contraceptive prevalence in Dembia District, northwest Ethiopia. *Ethiopian Journal of Health Development, 20(1):32-38.*

Kinfu Y (2001). The Quite Revolution: An Analysis of Change Toward Below-replacement Level Fertility in Addis Ababa. Unpublished PhD Thesis, Australian National University.

Kraudal Q (2000). A Search for Aggregate-level Effects of Education on Fertility, using Data from Zimbabwe in Demographic Research (www.demographic-research.org/volumes. 3(3)).

Leon A (2004). The Effect of Education on Fertility: Evidence from Compulsory Schooling Laws. Pittsburgh: University of Pittsburgh Press.

Lutz W (2002). The World's Changing Human Capital Stock: Multi-State Population Projections by Educational Attainment. Population and Development Review, 27(2): 323-339.

Mekonnen w and Worku A (2011).Determinants of fertility in rural Ethiopia: the case of Butajira Demographic Surveillance System (DSS). *BMC Public Health*, *11*(1), 782.

Mosammat, N., and Mohammad ,Z.(2013). Patterns and Determinants of age at first birth in Bangladesh. Journal of population studies, 35: 63-77.

Norton M (2005). New evidence on birth spacing: promising findings for improving new born, infant, child, and maternal health. *International Journal of Gynaecology and Obstetrics, 89:51-56.*

OkezieC ,Ogbe A and Okezie D (2010), "Socio-economic determinants of contraceptive use among rural women in Ikwnano Local Government Area of Abia State, Nigeria". *International NGO Journal ,5(4),74-77.*

Ojakaa D (2008). Trends and Determinants of Unmet Need for Family Planning in Kenya. DHS Working Papers No. 56. Calverton, MD: Macro International, Inc.

Oyedokun AO (2007), Determinants of Contraceptive Usage: Lessons from Women in Osun State, Nigeria*. Journal of Humanities and Social Science, Volume 1, Issue 2.*

Rao SR, Townsend J and Askew J (2006). Correlates of inter- birth intervals: Implications of optimal birth spacing strategies of Mozambique. *Population Council Working Paper*.

Ringheim K, Teller C and Sines E (2009). Ethiopia at a Crossroads: Demography, Gender, and Development. *Population Reference Bureau, 1-6.*

RutsteinS (2003). Effect of Birth Intervals on Mortality and Health: Multivariate Cross Country Analyses. Presentation to the USAID-sponsored Conference on Optimal Birth Spacing for Central America, held in Antigua, Guatemala.

Rutstein S (2005). Effects of preceding birth intervals on neonatal, infant, and under-five years mortality and nutritional status in developing countries: evidence from the demographic and health surveys. *International Journal of Gynaecology and Obstetrics 89, S7– S24.*

Saumya R, John T, Ian A (2006). Correlates of Inter-birth Intervals: Implications of Optimal Birth Spacing Strategies in Mozambique. Frontiers in Reproductive Health, Population Council

Schoemaker, Juan (2005). Contraceptive use among the poor in Indonesia. *International Family Planning Perspectives 31 (3): 106-14.*

Sedgh G, Hussain R, Bankole A, Singh S (2007). Women with Unmet Need for Contraception in Developing Countries and Their Reasons for Not Using a Method. New York: Guttmacher Institute.

Setty-Venugopal V, Upadhyay UD (2002).Birth Spacing: Three to Five Saves Lives. Population Reports, Series L, No. 13.Baltimore, Johns Hopkins Bloomberg School of Public Health, Population Information Program.

Shah NM, Shah MA, Al-Rahmani, E, Behbehani J, Radovanovic Z and Menon I (2001). Trends, patterns and correlates of contraceptive use among Kuwaitis, 1984-1999. *Medical Principles and Practice, 10(1): 34-40.*

Solomon A (2008). "Capturing the Demographic Dividend (Bonus): Concept and International Experiences." *Population and Development Ethiopia* 12, no. 1 (2008); and Ethiopia Ministry of Finance and Economic Development (MoFED), *Population and Development in Ethiopia: A Situation Analysis* (Addis Ababa, Ethiopia: MoFED, 2008).

Tewodros T (2011). Cross Sectional Study of Women Employment and Fertility in Ethiopia, 1-63.

Teerawichitchainan B, Amin S (2010). The role of abortion in the last stage of fertility decline in Vietnam. International Perspective on Sexual and Reproductive Health. 36:80–9.

Teklu H, Alula S and Gebreselassie T(2013)."Components of Fertility Change in Ethiopia. Further analysis of the 2000, 2005 and 2011 Demographic and Health Surveys." DHS Further Analysis Reports No.80. Calverton, Maryland, USA: ICF International.

Tessema G, Zeleke B ,Ayele T (2013). Birth interval and its predictors among married women in Dabat District, Northwest Ethiopia: A retrospective follow up study.

Thang N and Huong V (2003). Changes in Contraceptive Use in Vietnam. Journal of Biosocial Science, 35, 527–543.

Vidya S, Ushma U (2002). Birth spacing: three to five saves lives. Population reports, series L, No. 13. Baltimore, Johns Hopkins Bloomberg School of public health, population information program, summer.

Ushie MA (2009). Fertility Differentially in Urban and Rural Nigeria: A Comparative Study of Calabar and Bendi Communities in Cross River State, Nigeria. Unpublished Ph.d Thesis of the University of Calabar , Calabar – Nigeria.

Ushie MA, Ogaboh AA, Olumodeji EO and Attah F(2011).Socio-cultural and economic determinants of fertility differentials in rural and urban Cross Rivers State, Nigeria. *Journal of Geography and Regional Planning, 4(7), 383-391.*

World Bank, (2010) .The World Bank's Reproductive Health Action Plan 2010-2015.

Yohannes, S., Wondafrash, M., Abera M, Girma E (2011). Duration and determinants of birth interval among women of child bearing age in Southern Ethiopia. *BMC Pregnancy Childbirth , 11(1), 38.*

Youssef, RM. (2005). Contraception use and probability of continuation: community based survey of women in southern Jordan. *Eastern Mediterranean Health Journal*, 11(4), 545–58.

CHAPTER II

DATA AND METHODS

2.1 Study setting

Ethiopia is an ancient country. Paleontological studies identify Ethiopia as one of the cradles of mankind. For instance, "Dinknesh" or "Lucy," one of the earliest and most complete hominoid skeletons ever found was discovered in Hadar through archaeological excavations in 1974, and dates back 3.5 million years. Now a day, it embraces a complex diversity of nationalities, peoples, and linguistic groups. Its peoples altogether speak over 80 different languages, constituting 12 Semitic, 22 Cushitic, 18 Omotic, and 18 Nilo-Saharan languages (MOI, 2004).

Ethiopia has great geographical variety; its landscape features range from the highest peak at RasDashen, 4,550 metres above sea level, down to the Affar Depression, 110 metres below sea level (CSA, 2009).It is an agricultural country and agriculture accounts for 43 percent of the gross domestic product or GDP (CSA, 2009). Coffee has long been one of the main export items of the country; however, other agricultural products are currently being introduced on the international market.

The majority of the population lives in the highland areas of the country. The main occupation of the settled population is farming, while in the lowland areas, the mostly pastoral population moves from place to place with their livestock in search of grass and water. Among the nine regional states, Amhara, Oromiya and SNNP comprised about 80 percent of the total population of the country. Christianity and Islam are the main religions; about half of the population are Orthodox Christians, one-third are Muslims, about one in every five (18 percent) are Protestants, and 3 percentage followers of traditional religion (CSA, 2006).

In 2005 EDHS results indicate that there has been a decline in fertility from 6.4 births per woman in1990 to 5.4 births per woman in 2005, a one child drop in the last 15 years. Moreover, fertility dropped only slightly between 2000 and 2005, from 5.5 children per woman to 5.4, and then decreased further to 4.8 children in 2011.The decline was more pronounced in the 10 years between 1990 and 2000 than in the five years between 2000 and

2005 and in urban than in rural areas. Rural women on average have two and a half children more than urban women. There is a substantial differential in fertility by region; Addis Ababa has found the lowest fertility comparing to other region with 1.4 in 2005 and 1.5 in 2011children per woman. In 2005 Oromiya was recorded as the highest fertility level with total fertility level 5.6(CSA, 2006). However, in 2011 Somali was documented that the highest fertility level with total fertility level 7.1(CSA, 2012).

Ethiopian women generally begin sexual intercourse at the time of their first marriage. This can be seen from the identical medians in age at first marriage and age at first sexual intercourse (16.1) in 2005.

The interval between births is relatively long in Ethiopia. The median number of month's since the preceding birth is 33.8. Twenty-one Percent of non-first births occur within two years of a previous birth, 35 percent occur between 24 and 35 months later and 44 percent occur at least three years after a previous birth. Postpartum insusceptibility is one of the major factors contributing to the long birth interval in Ethiopia. The median duration of amenorrhea is 15.8 months, postpartum abstinence is 2.4 months, and insusceptibility is 16.7 months in 2005 (CSA, 2006).

Twenty-four percent of currently married women and 19 percent of currently married men have used a family planning method at least once in their lifetime. Fifteen percent of currently married women are using a method of contraception. Modern methods are more widely used than traditional methods; with 14 Percent of currently married women using a modern method and 1 percent using a traditional method. CSA, 2006

The contraceptive prevalence rate for married Ethiopian women who are currently using a method of family planning have been increased from is 15 %in 2005 to 29% in 2011 (CSA, 2006 and 2012). Almost all of these users are using modern methods. The most widely used method is injectable (10 percent) followed by the pill (3 percent).In 2005 and 2011 EDHS (Ethiopian Demographic health survey) covered a nationally representative sample of 2285 and 2527 of youth currently married women (age group 15-24) respectively (CSA, 2006 and CSA, 2012).

2.2. EDHS data

More than 300 surveys were conducted by the Demographic and Health Surveys programme (DHS) and over 90 countries were involved since the mid-80s. Standard DHS Surveys have large sample sizes (usually between 5,000 and 30,000 households) and typically are conducted about every 5 years, to allow comparisons over time.

The DHS are an important source of data for studies on the health of populations in developing countries who do not have a robust system for collecting information about the population. A number of DHS have been conducted in the countries of sub- Saharan Africa at regular time intervals (every five years) since 1984s (Corsi, Neuman, Finlay and Subramanian, 2012. DHS surveys collect information constitutes on fertility and total fertility rate, reproductive health, maternal health, child health, immunization and survival, HIV/AIDS; maternal mortality, child mortality, malaria, and nutrition among women and children stunted.

The 2011 EDHS was carried out under the aegis of the Ministry of Health (MOH) and was implemented by the Central Statistical Agency (CSA). ICF International provided technical assistance as well as funding to the project through the MEASURE DHS project, a USAID-funded project providing support and technical assistance in the implementation of population and health surveys in countries worldwide (CSA, 2012).

The sample for the 2011 EDHS was designed to provide population and health indicators at the national (urban and rural) and regional levels. The sample design allowed for specific indicators, such as contraceptive use, to be calculated for each of Ethiopia's 11 geographic/administrative regions (the nine regional states and two city administrations). The 2007 Population and Housing Census, conducted by the CSA, provided the sampling frame from which the 2011 EDHS sample was drawn. The 1994 Census provided an adequate frame for drawing the sample for the 2005 EDHS. Administratively, regions in Ethiopia are divided into zones, and zones, into administrative units called weredas. Each wereda is further subdivided into the lowest administrative unit, called kebele. During the 1994 and 2007 census each Kebele was subdivided into census enumeration areas (EAs), which were convenient for the implementation of the census. In general both 2005 and 2011 EDHS

sample was selected using a stratified, two-stage cluster design and EAs were the sampling units for the first stage.

Households comprised the second stage of sampling. A representative sample 14,500 and 17,817household was selected for the 2005and 2011 EDHS respectively. Because the sample is not self-weighting at the national level, all data in this report are weighted unless otherwise specified (CSA, 2006 and CSA, 2012).In the Somali region, in 18 of the 65 selected EAs listed households were not interviewed for various reasons, such as drought and security problems, and 10 of the 65 selected EAs were not listed due to security reasons. Therefore, the data for Somali may not be totally representative of the region as a whole. However, national-level estimates are not affected, as the percentage of the population in the EAs not covered in the Somali region is proportionally very small (CSA, 2006).

Data was collected through face to face interviews. Three types of questionnaires were administered in each survey, namely; the Household, Man and Woman's questionnaires. The Woman's Questionnaire was used to collect information from all women age 15-49. These women were asked questions on the following topics:

- Background characteristics such as age, education and media exposure
- Birth history and childhood mortality
- Knowledge and use of family planning methods
- Fertility preferences
- Antenatal, delivery and postnatal care
- Breastfeeding and infant feeding practices
- Vaccinations and childhood illnesses
- Marriage and sexual activity
- Women's work
- Husband's background characteristics
- Awareness and behaviour regarding AIDS and other sexually transmitted infections (STIs)
- Adult mortality, including maternal mortality

The principal objective of the Ethiopia Demographic and Health Survey (DHS) is to provide current and reliable data.

Data Collection Procedures

A structured and pretested questionnaire was used as a tool for data collection. The questionnaire was developed in English and then translated into three different local languages (Amharic, Oromiffa and Tigrigna). The questionnaire was developed based on standard DHS survey questionnaires. Structured interview schedules were performed by trained interviewers. In order to maintain the quality of data to be collected, interviewers were trained, a pre-test was performed before the actual data collection, frequent supervision was performed during data collection, and interviews were performed using local languages (CSA, 2012). Thirty-five interviewing teams conducted data collection for the 2011 EDHS. Each team comprised one team supervisor, one field editor, two male interviewers, four female interviewers, one cook, and one driver. Ten staff members from CSA coordinated and supervised fieldwork activities. ICF International staff and representatives from other organizations supporting the survey, including EHNRI, CDC, and USAID, participated in fieldwork monitoring. In addition to the field teams, a quality control team was present in each of the 11 regions. Each quality control team included a field coordinator, one female and one male staff member to monitor the quality of the interviews, and one biomarker quality control staff member. The quality control teams regularly visited and often stayed with the EDHS teams throughout the fieldwork period to closely supervise and monitor them. Data collection took place over a five-month period from 27 December 2010 to 3 June 2011.

All questionnaires for the 2011 EDHS were returned to the CSA headquarters in Addis Ababa for data processing, which consisted of office editing, coding of open-ended questions, data entry, and editing computer-identified errors. The data were processed by a team of 32 data entry operators, 6 office editors, and 4 data entry supervisors. Data entry and editing were accomplished using the SPSS version 22.0 software. The processing of data was initiated in January 2011 and completed in June 2011. Of the total number of 14,070 eligible women in 2005 the study sample, 8,914 were married women with at least one child. According to the 2011 EDHS, there were 16,515 eligible women, but the study sample used 9,594 married women with at least one child. n fertility and family planning behaviour, child mortality, adult and maternal mortality, children's nutritional status, the utilization of maternal and child health services, knowledge of HIV/AIDS and prevalence of HIV/AIDS and anaemia.

2.3. Methods

The study used Bongaarts model to estimate the indices of the four main proximate determinants of fertility. Generalized linear model with logit and log link were used to access the level of fertility and contraceptive use. In addition to these, survival analysis were performed to estimate marriage to first birth interval

2.3.1 Binary logistic regression

Generalized linear models (GLMs) were performed for this analysis. GLMs allow including non-normal errors, such as binomial, Poisson, and Gamma errors. Regression parameters are estimated using maximum likelihood. GLMs were found by (McCullagh and Nelder, 1989). The response can be scale, counts, binary, or events in trials. Factors were assumed to be categorical. The covariates, scale weight, and offset were assumed to be scaled. Cases were assumed to be independent observations.

Binary logistic regression used to identify the use of modern contraceptive use in married women by examining the determinants of contraceptive use.

Components of a generalized linear model (or GLM) for binary data

Response *Yi* and independent variables $Xi = (x_{i1},\ldots x_{ip})$ *for* $i=1,\ldots,n$

Random Component (the outcome): binomial distribution

In general, Yi, $1 \leq i \leq n$ independent with density from the exponential family:

$$F(yi;\theta,\emptyset) = \exp\{\frac{\theta y - b(\theta)}{a(\emptyset)} + c(y,\emptyset)\}$$

Here $\theta and \emptyset$ are a dispersion parameter $b(\theta_i)$, $a_i(\emptyset)$ and $c(y_i,\emptyset)$ are known function.

Systematic component (the design matrix multiplied by the parameter vector)

$$g(\pi_i)=x_i{}^t\beta = \beta_0+\beta_1 x_{i1}+\beta_2 x_{i2}+\ldots+\beta_p x_{ip} \text{ binomial predictor}$$

$$\beta = (\beta_0 \ldots \beta_p) \text{ Regression parameter}$$

Link function (the function, g(·) that "links" the systematic component to the random component):

$$g(\pi_i)=x_i{}^t\beta = \ln\left(\frac{\pi_i}{1-\pi_i}\right)= \beta_0+\beta_1 x_{i1}+\beta_2 x_{i2}+\ldots+\beta_p x_{ip}$$

We would have the canonical link of a Bernoulli/Binomial distribution.
Recall, the function:

$$g(\pi_i) = \ln\left(\frac{\pi_i}{1-\pi_i}\right) \text{ was called the logit or 'log odds.'}$$

2.3.2 Poisson log linear model

The specific measure used for fertility of women was the number of children ever born, which is a count value. The variable of interest in demographic health survey is the number of children ever born. All the factors (independent variables) were categorical. Thus, Poisson log linear type of mode is appropriate for this study. The main objective is to investigate the relationship between the probability of number of children ever born (μ) with age group, place of resident , educational level, work status, wealth indexes, media exposure on family planning, visited health facility and visited by family planning workers.

Components of a generalized linear model (GLM) for count data

Response Yi= (the number of children ever born)and independent variables Xi= (age group, place of resident , educational level, work status, wealth indexes, media exposure on family planning, visited health facility and visited by family planning workers) .

Random Component (the outcome): Poisson distribution

In general, Yi, $1 \leq i \leq n$ independent with density from the exponential family

f(yi;$\theta, \emptyset$)= exp{$\frac{\theta y - b(\theta)}{a(\emptyset)}$ +c(y,$\emptyset$) }

Here $\theta and \emptyset$ are a dispersion parameter b(θ_i), $a_i(\emptyset)$ and c(y_i,$\emptyset$) are known function

Systematic Component (the design matrix multiplied by the parameter vector)

$g(\mu) = \alpha+\beta_1 x_1+\beta_2 x_2+. \ldots +\beta_k x_k$=$y_i$ln($\mu_i$)-$\mu_i$- ln($y_i$!) Poisson predictor

$\beta = (\beta_0 \ldots \beta_p)$ Regression parameter

Link function (the function, g(·) that "links" the systematic component to the random Component)

$g(\mu_i)$= lnμ = $\alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_k x_k=\frac{y_i\theta_i - b(\theta_i)}{a_{i(\emptyset)}}$ + c(y_i, $\emptyset$) which is the " natural parameter of " of the Poisson distribution, and the log link is the " canonical link" for GLM with Poisson distribution.

The Poisson regression model for counts (with a log link) is

ln(μ_i)=$\alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_k x_k$ or$e^{\alpha+\beta_1 x_1+\beta_2 x_2+\cdots+\beta_k x_k} = \mu = e^{(\frac{y_i\theta_i - b(\theta_i)}{a_{i(\emptyset)}} + c(y_i,\emptyset))}$ **This is often referred to as "Poisson log linear model" .**

2.3.3 Survival analysis

In survival analysis we are interested in the time interval between marriage entry and first child birth. The outcome of interest is first birth (child birth).

Definition 1: Survival time measures the period of time from marriage to first child birth (Lee, 1992).

Definition 3: *Hazard* function is a function indicates the probability of an individual of having first child birth at *t* time in the condition that this individual survived to *t* time (Banerjee, 2007).

Kaplan Meier Product Limit Survivorship Function

The Product Limit estimate of the Survival Function (Kaplan and Meier, 1958) is defined as

S(t)=$\pi_{j=1}\left(1-\frac{d_j}{n_j}\right)$

Where,

dj = number of women having births at time tj

nj = number of women just prior to tj exposed to the risk of having birth

tj =time since the previous birth of a child to that woman

Median and mean survival time

A confidence interval for the median survival time is constructed using a robust nonparametric method due to Brookmeyer and Crowley (1982). Another confidence interval for the median survival time is constructed using a large sample estimate of the density function of the survival estimate (Andersen, 1995). If there are many tied survival times then the Brookmeyer-Crowley limits should not be used.

Samples of survival times are frequently highly skewed, therefore, in survival analysis; the median is generally a better measure of central location than the mean.

Cox's proportional hazards model

Marriage to first child interval is a continuous data (numeric). Thus, Cox proportional hazards regression models measures the relationship between a set of covariates and the hazard rate (first child birth), introduced by **Cox (1972)**. The model was applied to determine the relationship between a set of covariates (predictor variables) and first child birth. It is the most frequently used regression model in survival analysis because this model is semi-parametric and can be used for both censored and uncensored data. The key assumption for the model is proportional hazards: the hazard for any individual is a fixed proportion of the hazard for any other individual.

The formula for the Cox proportional hazard model is a product of $h_0(t)$ called the baseline hazard as well as exponential of the sum of $\beta_i$andX_i . It assumes that for an individual with a vector of covariates in x, the hazard rate (first child birth) at time t.

The proportional hazard model is given by:

$$h(t,X)= h_0(t)\exp\left(\sum_{i=1}^{p}\beta_i X_i\right)= h_0(t)\exp\left(\beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_p x_{pi}\right)$$

Where, X=$(X_1, X_2, \ldots, X_p)$ are the explanatory/predictor variables. The baseline hazard $h_0(t)$ determines the shape of the survival function and reflects the hazard when all covariates equal to 0. Since no assumptions on $h_0(t)$ are made (except that it must be positive), Cox model is considered semi parametric. There is no intercept in the model because the constant is absorbed in the baseline hazard. The hazard ratio is the ratio of the hazard function to the baseline hazard $h(t, X)/h_0(t)$. The log of the hazard ratio is a linear combination of parameters

which is

$$\log h(t, X)/h_0(t) = \exp(\beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_p x_{pi})$$

2.4. References

Brookmeyer, R., and Crowley, J. (1982). A confidence interval for the median survival time, *Biometrics; 38:29-41*.

CSA, (2006). Ethiopia demographic and health survey 2005. Central Statistics Agency of Ethiopia, Addis Ababa and Calverton, MD: Central Statistics Agency and ORC Macro; 2006.
CSA Ethiopia and ICF International (2012). Ethiopian Demographic and Health Survey report 2011. Addis Ababa, Ethiopia and Calverton, Maryland, USA.

Corsi, D. J., Neuman, M., Finlay, J. E., & Subramanian, S. V. (2012). Demographic and health surveys: a profile. *International Journal of Epidemiology*, *41*(6), 1602-1613.
Cox and David, R. (1972). "Regression Models and Life-Tables". *Journal of the Royal Statistical Society, Series B 34 (2): 187–220.*

McCullagh, P., and Nelder, A. (1989).Generalized Linear Models, Second Edition, Chapman and Hall, London.

CHAPTER III

Proximate Determinants of Fertility in Ethiopia: Comparative analysis of the 2005 and 2011 DHS

[1]YISHAK ABRAHAM LAILULO AND A. SATHIYA SUSUMAN

[1]*Department of Statistics and Population Studies, Faculty of Natural Sciences, University of the Western Cape, 7535 Bellville, Cape Town South Africa;*
Email: sappunni@uwc.ac.za

Abstract

Fertility is one of the elements in population dynamics that has significant contribution towards changing population size and structure over time. In Ethiopia, for the last ten years the total fertility rate has declined slightly from 5.5 to 4.8 children in 2011. But, the total fertility rate in urban has increased from 2.4 to 2.6 per 1000 live births. The Bongaarts model was applied to estimate the indices of the four main proximate determinants of fertility. Bongaarts defines the total fertility rate (TFR) of a population as a function of the total fecundity rate (TF), index of marriage (C_m), index of contraception (C_c), index of postpartum infecundability (C_i), and index of abortion (C_a); this can be written as TFR = C_m x C_c x C_i x C_a x TF. In 2005, the index of married women in urban areas was lower than rural, but it was unfortunately the same in urban and rural areas in 2011. For the last decade, the index of postpartum infecundability was recognized by a greatest fertility reduction effect compared with the index of contraception and index of marriage in rural residence of Ethiopia. The more the four indices of proximate determinants are lower, the more the fertility will be reduced. As such, the Ethiopian government, the international non-governmental organizations and policy makers must pay attention to increase the prevalence of contraceptive use and educate the society to fight against child marriage. The permanent contraceptive use such as female sterilization should be promoted; moreover, the legal organizations and the community must work together to raise the legal age at marriage to be made eighteen years.

3.1 Introduction

Ethiopia is the second populous country among Sub-Saharan Africa countries, and in 2015 it has been estimated to reach 94.53 million populations (Adugna, 2014). According to EDHS 2000, the Total Fertility Rate (TFR) in Ethiopia was 5.5 children per woman, this rate declined to 5.4 in 2005 (Teller, 2011) and further to 4.8 in 2011 (CSA, 2012). Even though showing a declining trend, like many African countries, the fertility rate of Ethiopia is still high. The Total fertility rate in urban Ethiopia is estimated at 2.6 and in rural areas it is estimated at 5.4 (per 1000 live births), according to the 2011 DHS. This variation could be attributed to the differences in cultural, economic and health factors which interfere with the process of human reproduction. Determinants such as the value the society gives to children, preferences relating to the sex of a child and family size, the social position and role of women in a society, economic needs and old age security schemes, and the frequency of sexually transmitted diseases affect fertility. Social organizations and cultural sceneries have an influence on the pace of family formation and childbirth (Falls, 2007). The two factors that determine fertility: The "direct" or "proximate" determinants and "indirect" determinants or background factors (Davis and Blake, 1956). "The background factors work through the proximate determinants to influence fertility"; they do not influence fertility directly. "The proximate determinants are behavioural mechanisms that act to reduce fertility". The principal characteristics of the proximate determinants are their direct influence on fertility. Indirect determinants are socioeconomic, cultural, and environmental (e.g., education, labour, and urban residence) - those elements that, if changed, would causally result in a change in overall fertility levels, all else being equal (Bongaarts, 1978, Bongaartsand Potter, 1983).

Marriage is the most known proximate determinant of fertility. Marriage is defined as the relatively stable union to which socially approved childbearing is limited in most societies (Bongaarts and Potter, 1983). The formation of marriage is usually associated with the beginning of childbirth. In societies where women marry at an early age, the beginning of childbirth is early and the period during which women bear children is relatively longer (Bongaarts and Potter, 1983). The age at which marriage occurs, the proportion of women who are married, accompanied by low level of contraceptive use, determine the level of

fertility in a society (Bongaarts et.al, 1984, Hailemariam, 1992) . Contraceptive use is also a proximate determinant of fertility. After postpartum amenorrhea, the risk of getting pregnant increases should the woman become sexually active and not use any form of contraception. A study in Kenya shows, "the value of the index of contraception (Cc) has declined from 0.81 to 0.72 from 1989-2003. This decline signals an increasing role of contraception in fertility reduction (Anyara and Hinde, 2006). Similar studies in Eastern and Southern Africa show that, "contraceptive prevalence rates for modern methods are above or close to 50 % in only two countries (Zimbabwe and Mauritius) and between 25% and 40% in five countries, namely Madagascar, Malawi and Kenya, Rwanda and Zambia" (Guengant and May, 2011). In the remaining countries, use of modern methods averaged between 10% and 20%". In addition to marriage and contraceptive use, women's exposure to the risk of pregnancy is determined by postpartum behaviour. Postpartum amenorrhoea which is largely determined by the duration and intensity of breastfeeding and postpartum abstinence determine the length of postpartum insusceptibility. Post-partum insusceptibility has an influence in the reduction of fertility (Blanc and Grey, 2000).

Therefore, this study compares the relative effects of marriage patterns, contraceptive use, and postpartum insusceptibility to fertility using the Bongaart's Proximate Determinants on Fertility framework. In addition, the study examines the relative contribution of each index for the reduction of fertility

Hypothesis (1): The increase in contraceptive method use will decrease total fertility rate.

Hypothesis (2): Rural residence index of post-partum infecundability (C_i) will decrease in 2011.

.

3.2. Data and Methods

Data: Ethiopian Demographic and Health Survey (EDHS) 2005 and 2011 were used. From the EDHS 2005, the total number of eligible women was 14070 and the study sample was 8914 (married women). According to the EDHS, 2011, there were 16515 eligible women but the study sample used 9594 (married women).

Methods:

Total fertility rate(TFR) of a population is a function of the total fecundity rate (TF), index of marriage (C_m), index of contraception (C_c), index of postpartum infecundability (C_i), and index of abortion (C_a), the model is expressed as (Bongaarts, 1978 and 1982).

$$TFR = C_m \times C_c \times C_i \times C_a \times TF \quad \text{(i)}$$

Where TFR is total fertility rate, TF is the total fecundity rate; C_m, C_c, C_i and C_a are indices measuring the fertility inhibiting effect of marriage, contraception, postpartum infecundability and abortion respectively. The value of each of these four indices ranges from 0 and 1. The index takes the value 0 when the fertility inhibition of the given intermediate fertility variable is complete and equal to 1 when there is no fertility inhibition effect. These indices are estimated as:

C_m = TFR/TMR; where, TMR = Total marital fertility rate. (ii)

$C_c = 1 - \alpha (u * e)$. (iii)

(iii)

Where, α is an adjustment for the couple having not using contraceptive method, Bongaarts (1978) estimated the constant as 1.08.

u = Average proportion of married women currently using contraception.

e = Use-effectiveness of contraceptive methods.

C_i= Birth interval in absence of breastfeeding/ Birth interval in presence of postpartum non-susceptible period caused due to breastfeeding.

$$C_i = \frac{20}{18.5+i}, \quad \text{(iv)}$$

C_a = TFR / {TFR + 0.4 (1+u) TA}, where TA is total abortion rate (v)

Bongaarts (1978) recognized relationship exists between the three cumulative fertility rates: total fertility rate (TFR), total marital rate (TM) and total natural marital fertility Rate (TN).

The basic relations between these indices and the cumulative fertility measures are:

Total Fertility Rate (TFR) = C_m *TM; (vi)

Total Marital Rate (TM) = C_c *C_a *TN; (vii)

Total Natural Marital Fertility Rate (TN) = C_i *TF (viii)

Operational definition

Age specific fertility rate (ASFR)

Number of births per year per 1000 women of a specific age (group). It is calculated as

$$\frac{\text{Number of births to women age } a}{\text{Number of women age } a} \times 1000$$ (Hopkins Public Health, 2006).

Total fertility rate (TFR)

The average number of children that would be born to a woman by the time she ended childbearing if she were to pass through all her childbearing years conforming to the age-specific fertility rates of a given year.It is also defined as the sum of the age-specific fertility rates (5-year age groups between 15 and 49) for female residents of a specified geographic area (nation, state, county, etc.) during a specified time period (usually a calendar year) multiplied by 5. Please note that this rate estimates the number of children a hypothetical cohort of 1,000 females in the specified population would bear if they all went through their childbearing years experiencing the same age-specific birth rates for a specified time period (United Nations, department of Economic and Social Affairs, 2008;United Nations data,

2010). Calculation: 5(∑ASFR) /1000, where ASFR is each five-year age-specific fertility rate.

Total fecundity rate

Fecundity is the capacity to reproduce; fertility, on the other hand, is the actual reproductive performance. Total fecundity rate is equal to the total natural marital fertility rate in the absence of lactation (Bongaarts, 1978).

3.3 Results

This section consists of two analysis findings, the first one constitutes of *the four main indices of fertility model and second part computes the inhabiting effect of the each four proximate determinants on fertility.*

Index of marriage

The index of marriage, C_m, (i.e. exposure to reproductive risk), would equal 1 if all women at reproductive risk were married and 0 in the total absence of intercourse. It is the weighed (by age- specific marital fertility rates) averages of the age-specific proportions of currently married women as follows:

$$C_m = \frac{\sum m(a) * g(a)}{\sum g(a)}$$

Where m (*a*) =age-specific proportion of currently married women and g(*a*)=age-specific marital fertility rates. The index Cm gives the proportion by which TFR is smaller than TM as the result of non-marriage; Cm =0 if nobody is married and Cm =1 if all women are married during the entire reproductive period. The index of marriage is intended to express the reduction in fertility caused by women not being sexually active throughout their entire reproductive period. able one presents the age-specific proportion of currently married women, age-specific marital fertility rates, and age-specific fertility rates of all women based on the types of place of residence.

Table 1 Estimated Index of marriage by place of residence in Ethiopia 2011

		Urban	
Age group	**m(a)**	**ASFR**	**g(a)**
15-19	0.044	27	613.6364
20-24	0.191	123	643.9791
25-29	0.288	158	548.6111
30-34	0.189	101	534.3915
35-39	0.158	75	474.6835
40-44	0.078	21	269.2308
45-49	0.052	22	423.077
Total		**527**	**3507.609**
		Rural	
Age group	**m(a)**	**ASFR**	**g(a)**
15-19	0.077	99	1285.714
20-24	0.176	236	1340.909
25-29	0.255	262	1027.451
30-34	0.175	218	1245.714
35-39	0.159	171	1075.472
40-44	0.095	77	810.5263
45-49	0.063	29	460.3175
Total		**1092**	**7246.104**

Source: Computed by the authors from 2011 EDHS,m(a) =age-specific proportion of currently married women, ASFR is age specific fertility rate

Urban

ASFR(a)=m(a)*g(a),$\sum ASFR(a) = 527$, TFR =2.635, g(a)= $5\frac{3202.812}{1000}$=5(3.507)=17.54,

Cm=$5\frac{TFR}{g(a)}$=$5\frac{2.635}{17.54}$=0.75

Thus, the urban index of marriage is 0.75

Therefore, from the relationship TFR = Cm * TM, the **TM = TFR/ Cm=2.635/0.75=3.51.**

Rural

ASFR (a) = m (a)*g(a),$\sum ASFR(a)$ =1092, TFR=5.46, g(a)=$5\frac{7246.104}{1000}$=5(7.246)=36.23,

C_m=$5\frac{TFR}{g(a)}$=$5\frac{5.46}{36.23}$=5(0.15)=0.75. Thus, the urban index of marriage is 0.75.

Hence, **TM = TFR/Cm=5.46/0.75=7.30**, TM is the total marital fertility rate.

Index of contraception

Index of contraception, Cc, would be equal 1 in the absence of contraceptive use (e.g. natural fertility populations) and 0 if all women at reproductive risk employed completely effective contraception. This index takes into account both the prevalence and use-effectiveness of contraceptive practices employed by those at reproductive risk and is calculated by:

Cc = 1-1.08 x e x u, where:

u is the average proportion of married women currently using contraception(including abstinence; male methods and sterilization)

e is the average contraceptive effectiveness;

1.08 is a sterility correction factor.

Since estimates of contraceptive effectiveness are problematic to obtain and thus not often available, the table 2 shows the standard method-specific values (adapted from data from the Philippines) which are used in the calculation of average effectiveness levels in developing countries (Bongaarts, 1982).

Table 2Estimated use of effectiveness by contraceptive method for developing countries

Method	Estimated use effectiveness
Sterilization	1.00
IUD	0.95
Pill	0.90
Other	0.70

Source: Bongaarts, 1982

The average use-effectiveness, **e**, is estimated as the weighted average of the method specific use-effectiveness levels **e(m),** with the weights equal to the proportion of women using a given method u(m). Thus,$\mathbf{e}=\frac{u(m)*e(m)}{e(m)}$.

Urban

$$e=\frac{u(m)*e(m)}{e(m)}=\frac{0.46791}{0.493}=0.95,\ u=\sum u(m)=0.95.\ \text{Thus, } C_c=1-1.08*u*e=1-0.506=0.5$$

Rural

$$e=\frac{u(m)*e(m)}{u(m)}=\frac{0.21114}{0.224}=0.94,\ u=\sum u(m)=0.109.\ \text{Thus, } C_c=1-1.08*u*e=1-0.227=0.77$$

From the relationship $TM=C_c*TNM$, $TNM=TM/C_c$, where, TNM is total natural marital fertility rate TNM (urban)=3.51/0.5=7.02. In addition to this, TNM (rural)=7.30/0.77=9.50

Table 3 presents the average use of contraceptive effectiveness (e) for urban 0.95 and rural 0.94. Comparative results of index of contraception (C_c) for urban 7.02 and rural 9.40.TNM equals to TM in the absence of contraception and induced abortion.

Table3 estimating the index of contraception (2011 EDHS)

		Urban	
Contraceptive Use	**u(m)**	**e(m)**	**u(m)*e(m)**
Sterilization	0.015	1.00	0.015
Injection	0.354	0.99	0.35046
IUD	0.009	0.95	0.00855
Pill	0.067	0.90	0.0603
Other(condom and implant)	0.048	0.70	0.0336
Total	**0.493**		**0.46791**
		Rural	
Contraceptive Use	**u(m)**	**e(m)**	**u(m)*e(m)**
Sterilization	0.002	1.00	0.002
injection	0.176	0.99	0.17424
IUD	0.002	0.95	0.0019
Pill	0.011	0.90	0.0099
Other(condom and implant)	0.033	0.70	0.0231
Total	**0.224**		**0.21114**

*Source: computed from 2011 EDHS. Where CU: Contraceptive use,*U(m): weighted the proportion of women using a given method e(m): the weighted average of the method specific use-effectiveness levels

From the relationship TNM = Ci * TF; where TF is fecundity rate

Urban, $TF=TNM/C_i=7.02/0.56=12.54$ and Rural, $TF=TNM/C_i=9.50/0.55=17.30$

As we have shown from above table (3) both sterilization and IUD contraceptive method use were very low comparing to other modern contraceptive use such as injection, pill and condom.

Index of post-partum infecundability

The index of post-partum infecundability, C_i, would equal 1 in the absence of post-partum amenorrhea (and post-partum abstinence) and 0 if the duration of post-partum infecundability were to continue indefinitely.

An estimate of the index of the post-partum infecundability is calculated as follows

$C_i=\frac{20}{(18.5+i)}$, where i =average duration of post-partum infecundability caused by breast feeding(lactation amenorrhea) and or and post-partum abstinence

$i=1.753*e^{0.1396*B-0.001872*B^2}$, where, B is the duration of breast feeding.

Breast feeding duration, Urban=24.3 and Rural=25.3(EDHS, 2011). Substituting the values in the place of B we will get the Post-partum infecundability (i) in Urban=17.26 and Rural =18.08

$$\text{Urban, } C_i=\frac{20}{18.5+17.26}=0.56, \text{ Rural, } C_i=\frac{20}{18.5+18.08}=0.55$$

Index of induced abortion

The index of induced abortion, C_a, would equal 1 in the absence of induced abortion and 0 if all pregnancies were interrupted by induced abortion. The index is calculated as follows

$$C_a=\frac{TFR}{TFR+0.4(1+u)*TA},$$

Where

TFR=an estimate of the total fertility rate, TA=total abortion rate, equal to the average number of induced abortions per women at the end of the reproduction period if induced abortion rates remain at prevailing levels throughout the reproductive period, and U=proportion women using contraception.

In Ethiopia induced abortion was difficult to establish due to the data was not well recorded as wells minimally available. Furthermore, the quality of data did not permit a valid estimate of TA; the index of induced abortion is taken to be 1 in each of urban and rural residence of women in both 2005 and 2011.

Estimation of Total Fertility

The total fertility rate is estimated from the indices according to the Bongaarts model:

$$TFR = 15.3 \times C_m \times C_c \times C_a \times C_i$$

The TF values of most populations fall within the range of 13 to 17 births per woman, with an average of 15.3.

The same procedure is performed to find the four main indices for proximate determinants in 2005.The computed results are shown below in (Table 4)

Table 4 Estimates of four important proximate determinants and the cumulative fertility rates in 2005 and 2011

Index estimate and fertility	EDHS 2005		EDHS 2011	
	Urban	Rural	Urban	Rural
C_m, index of married	0.58	0.64	0.75	0.75
C_i, Index of post-partum infecundability	0.55	0.58	0.56	0.55
C_c, Contraception Index	0.57	0.89	0.50	0.77
C_a, index of induced abortion	1.00	1.00	1.00	1.00
TM, Total marital fertility rate	4.14	9.40	3.51	7.30
TNM, Total natural fertility rate	7.26	10.56	7.02	9.50
TF, Total fecundity	13.2	18.20	12.54	17.30
TFR Model	2.78	5.05	3.21	5.01
TFR, Total fertility rate from report	2.4	6.00	2.63	5.46

Source: Computed by the authors from 2005 and 2011 EDHS

In 2005, C_i had the lowest value of all the indices of fertility in both urban and rural areas with 0.55 and 0.58 respectively. Whereas, the corresponding value for total fecundity (TF) in both urban and rural areas was 13.2 and 18.2 in 2005. In 2011, C_c had the lowest value of all the indices of fertility in urban areas with a value of 0.50, but the C_i for rural women had a value of 0.55.

The relative contribution accounted for by each proximate fertility determinants by birth per women

The Table 5 exhibits the magnitude of the total inhibiting effect being accounted by each proximate fertility determinant at two points in time. The differences between the total fecundity (TF) and the estimated TFR are attributed as the result of the inhibiting effect of each determinant. The total inhibiting effect is prorated by the proportion of the logarithm of each index to the sum of logarithm of all indices (Wang, et.al, 1987).

Inhabiting effect of each index by place of residence in 2005

Urban

The fertility inhibiting effect of marriage is obtained as:

[TF-TFR (estimated)] x log C_m / (log C_m + log C_c + log C_a + log C_i).

$$= (13.2\text{-}2.4)*\frac{log0.58}{log0.58+log0.57+log0.55}=3.45$$

The fertility inhibiting effect of contraception is obtained as:

[TF-TFR (estimated)] x log C_c / (log C_m + log C_c + log C_i).

$$= (13.2\text{-}2.4)*\frac{log0.57}{log0.58+log0.57+log0.55}=3.56$$

The fertility inhibiting effect of lactational infecundability is obtained as:

[TF-TFR (estimated)] x log C_i / (log C_m + log C_c + log C_i).

$$= (13.2\text{-}2.4)*\frac{log0.55}{log0.58+log0.57+log0.55}=3.80$$

Rural

The fertility inhibiting effect of marriage is obtained as:

[TF-TFR (estimated)] x log Cm / (log Cm + log Cc + log Ci).

$$= (18.20\text{-}6.00)*\frac{log0.64}{log0.64+log0.89+log0.55}=4.70$$

The fertility inhibiting effect of contraception is obtained as:

[TF-TFR (estimated)] x log Cc / (log Cm + log Cc + log Ci).

$$= (18.20\text{-}6.00)*\frac{log0.89}{log0.64+log0.89+log0.55}=1.22$$

The fertility inhibiting effect of lactational infecundability is obtained as:

[TF-TFR (estimated)] x log Ci / (log Cm + log Cc + log Ci).

$$= (18.20\text{-}6.00)*\frac{log0.58}{log0.64+log0.89+log0.55}=5.73$$

Inhabiting effect of each index by place of residence in 2011

Urban

The fertility inhibiting effect of marriage is obtained as:

[TF-TFR (estimated)] x log Cm / (log Cm + log Cc + log Ca + log Ci).

$$= (7.02-2.64)*\frac{log0.75}{log0.75+log0.50+log1+log0.56}=0.81$$

The fertility inhibiting effect of contraception is obtained as:

[TF-TFR (estimated)] x log Cc / (log Cm + log Cc + log Ca + log Ci).

$$= (7.02-2.64)*\frac{log0.50}{log0.75+log0.50+log1+log0.56} =1.95$$

The fertility inhibiting effect of lactational infecundability is obtained as:

[TF-TFR (estimated)] x log Ci / (log Cm + log Cc + log Ca + log Ci).

$$= (7.02-2.64)*\frac{log0.56}{log0.75+log0.50+log1+log0.56} =1.63$$

Rural

The fertility inhibiting effect of marriage is obtained as:

[TF-TFR (estimated)] x log Cm / (log Cm + log Cc + log Ca + log Ci).

$$= [17.30-5.46]*\frac{log0.75}{log0.75+log0.77+log0.55+log1} =3.00$$

The fertility inhibiting effect of contraception is obtained as:

[TF-TFR (estimated)] x log Cc / (log Cm + log Cc + log Ca + log Ci).

$$= [17.30-5.46]*\frac{log0.77}{log0.75+log0.77+log1+log0.55}= 2.70$$

The fertility inhibiting effect of lactational infecundability is obtained as:

[TF-TFR (estimated)] x log Ci / (log Cm + log Cc + log Ca + log Ci).

$$= [17.30-5.46]*\frac{log0.55}{log0.75+log0.77+log1+log0.55}= 6.17$$

Relative contribution of each proximate determinant by percentage

To measure the magnitude of the total inhibiting effect being accounted for by each of the proximate determinants of fertility is by simple decomposition of the difference between observed and potential fertility. To obtain the inhibiting effect of each proximate the basic

Bongaarts model is transformed thus: ln(TF) – ln(TFR) = ln(Ci) + ln(Cc) + ln(Cm), where ln denotes the natural log transformation. The proportional contribution of each determinant to the reduction of fertility from the TF to the TFR is given by the following formula:

$C_c = \frac{100ln(C_c)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)}$ (% reduction of C_c)

$C_m = \frac{100ln(C_m)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)}$ (% reduction of C_m)

$C_i = \frac{100ln(C_i)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)}$ (% reduction of C_i)

$C_a = \frac{100ln(C_a)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)}$ (% reduction of C_a)

The percentage contributions of other determinants can be computed thus. This percentage standardizes the result (Odimegwu and Zerai, 1996). Using the formula bellow, the percentage reductions by the four proximate determinants are computed bellow.

Relative contribution of each index for the reduction of fertility by percentage between urban and rural in 2005

Urban

$C_m = \frac{100ln(C_m)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)} = \frac{100ln0.58}{ln0.57+\ln0.55+ln0.58+\ln1} = 32$

$C_c = \frac{100ln(C_c)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)} = \frac{100ln0.57}{ln0.57+ln0.58+l0n0.55+ln1} = 33$

$C_i = \frac{100ln(C_i)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)} = \frac{100ln0.55}{ln0.57+ln0.58+ln0.55+ln1} = 35$

Rural

$C_m = \frac{100ln(C_m)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)} = \frac{100ln0.64}{ln0.64+\ln0.89+ln0.58+\ln1} = 40.30$

$C_c = \frac{100ln(C_c)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)} = \frac{100ln0.89}{ln0.89+ln0.58+ln0.64+ln1} = 10.50$

$C_i = \frac{100ln(C_i)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)} = \frac{100ln0.58}{ln0.89+ln0.58+ln0.64+ln1} = 49.20$

Relative contribution of each index for the reduction (inhabiting) of fertility by percentage between urban and rural in 2011

Urban

$$C_m = \frac{100ln(C_m)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)} = \frac{100ln0.75}{ln0.50+ln0.56+ln0.75+ln1} = 18.43$$

$$C_c = \frac{100ln(C_c)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)} = \frac{100ln0.50}{ln0.50+ln0.56+ln0.75+ln1} = 44.41$$

$$C_i = \frac{100ln(C_i)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)} = \frac{100ln0.56}{ln0.50+ln0.56+ln0.75+ln1} = 37.15$$

Rural

$$C_m = \frac{100ln(C_m)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)} = \frac{100ln0.75}{ln0.77+\ln0.55+ln0.75+\ln1} = 25.08$$

$$C_c = \frac{100ln(C_c)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)} = \frac{100ln0.77}{ln0.77+ln0.55+ln0.75+ln1} = 22.80$$

$$C_i = \frac{100ln(C_i)}{ln(C_c)+\ln(C_i)+ln(C_m)+\ln(C_a)} = \frac{100ln0.55}{ln0.77+ln0.55+ln0.75+ln1} = 52.12$$

Table 5 Total inhibiting effects accounted for by each proximate fertility determinant in rural and urban women of Ethiopia in both 2005 and 2011.

Proximate determinants	Fertility inhibiting effects (EDHS2005) (Birth per women)		%	
	Urban	**Rural**	**Urban**	**Rural**
C_m, Proportion Marriage	3.45	4.70	32.00	40.30
C_c, Index of Contraception	3.56	1.22	33.00	10.50
C_i, index of post-partum infecundity	3.80	5.73	35.00	49.20
Total: TF-TFR (estimated)	**10.81**	**11.65**	**100.00**	**100.00**
Fertility inhibiting effects (EDHS2011)				
C_m, Proportion Marriage	0.81	3.00	18.43	25.08
C_c, Index of Contraception	1.95	2.70	44.41	22.80
C_i, index of post-partum infecundability	1.63	6.17	37.15	52.12
Total: TF-TFR (estimated)	**4.40**	**11.87**	**100.00**	**100.00**

Source: Computed by the authors from 2005 and 2011 EDHS

As we can see from table 5 above, index of marriage in urban and rural areas have played for the reduction of fertility 32% and 40.30% respectively in 2005. Instead of increasing, the inhibiting effect of index of marriage in both urban and rural areas has declined from 32% to 18.43% and 40.30% to 25.08% in 2011 respectively.

Decomposition of change in TFR during the period 2005-2011:

The contribution made by each of the proximate determinants of fertility to an observed change in fertility between two points of time can be quantified by using the decomposition equation:

TFR (2011)/TFR (2005) = C_m (2011)/C_m (2005) + C_i(2011)/C_i (2005) + C_a (2011)/C_a (2005) + C_c (2011)/C_c (2005) + TF (2011)/TF (2005).

Pf = Pm + Pi + Pa + Pc + Pt + I

Where, Pf = [TFR (2011)/TFR (2005)] – 1= Proportional change in TFR between 2005 and 2011.

Pm = [C_m (2011)/C_m (2005)] – 1= Proportional change in TFR between 2005 and 2011 due to change in marriage.

Pc = [C_c (2011)/C_c (2005)] – 1= Proportional change in TFR between 2005 and 2011 due to change in contraception.

Pi = [C_i(2011)/C_i (2005)] – 1 = Proportional change in TFR between 2005 and 2011 due to change in postpartum infecundability.

Pa = [C_a (2011)/C_a (2005)] – 1 = Proportional change in TFR between 2005 and 2011 due to change in induced abortion.

Pt = [TF (2011)/TF (2005)] – 1 = Proportional change in TFR between 2005 and 2011 due to change in total fecundity rate.

The interaction factor *I* can be easily obtained by subtracting the sum of Pm, Pi, Pa, Pc and Pr from Pf. The decomposition equation simply yields the proportional change in TFR between two points of times, which equals the sum of the proportional change of the proximate determinants, and an interaction term.

The absolute change in TFR can be estimated by reusing the decomposition equation as [TFR (2011) - TFR (2005)] x TFR (2005) i.e. [TFR (2011) - TFR (2005)] = TFR (2005) x [Pm + Pi + Pa + Pc + Pr + I].

Table 6 Decomposition of change in TFR between 2005 and 2011 by place of residence

Factor responsible for fertility change	% of change in TFR		Distribution of % of change in TFR	
	Urban	Rural	Urban	Rural
Proportion of Women marriage (Pm)	29.31	17.20	299.08	-191.11
Contraception Practices (Pc)	-12.28	-13.48	-125.30	149.78
Duration of post-partum infecundability (Pi)	1.82	-5.17	18.57	57.44
Other Proximate determinants (Pt)	-5.00	28.80	-51.00	-320
Interaction (I)	-4.05	-36.35	-41.33	403.89
Total	**9.80**	**-9.00%**	**100.00**	**100.00**

Source: Computed by the authors from 2005 and 2011 EDHS.

A comparison of results between 2005 and 2011

The two indices such as C_c and C_i have dropped in 2011 and C_m has increased in both urban and rural residence. On the other, the percentage of fertility inhibiting effects for Cc and Ci in urban areas has increased from 33% to 44.41% and 35% to 37.15% respectively in 2011. Likewise, the percentage of fertility inhibiting effects on Cc and C_i in rural areas has increased from 10.50% to 22.80% and 49.20% to 52.12% respectively in 2011.

3.4 Discussion

In 2005, the index of married women in urban areas was lower than in rural areas with values of 0.58 and 0.64, rural respectively. Whereas, in 2011, the index of proportions married was unfortunately the same in urban and rural areas with values for Cm of 0.75. This may be due

to cultural factors in both urban and rural areas which contributed the same proportions. There was a considerable variation in the index of contraception between urban and rural areas; in 2005 the index of contraception was recorded by the higher inhibiting effect of fertility for urban women compared with rural women, whereas in 2011 the index of contraception was registered by the highest inhibiting effect of fertility for rural women than that of urban women. There was little variation in Ci, the index of postpartum infecundability.

In both 2005 and 2011 the index of postpartum infecundability was recognized by greatest fertility reduction effect compared with the index of contraception and index of marriage in rural residence. In addition to this, rural women reported highest durations of breastfeeding. Postpartum abstinence produces a reduction in the natural fertility level, with TN varying from 9.50 among the rural (with the highest i) women to 7.02 among the urban (with the lowest i) in 2011.

Contraceptive use yields a reduction in the total marital fertility rate. Even though the contraceptive use increased from 2005 to 2011 in urban areas, the total fertility rate has increased from 2.4 to 2.6 in 2011. Thus, **hypothesis (1)** the increasing contraceptive method use will decrease the total fertility rate (to be true) it should be modified as this form: the increasing contraceptive method use will decrease total fertility rate if other three indices of proximate determinants (C_i, C_m and C**a**) are fixed or decreasing. On the other hand, **Hypothesis 2** is accepted. Increasing contraceptive (decreasing C_c) use leads us to further reduction 1.95 births in urban areas and 2.70 births in rural areas in 2011. Whereas, in 2005 contraceptive use was contributing towards the reduction of fertility with 3.56 births in urban areas and 1.22 births in rural areas. This combines the impact of all the proximate fertility variables. In 2011, fertility (estimated by the model) in rural women was closer with the actual value than those of urban women.

3.5 Conclusion

This paper has tried to explore the contribution of the four main proximate determinants to fertility differentials in Ethiopia between the two periods of 2005 and 2011. The index of contraception (Cc) for urban and rural has dropped from 0.57 to 0.50 and 0.89 to 0.77 in respectively in 2011. Likewise, the index of post-partum infecundability for urban and rural areas has dropped slightly from 0.55 to 0.56 and from 0.58 and 0.55 respectively in 2011. But, index of marriage (Cm) has been increased for both urban and rural 0.58 to 0.75 and 0.64 to 0.75 respectively in 2011. The more the four indices of proximate determinants are lower, the more the fertility will be reduced. The findings have shown that two index of proximate determinants such as C_c and C_i have been improved in 2011. The index of marriage has not been improved and this means that if more people in both urban and rural areas are getting married at early age, the probability having children in life time will be increased. The researcher suggests that the Ethiopian government, the international NGO's and policy-makers have to give attention to increase the prevalence of contraceptive use and to educate the society not to allow their children get married at an early age. The new policy should be formulated to focus on women's contraceptive use and on teaching about the risks of child marriage.

3.6. References

Adugna, A , 2014. ORG. *Development and cultural change*, 211-235. WWW. ETHIODEMOGRAPHYANDHEALTH.

Anyara, E. L., &Hinde, A. (2006). Fertility transition in Kenya: a regional analysis of the proximate determinants. Southampton, UK, Southampton Statistical Sciences. Research Institute, 55pp. (S3RI Applications and Policy Working Papers, (A06/03).

Blanc, A. K., & Grey, S. (2000). Greater than expected fertility decline in Ghana: an examination of the evidence. Calverton, Maryland, Macro International, MEASURE DHS+, 2000 Aug. 23 p.

Bongaarts, J. (1978). A framework for analyzing the proximate determinants of fertility. Population and Development Review, 105-132.

Bongaarts, J. (1982). The fertility-inhibiting effects of the intermediate fertility variables. Studies in Family Planning, 179-189.

Bongaarts, J., and R. G. Potter. 1983. Fertility, Biology, and Behavior: An Analysis of the Proximate Determinants, New York: Academic Press.

Bongaarts, J., Frank, O., &Lesthaeghe, R. (1984). The proximate determinants of fertility in sub-Saharan Africa. Population and Development Review, 511-537.

CSA-Ethiopia, I. C. F. (2012). International: Ethiopia Demographic and Health Survey 2011. Central Statistical Agency of Ethiopia and ICF International Addis Ababa, Ethiopia and Calverton, Maryland, USA available at: http://www. measuredhscom/publications/publication-fr255-dhs-final-reports.cfm (accessed 25 June 2013).

Davis, K. and J. Blake (1956). Social Structure and Fertility: An Analytic Framework. Economic Development and Cultural Change 4 (4): 112-135.

Falls, J.A. (2007). Population a Lively Introduction. Population Reference Bureau. Washington, DC.

Guengant, J. P., & May, J. F. (2011). Proximate Determinants of Fertility in Sub-Saharan Africa and Their Possible Use in Fertility Projections, United Nations. Department of Economic and Social Affairs, Population Division.

Hailemariam, A. (1992). An overview of the determinants of high fertility in Ethiopia. Ethiopian Journal of Development Research, 14(2), 1-30.

Johns Hopkins Bloomberg School of Public Health 2006.

Odimegwu CO and Zerai A. 1996. Understanding the Proximate determinants of fertility of a Nigerian Ethnic Group. Genus , Vol.52, No. 3/4 67-87 http://www.jstor.org/stable/29789250 Accessed 28th February 2012.

Teller, C. (Ed.). (2011). The Demographic Transition and Development in Africa, Springer Science+ Business Media BV.

United Nations, Department of Economic and Social Affairs, Population Division. World Fertility Data 2008.

U.N. (2010). United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2010 Revision, New York, 2011. Accessed January, 3, 2012.

Wang, S. X., Yu-De Chen, Charles H. C., Chen R. W. Rochat, L. P. Chow and R. V. Rider (1987). Proximate determinants of fertility and policy implications in Beijing. Studies in Family Planning, Vi. 18, pp. 222-28.

CHAPTER IV

Determinants of modern contraceptive use in Ethiopia: based on EDHS 2005 and 2011

[1]YISHAK ABRAHAM LAILULO AND A. SATHIYA SUSUMAN

[1]*Department of Statistics and Population Studies, Faculty of Natural Sciences, University of the Western Cape, 7535 Bellville, Cape Town South Africa;*
Email: sappunni@uwc.ac.za

Abstract

This study aimed to compare the effects of the determinants of modern contraceptive use among married women between 2005 and 2011 in Ethiopia. Data was obtained from the Ethiopia Demographic and Health Survey (EDHS) 2005 and 2011. Bivariate and generalized linear models (binary logistic regression) were used to determine the relative contribution of the predictor variables. The odds of modern contraceptive use for women with Orthodox and Protestant religious affiliations have increased from 2.3 to 11.2 and 1.4 to 10.3 in 2005 and 2011, respectively. In both surveys holding other independent variables constant, women with three to four living children were less likely to use modern contraceptives than women who had five or more children. A woman's religious affiliation, the number of her living children and her socioeconomic status affected modern contraceptive use methods, which increased in 2011.

Keywords: Family planning methods, Contraceptive use, Religion, Living children

4.1. Introduction

Over the past two decades, the total fertility rate (TFR) of Ethiopia witnessed a rapid reduction from 6.4 in 1990 to 5.4 children per women in 2005 (Central Statistical Agency (CSA), 2005), a result of the introduction of contraceptive use. The prevalence rate in most African countries was estimated to be less than 15% by 1990, except in Zimbabwe, Botswana, South Africa and Kenya, where the prevalence was high (Rutenberg et al., 1991;

Ngom et al., 2005). In Tanzania, the contraceptive prevalence rate doubled from 10% in 1991/92 to 20% in 1994 (Mturi, 1996). In many African societies, the main reason for using contraceptives is birth spacing rather than limiting fertility. Recent demographic and health surveys (DHS) conducted in sub-Saharan Africa have shown an increase in contraceptive prevalence rates in various countries (World Population Data Sheet, 2016). The Population Reference Bureau (2004) also indicates that modern contraceptive use methods account for a large proportion of current contraceptive use, especially in the less developed regions where the methods constitute 90% of contraceptive use. The three most popular methods of contraceptives among married women are female sterilization, intrauterine device (IUD) and the birth control pill, with prevalence levels of 21%, 14% and 7%, respectively (PRB 2004).

According to the Ethiopian Demographic and Health Survey 2011, the prevalence rate of modern contraceptive use is about 27% (Central Statistical Agency (CSA, 2012), which is still very low when compared to the national population of the country. Furthermore, this is mainly in urban areas, and it is even lower among the rural population. The situation also varies from the regional perspective, as Addis Ababa, Dire Dawa, Tigray and Amhara contributed more. In the case of the Southern Nations Nationalities People's Region (SNNPR), the annual population growth rate is slightly higher (2.9%) than the national rate (2.7%) (CSA, 2012). Total fertility rate for the regions is 4.9, with an infant mortality rate of 85 per 1000 live births, and an under 5 mortality rate of 145 per 1000 live births. Maternal Mortality Ratio (MMR) in the five (Addis Ababa, Dire Dawa, Tigray and Amhara contributed more. In the case of the Southern Nations Nationalities People's Region) regions are 673/100,000. The child mortality rate is 50 deaths per 1,000 live births, with a Crude Birth Rate (CBR) of 35.7 births per 1,000 populations and a crude death rate of 13.2 deaths per year per 1,000 populations. However, the contraceptive prevalence rate (CPR) of the region is 25.8% and the unmet need for family planning is 25% (CSA, 2012).

4.2. Theoretical framework and literature review

The modern family planning movement began in the early 20th century, with a primary purpose to liberate women from the social and health consequences of unwanted pregnancies. The theoretical framework presented in this chapter is based on research and literature concerned with young women and family planning. The framework is an integration of the

intermediate determinants' framework proposed by Davis and Blake (1956). Demographic factors may shape a woman's desire to make use of services (for example, married women may have more modern attitudes towards health care), and the socio-economic status of an individual and her household determines her economic ability to do so. The determinants of reproductive health- service use have been found to be most consistent with a woman's educational attainment (Magadi et al., 2000). Higher levels of educational attainment result in greater use of sexual and reproductive health services. Both demographic and socio-economic determinants for the use of reproductive health services are mediated by cultural influences on health care-seeking behavior that shapes the way an individual perceives her own health and the available health services (Stephenson & Tsui, 2002).

Several studies have reported that women intended as boy's preference because of the cultural and ritual facts, a woman's age, the number of living sons she has, and her religious affiliation has an effect on contraceptive use. Because of ritual rights and A study carried out in rural West Bengal, India, found that factors with an effect on a woman's use of contraception consist of her age, the number of living sons she has, and her religious affiliation (Chacko, 2001). The number of living children is an important factor affecting the current use of contraception (Ojakaa, 2008). Parents who have experienced a loss of a child may be less likely to use contraceptives than others of the same parity (Adanu et al., 2009). This may arise from the desire to create a substitute for a dead child or to assure against childlessness and contributes to high fertility. In addition, contraceptive use and choice of a modern method depend on the sex of a couple's living children, implying some preference for sons, although women generally prefer to have children of both sexes (Oyedokun, 2007).

On the other hand, religion is one of the most important factors responsible for determining the social and personal behavior of the individual within the family. The relationship between religion and contraceptive behavior has been reported in many studies (Shah et al., 2006; Khan et al., 2007 and Padma et al., 2003). In Malawi, contraceptive use is related to the age of the respondent, with decreasing use of modern contraceptives as women age (Palamuleni, 2013). Palamuleni further found that women residing in urban areas are five times more likely to use contraception than their counterparts in rural areas. A growing number of research studies have been focused on the relationships of the modern contraceptive use methods and its determinants. Jabeen et al., (2011) and Sharma et al., (2012) reported a strong relationship between modern contraceptive use methods among

women and their age groups. They noted that the use of modern contraceptive methods was higher among women in older age groups compared with those of a younger age group.

4.2.1. Demographic Transition on Sub Saharan Africa

Female education is a key determinant of contraceptive use (NPC and ORC Macro 2004). Arbad et al., (2011), Faisal et al., (2013), and Yihunie et al., (2013) found a strong relationship between education and modern contraceptive use methods. Koc (2000) documented in Turkey that both spouses' education levels were positively associated with the use of modern contraceptive methods. After individual, cultural, fertility, and contextual variables were controlled for, a woman's education was found to be a stronger predictor of method use and method choice than that of her husband's education or choices. Women's education also played an important role in relation to contraceptive use, as literate women were more likely to use contraceptives than illiterate women (Khan et al., 2007 and Iyer, 2002). Another study confirmed that the education level of women has an impact on their contraceptive use (Jamie, 2006), because a lower education level is associated with lack of awareness and acceptability of family planning which affect the usage of contraceptives (Helweldery, 2004). On the other hand, the education level is positively and significantly associated with knowledge and adoption of family planning methods. Literacy -- particularly female literacy -- is seen to influence the awareness level and acceptance of family planning methods (Hussain, 2011). The relationship of education and the use of modern contraceptive methods cannot be overemphasized. Bbaale et al (2011) found that women with at least a primary education level were 8-10% more likely to be using contraception methods compared to women with no education. Meanwhile, the relationship was stronger among those women with a secondary education and post-secondary education, since they had a higher probability of using modern contraceptive methods.

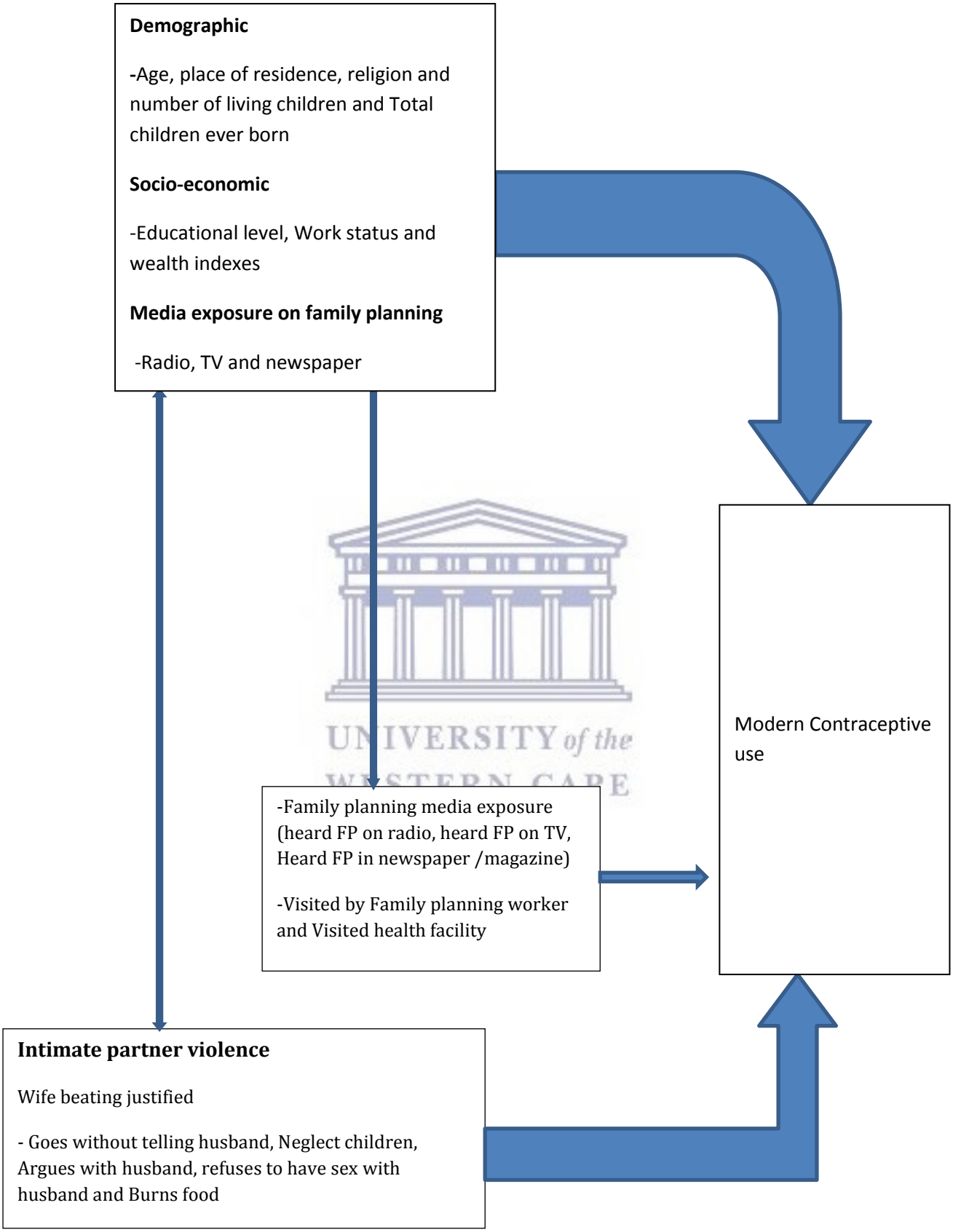
The work status of women has also been linked to knowledge and use of contraceptives. For example, contraceptive use in Malawi is influenced by work status, as women who are not working are less likely to use contraceptives than women who are working (Palamuleni, 2013). The finding is supported by another study where the acceptance rate was highest in the higher income groups (Palamuleni, 2013). The relationship of modern contraceptive use methods among women with higher household income and the highest wealth quintile has been reported. The EDHS (2011) indicates that a strong use relationship for modern contraceptive use methods exists among women who are employed, in

monogamous relationships, attend community conversations in connection with contraceptive use and are visited by a health worker at home. Women with high parity are associated with modern contraceptive use methods (Jabeen et al., 2011), and (Sharma et al., 2012). Sharma observed that modern contraceptive use tended to be lower if a woman was living in a rural area, older, in polygamous relationship, and Muslim.

Socioeconomic status is thus seen to have a definite impact on acceptance of methods of contraception. Promoting family planning on radio or television can be an important means of raising awareness, improving knowledge and stimulating the use of modern contraceptive methods. Kabir and Islam (2000) studied mass media family planning programs and confirmed their effect on contraceptive use in Bangladesh. They found that radio, television and newspapers spread the family planning message in urban areas. Islam and Hassan (2000) identified that radio and television were important sources for family planning information in Bangladesh. They found that people were more likely to use contraceptives when exposed to radio and television family planning messages compare with those who were not exposed to any media. On the other hand, Hossain (2005) found that in Bangladesh field workers' visits about family planning decreased the risk of non-use of contraceptives and reduced the risk of unwanted pregnancies. In addition to this, Palamuleni (2013) found that women who have not visited a health facility are 1.26 times less likely to use contraceptives than those who have visited a health facility.

Intimate partner violence (IPV) is one of the factors associated with women not being able to use or access contraceptives (Silverman et al., 2007; Fanslow et al., 2008; Williams et al., 2008). Sexually active women who did not experience IPV were more likely to regularly use condoms compared with their abused counterparts (Teitelman et al., 2008). Likewise, other studies have shown that women in violent relationships are less likely to use condoms because of increased risk of verbal or emotional abuse (Fanslow et al., 2008).This study will explore the association among demographic, socio-economic, family planning services, media exposure of family planning and intimate partner violence with modern contraceptive method use by married couples between 2005 and 2011.The hypotheses that will be tested in this study are: **H1**: There is a significant, positive association between women's modern contraceptive method use or family planning and socioeconomic levels, family planning services and media exposure. **H2**: Intimate partner violence is negatively associated with modern contraceptive use.

Figure 1 Conceptual framework for the determinants of contraceptive use



Source: Adapted from Davis& Blake (1956)

4.3. Data

This study used data obtained from the EDHS, 2011 and the EDHS 2005 which was downloaded from www.measuredhs.com (permission to do so was granted by ICF Micro International.) The survey produced cross-sectional data based on a nationally representative survey conducted in Ethiopia from September 2010 to January 2011 (CSA, 2011), while the EDHS 2005 took place from November 2004 to January 2005. The survey collected data on different topics from a multistage cluster sample of 17,817 households, and the EDHS 2005 collected data from a sample of 14,500 households (CSA, 2005).

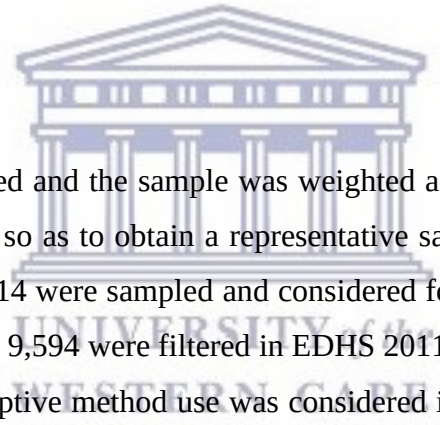
During the survey, regions in Ethiopia were divided into zones, and zones into administrative units known as "weredas". Each unit (weredas) was sub-divided into the lowest administrative unit known as "kebele". The 2011 EDHS sample was selected using a stratified, two-stage cluster design and enumeration areas (EAs) were the sampling units. The sample included 624 EAs, 187 in urban areas and 437 in rural areas. Meanwhile, the 2005 EDHS used a sample of approximately 14,500 households from 540 selected clusters. The sample was selected in two stages. In the first stage, 540 clusters (145 urban and 395 rural) were selected from the list of enumeration areas (EAs) in the 1994 Population and Housing Census sample frame (CSA, 2006).

Within the kebeles, the primary sampling units were the EAs and within each EA, the households were considered the secondary sampling units. A total of 17,817 households were selected for the sample, of which 17,018 were occupied during data collection. Of these, 16,702 were successfully interviewed, yielding a household response rate of 98%. In the EDHS 2005, a total of 14,645 households were selected, of which 13,928 were occupied. The total number of households interviewed was 13,721, yielding a household response rate of 99%. Moreover, a total of 14,717 eligible women were identified in these households and interviews were completed for 14,070 women, yielding a response rate of 96%. The EDHS 2011 was therefore a nationally representative survey of 16, 515 women aged 15-49 and 14, 110 men aged 15-59 years, and the 2005 survey was a nationally representative survey of 14,070 women aged 15-49 and 6,033 men aged 15-59.

The surveys used three structured questionnaires: the household questionnaire, the woman's questionnaire, and the man's questionnaire. The 2007 Population and Housing Census, provided the sampling frame from which the 2011 EDHS sample was drawn; meanwhile, the sample frame for the EDHS 2005 was drawn from the 1994 Population Census. The survey team obtained ethical clearance from the Ethiopian Health Sciences Research Committee, the Institutional Review Board of ICF Micro, and the Centers for Disease Control and Prevention in Atlanta, USA.

Although the number of explanatory variables for both males and females were not the same, the study focuses on those who use modern contraceptive methods. For the current study, contraceptive use described those who reported use of contraceptives: this was defined as 1= Not using modern contraceptive method and 0=Yes, representing those that use modern contraceptives.

4.4. Method



The relevant data was extracted and the sample was weighted according to the design of the EDHS 2011 and EDHS 2005 so as to obtain a representative sample for the study. Out of a sample of 14,070 women, 8,914 were sampled and considered for the EDHS 2005, while out of a sample of 16,515 women, 9,594 were filtered in EDHS 2011 and considered in the study. The variable modern contraceptive method use was considered in the study as the dependent variable. This variable was redefined as 0= Not using modern contraceptive method (to define those who reported not using any modern contraceptive method) and 1= Using modern contraceptive method. Descriptive analysis such as cross-tabulation (bivariate analysis) and the statistical significance of the association between the dependent and categorical variables was tested by Chi-square in order to fulfill the study objectives. This study also purposely included multivariate analysis (generalized linear model), since this model shows accurate and concrete evidence of the relationship of the dependent and independent variables, and makes inferences based on the evidence. In addition, the Fred Arnold sex preference model was also used in the study. Arnold (1986) has derived a method that compares actual contraceptive prevalence among women of each parity and the sex composition of living children with corresponding hypothetical estimates of prevalence derived on the assumption of no effect of sex preference on contraceptive use. If the sex of children is assumed to be of no important, then the couples with varying composition of living children at any parity are

expected to use contraceptive at the same rate as those couples at the same parity who are currently not satisfied with the sex composition of their children. The measure is defined as

$$\frac{\sum C_i * P_i}{\sum P_i},$$

Where C_i equals the maximum contraceptive use rate at parity i, P_i equals the number of persons at parity.

4.4.1. Generalized linear model

A generalized linear model was performed for this analysis. This model found by McCullagh and Nelder in 1989 also includes non-normal errors such as binomial, Poisson, and Gamma errors. Regression parameters are estimated using maximum likelihood. The response from the model could be in the form of scale, counts, binary, or events-in-trials, while factors are assumed to be categorical. The covariates, scale weight, and offset are assumed to be scale. Cases are assumed to be independent observations. Modern contraceptive uses are two possible values. The variable of interest in a demographic health survey is contraceptive use by type. The response was further coded as dummy variable 0 "not use modern contraceptive" and 1 "use modern contraceptive". All the factors (independent variables) were categorical. Thus, a binary logistic regression type of mode is appropriate for this study. The main objective is to investigate the relationship between the response probability $\pi = \pi(x)$ and the explanatory variables $x_1,\ldots,x_n$.

Link function (the function, g (·) that "links" the systematic component to the random Component)

$$g(\pi_i) = x_i{}^t\beta = \ln\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_p x_{ip}$$

We would have the canonical link of a Bernoulli/binomial distribution

Recall, the function

$g(\pi_i) = \ln\left(\frac{\pi_i}{1-\pi_i}\right)$ was called the logit or 'log odds'

4.4.2. Dependent and independent variables description

Multivariate analysis	
Dependent variables	
Modern contraceptive method use	Dichotomous categories: 0=Not modern contraceptive use 1=Modern contraceptive use
Independent variables	
Demographic variables	
Age of respondent	Classified in to seven categories: 15-19, 20-24, 25-29,30-34 35-39, 40-44 and 45-49
Place of residence	Classified in to dichotomous categories: Urban, Rural
Religion	Classified in to six categories: Orthodox ,Catholic, Protestant , Muslim , Traditional and Others
Number of living children	Categorized in to six categories :0=zero child, 1= one child , 2=two children, 3= three children, 4= four children and 5=five and More children
Total number of children ever born	Categorized in to six categories :0=zero child, 1= one child , 2=two children, 3= three children, 4= four children and 5=five and More children
Socioeconomic variables	
Educational level	Classified into five categories : 0= No education, 1= primary education , 2= secondary education and 3= higher education
working for the last 12 months	Categorized in to two categories : 0 =not working and 1=working
Wealth index	Classified into five categories : 1= Poorest, 2= poorer, 3= middle , 4= richer and 5= richest.
Family Planning service	
visited by family planning worker	Categorized in to two categories: 0=No and 1=yes
Visit health facility	Categorized in to two categories: 0=No and 1=yes
Media exposure on family planning	
Heard family planning on Radio	Classified in to two categories: 0=No and 1=yes
Heard family planning on TV	Classified in to two categories: 0=No and 1=yes
Heard Family planning in News paper	Classified in to two categories: 0=No and 1=yes
Intimate partner Violence	
Beating justified	
Goes without telling husband	Categorized in to two categories: 0=No and 1=yes
neglect children	Categorized in to two categories: 0=No and 1=yes
Argue with husband	Categorized in to two categories: 0=No and 1=yes
Refuses to have sex with husband	Categorized in to two categories: 0=No and 1=yes
Burn food	Categorized in to two categories: 0=No and 1=yes

4.5. Results

The results (as shown on **Table 1**) present the percentage distribution of currently married women and modern contraceptive use by demographic characteristics. As indicated, in 2005 women who reported use of modern contraception, majority was aged 25-29 years (about 24%), residing in the rural area (about 95%), and from the orthodox (about 43%) and Muslim (33.3%) religion affiliation. Moreover, about 32% had five and more number of living children, and a total number of children ever born of five and more. Within the same year (2005), those who reported use of modern contraceptive were highest among the age group of 20-24 years, and the minority was among those aged 45-49 years. However, majority were in the rural area (77.1%), and mostly from the orthodox (59.2%) religion, with a five and more

number of living children (35.2%). Moreover, 43% had five and more number of children ever born. In 2011, among women who reported not using modern method of contraceptives, majority (about 27%) was recorded among the age group 25-29 years, followed by those aged 30-34 years (16.3%), then 35-39 years (15.1%). About 90% of the women were in the rural area, and were from the Muslim (about 35%) and the protestant (23.3%) religion. Majority (33.3%) had five and more number of living children, followed by those with one to two (about 29%), then three to four (about 28%). The highest number of children ever born was recorded by those with five and more (42%), followed by those with three to four.

For those who reported use of modern contraceptives, 27.4% were aged 25-29 years, followed by about 20% who were within the age group 20-24 years, then 19.4% aged 30-34 years. More than half of them were in the rural area (70%), with 53.5% from the orthodox religion, followed by protestant (24.3%) then Muslim (about 21%). Moreover, majority had one to two number of living children (37%), followed by those with three to four children (about 30%), then five and more (26%). Those with total number of children ever born of one to two (34%), five and more (32.2%), followed by those with three to four (about 30%) recorded the highest rate of modern contraceptive use. The results indicate that, women who did not use modern contraceptive method have dropped for orthodox religious affiliation from 59.2 to 39 Percent in 2011. Moreover, as the number of living children increases, the percentage of women using modern contraceptive methods also increases except for women who got three to four living children in 2005. Likewise, as the total children ever born increases, the percentage of women using modern contraceptive method increases except for women who got three to four living children in 2005. **Table 2** shows that as wealth index of women increases, the percentage of women using modern contraceptive method also increase in both 2005 and 2011. The percentage of women using modern contraceptive methods have increased among those in the poorest and poorer wealth index from 6.3 to about 10 and 10.5 to about 17 Percent for both years respectively. In 2005, the higher percentages of women using contraceptive method were not working (64 Percent) compare to working (36 Percent). Whereas, in 2011, the higher percentages of women using contraceptive method were working women (about 83 Percent) compare to working about (12 Percent). In both 2005 and 2011, women who were not visited by family planning workers and visited health service accounts for a higher percentage of women not using modern contraceptive methods compared to those women who were visited by family planning workers and visited health service. For both years (2005 and 2011), women who were not visited by family planning

workers, and who did not visit health services, and not using modern method of contraceptives have dropped from about 93% to 82% and about 73 to 65% respectively. **Table 3** shows that in both 2005 and 2011, women who didn't hear family planning on radio, TV and newspaper and visited health service had accounts for the higher percentage of women not using modern contraceptive methods compared with those women who did hear. The percentage of women not using modern contraceptive methods have dropped among those who heard family planning on radio, TV and newspaper from about 77 to about 61 , about 97 to 91 and about 97 to 93 percent for 2005 and 2011 respectively. On the other hand, in both 2005 and 2011, women who were beaten justified goes without telling husband, neglect children, argue with husband, refuses to have sex with husband and burns food accounts for a higher percentage of not using modern contraceptive method compared to those women who were not justified that beating goes without telling husband.

Table 1: The percentage distribution of modern contraceptive method use for currently married women by demographic variables

	Modern contraceptive Method					
	2005			2011		Chi-square
Demographic variables	Weighted Not using	using	(x^2, sig)	Not using	Weighted using	(x^2, sig)
Age groups			(32.98, 0.000)			(75.10, 0.00)
15-19	9.7	5.6		7.8	6.3	
20-24	18.5	18.5		17.0	19.8	
25-29	23.9	27.0		26.5	27.4	
30-34	16.8	16.7		16.3	19.4	
35-39	13.6	17.7		15.1	15.9	
40-44	10.0	12.1		9.2	7.7	
45-49	7.4	2.2		8.2	3.5	
Place of residence			(167,0.000)			(442.68,0.000)
Urban	5.5	22.9		10.3	30	
Rural	94.5	77.1		89.7	70	
Religion			(49.03, 0.000)			(193.63,0.000)
Orthodox	42.6	59.2		39.0	53.5	
Catholic	1.2	0.6		1.2	1.1	
Protestant	20.6	16.6		23.3	24.3	
Muslim	33.3	22		34.6	20.6	
Traditional	1.1	1.2		0.9	0.4	
Others	1.0	0.4		1.0	0.1	
Number of living children			(13.64, 0.000)			(77.81, 0.005)
Zero	9.6	4.9		10.2	7.3	
One to two	28.9	31.6		28.6	37.0	
Three to four	30.0	28.3		27.9	29.7	
five and more	31.5	35.2		33.3	26	
Total children ever born			(17.21, 0.000)			(100.04,0.000)
Zero	6.6	3.6		9.3	6.9	
one to two	21.5	27.9		25.0	34.0	
three to four	23.4	25.5		23.7	26.9	
five and more	48.6	43.0		42.0	32.2	

Source: Ethiopian Demographic Health Survey 2005 and 2011

Table 2: The percentage distribution of modern contraceptive method use for currently married women by socio-economic and family planning service

Socio-economic variables	Modern contraceptive Method 2005 Weighted not using	using	Chi-Square (X2,Sig)	2011 Weighted not using	using	Chi-Square
Educational level			(147.57,0.000)			(182.03, 0.000)
No education	80.6	59.8		44.3	47.5	
Primary	16.1	26.3		48.9	37	
Secondary	2.9	11.7		3.7	7.5	
Higher	0.4	2.2		3.1	8	
Work status			(26.02, 0.000)			(3.77, 0.000)
Not working	75.3	64		13.4	11.7	
working	24.7	36		86.6	88.3	
Wealth index			(247.56, 0.000)			(538.47, 0.000)
Poorest	21.7	6.3		23.6	9.8	
Poorer	24	10.5		23.4	17.3	
Middle	22.1	21		22.2	18.5	
Richer	19	23.8		18.7	22.1	
Richest	13.2	38.4		12.1	32.2	
Family planning service						
Visited by Family planning worker			(7.36, 0.007)			(30.80, 0.000)
No	93.3	89.9		82	76.4	
Yes	6.7	10.1		18	23.6	
Visited health facility			(99.90, 0.000)			(155.53, 0.000)
No	72.6	50.1		64.8	49.2	
Yes	27.4	49.9		35.2	50.8	

Source: Ethiopian Demographic Health Survey 2005 and 2011

Table 3: The percentage distribution of modern contraceptive method use for currently married women by media exposure for family planning and intimate partner violence

variables	Modern contraceptive Method 2005 Weighted not using	using	Chi-Square (X^2, Sig)	2011 Weighted not using	using	Chi-Square (X^2, Sig)
Media exposure on family planning						
Heard FP on radio			(95.84, 0.000)			(115.30, 0.000)
No	77.3	56.4		73.3	60.7	
Yes	22.7	43.6		26.7	39.3	
Heard FP on TV			(81.02, 0.000)			(233.70, 0.000)
No	96.6	87.2		91	78.1	
Yes	3.4	12.8		9	21.9	
Heard FP in newspaper /magazine			(37.50,0.000)			(62.06, 0.000)
No	97.3	91.7		96.8	92.7	
Yes	2.7	8.3		3.2	7.3	
Intimate partner violence						
Beating justified Goes without telling husband			(15.41, 0.000)			(134, 0.000)
No	30.3	39.3		45.3	60.1	
Yes	69.7	60.7		54.7	39.9	
Neglect children			(6.32, 0.012)			(84.38,0.000)
No	30.9	36.6		39.6	51.2	
Yes	69.1	63.4		60.4	48.8	
Argue with husband			(21.88, 0.000)			(92.15, 0.000)
No	33.3	44.2		45.7	58	
Yes	66.7	55.8		54.3	42	
Refuse to have sex with husband			(46.56, 0.000)			(157, 0.000)
No	48.1	64.8		50.6	66.5	
Yes	51.9	35.2		49.4	33.5	
Burns food			(67.56, 0.000)			(162.53, 0.000)
No	30.1	49		41.5	57.7	
Yes	69.9	51		58.5	42.3	

Source: Ethiopian Demographic Health Survey 2005 and 2011

In 2011 the percentage of modern contraceptive method use for women with two living children is higher for those who had both sex of the children, it means the percentage of modern contraceptive use for women who got one boy and one girl is about 56.50. In contrary, the percentage of modern contraceptive method use for women who got two living children is higher for those who had two boys and zero girl (62), which means that 62 out 100 currently married women who got two boys and zero girl were using modern contraceptive method in 2005. On the other hand, in both 2005 and 2011, the percentage of modern contraceptive method use for women who got three living children is higher for women who had both sex of the children compare to those who got one sex of children. In 2005, the percentage of modern contraceptive method use for currently married women who had two girls-one boy and one girl-two boys were about 42 and 44 respectively.

Table 4: Sex preference and modern contraceptive use

Number and Sex of girls	Modern method use Weighted 2005	Modern method Use (weighted 2011)
0 child	42.1	57.50
One child		
1girl-0 boy	63.57	64.25
1boy-0 girl	56.9	59.55
Two children		
2girls-0 boy	46.77	46.15
1girl-1boy	58.41	56.50
2 boys-0 girl	62	50.10
Three children		
3 girls-0 boy	27.62	25.18
1girl-2boys	43.71	42.57
2 girls-1 boy	42	37.38
3 boys-0 girl	29.41	32.16
Four children		
4 girls- 0 boy	24.88	21.58
1 girl- 3 boys	28.35	24.50
3 girls-1 boy	28.34	29.07
2 girls-2 boys	33.53	32.43
4 boys-0 girl	19.8	21.80
Five and more children		
No boys	67.55	57.17
At least one child of each sex and		
girls>boys	67.41	50.77
girls=boys	55.65	52
boys>girls	73.71	60
No girls	69.27	56.74
Total modern contraceptive use	100	100

Source: Ethiopian Demographic Health Survey 2005 and 2011

Similarly, the percentage of modern contraceptive method use for currently married women who had two girls-one boy and one girl-two boys were about 37 and 42.60 respectively in 2011. Likewise, in both 2005 and 2011, the percentage of modern contraceptive method use for women who got four living was higher for women who had both sex of the children comparing to those who got one sex of children. Thus, in both 2005 and 2011 the percentage of modern contraceptive method use for currently married women who had both sex of children were higher than those of women with one sex. Finally, we can conclude that sex composition of children and modern contraceptive use are positively correlated.

A multivariate analysis

Table 5 shows that the odds of modern contraceptive use for women of the age group 25 -29 and 35-39 in 2005 were 5.26 and 5.32 times higher, respectively, than those of women of age group 45-49, holding other independent variables constant. The maximum likelihood of modern contraceptive use increases with women of age greater than 15 and less than 29 in 2005, AOR=3.70; 95% CI = (1.63, 8.33) , AOR=4.46; 95% CI = (2.17, 9.16) and AOR=5.26; 95% CI = (2.66, 10.40) for the age group 15-19, 20-24 and 25-29 respectively. On the other hand, the odds of modern contraceptive use for women of the age group 20 -24 and 30-34 in 2011 were 2.52 and 2.72 times higher, respectively, than those of women of age group 45-49, holding other independent variables constant. In 2005 and 2011, women from urban areas were more likely to use modern contraceptives method than their rural counterparts (AOR=4.70; 95% CI = (3.44, 6.41)) and (AOR=3.43; 95% CI = (2.98, 3.95)) respectively, holding other independent variables constant.

Comparing the results for 2005 and 2011, the odds of modern contraceptive use for women of the age group 25 -29 and 35-39 have dropped from 5.26 to 2.16 and 5.32 to 2.52 respectively. Likewise, the odds of modern contraceptive use for other age group of women have declined. Similarly, the odds of modern contraceptive use for urban areas women have decreased in 2011 from 4.70 to 3.43 respectively. On the other hand, in 2005 and 2011, women from orthodox religious affiliation were more likely to use modern contraceptives than other religious affiliation AOR=2.27; 95% CI = (0.53, 9.8) and AOR=11.17; 95% CI = (2.7, 46.21) respectively. Furthermore, in 2005 and 2011, women from protestant religious affiliation were more likely to use modern contraceptives than other religious affiliation AOR=1.41; 95% CI = (0.32, 6.16) and AOR=10.34; 95% CI = (2.50, 42.72) respectively.

In contrary, in 2005 and 2011, women with number of living children three to four were less likely to use modern contraceptives use than those women who got five and more children (AOR=0.41; 95% CI = (0.26, 0.65)) and (AOR=0.89; 95% CI = (0.71, 1.12)) respectively, holding other independent variables constant. The odds of modern contraceptive use for women with total number of children ever born zero, one to two and three to four were respectively 2.40, 5.01 and 1.91 times higher than those of women with number of children ever born five and more, holding other independent variables constant. And also the odds of modern contraceptive use for women with living children zero, one to two and three to four have been increased in 2011 from 0.13 to 0.18, 0.16 to 0.65 and 0.41 to 0.89 respectively. In addition, as the women who got number of children ever born and their use of modern contraceptives were positively related with each other in 2011.

Table 5: Generalized linear model (binary logistic regression) showing demographic factors on modern contraceptive method use for currently married women in 2005 and 2011.

Variables	Modern contraceptive use 2005			2011		
	Weighted Ex(B)	95% CI Lower	Upper	Weighted Ex(B)	95% CI Lower	Upper
Demographic variables						
Age group(45-49=RC)						
15-19	3.688	1.634	8.326	2.284	1.582	3.296
20-24	4.456	2.168	9.158	2.519	1.836	3.455
25-29	5.261	2.662	10.398	2.158	1.611	2.891
30-34	3.942	2.009	7.735	2.715	2.046	3.602
35-39	5.318	2.732	10.349	2.516	1.898	3.335
40-44	4.346	2.199	8.592	2.117	1.559	2.875
Place of residence(Rural=RC)	***			***		
Urban	4.695	3.441	6.407	3.431	2.984	3.945
Religion (Other=RC)	***			***		
Orthodox	2.272	0.527	9.8	11.17	2.7	46.205
Catholic	0.559	0.072	4.342	9.613	2.163	42.716
Protestant	1.409	0.322	6.161	10.337	2.494	42.833
Muslim	1.314	0.303	5.709	6.005	1.449	24.887
Tradition	2.513	0.455	13.872	3.464	0.683	17.576
Number of living children (five and more=RC)	***			***		
Zero	0.133	0.041	0.432	0.188	0.083	0.43
One-Two	0.159	0.073	0.348	0.654	0.458	0.932
Three-four	0.414	0.264	0.649	0.892	0.714	1.116
Total children eve born (five and more=RC)	***			***		
Zero	2.393	0.653	8.778	3.236	1.382	7.576
One-Two	5.014	2.231	11.27	2.065	1.433	2.975
Three-four	1.909	1.19	3.063	1.355	1.078	1.705

Source: Ethiopian Demographic Health Survey 2005 and 2011. ***=<0.05(statistically significant),

The results on **Table 6** indicates that, the maximum likelihood of modern contraceptive use increases with increasing educational level in both 2005 and 2011. In 2005, the odds of modern contraceptive use for women with no education, primary and secondary education were 0.3, 0.47 and 0.60 times less, respectively than those of women with higher educational level, keeping all other independent variables constant. Similarly, in 2011, women with no education, primary and secondary educational level were less likely to use modern contraceptive method than those with higher education level AOR=0.68; 95% CI = (0.49, 0.96), AOR=0.87; 95% CI = (0.62, 1.22) and AOR=1.32; 95% CI = (0.88, 1.98), respectively, holding other independent variables constant.

Similarly, in both 2005 and 2011, women who were currently not working were less likely to use modern contraceptive method than working women AOR=0.62; 95% CI = (0.50, 0.78) and AOR=0.97; 95% CI = (0.83, 1.3) respectively, holding other independent variables constant. Likewise, women with richer wealth index were less likely to use modern contraceptives method than those in the richest wealth index AOR=0.53; 95% CI = (0.39, 0.72) and AOR=0.50; 95% CI = (0.42, 0.59) respectively. The odds of modern contraceptive use for women who were not visited by family planning worker dropped in 2011 from 0.85 to 0.81. In 2005 and 2011, women who were not visited by family planning worker were 0.85 and 0.81 times less likely to use modern contraceptive method than those women who were not visited by family planning worker. Likewise, women who did not visit health facilities were less likely to use modern contraceptive method than those who visited it AOR=0.38; 95% CI = (0.31, 0.46) and AOR=0.57; 95% CI = (0.52, 0.63) respectively, holding other independent variables constant in 2005 and 2011.

The odds of modern contraceptive method use for women who did not heard FP on TV and heard FP in newspaper/magazine have decreased in 2011 from 0.44 to 0.43 and 1.02 to 0.82 for both years respectively. Which indicate that women who did not heard FP on TV and heard FP in newspaper/magazine were 0.43 and 0.82 times less likely to use modern contraceptive methods respectively in 2011, holding other independent variables constant. Whereas, the odds of modern contraceptive method use for women who do not heard FP on radio has increased in 2011 from 0.47 to 0.75. This has shown that those women who do not heard FP on radio was 0.75 times less likely use modern contraceptive methods respectively in 2011, fixing other independent variables constant.

In 2005 and 2011, the odds of modern contraceptives method use for women who reported that beaten justification goes without telling husband (AOR=1.13; 95% CI = (0.87, 1.46)) and (AOR=1.33; 95% CI = (1.17, 1.52)) respectively. Moreover, Odds of modern contraceptives method use for women who have not beaten justified refuse to have sex with husband (AOR=1.49; 95% CI = (1.18, 1.88)) and (AOR=1.36; 95% CI = (1.19, 1.55)) respectively, fixing other independent variables constant in 2005 and 2011. Likewise, in 2005 and 2011, Odds of modern contraceptives method use for women who have not beaten justified burns food (AOR=1.89; 95% CI = (1.49, 2.40)) and (AOR=1.44; 95% CI = (1.27, 1.64)) respectively, fixing other independent variables constant in 2005 and 2011.

Considering the findings from both the descriptive and multivariate analysis performed, we therefore conclude that, religion, place of residence, age of respondents, number of living children, work status, education level and the total number of children ever born were major determinants of modern contraceptive use methods in Ethiopia. These variables play a crucial role in determining whether a woman use a modern contraception or not.

Table 6: Generalized linear model (binary logistic regression) showing the effect of socioeconomic, family planning service, media exposure on family planning and intimate partner violence on modern contraceptive method use for currently married women in 2005 and 2011.

Variables	2005 Weighted Ex(B)	95% CI Lower	Upper	2011 Weighted Ex(B)	95% CI Lower	Upper
Socio-economic variables						
Educational level	***			***		
(higher education=RC)						
No education	0.3	0.11	0.819	0.681	0.485	0.957
Primary	0.465	0.169	1.279	0.871	0.622	1.221
Secondary	0.602	0.212	1.711	1.323	0.881	1.986
Work status (working=RC)	***			***		
Not working	0.622	0.497	0.777	0.966	0.827	1.129
Wealth index (Richest=RC)				***		
Poorest	0.162	0.107	0.247	0.192	0.158	0.234
Poorer	0.195	0.133	0.284	0.337	0.284	0.401
Middle	0.447	0.326	0.613	0.384	0.324	0.456
Richer	0.527	0.388	0.716	0.497	0.421	0.587
Family planning service						
Visited by Family planning worker	***			***		
No	0.846	0.601	1.192	0.812	0.718	0.919
Visited health facility	***			***		
No	0.38	0.311	0.464	0.572	0.517	0.634
Media exposure on family planning	***			***		
Heard FP on radio (No=RC)						
No	0.465	0.374	0.578	0.746	0.664	0.84
Heard FP on TV (No=RC)	***			***		
No	0.444	0.276	0.714	0.431	0.366	0.507
Heard FP in newspaper /magazine (No=RC)	***			***		
No	1.025	0.598	1.755	0.82	0.638	1.055
Intimate partner violence						
Beating justified						
Goes without telling husband (yes=RC)	***			***		
No	1.125	0.869	1.456	1.333	1.171	1.518
Neglect children (yes=RC)	***			***		
No	0.711	0.541	0.934	0.985	0.859	1.129
Argue with husband (yes=RC)	***			***		
No	1.148	0.891	1.479	0.989	0.863	1.134
Refuse to have sex with husband (No=RC)	***			***		
No	1.487	1.178	1.878	1.36	1.191	1.553
Burns food (yes=RC)	***			***		
No	1.888	1.485	2.399	1.443	1.267	1.644

Source: Ethiopian Demographic Health Survey 2005 and 2011. ***=<0.05(statistically significant),

4.6. Discussion

The results show that almost all characteristics -- women's ages, places of residence, religion, the number of living children, total children born, women's education, women's working status, household wealth index, family planning worker visits, health facility visits, and intimate partner violence -- have a significant impact on relationship to modern contraceptive use. This was supported by previous studies in other countries (Douthwaite and Ward, 2005; Schoemaker, 2005; Iyer, 2002). In addition to these studies, other studies have confirmed that in Ethiopia, women in the richest household wealth index, educated women, employed women, urban women, and women are Christian tend to use modern contraception more than other women (Lakew et al., 2013; Mekonnen and Worku 2011; UNFPA 2012).

Similarly, the use of modern contraceptives by rural women was significantly less than that of urban women in 2005 and 2011. A number of studies have documented that rural areas have lower levels of contraceptive use as opposed to urban areas in which women are more likely to use contraceptives (Olalekan & Olufunmilayo, 2012; White & Speizer, 2007; Rahayu et al., 2009). This might be due to the availability of contraceptives or the acceptability of contraceptive methods by the community, knowledge of family planning and the power of decision making. Moreover, Kebede (2006) found that in Ethiopia, urban women had more access to health services than rural women. Bogale, et al., (2011) documented that the majority of rural residents had little knowledge about other types of contraceptive methods, especially long term and permanent methods: hence, there was less utilization of other methods. In addition, Ethiopia is a patriarchal society whereby in the rural areas, the majority of the decisions regarding the use of family planning are made by the husband, due to women's economic dependence, low educational levels and the existing culture (Bogale, et al., 2011).

In Ethiopia, the odds of modern contraceptive use among women of all age groups have dropped drastically in 2011. Moreover, women whose ages fall between 25 and 39 were more likely to use modern contraceptives than those who belong to other age groups. This is similar to Blum (2007) who found that women in middle age are more likely to use modern contraceptives than teenagers and older women. Moreover, in both 2005 and 2011, as the number of a woman's living children increases, the odds of her modern contraceptive use

increases. Women who have more living children are more likely to use modern contraceptives than those with fewer children. In both 2005 and 2011, Christian women tended to use modern contraceptives more than Muslim women and those of traditional religions. Similarly, Catholic and Protestant women were more likely to use modern contraceptives compared to those of other religious groups (Cau, et al 2013).

On the other hand in Ethiopia, women's educational status and wealth index were significantly associated with modern contraceptive method use in 2005 and 2011. Women from the richest wealth quintile and educated women were likely to use modern contraception more than did other women. Studies in other parts of Africa have shown a similar relationship between educational status and modern contraceptive use (Iyer, 2002; Schoemaker, 2005). In both 2005 and 2011, media exposure had significant effects on modern contraceptive use. Women who did not have family planning exposure on radio and TV were less likely to use modern contraceptive methods than those who did. It was also noted by Olenick (2000) that women of these countries who were exposed to family-planning campaigns over the media were more likely to use modern contraceptive techniques than women who were not exposed. In 2005 and 2011, intimate partner violence was significantly associated with modern contraceptive use. This was also proved by Dalal, et al., (2012) who determined that women in Bangladesh who experienced intimate partner violence used more contraceptives than those who did not experience such problems. Both hypotheses **H1**: There is a significant positive association between socioeconomic, family planning services, and media exposure on family planning with women's modern contraceptive methods use (accepted) and also **H2**: Intimate partner violence is negatively associated with modern contraceptive use (accepted).

4.7. Conclusion

The effects of a woman's religious affiliation, the number of her living children and her socioeconomic status on modern contraceptive use rate increased in 2011. Modern contraceptive methods use was found to be higher in urban than rural areas. Increasing socio-economic status of women, family planning services, media exposure about family planning and decreasing intimate partner violence will increase the use of modern contraceptive methods. The use of modern contraceptives among married women has shown a remarkable

increase over the past decades in Ethiopia. Wealth index, women's education, religion, not working, and age were significantly associated with a married woman's use of modern contraceptives. Such changes could be attributed to the differences in characteristics between the 2005 and 2011 EDHS. Moreover, the increase in contraceptive use could be attributed to the changes in contraceptive use behaviors, especially among the rural and urban population and members of the Orthodox, Roman Catholic and Protestant churches. In general, the specific and overall knowledge about the contraceptive methods (any one of the methods) rate shows high proportion. The study concludes that women's knowledge about any one of the specific methods shows a very low rate. Women need to be empowered and health extension workers should give more attention to the husband's attitude, reducing violence against women, and encouraging contraceptive use. In addition to this, family planning interventions are needed about the availability or acceptability of methods, knowledge of the methods, and the power of decision making.

4.8. References

Adanu, R. M., Seffah, J. D., Hill, A. G., Darko, R., Duda, R. B., & Anarfi, J. K. (2009). Contraceptive use by women in Accra, Ghana: results from the 2003 Accra Women's Health Survey. *African Journal of Reproductive Health, 13* (1).

Arbab, A., Bener, A.,& Abdulmalik, M. (2011). Prevalence, awareness and determinants of contraceptive use in Qatari women, *East Medical Health Journal*, 17(1), 14.

Bbaale, E., & Mpuga, P. (2011) Female education, contraceptive use and fertility: evidence from Uganda: Consilience. *Journal of Sustainable Development,* 6(1), 20–47.

Blum, R.W. (2007). Youth in sub-Saharan Africa. Journal of Adolescent Health, 41(3), 230-238.

Bogale, B., Wondafrash, M., Tilahun, T., & Girma, E. (2011).Married women's decision making power on modern contraceptive use in urban and rural southern Ethiopia. *BMC Public Health, 11*(1), 1.

Cau, B. M., Sevoyan, A., & Agadjanian, V. (2013). Religious affiliation and under-five mortality in Mozambique. *Journal of Biosocial Science*, 45(03), 415-429

Chacko, E. (2001). Women's use of contraception in rural India: a village-level study, *Health & Place*, *7*(3), 197-208.

Central Statistical Agency [Ethiopia] and ICF International: Ethiopia Demographic and Health Survey 2011. Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Agency and ICF International; 2012.

Central Statistical Agency [Ethiopia] and ORC Macro. 2006. Ethiopia Demographic and Health Survey 2005. Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Agency and ORC Macro.

Dalal, K., Andrews, J., & Dawad, S. (2012). Contraception use and associations with intimate partner violence among women in Bangladesh, Journal *of Biosocial Science*, *44*(01), 83-94.

Davis, K., and Blake, J. (1956). Social structure and fertility: An analytic framework. *Economic Development and Cultural Change*, 5(4), 190-211.

Douthwaite, M., and Patrick, W. (2005). Increasing contraceptive use in rural Pakistan: an evaluation of the Lady Health Worker Programme. *Health Policy and Planning*, 20 (2), 117-23.

Helwedery, S. (2004). *Factors influencing contraceptive use among currently married women in Sulawesi, Indonesia* (Doctoral dissertation).
(Available at http://mulinet11.li.mahidol.ac.th/thesis/2547/cd368/4638506.pdf)

Faisal, B., & Eria, H. (2013). Micro effects of women's education on contraceptive use and fertility: the case of Uganda. *Journal of International Development, 763-778*

Fanslow, J., Whitehead, A., Silva, M. & Robinson, E. (2008). Contraceptive use and associations with intimate partner violence among a population-based sample of New Zealand women. *Australian and New Zealand Journal of Obstetrics and Gynecology*, 48(1), 83–89.

Hossain, M. B. (2005). Analyzing the relationship between family planning workers 'contact and contraceptive switching in rural Bangladesh using multilevel modeling. *Journal of Biosocial Science*, *37*(05), 529-554.

Hussain, N. (2011). Demographic, Socio-Economic and Cultural Factors Affecting Knowledge and Use of Contraception Differentials in Malda District, West Bengal, *Journal of Community Medicine & Health Education*.

Islam, M.M., & Hassan ,A.H.M.S. (2000). Mass Media Exposure and Its Impact on Family Planning in Bangladesh. *Journal of Biosocial Science*, 32, 513–526.

Iyer, S. (2002) Religion and the Decision to use contraception in India. *Journal for the Scientific Study of Religion;* 41(4), 711-722.

Jabeen, M., Gul, F., Wazil, F., & Javed, N. (2011). Knowledge, attitudes and practices of contraception in women of reproductive age. Gomal Journal of Medical Sciences, 9(2).

Jamie, J.G. (2006) Factors Influencing Filipino Couples Desired Family Size and Contraceptive Use in The Philippines. Master Thesis. Institute of Population Reproductive Health Research, Mahidol University.

Kabir, M., & Islam, M. A. (2000). The Impact of Mass Media Family planning Programmes on Current Use of Contraception in Urban Bangladesh, *Journal of Biosocial Science,* 32 (03), 411–419.

Kebede, Y. (2006). Contraceptive prevalence in dembia district, northwest Ethiopia. *Ethiopian Journal of Health Development, 20*(1), 32-38.

Khan, R.E.A., & Khan, T. (2007) How a Married Woman's Characteristics Affect Her Contraceptive Behavior. Journal of Applied Sciences, 7, 2782-2787.

Koc, I. (2000). Determinants of contraceptive use and method choice in Turkey. *Journal of Biosocial Science*; 32(3): 329-42.

Lakew, Y., Reda, A., Tamene, H., Benedict, S., & Deribe, K. (2013). Geographical variation and factors influencing modern contraceptive use among married women in Ethiopia: evidence from a national population based survey. *Reproductive Health*, 10(52).

Magadi M. A., Madise N.J. & Rodrigues R.N. (2000). Frequency and timing of antenatal care in Kenya: explaining the variations between women of different communities, *Social Sciences and Medicine*, 51(4), 551-561.

Mekonnen, W., & Worku, A. (2011). Determinants of low family planning use and high unmet need in butajira district, South Central Ethiopia. Reproductive Health, 8(1), 37.

Mturi A. J. (1996). Pattern of fertility and contraceptive use in Tanzania. PhD Thesis: Department of Social Statistics, Faculty of Social Science, University of Southampton.

Ngom P., Wilcher, R., Kuyoh, M., Dube, H., Martin, S., Kimani, J., Nutley, T., & Maggwa, N. (2005). Family planning needs in the context of the HIV/AIDS epidemic: findings from a three country assessment covering Kenya, South Africa and Zimbabwe. XXV IUSSP International Conference Tours, France 18-23 July.

NPC and ORC Macro 2004.Nigeria Demographic and Health Survey 2003. Calverton, Maryland: National Population Commission and ORC Macro. 333p.

Olalekan, A.W., & Olufunmilayo, A.E. (2012). A Comparative Study of Contraceptive Use among Rural and Urban Women in OsunState, Nigeria. *International Journal of Tropical Disease and Health*, 2(3), 214-224.

Olenick, I. (2000). Women's exposure to mass media is linked to attitudes toward contraception in Pakistan, India and Bangladesh, *International Family Planning Perspectives*, *26*(1), 48-50.

Oyedokun, A. O. (2007). Determinants of contraceptive usage: lessons from women in Osun State, Nigeria, *Journal of Humanities and Social sciences, 1*(2), 1-14.

Mohanan, P., Kamath, A., & Sajjan, B.S. (2003) Fertility Pattern and Family Planning Practices in a Rural Area in Dakshina Kannada, Indian Journal of Community Medicine, 28 (1), 54-65.

Palamuleni, M. E. (2013). Socio-economic and demographic factors affecting contraceptive use in Malawi: original research article. *African Journal of Reproductive Health, 17*(3), 91-104.

Population Reference Bureau (2004). The unfinished agenda: meeting the need for family planning in less developed countries, *Policy Brief.*

Rahayu, R., Utomo, I., & McDonald, P. (2009). Contraceptive Use Pattern among Married Women in Indonesia. Paper presented at the International Conference on Family Planning: Research and Best Practices, November 15-18, 2009, Kampala, Uganda.

Rutenberg N., Ayad M., Ochoa L.H. & Wilkinson M. (1991). Knowledge and use of contraception. Demographic and health surveys comparative studies No.6, Columbia, Maryland, USA: Institute for resource development/Macro International Inc

Schoemaker, J. (2005). Contraceptive use among the poor in Indonesia, *International Family Planning Perspectives;* 31 (3), 106-14.

Shah, N.J., Pradhan, P., Reddy, A.S., & Joseph, B. (2006). Contraceptive practices in newly married women in sub-urban Bangalore, *Health and Population- Perspectives and Issues*, 29, 21-28.

Sharma, V., Mohan, U., Das, V., & Awasthi, S. (2012). Socio demographic determinants and knowledge, attitude, practice: Survey of family planning, *Journal of Family & Medical Primary Care*, 1(1), 43–47. Accessed from http://www.ncbi.nlm.nih.gov/pmc/articles/ PMC3893950/ 03/12/13

Silverman, J. G., Gupta, J., Decker, M. R., Kapur, N., & Raj, A. (2007). Intimate partner violence and unwanted pregnancy, miscarriage, induced abortion, and stillbirth among a national sample of Bangladeshi women, *BJOG: An International Journal of Obstetrics & Gynaecology,*, 114(10), 1246–1252.

Stephenson, R.,. & Tsui, A. O. (2002). Contextual influences on reproductive health service use in Uttar Pradesh, India, *Studies in Family Planning*, 33(4), 303-320.

Teitelman, A. M., Ratcliffe, S. J., Morales-Aleman, M. M. & Sullivan, C. M. (2008) Sexual relationship power, intimate partner violence, and condom use among minority urban girls, *Journal of Interpersonal Violence* 23(12), 1694–1712.

UNFPA (2012) A decade of change in contraceptive use in Ethiopia. In-depth Analysis of the EDHS 2000-2011.

White, J., & Speizer, I. (2007). Can family planning outreach bridge the urban-rural divide in Zambia? *BMC Health Service Research,* 7(1), 143.

Williams, C. M., Larsen, U. & McCloskey, L. A. (2008) Intimate partner violence and women's Contraceptive use, *Violence Against Women,* 14 (12), 1382–1396.

World Population Data Sheet (2016). World Population Data Sheet with special focus on human needs and sustainable resources, *Population Reference Bureau*, Available at; http://www.prb.org/pdf16/prb-wpds2016-web-2016.pdf. Accessed 2016.

Lakew , Y., Reda, A.A., Tamene, H., Benedict, S., & Deribe, K. (2013) Geographical variation and factors influencing modern contraceptive use among married women in Ethiopia: evidence from a national population based survey, *Reproductive Health Journal*, 10(1),52.

CHAPTER V

Religion and Fertility in Ethiopia

[1]YISHAK ABRAHAM LAILULO AND A. SATHIYA SUSUMAN

[1]*Department of Statistics and Population Studies, Faculty of Natural Sciences, University of the Western Cape, 7535 Bellville, Cape Town South Africa;*
Email: sappunni@uwc.ac.za

Abstract

The aim of the study is to examine the degree to which Christian and Muslim religious differences in fertility can be explained by contraceptive use. Data from the Ethiopia Demographic and Health Survey (EDHS) 2005 and 2011 were used. Bivariate, one-way ANOVA and generalized linear model (GLM, Poisson regression) were used to determine the relative contribution of the predictor variables. For Christian religious women using contraception, the more educated a woman was, the less likely she was to have children in both in 2005 and 2011. Programs focusing on promoting specific permanent contraception methods must be needed for women to improve fertility behavior. In addition, family planning policy at the country level must endorse initiatives of religious leaders as they are working closer with health institutes that would support a decline in fertility.

Keywords: Children ever born; Surviving children; Christian; Muslim; Family Planning; Ethiopia

5.1. Introduction

Fertility behavior is the most important factor associated with population dynamics. It has effects on the change and structure of the population in sub-Saharan countries, where the fertility rate is high compared to the rest of the world (Hinde and Mturi, 2000). In Ethiopia there is high fertility and a rapid population growth rate. Ethiopia is the second-most populous nation on the African continent after Nigeria; its population was expected to be 99.39 million in 2015 (United Nations Population Divisions, 2015). According to the 2011

Ethiopian Demographic and Health Survey (EDHS), the total fertility rate at the national level was 4.8 children per woman (Central Statistical Authorities (CSA), 2012). The total fertility rate is still high compared to developed countries (Population Reference Bureau, 2009).

Population growth has impact on the well-being of the population in terms of socioeconomic development, environmental sustainability, and resource supply (Canning and Schultz, 2012). Resource-poor countries with population growth are faced with creating jobs for a potential workforce, while their governments have shortages of resources to meet increasing demand for services and infrastructure (Greene, 2012). The effect of high fertility is also challenging for individuals. When many children are born to one mother, there is an economic challenge in her household and an increase in the probability of her family entering into poverty (Aassve et al., 2005). In families that do not have adequate incomes for education, food, and health care, children, particularly girls, may be forced to drop out of school and marry early (Greene, 2012). High fertility also increases the risk that a child is born prematurely or with low birth weight (Conde-Agudelo et al., 2006) and becomes stunted as he or she grows (Kravdal and Kodzi, 2011), and untimely birth increases maternal health risks (Greene, 2005).

Several studies found that women's age, place of residence, religion, educational level, work status, wealth index, media exposure on family planning, and the use of family planning methods were linked with fertility. Age has a great influence on fertility levels. In some communities, especially in highly developed countries, couples in their 30s and 40s are still attempting a first pregnancy due to delays in starting a family (Ushie et al., 2011). However, in African countries women example in Nigeria as young as 14 have given birth or are in marriage unions and at the risk of pregnancy and childbirth (Ushie, 2009). On the other hand, women's place of residence has an effect on fertility. Studies done in Nepal and Uganda also documented that women residing in rural areas are more likely to have more children than those in the urban areas (Adhikari, 2010; Bbaale, 2011). Moreover, education is widely held to be a key determinant of fertility (Leon, 2004; Ushie et al., 2011). Numerous studies done in both developed and developing countries have shown that an increase in female education level was associated with a decrease in fertility (Sackey, 2005; Vavrus and Larsen, 2003). Similarly, women's wealth indexes have an impact on fertility. Adhikari (2010) found that the poorest women had higher fertility than the richest women. Furthermore, Adhikari (2010)

and Rabbi (2012) found that mass media may be influential in the flow of attitudes and knowledge about family planning (FP), which indirectly affects fertility and social behavior. Adhikari (2010) also investigated that women who were exposed to radio or TV had fewer children than those who were not exposed.

5.1.1. The Role of Religion on Fertility

Davis and Blake (1955) studied an analytic framework to understand the processes underlying conception and birth. The three major processes are exposure to intercourse, exposure to conception, and gestation and parturition. Each of these can be further subdivided. Bongaarts (1982) simplified this framework, noting that four factors account for much of the worldwide variation in fertility. These four factors are the proportion of marriage, use of contraception, incidence of abortion, and breast-feeding. Extending this logic, religion will influence fertility if it has effects on these proximate determinants. This research will focus on one of these factors: contraception.

Contraception use plays a significant role in mediating the relationship between religion and fertility in developing countries. The main reason for religious group differences in contraception is that members of some groups believe it is not acceptable to use birth control (they believe it a sin against God—the particularistic theology assumption). Religion is one of the most important factors responsible for determining the social and personal behavior of the individual within the family. The relationship of religion with contraceptive behavior had been reported in many studies (Shah et al., 2006; Chandra et al., 2005; Mohanan et al., 2003). Moreover, religious worshippers can provide a social network facilitating the spread of information about contraception. A study in Mozambique found that in Catholic and Protestant congregations, socio-culturally diverse and inclusive environments were more favorable for the spread and legitimization of modern contraception (Agadjanian, 2001). Contraception use practices vary extensively in countries with a Muslim majority (Jones, 2006; Hull, 2005). A study of Muslim and Hindu women in Southern India found that 99% of Muslim women did not think their religion allowed contraceptive use compared to 81% of Hindu women (Iyer, 2002). In Ghana, contraceptive use is highest among Protestant women, intermediate among Catholics, and lowest among Muslims and traditional groups, but most of these differences are reduced when controls are added for demographic and socioeconomic

characteristics (Addai, 1999). Several other studies also find lower contraceptive use among Muslims in a variety of settings (Hogan and Biratu, 2004; Akafuah and Sossou, 2008; Dharmalingam and Morgan, 2004; Iyer, 2002). The objective of this research is to examine the degree to which Christian and Muslim religious differences in fertility can be explained by contraceptive use.

5.2. Data and Method

The data used for this study was EDHS 2005 and 2011. Bivariate analysis (cross tabulation), one-way ANOVA, and multivariate analysis (a GLM) were performed.

5.2.1. Generalized Linear Model

GLMs were performed for this analysis. GLMs allow also including non-normal errors such as binomial, Poisson, and Gamma errors. Regression parameters are estimated using maximum likelihood. GLMs was found by McCullagh and Nelder (1989). The response can be scale, counts, binary, or events in trials. Factors are assumed to be categorical. The covariates, scale weight, and offset are assumed to be scale. Cases are assumed to be independent observations.

The specific measure used for fertility of women was the number of children ever born, which is a count value. The variable of interest in the demographic health survey is the number of children ever born. All the factors (independent variables) were categorical. Thus, the Poisson log linear type of mode is appropriate for this study. The main objective is to investigate the relationship between the probability of the number of children ever born (μ) with age group, place of residence, educational level, work status, wealth index, media exposure on family planning, health facility visits, and visits by FP workers.

Components of a Generalized Linear Model for Count Data

Response Y_i = (CEB) and independent variables X_i= (age group, place of resident, educational level, work status, wealth index, media exposure to FP, visits to health facilities, and visits by FP workers) for i=1,…,n

Random Component (the Outcome): Poisson distribution

In general, Y_i, $1 \leq i \leq n$ is independent with density from the exponential family

$$f(yi;\theta,\emptyset)= \exp\{\frac{\theta y-b(\theta)}{a(\emptyset)} +c(y,\emptyset)\ \}$$

Here θ and∅ are a dispersion parameter b(θ_i), a_i(∅) and c(y_i,∅) are known functions, confirming Yi ~Poisson(t_(i) μ(x_(i,) β)) Poisson distribution belongs to the exponential. The probability density function (p.d.f.) is

$$\mu = f_i(y_i) =\frac{e^{-\mu_i}\mu_i^{y_i}}{y_i!}$$

For y_i =0, 1, 2 ... The moments are

$$E(y_i)=Var(y_i)=\mu_i$$

Let us verify that this distribution belongs to the exponential family as defined by Nelder and Wedderburn (1972). Taking logs we find

$$\ln f_i(y_i) = \ln(\frac{e^{-\mu_i}\mu_i^{y_i}}{y_i!})$$

$g(\mu) = \ln f_i(y_i) = y_i\ln(\mu_i)- \mu_i- \ln(y_i!)$ This expression has the general exponential form

$$\ln f_i(y_i)=\frac{y_i\theta_i-b(\theta_i)}{a_{i(\emptyset)}} + c(y_i, \emptyset) \text{ or } f_i(y_i)= e^{(\frac{y_i\theta_i-b(\theta_i)}{a_{i(\emptyset)}} + c(y_i,\emptyset))}$$

Looking at the coefficient of y_i we see immediately that the canonical parameter is

$$\theta_i=\ln(\mu_i)$$

and therefore that the canonical link is the log. Solving for μ_i we obtain the inverse link

$\mu_i = e^{\theta_i}$

and we see that we can write the second term in the probability density function as

$$b(\theta_i)=e^{\theta_i}$$

The last remaining term is a function of y_i only, so we identify

$$C(y_i,\emptyset)=-\ln(y_i!)$$

Finally, note that we can take $a(\emptyset)=\emptyset \; and \; \emptyset = 1$, just as we did in the Binomial case.

Systematic Component (the design matrix multiplied by the parameter vector)

$g(\mu) = \alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_k x_k=y_i \ln(\mu_i)-\mu_i-\ln(y_i!)$ Poisson predictor

$\beta = (\beta_0 \ldots \beta_p)$ Regression parameter

Link function (the function, g (·) that "links" the systematic component to the random Component)

$g(\mu_i)= \ln\mu = \alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_k x_k=\frac{y_i\theta_i-b(\theta_i)}{a_{i(\emptyset)}} + c(y_i, \emptyset)$ which is the " natural parameter of " of the Poisson distribution, and the log link is the " canonical link" for GLM with Poisson distribution.

The Poisson regression model for counts (with a log link) is

$$\ln(\mu_i)= \alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_k x_k \text{ or } e^{\alpha+\beta_1 x_1+\beta_2 x_2+\cdots+\beta_k x_k} = \mu= e^{\left(\frac{y_i\theta_i-b(\theta_i)}{a_{i(\emptyset)}} + c(y_i,\emptyset)\right)}$$

This is often referred to as *"Poisson log linear model"*.

5.2.2. Dependent and Independent Variables

This paper analyzed the specific measure of fertility; that is, CEB. So the dependent variable used in this paper is CEB. CEB comprises information on the number of all children born alive (lifetime fertility) up to the survey date. Mean number of children ever born to women represents the childbearing experience of a real age cohort and reflects current and past fertility behavior. Mediating variables, such as contraception use, are classified as use and non-use, and religions are classified as Muslim and Christian (orthodox).

Finally, the number of children ever born (dependent variable) is treated as an interval scale in both bivariate and multivariate analyses. The CEB for currently married women, irrespective of the age group (lifetime fertility), were analysed as a measure of fertility. The demographic, socioeconomic, and FP program exposure used as independent variables are: age group of respondents, place of residence, educational level, work status, wealth index, health service (visited by a health facility and visited by an FP program) and mass media exposure. All of the independent variables were categorically variable.

5.3. Results

5.3.1. The percentage distribution of contraceptive use and mean children ever born

Percentage Distribution of Contraceptive Use by Religion

Percentages of contraceptive use (as shown in Table 1 and 2) of women from Christian religious affiliations of the age group 15 to 44 were recorded higher than those of Muslim women of the same age group in 2005. Similarly, in 2011 women from Christian religious affiliations were found to have higher percentages of contraceptive use than those of Muslim women in all age groups. On the other hand, contraception non-use and use for women who follow Christian religious affiliations were statistically significant with age group in both 2005 and 2011. Moreover, in both 2005 and 2011, women who were residing in urban and rural areas with Christian religious affiliations were recorded a higher percentage of contraceptive use than those of Muslim women, respectively.

In Christian religious affiliations, women with higher educational levels were found to have the highest percentage of contraceptive use, more than those of women with no primary or secondary educational levels, respectively, in both 2005 and 2011. Similarly, within Muslim religious affiliations, women who achieved higher educational levels were found to have the

highest percentage of contraceptive use, more than those of women with no, primary, and secondary educational levels, respectively, in 2011. Similarly, women from Christian religious affiliations and any educational level (no, primary, secondary, and higher) recorded a higher percentage of contraceptive use than the corresponding educational levels of Muslim women in 2011. Similarly, both in 2005 and 2011, women who didn't work and with Christian religious affiliations recorded a higher percentage of contraceptive use than Muslim women. Likewise, working women with Christian religious affiliations had a higher percentage of contraception use (28.1 and 39.3) than those of Muslim women (17.4 and 21), respectively, in both 2005 and 2011.

In addition to these, in both 2005 and 2011, women from Christian religious affiliations in all wealth indexes (poorest, poorer, middle, richer, and richest) had a higher percentage of contraceptive use than the corresponding wealth indexes of Muslim women. Likewise, in both 2005 and 2011, women from Christian religious affiliations who did hear about FP (from radio, TV, or newspapers) were found to have higher percentages of contraceptive use than Muslim women respectively. Furthermore, women's contraceptive non-use and use by religious affiliation (Christian and Muslim) were statistically significant with place of residence, educational level, wealth index, hearing about FP (from radio, TV, and newspaper) and visited by a health facility in both 2005 and 2011.

The Mean Number of Children Ever Born

The findings (see Table 3) highlighted in 2011 show that the mean numbers of children of contraceptive nonusers women were significantly associated with age group, place of residence, educational level, wealth index, and media exposure to FP (radio, TV, and newspaper) for both Christian and Muslim women. In addition, as the age group of contraceptive nonusers increases, the average CEB increases too for both Christian and Muslim women in 2005 and 2011. On the other hand, for all age groups in 2011, of contraceptive nonusers, the average numbers of children for women with Muslim religious affiliations were higher than those of Christians.

The results (see Table 4) show that in both 2005 and 2011, in contraception users, as educational level of women who belong to Christian and Muslim religious affiliation increases, CEB decreases. Moreover, for all educational levels of women using contraceptives, the average number of children for Muslim women was higher than Christian in 2011. But, for all educational levels of women using contraceptives, the average CEB for

Christian women was higher than for Muslims in 2005. In addition, for both Christians and Muslims, the mean CEB for contraceptive users was significantly associated with age, place of residence, educational level, wealth index, and media exposure to FP (TV and newspaper) as well as visits by an FP worker in 2011.

5.3.2. Generalized Linear Models Analysis

Table 5 and 6 present differentials in the fertility levels of Christian and Muslim women with contraception methods (non-use and use) by age group, residence, education level, work status, wealth index, media exposure to FP, and health services using a GLM (Poisson log linear model).

Fertility Levels of Contraception Nonuser Women by Religion

The results (see Table 5) underline that currently married woman who didn't use contraception methods and with older ages were associated with a higher CEB for both Christians and Muslims, except Muslim women in the age group 40–44 in 2011.

The link of women's CEB and age group showed that the Adjusted Incidence Rate Ratio (AIRR) of Muslim women of all groups (15–44) with contraceptive non-use were higher than corresponding age groups of Christian women, making other independent variables constant in 2011. Women following Christian and Muslim religious affiliations who didn't use contraception of the age group 40–44 were about 0.92 (AIRR=0.922, 95% CI: 0.839–1.013) and 0.86 (AIRR=0.858, 95 % CI: 0.747–0.982) times less likely to have children than those of the age group 45–49 in 2005, respectively, fixing other independent variables. On the other hand, Christian women with contraceptive non-use of the age group 40–44 were about 0.86 (AIRR=0.856, 95% CI: 0.80–0.917) times less likely to have children than those of the age group 45–49 in 2011, fixing other independent variables. On the contrary, Muslim women with contraceptive non-use of the age group 40–44 were about 1.03 (AIRR=1.027, 95% CI: 0.934–1.13) times more likely to have children than those of the age group 45–49 in 2011, making other independent variables constant. In addition, Christian women who didn't use contraception and were urban residents were about 0.16 or 16% (AIRR=0.84, 95% CI: 0.699–1.009) times less likely to have children than rural women in 2005, fixing other independent variables. On the contrary, Muslim women who didn't use contraception and were urban residents were about 1.17 (AIRR=1.173, 95% CI: 0.895–1.537) times more likely to have children than rural women in 2005, making other independent variables constant.

Moreover, for contraception nonusers who belonged to the Christian religion, the more educated women were associated with the fewer children in 2011. Women following Christian religious affiliations who didn't use contraception with no, primary, and secondary educational levels were about 1.60 (AIRR=1.60, 95% CI: 1.30–1.97), 1.59 (AIRR=1.59, 95% CI: 1.29–1.95), 1.40 (AIRR=1.40, 95% CI: 1.11–1.78) times more likely to have children than women with higher educational levels, age 45–49, in 2011, fixing other independent variables. Furthermore, Christian women with contraceptive non-use who didn't hear about FP on TV were about 1.18 (AIRR=1.18, 95%CI: 0.875–1.59) and 1.30 (AIRR=1.296, 95%CI: 1.168–1.438) times more likely to have children than women who did hear in 2005 and 2011, respectively, fixing other independent variables. Similarly, in contraception nonusers those with Muslim religious affiliations who didn't hear about FP on TV were about 1.63 (AIRR=1.634, 95%CI: 0.941–2.837) and 1.19 (AIRR=1.193, 95% CI: 1.054–1.35) times more likely to have children than those who did hear, in 2005 and 2011, respectively, fixing other independent variables. Thus, in contraception nonusers, the fertility levels of Muslim women who had not heard about FP on TV and newspapers were higher than those of Christian women in 2005. Finally, in both Christian and Muslim religious women with contraception non-use, age group and place of residence were significantly associated with CEB.

Fertility Levels of Contraception Users by Religion

The findings (see Table 6) emphasized the relationship between CEB and age groups and showed that the AIRR of Muslim women in age groups 25–44 with contraceptive use were higher than corresponding age groups of Christian women, making other independent variables constant in both 2005 and 2011. Christian and Muslim women who did use contraception in the 40–44 age group were about 0.88 (AIRR=0.875, 95% CI: 0.628–1.219) and 0.99 (AIRR=0.988, 95% CI: 0.533–1.829) times less likely to have children than those of age group 45–49, in 2005, respectively, fixing other independent variables. Similarly, the corresponding AIRR for Christian and Muslim women with contraceptive use in the 40–44 age group were about 0.81 (AIRR=0.811, 95% CI: 0.72–0.914) and 0.83 (AIRR=0.826, 95% CI: 0.646–1.055) times less likely to have children than those women of age group 45–49, in 2011, fixing other independent variables. Likewise, Christian and Muslim women who did use contraception and were urban residents were about 0.89 (AIRR=0.891, 95% CI: 0.807–0.985) and 0.66 (AIRR=0.657, 95% CI: 0.53–0.815) times less likely to have children than rural women, in 2011, respectively, fixing other independent variables.

On the other hand, for Christian women with contraception use, the more educated the woman was, the less likely she was to have children in their life in both 2005 and 2011. But, for Muslim women with contraception use, the more educated a women was, the more likely she was to have children in her life in both 2011. Furthermore, Christian women with contraceptive use whose wealth index (poorest, poorer, middle, and richer) was about 1.26 (IRR= 1.256, 95% CI: 1.103–1.432), 1.14 (AIRR=1.139, 95% CI: 1.005–1.291), 1.06 (AIRR= 1.06, 95% CI: 0.94–1.205), and 1.19 (AIRR=1.191, 95% CI:1.062–1.337) times more likely to have children than richest women in 2011, respectively, fixing other independent variables. On the contrary, Muslim women who did use contraception with wealth indexes (poorest, poorer, middle, and richer) were about 0.80 (AIRR=0.796, 95% CI: 0.635–0.998), 0.83 (AIRR=0.832, 95% CI: 0.683–1.014), 0.76 (AIRR=0.755, 95% CI: 0.614–0.93), and 0.99 (AIRR=0.991, 95% CI: 0.816–1.203) times less likely to have children than the richest women in 2011, respectively, fixing other independent variables. Finally, age group, place of residence, and wealth index of women who did use contraception methods, for Christian and Muslim women, were significantly associated with CEB in 2011.

5.4. Discussion

The results from EDHS 2005 and 20011 have shown that religion has an extremely high effect on the acceptance of modern contraception among people, thus it affect women's fertility behavior outcomes. A number of studies on this issue were done recently in developing countries (Jones 2006; Morgan et al., 2002; Roudi-Fahimi, 2004; Boonstra, 2001; Akafuah, 2008; Skirbekk et al., 2015). Even though, studies focusing on religious impact on fertility were inadequate. In Ethiopia it has not been totally done. This could be a new study of the Ethiopian situation. Many factors are linked with the increase of fertility level; especially religion plays a major role. In general, the impact of demographic and socioeconomic variables on fertility indicated that Muslim women's fertility levels were higher than those of Christians in both 2005 and 2011.There are two reasons why it has become high. First, the contraception use of Muslim women was lower than for Christians in both 2005 and 2011. Second, Ethiopia is a patriarchal society; women are considered inferior to men (Haregewoin and Emebet, 2002), thus a married woman's decision-making about FP is lower compared to her husband. This attitude is greater in Muslim society than Christian. For instance, in Ethiopia fertility levels by region have dropped for the last decade, but the total fertility of the Oromiya region is still higher compared to other regions (CSA, 2006, 2012). This might be due to the high proportion of Muslims recorded by the Oromiya region.

As a result, religion has a great impact on the increase of fertility levels in the Oromiya region. Fertility of Christian and Muslim women with contraceptive non-use was significantly associated with age group and residence in both 2005 and 2011. Similarly, in contraception nonusers, fertility levels for both Christian and Muslim women were significantly associated with age group and residence in 2011. On the other hand, fertility levels of women who follow Christian religious affiliations with contraceptive use and non-use were significantly associated with educational level in 2011. This was supported by previous studies in other countries that found that the respondents' age, region, place of residence, education attainment, employment status, and wealth quintile were significantly linked with fertility (Kazembe, 2009; Alene and Worku, 2008; Westoff and Frejka (2007)).

Age of women was a significant determinant of fertility level as older women had higher fertility levels than younger women for Christians and Muslims. But, as the age of women increases, Muslims had higher fertility levels than Christians. This might be because Muslim women marry at younger ages than Christians. An increase in age at first marriage has a negative effect on high fertility. Early marriage exposes woman's entry into a sexual union and the beginning of exposure to childbearing. Our finding is similar to many other studies that find that older age at first marriage played an important role in the reduction in fertility (Sibanda et al., 2003; Serbessa et al., 2003). On the other hand, for both Christian and Muslim women, the findings have shown that rural women have higher fertility than urban women. This is due to the fact that rural women are less likely to be exposed to FP than urban women as they had little knowledge about types of contraceptive methods—especially long-term and permanent methods. The other reason could be that people who live in rural areas tend to marry at a younger age than those in urban areas (CSA, 2012). Moreover, for women who reside in urban areas, incident rate ratios of CEB for Muslim women were higher than those of Christians in 2011. Women who belong to Muslim religious affiliations are less likely use contraceptive methods than Christians, both urban and rural. This due to the fact that the desire to have more children is greater for Muslim women than Christian.

Moreover, the results have shown that a woman's fertility is negatively associated with her level of education. Women with low levels of education were confirmed to be more likely to have more children than women who had tertiary education. Likewise, studies conducted in Nigeria (ADEBIMPE et al., 2011) and Ethiopia (Gurmu and Mace, 2008) showed that women who had many years of education had significantly lower fertility as compared to

those who had never been enrolled in any formal education system. Alene and Worku (2008) also reported that women who had at least a high school education showed nearly a two-thirds reduction in fertility compared to women with no education. Basu (2002) found that women's education has a positive impact on their reproductive decisions, access to different types of partners than less-educated women, and increased exposure to mass media. Thus, education gives awareness to women and makes them more responsive to their own health and the health of their children, which are negatively linked with the number of children a woman will have during her lifetime. Similarly, the findings have shown that women's wealth quintile affects fertility level. As the wealth indexes of women who follow the Christian religion increases, CEB decreases; thus, women in the richer and richest wealth quintiles have fewer children than poorer and poorest women. This result is also supported by the findings of Adebimpe et al. (2011). For both Christians and Muslims, contraception nonusers who didn't hear about FP on TV as well as in newspapers had higher fertility levels than those who had heard. Muslim women who didn't hear about FP on TV were more likely to have higher CEB than Christians in 2005.

5.5. Conclusion

In Ethiopia, the fertility levels of women are high. Factors that contribute to increasing fertility levels are age, place of residence, religion, educational level, work status, wealth index, health facilities, and media exposure to FP. Among these factors religion plays a major role. Findings have shown that contraceptive uses of Christian women were higher than Muslims, which has a direct impact on their fertility. Muslim women have a significantly higher level of fertility than non-Muslim women who are less religious and hold weaker family values. Therefore, programs that focus on women's educational level and work status must be amended as they are crucial to improve the utilization of FP among women, which would also help to reduce fertility. Similarly, more emphasis needs to be placed on messages conveyed via the mass media, addressing the advantages of small family size and family planning. Mass media can present a wider range of knowledge and lead to adopting contraception. Furthermore, long-running programs focusing on promoting specific permanent contraception methods are needed for women to improve the fertility behavior. It is a fact that Ethiopian societies respect and accept what is said by religious leaders. Thus, FP policy at the country level must endorse initiatives of religious leaders who work closely with the health institutes and support a decline in fertility.

5.6. References

Aassve A, Engelhardt H, Francavilla F, Kedir A, Kim J, Mealli F, Mencarini L, Pudney S, Prskawetz A (2005). Poverty and fertility in less developed countries: a comparative analysis. Essex: Institute for Social and Economic Research.

Alene D and Worku A (2008). Differentials of fertility in North and South Gondar zones, northwest Ethiopia: A comparative cross-sectional study. *Journal of BMC Public Health*, 8:397 doi:10.1186/1471-2458-8-397.

AddaiI (1999). Does religion matter in contraceptive use among Ghanaian women? *Review of Religious Research*, 40, 259–277.

Adebimpe O, Asekun-Olarinmoye, E., Bamidele O &AbodunrinO (2011).Comparative study of socio-demographic determinants and fertility pattern among women and urban communities in south western Nigeria. *Continental Journal of Medical Research* 5, 32-40 .

Adhikari R (2010). Demographic, socio-economic, and cultural factors affecting fertility differentials in Nepal. BMC *pregnancy and childbirth*, *10*(1), 1.

Agadjanian V (2001). Religion, social milieu, and the contraceptive revolution. *Journal of Population Studies*, 55,135–14.

Akafuah A and Marie-Antoinette S (2008).Attitudes toward and use of knowledge about family planning among Ghanaian men, *International Journal of Men's Health*, 7, 109–121.

Basu M (2002). Why does education lead to lower fertility? A critical review of some of the possibilities. World Development, 30:1779–1790.

Bbaale E (2011). Female education, labour-force participation and fertility: evidence from Uganda. *Faculty of economics and Management, Makerere University*, 1-41.

Bongaarts J (1982). The fertility-inhibiting effects of the intermediate fertility variables, *Studies in Family Planning, 13, 179–189.*

Boonstra H (2001). Islam, Women and Family Planning: A Primer. *The Guttmacher Report on Public Policy* Dec 4-7.

Canning D and Schultz P (2012). The economic consequences of reproductive health and family planning, Lancet, 380:165–171.

Central Statistics Agency of Ethiopia and ORC Macro: Ethiopia demographic and health survey (2011). Addis Ababa and Calverton, MD: Central Statistics Agency and ORC Macro. 2012.

Central Statistics Agency of Ethiopia and ORC Macro: Ethiopia demographic and health survey (2005). Addis Ababa and Calverton, MD: Central Statistics Agency and ORC Macro; 2006.

Chandra K, Kandpal D and Negi S (2005). Epidemiological correlates of contraceptive prevalence in rural population of Dehradun district. *Indian Journal of Community Medicine*, *30*(2), 60-62.

Conde-Agudelo A, Rosas-Bermu A, Kafury-GoetaC (2006).Birth spacing and risk of adverse perinatal outcomes: a meta-analysis, JAMA , 295:1809–1823.

Davis K and Blake J (1955). Social structure and fertility: An analytic framework. Economic Development and Cultural Change, 4, 211–235.

Dharmalingam A and Philip S (2004).Pervasive Muslim-Hindu fertility differences in India,Journal of Demography, 41, 529–545.

Famule D (2010). Regional levels and differentials of fertility in Osun State, Nigeria. *Pacific Journal of Science and Technology* 11, 449-454 (2010).

Greene M (2012). By choice not by chance. Family planning human rights and development,United Nations Population Fund.

Greene E and Merrick T (2005). Poverty reduction: does reproductive health matter? Washington DC: World Bank.

Gurmu E and Mace R (2008). Fertility decline driven by poverty: the case of Addis Ababa, Ethiopia. Journal of Biosocial Science, 40(3):339-58.

Haregewoin C and Emebet M (2002). *Country Gender Profile Ethiopia*. Addis Ababa, Ethiopia: Sida, Swedish International Development Cooperation Agency.

Hinde A and Mturi A (2000). Recent Trends in Tanzanian Fertility, *Population Studies,* 54(2):177–191.

Hogan P and Biratu B (2004). Social identity and community effects on contraceptive use and intentions in Southern Ethiopia. Studies in Family Planning, 35, 79–90.

Hull H (2005). People, population and policy in Indonesia, Equinox Publishing.

Iyer S (2002). Religion and the decision to use contraception in India. *Journal for the Scientific Study of Religion*, 41, 711–722.

Jones W (2006).A demographic perspective on the Muslim World. *Journal of Population Research,* 23, 243–265.

Kazembe N (2009). Modelling individual fertility levels in Malawian women: a spatial semi parametric regression model. *Statistical Methods and Applications,* 18(2), 237-255 .

Khan E and Khan T (2007). How a Married Woman's Characteristics Affect Her Contraceptive Behavior. *Journal of Applied Sciences,* 7: 2782-2787.

Kraudal Q (2000). A Search for Aggregate-level Effects of Education on Fertility, using Data from Zimbabwe. *Demographic Research*, 3.

Kravdal Ø, Kodzi I (2011). Children's stunting in sub-Saharan Africa: is there an externality effect of high fertility? *Demographic Research*, 25, 565.

León A (2004). The effect of education on fertility: evidence from compulsory schooling laws. Unpublished paper, University of Pittsburgh.

McCullagh, P. and Nelder, J. A (1989) Generalized Linear Models, Second Edition, Chapman and Hall, London.

Mohanan P, Kamath A and SajjanS (2003). Fertility Pattern and Family Planning Practices in a Rural Area in Dakshina Kannada. *Indian Journal of Community Medicine,* 28: 54-65.

Morgan P, S. Stash, H Smith, and K Mason (2002). Muslim and Non-Muslim Differences in Female Autonomy and Fertility: Evidence from Four Asian Countries. *Population and Development Review* 28(3).

Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2015). *World Population Prospects*: The 2015 Revision.

Population Reference Bureau (2009). *World population data sheet, Washington DC.*

Rabbi F (2012). Mass media exposure and its impact on fertility: Current scenario of Bangladesh. Journal *of Scientific Research*, 4(2), 383.

Roudi-Fahimi F (2004). *Islam and Family Planning, Washington* DC, USA, Population Reference Bureau.

Sackey A (2005). *Female labour force participation in Ghana: The effects of education* (Vol. 150), African *Economic Research Consortium.*

Serbessa D (2002). Differential Impact of Women's Educational Level on Fertility in Africa: The Case of Ethiopia, in Hiroshima University, Japón, http://home.hiroshim.au. ac jp/cice/e forum/69Differential (Vol. 20)

Shah J, Pradhan P, Reddy S and Joseph B (2006).Contraceptive practices in newly married women in sub-urban Bangalore. Health and Population Perspectives and Issues, 29(1), 21-28.

Sibanda A, Woubalem Z, Hogan DP, Lindstrom P (2003). The proximate determinants of the decline to below-replacement fertility in Addis Ababa, Ethiopia**,** *Studies in Family Planning*, 34(1):1-7.

Skirbekk V , M Stonawski, S. Fukuda, T. Spoorenberg, C. Hackett, and R. Muttarak (2015) . Is Buddhism the Low Fertility Religion of Asia? *Demographic Research* 32(1): 1-28.

United Nations (2015). Population Division of the Department of Economic and Social Affairs, world Population Prospects.

Ushie A (2009). Fertility Differentially in Urban and Rural Nigeria: A Comparative Study of Calabar and Bendi Communities in Cross River State, Nigeria. *Unpublished Ph. d Thesis of the University of Calabar, Calabar–Nigeria*.

Ushie A, Ogaboh A, Olumodeji O and Attah F (2011).Socio-cultural and economic determinants of fertility differentials in rural and urban Cross Rivers State, Nigeria. *Journal of Geography and Regional Planning*, *4*(7), 383.

Vavrus F and Larsen U (2003). Girls' Education and Fertility Transition: An Analysis of Recent Trends in Tanzania and Uganda, Economic *Development and Cultural Change.* 51(4), 945-76.

Westoff F and Tomas F (2007). Religiousness and Fertility among European Muslims. *Population and Development Review,* 33:785-809.

Table 1: The percentage distribution of contraceptive non-use and use for currently married women by religious affiliation for socio-demographic variable in 2005

	Contraceptive non-use and use(2005) by religion			
Variables	Christian(non-use)	Christian (use)	Muslim(non-use)	Muslim(use)
Demographic				
Age group	$\chi^2_{(6)} = 38.50***$		$\chi^2_{(6)} = 5.06$	
15-19	88.5(123)	11.5(16)	91.1(102)	8.9(10)
20-24	79(214)	21(57)	85.5(171)	14.5(29)
25-29	76.6(253)	23.4(78)	88(213)	12(29)
30-34	77.8(172)	22.2(49)	90.2(148)	9.8(16)
35-39	70.9(146)	29.1(60)	89(138)	11(17)
40-44	75.6(130)	24.4(42)	89.3(75)	10.7(9)
45-49	95.8(114)	4.2(5)	93.9(62)	6.1(4)
Place of residence	$\chi^2_{(1)} = 109.94***$		$\chi^2_{(1)} = 29.48***$	
Urban	50.3(94)	49.7(96)	63.6(28)	36.4(16)
Rural	83.3(1057)	16.7(212)	90(880)	10(98)
Socio-economic				
Educational level	$\chi^2_{(3)} = 119.90***$		$\chi^2_{(3)} = 49.74***$	
No education	84.1(943)	15.9(178)	91.3(787)	8.7(75)
Primary	67.7(197)	32.3(94)	77.4(120)	22.4(35)
Secondary	33.3(11)	67.7(22)	20(1)	80(4)
Higher	17.6(3)	82.4(14)	100(1)	0.0(0)
Work status	$\chi^2_{(1)} = 18.069***$		$\chi^2_{(1)} = 13.037***$	
Not working	82.1(805)	17.9(176)	90.9(628)	9.1(63)
Working	71.9(297)	28.1(116)	82.6(218)	17.4(46)
Wealth index	$\chi^2_{(4)} = 131.04***$		$\chi^2_{(4)} = 96.331***$	
Poorest	93.8(211)	6.2(14)	95.5(294)	4.5(14)
Poorer	85.9(238)	14.1(39)	98(245)	2(5)
Middle	82.8(269)	17.2(56)	82.9(180)	17.1(37)
Richer	80.6(241)	19.4(58)	83(127)	17(26)
Richest	57.9(195)	42.1(142)	66.3(63)	33.7(132)
Media exposure on (FP)				
Heard (FP) on radio last few months	$\chi^2_{(1)} = 55.43***$		$\chi^2_{(1)} = 49.19***$	
No	84(876)	16(166)	92.7(723)	7.3(57)
Yes	66.5(282)	33.5(529)	76.4(185)	23.6(57)
Heard (FP) on TV last few months	$\chi^2_{(1)} = 53.79***$		$\chi^2_{(1)} = 20.09***$	
No	81.2(1098)	18.8(255)	89.5(895)	10.5(105)
Yes	51.4(56)	48.6(53)	59.1(13)	40.9(9)
Heard (FP) In newspaper/ magazine last few months	$\chi^2_{(1)} = 41.49***$		$\chi^2_{(1)} = 0.946$	
No	80.7(1111)	19.3(266)	89(1895)	11(111)
Yes	51.2(43)	48.8(41)	81.3(13)	18.8(3)
Health service(last 12 months)				
Visited by family planning worker	$\chi^2_{(1)} = 4.108***$		$\chi^2_{(1)} = 0.991$	
No	79.6(1074)	20.4(276)	88.6(845)	11.4(109)
Yes	71.4(80)	28.6(32)	92.5(62)	7.5(5)
Visited health facility	$\chi^2_{(1)} = 42.33***$		$\chi^2_{(1)} = 31.14***$	
No	83.7(840)	16.3(164)	92.4(668)	7.6(55)
Yes	68.7(314)	31.3(143)	80.3(241)	19.7(59)
Number of cases (contraceptive)	non-use cases:2064	Uses cases:421	Total:2485	

Source EDHS 2005. ***=<0.05(statistically significant). FP: Family planning

Table 2: The percentage distribution of contraceptive non-use and use for currently married women by religious affiliation for socio-demographic variable in 2011

	Contraceptive non-use and use (2011)			
	Religion			
Variables	Christian (non-use)	Christian (use)	Muslim(non-use)	Muslim(use)
Demographic				
Age group	$\chi^2_{(6)} = 6.70***$		$\chi^2_{(6)} = 11.14$	
15-19	59(157)	41.0(109)	85.5(142)	14.5(24)
20-24	61.9(338)	38.1(208)	76.7(342)	23.3(104)
25-29	55(423)	45(346)	78.9(540)	21.1(144)
30-34	57.7(319)	42.3(234)	77.7(290)	22.3(83)
35-39	62.9(327)	37.1(193)	80.5(252)	19.5(61)
40-44	68.7(206)	31.3(94)	79.1(155)	20.9(41)
45-49	78.9(221)	21.1(59)	87.2(102)	12.9(15)
Place of residence	$\chi^2_{(1)} = 263.75***$		$\chi^2_{(1)} = 88.93***$	
Urban	36.1(268)	63.9(474)	55.9(132)	44.1(104)
Rural	69.2(1724)	30.8(769)	82.1(1691)	17.9(368)
Socio-economic				
Educational level	$\chi^2_{(3)} = 106.68***$		$\chi^2_{(3)} = 73.31***$	
No education	68.9(1169)	31.4(535)	83.9(955)	16.1(183)
Primary	57.5(679)	42.5(502)	77.9(796)	22.1(226)
Secondary	42.1(72)	57.9(99)	54.9(45)	45.1(37)
Higher	40(72)	60(108)	50(26)	50(26)
Work status	$\chi^2_{(1)} = 6.14***$		$\chi^2_{(1)} = 1.59$	
Not working	66.9(292)	33.1(146)	82.1(261)	17.9(57)
Working	60.7(1697)	39.3(1098)	79(1561)	21(415)
Wealth index	$\chi^2_{(4)} = 224.52***$		$\chi^2_{(4)} = 136.29***$	
Poorest	75.4(425)	24.6(139)	88.6(420)	11.4(54)
Poorer	70.2(474)	29.8(201)	81.6(425)	18.4(96)
Middle	66.9(450)	33.1(223)	84.4(422)	15.6(78)
Richer	60(345)	40(230)	77.9(378)	22.1(107)
Richest	39.8(298)	60.2(450)	56.4(177)	43.6(137)
Media exposure on (FP)				
Heard (FP) on radio last few months	$\chi^2_{(1)} = 66.185***$		$\chi^2_{(1)} = 32.95***$	
No	66.6(1421)	33.4(714)	82.4(1353)	17.6(288)
Yes	51.9(570)	48.1(529)	71.7(469)	28.3(185)
Heard (FP) on TV last few months	$\chi^2_{(1)} = 97.48***$		$\chi^2_{(1)} = 85.86***$	
No	65.3(1767)	34.7(940)	81.9(1705)	18.1(377)
Yes	42.4(224)	57.6(304)	54.9(117)	45.1(96)
Heard (FP) In newspaper/ magazine last few months	$\chi^2_{(1)} = 43.06***$		$\chi^2_{(1)} = 32.64***$	
No	63.1(1913)	36.9(1121)	80.2(1792)	19.8(442)
Yes	39.7(79)	60.3(120)	50(30)	50(30)
Health service(last 12 months)				
Visited by family planning worker	$\chi^2_{(1)} = 3.59$		$\chi^2_{(1)} = 38.55***$	
No	62.4(1573)	37.6(947)	82(1501)	18(329)
Yes	58.5(419)	41.5(297)	69(320)	31(144)
Visited health facility	$\chi^2_{(1)} = 32.39***$		$\chi^2_{(1)} = 14.88***$	
No	65.7(242)	34.3(649)	82(1139)	18(250)
Yes	55.8(750)	44.2(594)	75.3(681)	24.7(223)
Number of cases (contraceptive)	Non-use:3814		Uses:1715	

Source EDHS 2011. ***=<0.05(statistically significant). Family planning (FP)

Table 3 Predicators of contraceptive non-use and their mean children ever born by religion category (Christian, Muslim) in 2005 and 2011 using one way Anova

Variables	Contraceptive non- use (2005) Mean CEB		Contraceptive non-use (2011) Mean CEB	
	Christian	Muslim	Christian	Muslim
Demographic				
Age group	F=73.97***	F=42.60***	F=451.2881***	F=371.731***
15-19	0.66	0.32	0.51	0.76
20-24	1.76	1.62	1.55	1.99
25-29	3.01	4.08	3.00	3.55
30-34	3.88	4.39	4.45	5.42
35-39	6.33	7.09	5.70	6.39
40-44	7.37	7.42	6.63	7.73
45-49	7.55	10.29	8.18	7.40
Place of residence	F=33.47***	F=3.56	F=60.734***	F=4.75***
Urban	2.82	2.76	2.86	3.78
Rural	4.70	4.30	4.39	4.34
Socio-economic				
Educational level	F=`21.615***	F=3.795***	F=33.72***	F=8.617***
No education	4.56	4.61	4.60	4.47
Primary	3.33	4.02	3.91	4.01
Secondary	2.23	2.25	2.56	3.35
Higher	1.79	2.67	1.69	2.74
Work status	F=0.022	F=0.822	F=0.936	F=4.37
Not working	4.05	3.82	4.02	4.18
Working	4.10	4.35	4.21	4.32
Wealth index	F=7.04***	F=2.44	F=25.57***	2.986***
Poorest	6.26	4.89	4.56	4.47
Poorer	3.95	7.73	4.33	4.16
Middle	4.29	3.47	4.69	4.26
Richer	5.23	3.86	4.06	4.60
Richest	3.44	4.10	2.76	3.87
Media exposure on FP				
Heard family planning radio last few months	F=0.120	F=4.86***	F=13.896***	F=8.725***
No	4.17	4.70	4.34	4.19
Yes	4.06	3.47	3.78	4.63
TV last few months	F=18.733***	F=2.50	F=86.293***	F=10.23***
No	4.42	4.22	4.40	4.36
Yes	2.65	2.59	2.44	3.49
In newspaper/magazine last few months				
F=11.97***		F=0.148	F=47.001***	F=10.277***
No	4.33	4.11	4.28	4.33
Yes	2.75	3.42	1.91	2.64
Health service(last 12 months)				
Visited by family planning worker	F=19.125***	F=3.885***	F=13.923***	F=3.566
No	3.99	4.35	4.05	4.25
Yes	5.48	5.10	4.67	4.58
Visited health facility	F=0.95	F=3.57	F=9.01***	F=0.918
No	4.04	4.51	4.34	4.26
Yes	4.23	4.08	3.92	4.39

Source EDHS 2005 and 2011. ***=<0.05(statistically significant)

Table 4 Predicators of contraceptive use and their mean children ever born by religion category (Christian, Muslim) in 2005 and 2011 using one way Anova

Variables	Contraceptive use (2005) Mean CEB		Contraceptive use (2011) Mean CEB	
	Christian	Muslim	Christian	Muslim
Demographic				
Age group	F=73.97***	F=42.60***	F=294.96***	F=105.58***
15-19	0.66	0.32	0.65	0.36
20-24	1.76	1.62	1.40	1.59
25-29	3.01	4.08	2.45	3.10
30-34	3.88	4.39	4.12	4.49
35-39	6.33	7.04	5.05	6.34
40-44	7.37	7.42	6.62	6.87
45-49	7.55	10.29	8.14	7.95
Place of residence	F=33.47***	F=3.563	F=80.01***	F=17.39***
Urban	2.82	2.76	2.61	2.83
Rural	4.70	4.30	3.92	4.04
Socio-economic				
Educational level	F=9.646***	F=0.73	F=31.17***	F=1.70***
No education	4.96	4.38	4.04	3.93
Primary	3.94	3.93	3.31	3.82
Secondary	2.87	1.72	2.23	3.43
Higher	2.46	3.74	1.93	2.77
Work status	F=0.022	F=0.822	F=0.325	F=3.83
Not working	4.05	3.82	3.54	4.42
Working	4.10	4.35	3.41	3.69
Wealth index	F=7.04***	F=2.44	F=25.63***	2.81***
Poorest	6.26	4.89	4.20	3.69
Poorer	3.95	7.73	3.86	4.11
Middle	4.29	3.47	3.94	3.28
Richer	5.23	3.86	3.90	4.32
Richest	3.44	4.10	2.48	3.43
Media exposure on FP				
Heard family planning radio last few months	F=0.12	F=4.86***	F=3.64	F=4.38***
No	4.17	4.70	3.54	3.98
Yes	4.06	3.47	3.26	3.45
TV last few months	F=18.73***	F=2.49***	F=62.18***	F=6.22***
No	4.42	4.22	3.74	3.93
Yes	2.65	2.59	2.43	3.17
In newspaper/magazine last few months				
F=11.97***		F=0.148	F=91.08***	F=4.97***
No	4.33	4.11	3.65	3.85
Yes	2.75	3.42	1.35	2.73
Health service(last 12 months)				
Visited by family planning worker	F=1.96	F=5.47***	F=35.82***	F=11.04***
No	4.04	3.95	3.18	3.51
Yes	4.77	7.10	4.20	4.39
Visited health facility	F=4.1***	F=075	F=0.40	F=0.002
No	3.82	4.34	3.47	3.78
Yes	4.46	3.85	3.37	3.77

Source EDHS 2005 and 2011. . ***=<0.05(statistically significant)

Table 5 Predicators of contraceptive non-use and their fertility level by Religion category (Christian, **Muslim**) in 2005 and 2011 using Generalizer linear model (Poisson log linear)

	Contraceptive (non-use) 2005		Contraceptive(non-use) 2011	
		IRR(95% CI)	IRR(95% CI)	
Variables	Christian	Muslim	Christian	Muslim
Demographic				
Age group	***	***	***	***
15-19	0.077(0.06-0.099)	0.143(0.115-0.177)	0.063(0.051-0.078)	0.102(0.083-0.126)
20-24	0.247(0.219-0.279)	0.286(0.248-0.331)	0.199(0.181-0.218)	0.269(0.241-0.299)
25-29	0.423(0.383-0.467)	0.454(0.40-0.541)	0.376(0.351-0.404)	0.467(0.428-0.509)
30-34	0.629(0.571-0.694)	0.671(0.59-0.761)	0.558(0.522-0.597)	0.728(0.666-0.797)
35-39	0.804(0.731-0.885)	0.817(0.722-0.925)	0.707(0.664-0.753)	0.852(0.778,0.933)
40-44	0.922(0.839-1.013)	0.858(0.747-0.982)	0.856(0.80,0.917)	1.027(0.934-1.13)
45-49 [RC]				
Place of residence	***		***	***
Urban	0.84(0.699-1.009)	1.173(0.895-1.537)	0.839(0.74-0.952)	0.79(0.68-0.918)
Rural [RC]				
Socio-economic				
Educational level			***	
No education	1.391(0.877-2.204)	1.353(0.830-2.199)	1.6(1.301-1.968)	1.162(0.907-1.49)
Primary	1.463(0.925-2.314)	1.398(0.860-2.272)	1.587(1.293-1.948)	1.137(0.89-1.454)
Secondary	1.382(0.849-2.248)	0.393(0.090-1.717)	1.404(1.108-1.778)	1.152(0.861-1.541)
Higher [RC]				
Work status	***	***		
Not working	1.009(0.946-1.077)	1.126(1.042-1.218)	1.011(0.953-1.072)	0.99(0.924-1.061)
Working [RC]				
Wealth index				
Poorest	1.203(1.065-1.357)	0.978(0.824-1.162)	1.113(0.977-1.268)	0.856(0.745-0.983)
Poorer	1.228(1.09-1.384)	0.993(0.838-1.176)	1.094(0.961-1.245)	0.845(0.736-0.969)
Middle	1.143(1.014-1.289)	1.161(0.98-1.376)	1.081(0.949-1.23)	0.882(0.769-1.012)
Richer	1.166(1.036-1.312)	1.052(0.884-1.252)	1.007(0.886-1.145)	0.913(0.798-1.044)
Richest [RC]				
Media exposure on FP				
Heard family planning last few months				
Radio				
No	1.019(0.942-1.103)	0.989(0.903-1.085)	1.019(0.968-1.072)	0.964(0.91-1.02)
Yes [RC]				
TV			***	
No	1.18(0.875-1.59)	1.634(0.941-2.837)	1.296(1.168-1.438)	1.193(1.054-1.35)
Yes [RC]				
In newspaper/magazine	***			***
No	1.419(1.076-1.872)	1.078(0.781-1.488)	1.182(0.987-1.417)	1.673(1.291-2.167)
Yes [RC]				
Health service(last 12 months)	***			
Visited by FP worker			***	***
No	0.896(0.809-0.993)	1.011(0.884-1.155)	0.925(0.88-0.973)	1.052(0.988-1.119)
Yes [RC]				
Visited health facility	***			***
No	0.918(0.858-0.982)	1.062(0.98-1.151)	0.992(0.949-1.038)	0.949(0.903-0.997)
Yes [RC]				

Source EDHS 2005 and 2011. . ***=<0.05(statistically significant), where AIRR =Adjacent incident rate ratio

Table 6 Predicators of contraceptive use and their fertility level by religion category (Christian , Muslim) in 2005 and 2011 using Generalizer linear model (Poisson log linear).

	Contraceptive (use) 2005		Contraceptive(use) 2011	
		IRR(95% CI)	IRR(95% CI)	
Variables	Christian	Muslim	Christian	Muslim
Demographic				
Age group	***	***	***	***
15-19	0.081(0.042-1.57)***	0.034(0.01-0.114)***	0.082(0.064-0.104)***	0.039(0.019-0.08)***
20-24	0.216(0.148-0.317)***	0.187(0.11-0.318)***	0.197(0.17-0.228)***	0.19(0.146-0.246)***
25-29	0.386(0.271-0.545)***	0.51(0.323-0.803)***	0.327(0.292-0.365)***	0.377(0.3-0.474)***
30-34	0.474(0.332-0.675)***	0.609(0.361-1.028)	0.532(0.476-0.594)***	0.576(0.456-0.726)***
35-39	0.758(0.54-1.062)	0.97(0.586-1.605)	0.646(0.579-0.72)***	0.744(0.58-0.956)***
40-44	0.875(0.628-1.219)	0.988(0.533-1.829)	0.811(0.72-0.914)***	0.826(0.646-1.055)
45-49 RC				
Place of residence			***	***
Urban	0.844(0.673-1.059)	0.61(0.358-1.039)	0.891(0.807-0.985)***	0.657(0.53-0.815)***
Rural RC				
Socio-economic				
Educational level			***	
No education	1.394(1.014-1.917)***	1.437(0.634-3.259)	1.228(1.042-1.447)***	0.735(0.547-0.987)***
Primary	1.465(1.082-1.984)***	1.435(0.633-3.249)***	1.137(0.969-1.335)	0.736(0.553-0.98)***
Secondary	1.016(0.699-1.479)	0.762(0.197-2.948)	1.078(0.886-1.313)	0.793(0.573-1.099)
Higher RC				
Work status				
Not working	0.99(0.876-1.12)	1.123(0.892-1.415)	0.946(0.864-1.036)	1.153(0.996-1.334)
Working RC				
Wealth index			***	***
Poorest	1.113(0.868-1.427)	0.819(0.541-1.241)	1.256(1.103-1.432)***	0.796(0.635-0.998)***
Poorer	0.901(0.712-1.14)	1.032(0.647-1.645)	1.139(1.005-1.291)***	0.832(0.683-1.014)
Middle	0.952(0.787-1.151)	0.798(0.559-1.138)	1.064(0.94-1.205)	0.755(0.614-0.93)***
Richer	1.061(0.887-1.27)	0.74(0.495-1.107)	1.191(1.062-1.337)***	0.991(0.816-1.203)
Richest RC				
Media exposure on Family planning (FP) last few months				
Heard (FP) on Radio				
No	0.972(0.849-1.112)	0.957(0.752-1.218)	0.946(0.883-1.013)	1.072(0.95-1.21)
Yes RC				
Heard (FP) on TV			***	
No	1.089(0.809-1.467)	0.942(0.481-1.844)	1.161(1.046-1.288)***	1.0089(0.834-1.219)
Yes RC				
Heard (FP) In newspaper/magazine			***	
No	0.965(0.728-1.279)	1.848(0.737-4.634)	1.496(1.26-1.777)***	1.285(0.986-1.676)
Yes RC				
Health service(last 12 months)				
Visited by FP worker				
No	1.007(0.843-1.203)	0.89(0.524-1.514)	0.967(0.904-1.035)	0.974(0.875-1.085)
Yes RC				
Visited health facility	***			
No	0.859(0.76-0.971)	0.818(0.627-1.067)	0.964(0.906-1.027)	0.949(0.856-1.051)
Yes RC				

Source EDHS 2005 and 2011. ***=<0.05(statistically significant),where AIRR =Adjacent incident rate ratio.

CHAPTER VI

Correlates of age at marriage and birth interval in Ethiopia: A survival analysis

[1]YISHAK ABRAHAM LAILULO AND A. SATHIYA SUSUMAN

[1]*Department of Statistics and Population Studies, Faculty of Natural Sciences, University of the Western Cape, 7535 Bellville, Cape Town South Africa;*
Email: sappunni@uwc.ac.za

Abstract

Age at first marriage have a significant effect on birth interval. This study investigates the relationship between age at marriage to birth interval and its associated factors in Ethiopia. The objective of the study is to examine the estimated age at first marriage to first birth interval and its main associated factors by age at first marriage and place of residence in Ethiopia. Data from the Ethiopia Demographic Health Survey (EDHS) 2011 was used. Cox Proportional Hazard model is used to determine the significant factors contributing towards age at marriage to first birth interval in Ethiopia. The findings from the Cox proportional hazard model indicate that age at first marriage, religion, region, educational level and work status are the most important significant covariates of 'age at first marriage to first birth interval' in Ethiopia. Age at first marriage of women and their socio-economic factors contribute to differences in first birth interval. On the other hand, in Muslim dominated region such as Somali the time of transition to motherhood is early due to their religious belief.

Keywords: First birth interval, Cox Proportional Hazard model, Kaplan Meier survival estimate, demographic and socio-economic variables.

6.1. Introduction

Ethiopia is facing the problem of rapid population growth as well the inadequacy of resources. The government developed several strategies to control this rapid population growth since 1993. One of the population policies was reducing the current total fertility rate of 7.7 children per woman to approximately 4.0 by the year 2015. But more emphasis was put on the stopping behaviour of fertility. Control over spacing behaviour was not totally given attention. The two child policies, delayed marriages as well as at least four year birth interval can give better results in lowering the fertility (Hoa, Toan, Johansson, Hoa, Hojer, & Persson, 1996).

The time interval between marriage and first live birth is named as "*marriage to first birth interval*". It is one of the most important events in a woman's life. Early beginning of first birth reduces the quality of life because of responsibilities of motherhood and childcare. Mosammat and Mohammad (2013) found early entry into motherhood increases the reproductive period and subsequently fertility. Birth intervals are generally shorter in Ethiopia, with a median interval of 33.9 months (Central Statistical Authority (CSA), 2011). For the purpose of creating effective policy to encourage people for longer first birth interval, it is therefore necessary that the various socio-economic and demographic factors that influence first birth interval length be studied.

Kumar and Danabalan (2006) in India and Islam (2009) in Bangladesh have done empirical works on the effects of marriage instability due to early marriage on timing of first birth. They documented the mediating effects of socio-economic, demographic, and cultural characteristics of marriage partners. The analysis of first birth interval is very important due to its demographic (Kumar and Danabalan 2006), health (Ezra & Gurmu 2002), and socio-economic (Ermisch & Pevalin 2005) implications. Early marriage and early childbearing are common in Ethiopia. Entry into first marriage is one of the key factors influencing the reproductive health of adolescents and marks the point in a woman's life when childbearing becomes socially acceptable (Moore et al., 2008).

Marriage to first birth interval was associated with age of women at marriage, religion, place of residence and education. Gurmu & Etana (2005) found the difference among the women age and occupation had not affected the marriage to first birth interval. Women age at first marriage, education, occupation, and place of residence are linked with first birth interval. Increase in age at marriage has resulted in significantly short first birth interval. Age at marriage is an important predictor of fertility in Pakistan, like other countries where there is no concept of pre-marital sex (Hinde & Mturi, 2000 as cited in Woldemicael, 2008). Gurmu & Etana (2005) had found significant effect of age at marriage on first birth interval in Ethiopia. Kamal & Pervaiz (2013) found that, urban residents have longer first birth interval than rural residents if the other factors are controlled.

Education of women has a positive effect on first birth interval. Gangadharan & Maitra (2001); Kamal & Pervaiz (2013) found that, the more women attend education, the shorter their marriage to first birth interval. Similarly, working women have shorter first birth interval compared to those not working. This is due to the fact that, the work status of woman has strong negative effect if her work clashes with her motherly role. Thus, Wealth index for all categories (Poorest, Poorer, Middle, and Richer) has shown more risk of long birth interval as compared to richest (Kamal & Pervaiz, 2013).The objective of this research is to investigate the estimate of the young women first marriage to first birth interval and its main associated factors by age at first marriage and place of residence in Ethiopia.

6.2. Methodology

Secondary data extracted from the Ethiopia Demographic and Health Survey conducted in 2011 under auspices of the Ministry of Health by the authority of Central statistical Agency of Ethiopia has been used for this study. EDHS 2011 covered a nationally representative sample of 2527 married women of age group (15-24).

Study settings

In Ethiopia, there are 11 regions, such as: Tigray, Affar, Amhara, Oromiya, Somali, Benishangul-Gumuz, SNNP, Gambela, Harari, Addis Ababa and Dire Dawa. According to CSA (2014) for population abstract, Ethiopian population was 90,078,000 in 2014, total population by place of residence, urban (17,459,000) and rural (72,619,000). Of the total, the

male population was (45,251,000) and females (44,827,000). Total number of youth population of the age group 15-24 is 18, 583,766 and of this males were (9,400,589) and females (9,183,177). Seventeen percent of women age 15-24 and 19 percent of men in the same age group have used a method of family planning at some time (Govindasamy et al., 2002).

Among sexually experienced women 15-24, Amhara region was the lowest percentage that have ever used a method of contraception which was about 14.2%, followed by Oromiya 14.7%. Of the same age group, the highest percentage was recorded in Addis Ababa (35.7%) (Govindasamy et al., 2002). As a result, the total fertility for Addis Ababa was about 1.5, which was below replacement level. Moreover, Somali was the highest total fertility region which was about 7.1 followed by Oromiya 5.6 (EDHS, 2011)

Why this study is important?

In Ethiopia it has been a challenge to increase age at marriage due to effect of strong social customs and religion on it. If population control policies are formulated, particularly the first birth interval is controlled, then higher order birth interval will also be controlled (Islam, 2009 as cited in Kamal and Pervaiz, 2013).

The importance of the study was to examine the determinants of first birth interval in Ethiopia on the ground that there is social pressure to prove couple's fertility soon after marriage in communities. As a result, women family planning usage was low. Previous studies have reported the associated factors of age at first marriage to first birth interval, but no emphasis so far have been made on the associated factors of young women (women of the age group 15-24) first marriage to first birth by age at first marriage and place of residence. This, study is different because it shows the extent to which age at first marriage to first birth interval differs as age at marriage increases, and the changes in place of residence of women. In 2011 DHS reported that 38 percent of births (in Ethiopia) given by less than 18 years of mothers. Family planning use rate is just 20 percent but awareness about any method was 98 percent. We want to know exactly the birth interval by age at marriage with different age group. None of the study captivated with these important issue. Therefore, the present study purposively focused on different women's age groups comparable 15-19, 20-24 and 25 and above.

6.2.1. Description of variables

Various socio-economic, demographic, family planning exposure and health facility factors are accounted to be explanatory or variables.

As the dependent variable is first birth interval, clearly, throughout an interval women may either have a birth (event) and event of interest did not happen while women were under observation (censored). It is right censored (fixed type I censoring) which means everyone who does not have an event observed during the course of the study is censored at the time of the survey.

6.2.2. Survival analysis

In survival analysis we are interested in the time interval between marriage entry and first child birth. The outcome of interest is first birth (child birth).

Definition 1: Survival time measures the period of time from marriage to first child birth (Lee, 1992).

Definition 3: *Hazard* function is a function indicates the probability of an individual of having first child birth at *t* time in the condition that this individual survived to *t* time (Banerjee, 2007).

Kaplan Meier Product Limit Survivorship Function

The Product Limit estimate of the Survival Function (Kaplan and Meier, 1958) is defined as

$S(t)=\pi_{j=1}\left(1-\frac{d_j}{n_j}\right)$

Where,

dj = number of women having births at time tj

nj = number of women just prior to tj exposed to the risk of having birth

tj =time since the previous birth of a child to that woman

Median and mean survival time

A confidence interval for the median survival time is constructed using a robust nonparametric method due to Brookmeyer and Crowley (1982). Another confidence interval for the median survival time is constructed using a large sample estimate of the density function of the survival estimate (Andersen, 1995). If there are many tied survival times then the Brookmeyer-Crowley limits should not be used.

Samples of survival times are frequently highly skewed, therefore, in survival analysis; the median is generally a better measure of central location than the mean.

Cox's proportional hazards model

Marriage to first child interval is a continuous data (numeric). Thus, Cox proportional hazards regression models measures the relationship between a set of covariates and the hazard rate (first child birth), introduced by Cox (1972). The model was applied to determine the relationship between a set of covariates (predictor variables) and first child birth. It is the most frequently used regression model in survival analysis because this model is semi-parametric and can be used for both censored and uncensored data. The key assumption for the model is proportional hazards: the hazard for any individual is a fixed proportion of the hazard for any other individual.

The formula for the Cox proportional hazard model is a product of $h_0(t)$ called the baseline hazard as well as exponential of the sum of β_i and X_i . It assumes that for an individual with a vector of covariates in x, the hazard rate (first child birth) at time t.

The proportional hazard model is given by:

$$h(t,X)= h_0(t)\exp\left(\sum_{i=1}^{p}\beta_i X_i\right)= h_0(t)\exp\left(\beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_p x_{pi}\right)$$

Where, $X=(X_1, X_2, \ldots., X_p)$ are the explanatory/predictor variables. The baseline hazard $h_0(t)$ determines the shape of the survival function and reflects the hazard when all covariates equal to 0. Since no assumptions on $h_0(t)$ are made (except that it must be positive), Cox model is considered semi parametric. There is no intercept in the model because the constant is absorbed in the baseline hazard. The hazard ratio is the ratio of the hazard function to the baseline hazard $h(t, X)/h_0(t)$. The log of the hazard ratio is a linear combination of parameters

which is

$$\log h(t, X)/h_0(t) = \exp\left(\beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_p x_{pi}\right)$$

6.3. Results

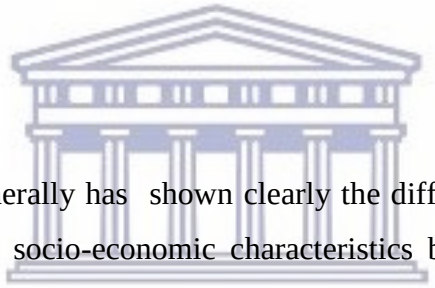
Table 1 presents the socio-economic and demographic characteristics for timing of first motherhood (in months) by age at marriage. Marriage to first birth interval is significantly associated with place of residence, religion, region and educational level for both women of age at marriage 15-19 and 20-24. On the other hand, marriage to first birth interval is significantly associated with region and educational level for both women of age at marriage 25 and older. Women who got married at older age give birth to their first child earlier than those of younger.

Table 2 presents the proportional hazard model estimate of relative risk of covariates of first birth interval in Ethiopia. It has been observed from the Cox's proportional Hazard regression analysis that in women age at marriage, religion, region and education has positive significant effect on their marriage to first birth interval. Women who were living in rural areas are found to have 14 Percent lower risk of being a mother than those of urban areas respectively in 2011. From the proportional hazard model it is apparent that women who belong to Muslim religion were 47 % higher risk of being a mother than those of Christian religious affiliation. Moreover, religion is significantly associated with marriage to first birth interval. Highest hazard ratio recorded by Somali, which is 2.56 times more likely to be risked of having first child than Tigray region. Likewise, the lowest hazard ratio found in Amhara region, which is about 18 percent higher likelihood on first birth compared to Tigray region. Respondent's education has significant positive influence on the marriage to first birth interval. From the analysis, it is observed that, the odd ratios of the women who are primary, secondary and higher educated have 32, 44 and 42 Percent higher risk of having birth than their illiterate counterparts respectively.

Table 3 presents the proportional hazard model estimate of relative risk of covariates of first birth interval by age at marriage in Ethiopia. It has been observed from the Cox's proportional Hazard regression analysis that in young women religion, region, education and work status has significant effect on their marriage to first birth interval. In general, as age at first marriage increases, the hazard ratio of marriage to first birth interval (in moths) by demographic and socio-economic covariates have been declined. Hazard ratio of marriage to first birth interval of young women by age at marriage 15-19 and 20-24 who belongs to

Muslim religious affiliation were (HR=1.22, CI (1.09-1.37)) and HR=1.13, CI (1.03-1.24)) respectively. This indicate that young women age at marriage 15-19 and 20-24 who belongs to Muslim religious affiliation have 22% and 13% higher risk of being a mother than those of Christian religious affiliation. . Moreover, region is significant positively associated with marriage to first birth interval except in Amhara region. Women with age at marriage 15-19 and 20-24 of living in the Amhara region were 0.81 and 0.86 times less likely to be at risk of having first child than those of Tigray region. In addition to these, young women education has significant positive influence on the marriage to first birth interval. From the analysis it is observed that, young women of age at marriage 15-19 who are primary, secondary and higher education have 27, 29 and 92 Percent higher risk of having birth than illiterate counterparts respectively. Similarly, those with age at marriage of 20-24 who have primary, secondary and higher education have 22, 16 and 5 Percent higher risk of having birth than illiterate counterparts respectively.

6.4. Discussion



The findings of this study generally has shown clearly the difference in first birth interval linked with demographic and socio-economic characteristics by age at first marriage and place of residence of respondents. The religious, regional, educational and work status variation in first marriage to first birth interval could be related to age at first marriage. In addition to this, traditional norms and values governing the formation and stability of marriage are highly affected by the interval between first marriage and first birth.

Religion is found to be the most significant factors influencing the variation in the young women's first birth interval. For both Muslim and Christ religious women, as age at first marriage increases, first marriage to first birth interval decreases. But, for all women aged 25 and above who are either Muslim or Christian, they have the same first birth interval. This is due to norms and culture of Ethiopia which encourage women to get first child immediately after marriage. A woman who gives birth to a child are more likely to be respected by husband as well as in the community compared with those women who do not have a child. The husband's family are pledged their son to have a child so that they would think that they have replaced the generation, unless they never become happy. As a result, the couple may not have rested till they get a child. On the other hand, regardless of age at first marriage of

young women, a Muslim religious woman prefers to have her first child early than Christian. This was supported by previous studies in other countries that found that women religious afflictions were significantly linked with fertility (Alam, 2015). It might be due to the fact that different religious teachings play varying role on the issue such as the importance of family, as well as perspective messages regarding fertility control measure that is contraception and abortion. Muslims place the highest premium on large families and they have restriction of using contraceptive devices. Moreover, there is a regional discrepancy of first birth interval in Ethiopia. As age at first marriage increases, first birth interval decreases by region. Somali and Oromiya region women were more likely to give first child early than other region women. This is because of the Muslim dominance in the region. It has been indicated that Muslim religious women prefers first child early than Christian as well as they get married at early age.

Furthermore, urban women with no education have shortest first birth interval compare with women of other educational level. Following as educational level of urban women increases, they delays first birth. Women's education is therefore an essential component of reproductive behavior. Our results agree with the findings of other studies (Gyimah, 2005; Rasekh, Momtaz, 2007). When women spend a longer time at school, this is likely to significantly affect both age at marriage and the duration between marriage and the first birth. On the other hand, considering the whole population without restricting the place residence, educational level increases with a decrease in first birth interval for both women of age at marriage (15-19 and 20-24). This was due to the fact that, as women educational level increases, the more they would be generating money. In addition to these, working women are statistically more likely to have shorter first birth interval than those not working as evident by Alam 2015 in his study. It is because of working women could get some income that is able to afford the feeding as well as shelters for their household. Thus, they would prefer to give a child earlier than those not working.

6.5. Conclusion

The aim of the study has been to investigate first marriage to first birth interval and its associated factors in Ethiopia. To examine the risk factors of timing of first motherhood using Cox's proportional Hazard model in order to examine time varying covariates. The finding of multivariate analysis have shown that age at first marriage, religion, region and respondents ''education'' are the most important significant factors of first marriage to first birth interval in Ethiopia. The significant covariates by age at first marriage are religion, region, and educational level and work status. Not only increasing age at first marriage of women reduces fertility but also their socio-cultural factors contribute to differences in fertility behavior. In Amhara region, a common rural area where women get marriage at early age, to some extent for cultural reasons; the time of change to motherhood is delayed. On the other hand, in Muslim dominated region such as Somali, the time of transition to motherhood is early due to their religious belief. However, women who were residing in urban areas of Somali had very short first birth interval, it might be because they gets pregnant earlier before they got married. In addition to this, the socio-economic and cultural practices are the key factors that allow couples to enter into marital life late and give first birth soon. As a result of education, it is more likely that young women will not accept the traditional marriage norms and values that promote early marriage and early first birth.

Educated women will prefer to delay their age at first marriage in order to further their education. While age at first marriage increases, couples frequently bear their first child almost immediately after marriage not only to balance for their late start but also to confirm maternal fertility. Increasing first marriage to first birth interval is more likely to reduce the total fertility rate of a young woman. Thus, in the increasing prevalence of contraceptive use and improvement in women's socio-economic situation is necessary to carry changes related with dropping fertility and improving maternal and child health through increasing first birth interval. Hence, in an attempt to decrease the fertility by increasing women age at first marriage, it is necessary that we have a look at their educational level, work status, wealth indexes and norms within which marriage takes place. Therefore, Ethiopia public health policy must amend a policy that includes minimal interval from first marriage to first birth of 36 months.

6.6. References

Andersen PK et al. (1995). Statistical models based on counting processes, *Springer-Verlag* , New York.

Banerjee, T. (2007) Bayesian analysis of generalized odds-rate hazards models for survival data, *Lifetime Data Analysis*, 13, 241-260. http://dx.doi.org/10.1007/s10985-007-9035-3

Brookmeyer, R., & Crowley J. (1982). A confidence interval for the median survival time, *Biometrics:* 38:29-41.

Central Statistics Agency of Ethiopia & ORC Macro (2011). Ethiopian Demographic and Health Survey 2011, Addis Ababa and Calverton, MD, Central Statistics Agency and ORC Macro. Washington DC.

Cox, David R (1972)."Regression models and life-tables", *Journal of the Royal Statistical Society*, Series B, 34 (2): 187–220.

Central Statistical Agency (2014), Population Statistics abstract: (http://www.csa.gov.et/index.php/2013-02-20-13-43-35/national-statistics-abstract/141-population)

Ermisch, J., & Pevalin, D.J. (2005). "Early motherhood and later partnerships", *Journal of Population Economics*; 18, (3): 469-489.

Ezra, M., & Gurmu, E. (2002). "Correlates of marriage and family patterns in southern Ethiopia", *Ethiopian Journal of Development Research*; 24, (1):58-91.

Gangadharan, E.W.L. & Maitra, P. (2001). The Effect of Education on the timing of marriage and first birth in Pakistan. ASARC Working Papers: Australian National University, *Australia South Asia Research Centre*.

Govindasamy, P., Kidanu, A., & Bantayerga, H. (2002). Youth reproductive health in Ethiopia, OCR Macro.

Gurmu, E., & Etana, D. (2005). Early marriage and first birth interval in Ethiopia: Evidences from Ethiopian Demographic and Health Survey 2005. Retrieved from http://paa2010.princeton.edu/download.aspx?submissionId=101078

Gyimah, SO. (2005). The dynamics of timing and spacing of births in Ghana, *Journal of Computational Family Studies*, 36: 41-60.

Hinde, A., & Mturi, A. J. (2000). Recent trends in Tanzanian fertility, *Population Studies;* 54(2), 177-191.

Hoa, H. T., Toan, N. V., Johansson, A., Hoa, V. T., Hojer, B. & Persson, L.A. (1996). Child spacing and two child policies in practice in Rural Vietnam: cross sectional survey, *British Medical Journal;* 313, 1113-1116.

Islam, S. (2009). Differential determinants of birth spacing since marriage to first live birth in Rural, *Bangladesh, Pertanika Journal of Social Science and Humanity*; 17(1), 1-6.

Kamal, A., & Pervaiz, M. K. (2013). Determinants of Marriage to First Birth Interval in Pakistan, Journal *of Statistics*; 20(1).

Kaplan, E. L., & Meier, P. (1958).Nonparametric estimation from incomplete observations, *Journal of the American Statistical Association*; 53(282), 457-481.

Kumar, G. & Danabalan, M. (2006). "Determinants of Delayed First Birth", Indian *Journal of Community Medicine;* 31 (4).

Lee, E.T. (1992) Statistical Methods for Survival Data Analysis. 2nd Edition, Wiley Inter-science Publication, New York.'

Moore, Z., Govindasamy, P., DaVanzo, J., Bizuneh, G., & Themme, A. (2008).Trends in youth reproductive health in Ethiopia 2000 and 2005.

Mosammat N & Mohammad Z (2013). Patterns and determinants of age at first birth in Bangladesh. *Journal of Population Studies*; 2013 35: 63-77

Rasekh A, & Momtaz M. (2007). The Determinants of Birth Interval in Ahvaz-Iran: A Graphical Chain Modelling Approach. *Journal of Data Sciences*; 5: 555-576.

Saxena, P. C. & Aoun, H. Y. (1997). Women's education, economic activity and fertility: Relationship re-examined (a study based on Lebanese community), *Al-Abhath.*

Woldemicael, G. (2008). Recent fertility decline in Eritrea: Is it a conflict-led transition? *Demographic Research,* 18(2), 27-58. http://www.demographic-research.org/Volumes/Vol18/2.

Table 1 Kaplan Meier Estimates of Median survival time (ST) linked with socio-economic and demographic characteristics for timing of first motherhood by age at first marriage

Covariates	Age at first marriage **(15-19)** Median ST for Birth Interval (in months)	95% of CI	Age at first marriage **(20-24)** Median ST for Birth Interval (in months)	95% of CI	Age at first marriage **(25+)** Median ST for Birth Interval (in months)	95% of CI
Demographic						
Place of residence						
Urban	23	(18.95-27.05)	21	(19.03-22.97)	16	(14.49-17.51)
Rural	27	(25.39-28.61)	19	(17.92-20.08)	17	(15.82-18.18)
Religion	***		***			
Christian	29	(25.83-32.17)	21	(19.73-22.27)	16	(14.69-17.31)
Muslim	24	(21.73-26.28)	18	(16.56-19.44)	16	(14.51-17.49)
Region	***		***		***	
Tigray	42	(36.03-47.97)	23	(19.79-26.21)	18	(14.04-21.97)
Affar	20	(14.86-25.14)	16	(10.86-21.14)	16	(13.56-18.44)
Amhara	54	(47.45-60.56)	28	(24.70-31.30)	22	(19.33-24.67)
Oromiya	20	(17.18-22.82)	18	(16.11-19.89)	16	(13.78-18.22)
Somali	23	(17.56-28.44)	17	(13.46-20.54)	11	(8.18-13.82)
Benishangul-Gumuz	25	(16.42-33.58)	19	(15.72-22.28)	16	(13.06-18.94)
SNNP	24	(21.03-26.97)	15	(12.60-17.40)	12	(10.97-13.03)
Gambela	24	(17.59-30.41)	21	(17.44-24.56)	15	(11.47-18.53)
Harari	21	(16.85-25.16)	20	(17.69-22.32)	19	(15.53-22.47)
Addis Ababa	19	(15.84-22.16)	18	(14.63-21.37)	16	(13.57-18.43)
Dire Dawa	24	(19.51-28.49)	16	(13.23-18.78)	19	(16.39-21.61)
Socio-economic						
Educational level	***		***		***	
No education	29	(25.97-32.03)	21	(19.24-22.76)	19	(17.43-20.58)
Primary	24	(22.31-25.69)	18	(16.73-19.27)	15	(13.63-16.37)
Secondary	21	(15.82-26.19)	20	(15.13-24.87)	14	(11.98-16.02)
Higher	17	(12.04-21.96)	22	(18.8-25.2)	16	(13.35-18.65)
Work status	***		***			
Not working	22	(18.59-25.41)	21	(18.72-23.28)	18	(15.87-20.13)
Working	27	(25.26-28.74)	19	(17.92-20.08)	16	(14.98-17.03)
Wealth indexes						
Poorest	27	(23.86-30.14)	21	(18.93-23.07)	17	(14.92-19.08)
Poorer	26	(22.71-29.30)	20	(17.03-22.97)	17	(14.46-19.55)
Middle	28	(25.04-30.96)	18	(15.82-20.18)	18	(15.42-20.58)
Richer	23	(19.12-26.89)	19	(16.86-21.14)	15	(12.62-17.38)
Richest	24	(20.29-27.71)	21	(19.08-22.92)	15	(13.55-16.46)

Source: Ethiopian Demographic Health Survey 2011. ***=<0.05(statistically significant),

Table 2 Cox's Proportional Hazard Regression coefficients and relative risk of marriage to first birth interval by place of residence (women of age group 15-24)

Covariates	Hazard ratio 95% of Confidence Interval)		
	Urban	Rural	Total
Demographic			
Age at marriage		***	***
15-19[RC]			
20-24	0.88(0.57-1.37)	1.43(1.21-1.69)	1.69(1.29-2.22)
Religion		***	***
Christian [RC]			
Muslim	1.36(0.90-2.05)	1.45(1.23-1.70)	1.47(1.31-1.65)
Region		***	***
Tigray[RC]			
Affar	1.09(0.34-3.44)	1.18(0.77-1.80)	2.083(1.58-2.74)
Amhara	0.46(0.10-2.22)	0.59(0.41-0.84)	1.18(0.94-1.49)
Oromiya	0.74(0.28-1.95)	1.55(1.10-2.17)	2.481(1.98-3.11)
Somali	1.24(0.36-4.26)	1.83(1.18-2.84)	2.576(1.94-3.43)
Benishangul-Gumuz	0.43(0.16-1.22)	1.07(0.73-1.54)	1.432(1.13-1.82)
SNNP	1.23(0.36-4.22)	1.53(1.06-2.22)	2.382(1.87-3.04)
Gambela	0.86(0.32-2.30)	1.02(0.65-1.59)	1.865(1.40-2.49)
Harari	0.79(0.32-1.93)	1.67(1.11-2.53)	2.297(1.75-3.02)
Addis Ababa	0.97(0.38-2.46)	--------	2.096(1.48-2.98)
Dire Dawa	0.96(0.40-2.31)	1.66(1.03-2.68)	2.389(1.76-3.24)
Socioeconomic			
Educational level			***
No education [RC]			
Primary	1.04(0.55-1.95)	1.23(1.05-1.45)	1.32(1.17-1.50)
Secondary	0.89(0.41-1.91)	1.41(0.93-2.14)	1.44(1.14-1.82)
Higher	1.12(0.51-2.47)	1.13(0.67-1.90)	1.42(1.10-1.83)
Work status			
Not working [RC]			
Working	1.52(0.83-2.80)	0.92(0.74-1.14)	1.08(0.93-1.25)
Wealth indexes			
Poorest [RC]			
Poorer	0.70(0.06-7.78)	1.10(0.88-1.37)	1.02(0.85-1.21)
Middle	2.72(0.37-19.73)	1.18(0.94-1.48)	1.03(0.86-1.23)
Richer	1.29(0.23-7.11)	0.99(0.78-1.25)	0.97(0.82-1.16)
Richest	1.22(0.30-4.99)	1.08(0.73-1.59)	1.19(1.00-1.41)

Source: Ethiopian Demographic Health Survey 2011.
***=<0.05(statistically significant),

Table 3 Cox's Proportional Hazard Regression coefficients and relative risk of marriage to first birth interval by demographic and socio-economic covariates (of age at first marriage)

	Age at first marriage (15-19) Hazard ratio	age at first marriage (20-24) Hazard ratio	age at first marriage (25+) Hazard ratio
Covariates			
Demographic			
Place of residence			
Urban [RC]			
Rural	1.04(0.88-1.24)	1.08(0.96-1.21)	0.95(0.85-1.06)
Religion	***	***	
Christian [RC]			
Muslim	1.22(1.09-1.37)	1.13(1.03-1.24)	1.02(0.92-1.13)
Region	***	***	
Tigray [RC]			
Affar	2.41(1.75-3.33)	1.24(0.98-1.56)	1.19(0.93-1.51)
Amhara	0.81(0.61-1.07)	0.86(0.71-1.04)	0.77(0.61-0.96)
Oromiya	2.21(1.67-2.93)	1.39(1.16-1.66)	1.28(1.04-1.57)
Somali	1.50(1.06-2.12)	1.17(0.92-1.50)	1.44(.11-1.87)
Benishangul-Gumuz	1.26(0.93-1.70)	1.20(0.97-1.48)	1.11(0.86-1.44)
SNNP	1.79(1.34-2.38)	1.56(1.29-1.89)	1.52(1.23-1.87)
Gambela	1.91(1.38-2.66)	1.12(0.88-1.43)	1.10(0.82-1.46)
Harari	1.81(1.32-2.49)	1.09(0.86-1.37)	0.92(0.71-1.19)
Addis Ababa	1.36(0.88-2.11)	1.27(0.97-1.66)	1.18(0.95-1.49)
Dire Dawa	1.24(0.88-1.75)	1.37(1.08-1.73)	1.13(0.88-1.44)
Socioeconomic			
Educational level	***	***	
No education [RC]			
Primary	1.27(1.13-1.43)	1.22(1.11-1.34)	1.29(1.15-1.44)
Secondary	1.29(0.99-1.67)	1.16(0.93-1.46)	1.20(0.99-1.44)
Higher	1.92(1.39-2.65)	1.05(0.82-1.35)	1.26(1.05-1.51)
Work status	***	***	
Not working [RC]			
Working	0.83(0.71-0.98)	1.16(1.02-1.31)	1.08(0.94-1.25)
Wealth indexes			
Poorest [RC]			
Poorer	0.79(0.67-0.94)	1.03(0.89-1.18)	0.96(0.81-1.14)
Middle	0.90(0.76-1.07)	1.16(1.01-1.34)	1.05(0.89-1.25)
Richer	0.94(0.79-1.12)	1.17(1.01-1.36)	1.18(1.00-1.39)
Richest	0.84(0.70-1.01)	1.03(0.90-1.20)	1.15(0.99-1.31)

Source: Ethiopian Demographic Health Survey 2011. ***=<0.05(statistically significant),

Kaplan Meier Estimates for Marriage to First Birth Interval

Survival functions are plotted from Figures 1-8 for all background characteristics

Figure 1(Age at marriage 15-19)

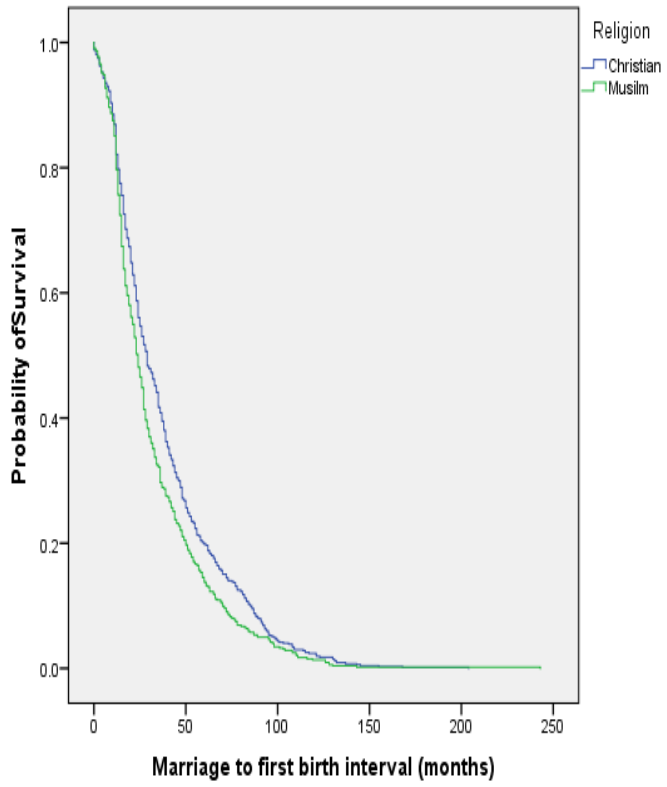


Figure 2(Age at marriage 20-24)

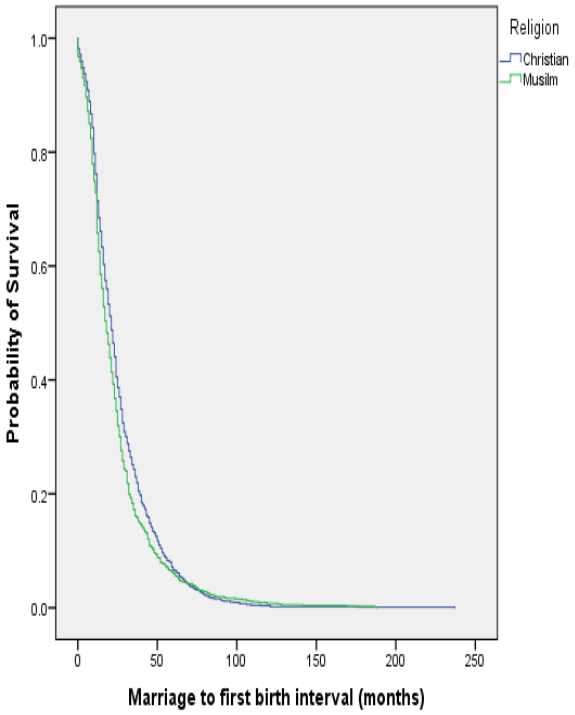


Figure 3(Age at marriage 15-19)

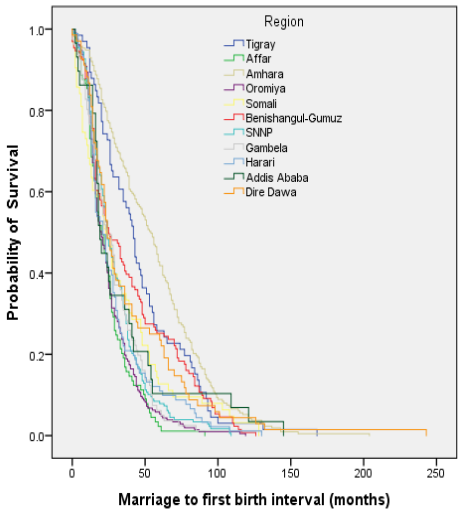


Figure 4(Age at marriage 20-24)

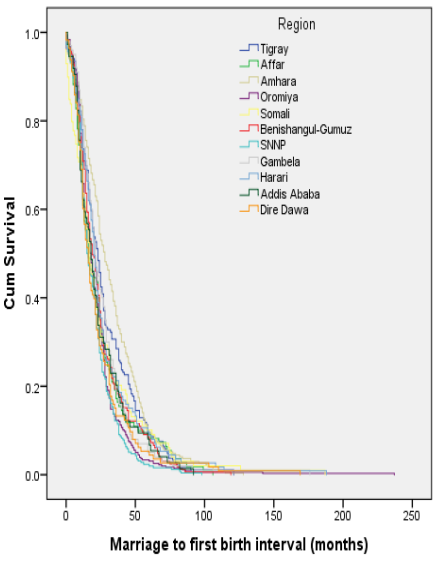


Figure 5(Age at marriage 15-19)

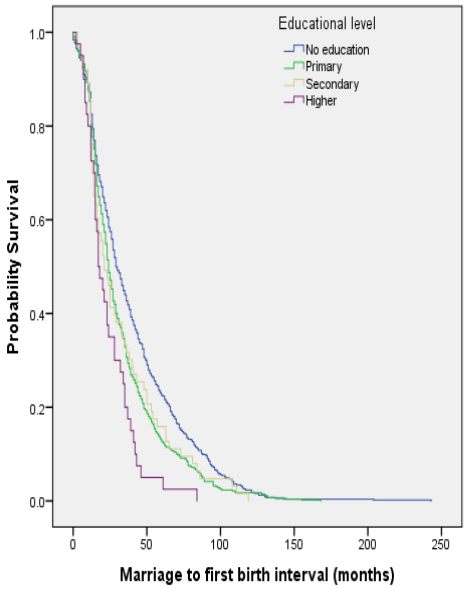


Figure 6(Age at marriage 20-24)

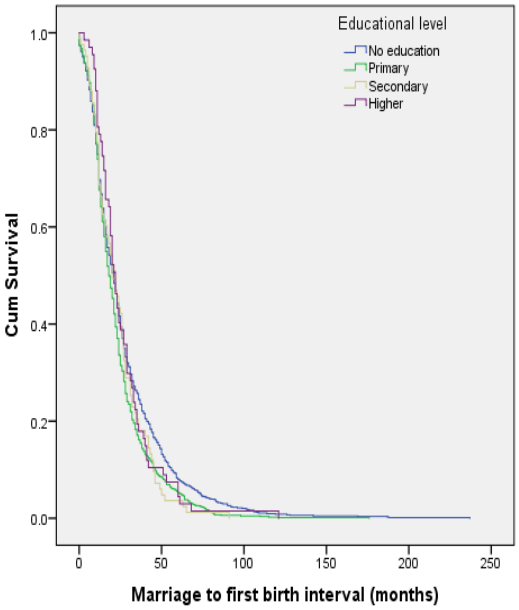


Figure 7 (Age at marriage 15-19)

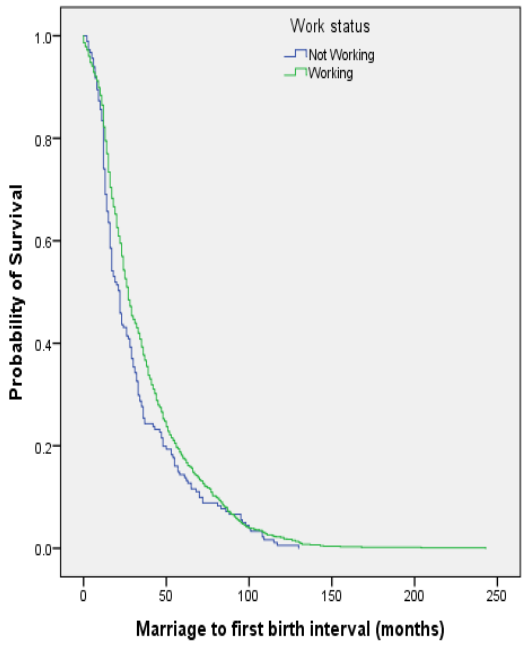
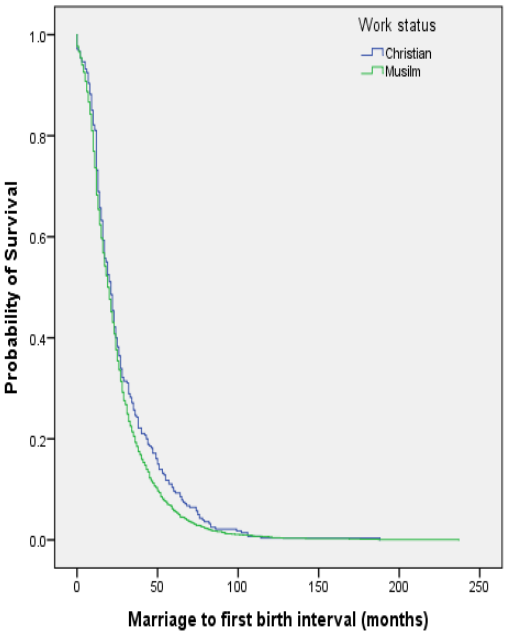


Figure 8 (Age at marriage 20-24)



CHAPTER VII

Age-specific fertility rate (35–49) and their fertility behaviour among currently married women in Ethiopia

[1]YISHAK ABRAHAM LAILULO AND A. SATHIYA SUSUMAN

[1]Department of Statistics and Population Studies, Faculty of Natural Sciences, University of the Western Cape, 7535 Bellville, Cape Town South Africa;
Email: sappunni@uwc.ac.za

Abstract

As per the 2011 Ethiopia Demographic Health Survey there is high fertility, meaning total fertility rate of 4.8 per 1,000 women, and a rapid population growth rate of 2.6. This study specifically focused on the 35- to 49-year-old, currently married mothers' fertility scenario. This group included the complete fertility rate, including children ever born in the mother's lifetime. The data used for this study was EDHS 2011. One-way ANOVA and multivariate analysis (a GLM) were performed. EDHS 2011 covered a nationally representative sample of 3,529 married women of the age group 35–49. Muslim women of older ages were about 1.08 (AIRR=1.08, 95% CI: 0.49–2.36) times more likely to have children than women following traditional religion, fixing other independent variables. In addition, women with no educational level were about 2.17 (AIRR=2.17, 95% CI: 1.52–3.10) times more likely to have children than those with higher educational levels, fixing other independent variables. The government of Ethiopia must adopt an agricultural program that will benefit women more to improve their status. Therefore, when women's income and education increase, they want to live a quality life, thus they prefer to have fewer children.

Key words: *children ever born, Poisson log linear model, sex preference, education, religion and region*

7.1. Introduction

Fertility is one of the main population components. It contributes to the change and structure of the population in sub-Saharan countries, where the fertility rate is high compared to the rest of the world (Hinde and Mturi, 2000). In Ethiopia the situation is similar; that is, there is high fertility and a rapid population growth rate. According to the 2011 Ethiopian demographic and health survey, the total fertility rate at the national level was 4.8 children per woman (CSA, 2012).

For a high fertility rate, the main reasons might be early age at first marriage, desire for more children, and extremely low contraceptive use (Gibson and Labour, 2002). Agriculture is the backbone of the Ethiopian economy. Because the major economic sector depends on it, most families want to have large numbers of children. In most rural areas, children help their close relatives in farming activities; thus children make immense financial contributions on their own throughout their lifetimes. Likewise, in many countries in sub-Saharan Africa, having many children is perceived as an advantage and a gift from God in a number of Ethiopian rural communities (Bairagi, 2001).

According to Bogaart (1987), determining factors affecting fertility are broadly classified into proximate (direct) and distal (indirect). Indirect factors are socio-economic, cultural, and environmental—those elements that, if changed, would causally result in a change in overall fertility levels, all else being equal.

The fertility rate of a population is affected by direct or indirect factors. The degree of influence of these factors on fertility may differ from population to population or from society to society (Asghar et al., 2014). Place of residence, religion, education, work status, and wealth indexes are some of the factors that have been extensively studied. Parents' preference of a son over a daughter is also one of the most important factors.

Several studies have shown that education of women, female labor force participation, urban residence, household wealth, cultural norms, and overall levels of social development have affected fertility (Ezeh and Dodoo,2001; Bongaarts, 2008; Garenne, 2007; Shapiro and Gebreselassie, 2007). Yang (2003) further confirmed that the educational level, economic

status, and proportion of women working have direct negative effects on a community's fertility level. Similarly, Cernic-Istenic and Kveder (2008) recognized that fertility behavior of individuals is closely linked with economic and social characteristics of their life settings. McQuillan (2004) argued that religion has a direct effect on fertility only if the particular religion has strong fertility norms. Hanks (2006) showed that when Muslims are minority residents, they tend to have higher fertility rates than non-Muslims. He further found when they constitute the majority in the area where they live, their fertility rates are actually lower than non-Muslims. Similarly, Findley (2005) described that the relationship between fertility behavior and place of residence has a direct linkage. On the other hand, Adhikari (2010) confirmed that rural women have higher fertility than urban women. Education is extensively held to be a key determinant of fertility (Leon, 2004). Kraudal (2000) also found that there is a negative association between education and fertility. Likewise, Brewster and Rindfuss (2000) showed the negative influence of women's employment on fertility using data from developed countries. Additional findings showed that there is a negative relationship between unemployment and fertility rates: the higher the unemployment, the lower the significant of fertility (Adsera, 2004; Orsal and Goldstein, 2010; Shreffler and Johnson, 2013). Adsera (2010) showed that as unemployment levels increase, people delay first and second births. Adhikari (2010) observed an inverse relationship between wealth status and fertility, with significantly lower fertility among the richest women compared to fertility among the poorest.

In addition to these factors, a strong preference for sons may be a barrier for drops in fertility if couples continue having children after attaining their overall family size goal because they are not satisfied with the sex composition of their children. But research on the association between son preference and fertility is confounded by the observation that the link is weak in both high- and low-fertility populations. In high-fertility societies, most couples continue to have children in spite of the number of sons and daughters they already have. In low-fertility societies, the influence of son preference is also weak because few couples want to have more than one or two children, even if they do not achieve their ideal number of sons and daughters (Kumar, 2013). Therefore, the effect of son preference on fertility is thought to be most pronounced in countries like India, which are in the middle of a fertility transition. In India, parity progression determined by the desire for sons accounted for 7% of births (Chaudhuri, 2012). In the same study it was found that at any given parity, the last-born child of women who had stopped childbearing was more likely to be a son than a daughter. A strong

preference for sons has been found to be common in Indian society, affecting the choice regarding number and sex composition of children (Clark 2000; BhatandZavier 2003; Varma and Babu, 2007). Overall, the northern and western states consistently show low child sex ratios across decades and show a very high son preference (Bhat, 2002; Retherford and Roy 2003; Bhaskar and Gupta 2007).

In Ethiopia most child birth occurs in wedlock. More than 90% of the women who had a live birth in the preceding five years were married and living with a partner. Of all women who gave birth in the preceding five years, the majority (between 44 and 49%) happened to women age 25–34. This was followed by older women, age 35–49. The proportion of youth (age 15–24) who had a live birth were 27.5% in 2000 and 25.4% in 2011. Child birth among adolescents age 15–19 constituted between 5.1 and 6.1% during the survey period (UNFP, 2012).This study will explore the association between older women's fertility and their demographic, socio-economic, and sex preference factors within married couples in Ethiopia.

7.2. Data and Method

The data used for this study was EDHS 2011. One-way ANOVA and multivariate analysis (a GLM) were performed. EDHS 2011 covered a nationally representative sample of 3,529 married women of the age group 35–49.

7.2.1. Description of variables

Dependent and independent variables

This paper analyzed the specific measure of fertility; that is, children ever born (CEB). So the dependent variable used in this paper is CEB. CEB comprises information on the number of all children born alive (lifetime fertility) up to the survey date. Mean number of CEB to women represents the childbearing experience of a real age cohort and reflects current and past fertility behavior. CEB, the dependent variable, is treated as an interval scale in both one-way ANOVA and generalized linear model (Poisson log linear model). The CEB of older women age 35–49 (completed fertility) was analyzed as a measure of fertility. The demographic, socio-economic, and sex preference variables used as independent variables are: place of residence, religion, region, education, work status, wealth indexes and preference of sons or daughters. All independent variables are categorical.

7.2.2. Generalized linear model (GLM)

GLMs were performed for this analysis. GLMs allow including non-normal errors such as binomial, Poisson, and Gamma errors. Regression parameters are estimated using maximum likelihood. GLMs were found by McCullagh and Nelder (1989). The response can be scale, counts, binary, or events in trials. Factors are assumed to be categorical. The covariates, scale weight, and offset are assumed to be scale. Cases are assumed to be independent observations. The specific measure used for the fertility of older women (age 35–49) is the CEB, which is a count value. The variable of interest in the demographic health survey is CEB. All the factors (independent variables) were categorical. Thus, the Poisson log linear type of mode is appropriate for this study. The main objective is to investigate the relationship between the probability of CEB (μ) with place of residence, religion, region, educational level, work status, wealth index and sex preference (sons or daughters).

Poisson log linear model

Response Yi = (CEB) and independent variables Xi=(place of resident, region, religion, educational level, work status, wealth indexes and sex preference) for *i=1,…,n.*

Link Function (the function, g(·) that "links" the systematic component to the random component),

$g(\mu_i)$= lnμ = $\alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_k x_k=\frac{y_i\theta_i-b(\theta_i)}{a_{i(\emptyset)}}$ + c(y_i, $\emptyset$), which is the "natural parameter" of the Poisson distribution, and the log link is the "canonical link" for GLM with Poisson distribution.

The Poisson regression model for counts (with a log link) is

ln(μ_i)=$\alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_k x_k$ or$e^{\alpha+\beta_1 x_1+\beta_2 x_2+\cdots+\beta_k x_k}$ = $\mu=e^{(\frac{y_i\theta_i-b(\theta_i)}{a_{i(\emptyset)}}+c(y_i,\emptyset))}$

This is often referred to as "Poisson log linear model."

7.3. Results

The mean number of children ever born for older women

The results **(see Table 1)** highlighted in 2011 show that the mean numbers of children for older women (age 35–49) were significantly associated with place of residence, religion, region, educational level, wealth and sex preference (sons or daughters). In addition, the mean CEB for women living in rural areas (about 7) was higher than those in urban areas (about 4.20). On the other hand, in older women, the average numbers of children for women in Muslim religious affiliations were (about 6.8) higher than those for Christians (Protestant [6.34], Catholic [6.10], and Orthodox [5.94]). In addition, in older women, the highest mean CEB was found by Affar (7.23), following Somali (which was about 7). Moreover, in older women with educational levels, the mean CEB declined in 2011. Furthermore, in older woman, as the number of boys she has increases, the average CEB increases too. Similarly, as the number of daughters for older women increases, their mean CEB also increases.

Generalized linear models analysis

Table 2 presents differentials in the fertility levels of older women (age 35–45) by place of residence, religion, region, education level, work status, wealth indexes and sex preference (sons or daughters) using a GLM (Poisson log linear model).

The link of older women's CEB and place of residence showed that the Adjusted Incidence Rate Ratio (AIRR) of urban women (age 35–49) were lower than corresponding age groups of rural women, making other independent variables constant in 2011 **(see Table 2).** Urban older women were about 28% (AIRR=0.72, 95% CI: 0.54–0.95) less likely to have children than those in rural areas in 2011, respectively, fixing other independent variables. On the other hand, older Muslim women were about 1.08 (AIRR=1.08, 95% CI: 0.49–2.36) times more likely to have children than those following traditional religion, fixing other independent variables. In addition, women with no educational level were about 2.17 (AIRR=2.17, 95% CI: 1.52–3.10) times more likely to have children than those with higher educational levels, fixing other independent variables. Furthermore, women with two sons were about 69% (AIRR=0.31, 95% CI: 0.24–0.38) less likely to have children than those with

three sons in 2011, making other independent variables constant. Similarly, women with two daughters were about 67% (AIRR=0.31, 95% CI: 0.27–0.42) less likely to have children than those with three daughters, making other independent variables constant**.**

Finally, place of residence, educational level, and sex preference (sons or daughters) of older women were significantly associated with CEB in 2011.

7.4. Discussion

The present study also shows that rural women have higher fertility than urban women. It was confirmed by Adhikari (2010) and Ushie et al. (2011). This could be due to the fact that rural women are less likely to use contraceptives than urban women; thus, the fertility levels in rural areas would be higher than urban (Retherford and Thapa, 2003). Carr et al. (2006) argued that urban women are more likely to be better educated and employed in the modern sectors. Likewise, Ushie et al. (2011) found that urban women earn higher incomes than those in rural, areas; as such they are more liable to use contraceptives. The other reason might be that families who have many children, their relatives, or other members of the social environment (community) increase their parents' status, prestige, power, or social recognition. These changes give them access to resources and advantages they did not have before (Bühler, 2008). Rural population accounts for 84% of the total population of Ethiopia, and they derive their incomes primarily from agriculture-based activities (Dorosh and Schmidt, 2010). Ethiopia Land Administration and Use Proclamation (proc. 456/2005) in 2005 declared that "peasant farmers and pastoralists engaged in agriculture for a living shall be given rural land free of charge." A person above the age of 18 may claim land for agricultural activities. Women who want to be involved in agriculture shall also have the right to get and use land (Ambaye, 2012). Thus, in rural areas a household that has many children above the age of 18 will benefit more by owning of land compared with those having fewer children.

Moreover, the fertility of a woman is negatively associated with her level of education. This is also supported by other studies (Adhikari, 2010; Ndahindwa et al., 2014). This is due to educated women being more likely to use contraception than uneducated women (Iyer, 2002; Schoemaker, 2005). It might be also that educated women are curious about information; education empowers women and increases awareness on their own health and the health of their children. Moreover, education increases women's confidence to be employed outside

the home environment; thus they are more concerned about for changes in their lives either academically or financially. On the other hand, educated women also have increased social power to control their reproductive decisions, increased exposure to mass media, and opportunities for professional growth (Basu, 2002). As a result, they want to have fewer children rather than giving birth to many children.

Furthermore, the findings have shown that the sex preferences of women (sons or daughters) are associated with their fertility. Parents' reproductive behaviour is more or less influenced by sex preference for their children. This finding was supported by Arnold (1997); he found that sex preference for children affects reproductive behaviours of women in countries such as in Nepal, India, Bangladesh, Egypt, Jordan, and Tunisia. Nath (2012) found that couples' desire for number of sons influences fertility differential. Likewise, Hussain (2000) also documented that the sex of surviving children is strongly correlated with subsequent fertility based on the fact that birth spacing following a male child is longer than that following a female child. As a result, the preference for sons affected use of family planning methods (Uprety, Jha, and Poudel, 2011). Son preference also varies according to cultural background even within a country (Leone, 2003). Sons are generally preferred over daughters because of a complex link of economic and sociocultural factors. Children of a particular sex are often desired to provide certain benefits, such as financial, social, or psychological benefits (El-Gilany and Shady, 2007). In Ethiopia, sons are supposed to have greater economic usefulness than daughters because male children are able to provide support in agriculture and to work for social security. The other reason is that Ethiopia is a patriarchal society and sons are also valued for continuing the family name.

7.5. Conclusion

Factors that contribute to older women's fertility levels are place of residence, educational level, and sex preference (sons or daughters). Among these factors, education and sex preference of the child play major roles. More emphasis needs to be put on rural community attitude changes, particularly on women. It is believed that women are not able to carry out work that needs more energy. Thus, the work of women is differentiated. Hence, the culture allows that agricultural work is carried out mostly by men. Continued teaching must be delivered to rural communities so they value women and men equally in any category of work. The government of Ethiopia must adopt agricultural programs that will benefit women more to improve their status. Therefore, when women's incomes and education increase, they want to live a quality life; thus they prefer to have fewer children.

7.6. References

Adhikari, R.(2010). Demographic, socio-economic, and cultural factors affecting fertility differentials in Nepal, *BMC pregnancy and childbirth*, *10*(1), 1

Adsera, A. (2004). Changing Fertility Rates in Developed Countries. The Impact of Labor Market Institutions, *Journal of Population Economics*, Vol. 17, pp. 17-43.

Ambaye, D. W. (2012). Land rights in Ethiopia: Ownership, equity, and liberty in land use rights, *FIG Working week, Rome, Italy*, 6-10.

Arnold, F. (1997).Gender preferences for children. In Demographic and Health Surveys Comparative Studies No. 23; 1997.

Asghar, M., Murry, B. , and Saraswathy, N. (2014).Fertility behaviour and effect of son preference among the Muslims of Manipur, India, *Journal of Anthropology*, *2014*.

Bairagi, R. (2001). Effect of Sex Preference on Contraceptive Use, Abortion and Fertility in Matlab, Bangladesh, International Family Planning perspectives, 27(3):137–143.

Basu, A.M. (2002). Why does education lead to lower fertility? A critical review of some of the possibilities, *Journal of world Development, 30:1779–1790.*

Bhat, PNM. (2002). on the trail of missing Indian females – II: Illusion and reality. Economic and Political Weekly, 37(52): 5244-5263.

Bhaskar, V. and Gupta, B. (2007). India's development in the era of growth, Oxford Review of Economic Policy, 23(2): 135-142.

Bhat, PNM., and Zavier, AJF. (2003). Fertility decline and gender bias in northern India, *Demography*, 40(4): 637-657.

Bongaarts, J. (1978). A Framework for Analyzing the Proximate Determinants of Fertility. Population and Development Review, 4(1): 105-132

Bongaarts, J. (2008). Fertility transitions in developing countries: progress or stagnation? Studies in Family Planning 2008, 39:105-110.

Brewster, KL., and Raindfuss, R.R. (2000). Fertility and Women's Employment in Industrialized Nations, *Annual Review of Sociology*, Vol. 26, pp. 271-296.

Bühler, C. (2008). On the structural value of children and its implication on intended fertility in Bulgaria, *Demographic Research*, *18*, 569-610.

Carr, D.L., Pan, W.K.Y., Bilsborrow, R.E., (2006). Declining Fertility on the Frontier: The Ecuadorian Amazon, Population and Environment, 28(1), 17-39.

Cernic, IM., and Kveder, A. (2008). Urban-Rural Life Setting as the Explanatory Factor of Differences in Fertility Behaviour in Slovenia, Informatica, 32: 111-12.

Chaudhuri, S. (2012). The desire for sons and excess fertility: A household- level analysis of parity progression in India, International Perspectives on Sexual and Reproductive Health, 38(4): 178–186.

Clark, S. (2000). Son preference and sex composition of children: Evidence from India, Demography, 37(1): 95- 108.

Dorosh, P., and Schmidt, E. (2010). *The rural-urban transformation in Ethiopia* (No. 13), International Food Policy Research Institute (IFPRI).

El-Gilany, A., and Shady, E. (2007).Determinants and causes of son preference among women delivering in Mansoura, Egypt, *Eastern Mediterranean Health Journal*, *13*(1), 119.

Ezeh, AC., and Dodoo, FN. (2001). Institutional change and African fertility transition: the case of Kenya, Genus, 135-164.

Garenne, M. (2007).Situations of fertility stall in sub-Saharan Africa. Paper presented at the 5th African Population Conference, UAPS, Arusha, Tanzania, 10-14 December 2007 .

Gibson, M., Labour, M R. (2002). Saving Technology and Fertility Increase in Rural Africa. Current Anthropology. 43:213–222. [PubMed]

Hanks, JJ. (2006), On the Politics and Practice of Muslim Fertility Comparative Evidence from West Africa, *Medical Anthropology Quarterly*, Vol. 20, No. 1, pp. 12-30.

Hinde, A.,and Mturi, A.(2000). Recent Trends in Tanzanian Fertility. Population Studies. 54(2):177–191.[PubMed]

Hussain, R., Fikree, F. F., and Berendes, H. W. (2000).The role of son preference in reproductive behaviour in Pakistan, *Bulletin of the World Health Organization*, *78*(3), 379-388.

Iyer, S. (2002). Religion and the Decision to use contraception in India, *Journal for the Scientific Study of Religion*, 41: 711-722.

Kraudal, Q. (2000). A Search for Aggregate-level Effects of Education on Fertility, using Data from Zimbabwe, Demographic Research ,3 (www.demographic-research.org/volumes. 3(3)).

Leone ,T., Matthews, Z., Zuanna, G.D .(2003). Impacts and determinants of sex preference in Nepal, *International Family Planning Perspectives*, 29:69–75.

Leon, A. (2004). The Effect of Education on Fertility: Evidence from Compulsory Schooling Laws. Pittsburgh: University of Pittsburgh Press.

McQuillan, K. (2004), When Does Religion Influence Fertility? Population and Development Review, Vol. 30, No. 1, pp. 25-56.

Nath, D.C., and Singh, B. (2012).Impact of son preference on fertility indices in Manipur. Intern Journal of Management, *Economics Social Science*, 1:26–32.

Ndahindwa, V., Kamanzi, C., Semakula, M., Abalikumwe, F., Hedt-Gauthier, B., and Thomson, D. R. (2014). Determinants of fertility in Rwanda in the context of a fertility

transition: a secondary analysis of the 2010 Demographic and Health Survey, *Reproductive health, 11(1), 87.*

Orsal, K., and Goldstein, R. (2010).The Increasing Importance of Economic Conditions for Fertility, MPIDR Working Paper WP 2010-014, Rostock: *Max Planck Institute for Demographic Research*.

Retherford, RD. and Roy, TK. (2003).Factors Affecting Sex-selective Abortion in India and 17 Major States. National Family Health Survey, Subject Report 21, Mumbai: International Institute for Population Sciences.

Retherford, R.D., and Thapa, S. (2003). Fertility in Nepal, 1981-2000: Level, trend, and component of change, *Population and Health Series, No. 111*.

Schoemaker, J (2005). Contraceptive use among the poor in Indonesia, *International Family Planning Perspectives, 31 (3): 106-14.*

Shapiro, D., and Gebreselassie, T. (2008).Fertility transition in sub-Saharan Africa: falling and stalling, *African Population Studies, 23:3-23.*

Shreffler, KM., and Johnson, DR. (2013), Fertility intentions, career considerations and subsequent births. The moderating effects of women's work hours, *Journal of family and economic issues, Vol. 34, No. 3, pp. 285-295.*

Sisouphanthong, B., Xaovana, V., Louangvixa, B., Chanthalanouvong, T. (2000).Lao reproductive health survey, Lao department of statistics, Vientiane 2000.

United Nations, (1983).Manual X: Indirect techniques for demographic estimation, Population Studies, No. 81. New York 1983.

UNFP, (2012). Trends in Maternal Health in Ethiopia. Challenges in achieving the MDG for maternal mortality In-depth Analysis of the EDHS 2000-2011 December, Addis Ababa.

Uprety, S., Jha, N., Poudel, I.S., Pokharel, P.K., Poudel, M., and Niraula, S.R, (2011).Impact and determinants of gender preference in Duhavi VDC of eastern Nepal, *Journal of the Nepal Medical Association, 51(181):28–33*.

Ushie, M. A., Ogaboh, A. A., Olumodeji, E. O., and Attah, F. (2011).Socio-cultural and economic determinants of fertility differentials in rural and urban Cross Rivers State, Nigeria, *Journal of Geography and Regional Planning*,*4*(7), 383.

Varma, GR., and Babu, BV. (2007). Son preference and desired family size in a rural community of West Godavari district, Andhra Pradesh, India, *Journal of Social Science, 15(1): 59-64.*

Yang, S.W. (2003). Rural-Urban Differences in Factors Affecting Fertility: A Case Study of Ohio, *Paper presented at the Annual Meeting of the Rural Sociological Society*.

Table 1.Older women fertility in Ethiopia by their demographic, socio-economic and sex preference, based on EDHS 2011.

Variables	Mean CEB		95% of CI
Place of residence	F=393.34***		
Urban		4.19	(3.94-4.43)
Rural		6.90	(6.78-7.02)
Religion	F=9.93***		
Orthodox		5.94	(5.75-6.13)
Catholic		6.10	(5.12-7.08)
Protestant		6.34	(6.07-6.60)
Muslim		6.83	(6.65-7.02)
Traditional		6.29	(4.76-7.81)
Region	F=26.79***		
Tigray		6.54	(6.25-6.83)
Affar		7.21	(6.74-7.67)
Amhara		6.70	(6.43-6.98)
Oromiya		6.76	(6.46-7.06)
Somali		7.05	(6.52-7.58)
Benishangul-Gumuz		6.71	(6.33-7.09)
S.N.N.P		6.94	(6.67-7.21)
Gambela		5.23	(4.78-5.68)
Harari		5.39	(4.86-5.92)
Addis Ababa		3.35	(2.98-3.72)
Dire Dawa		5.34	(4.84-5.84)
Educational level	F=105.40***		
No education		6.96	(6.81-7.11)
Primary		6.23	(6.04-6.42)
Secondary		4.53	(4.05-5.02)
Higher		2.85	(2.50-3.20)
Work status	F=0.21		
Not working		6.42	(6.11-6.73)
Working		6.34	(6.22-6.47)
Wealth indexes	F=82.55***		
Poorest		7.01	(6.81-7.22)
Poorer		6.73	(6.49-6.98)
Middle		6.88	(6.61-7.14)
Richer		6.90	(6.64-7.16)
Richest		4.46	(4.19-4.71)
Sex Preference			
Number of son	F=210.71***		
0		2.63	(2.27-2.98)
1		4.69	(4.44-4.93)
2		6.03	(5.84-6.23)
3		7.12	(6.93-7.30)
Number of daughters	F=225.12***		
0		1.84	(1.53-2.16)
1		3.75	(3.53-3.98)
2		5.19	(4.97-5.41)
3		6.32	(6.13-6.50)

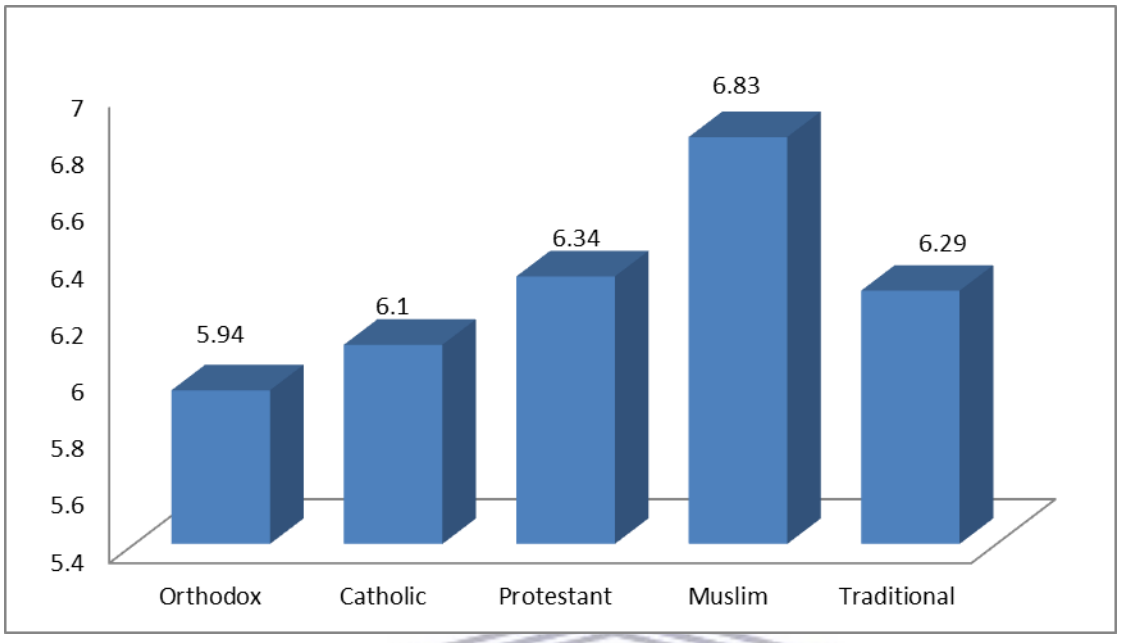
Source: Ethiopian Demographic Health Survey, 2011. ***<0.05 (Statistically significant).

Table 2 Predicators of older women fertility level by demographic, socio-economic and sex preference of women in 2011 using generalized linear model (Poisson log linear).

Variables	B	IRR (95% CI)
Place of residence	***	
Urban	-.335	0.72(0.54-0.95)
Rural		
Religion		
Orthodox	-.128	0.88(0.40-1.94)
Catholic	-.269	0.76(0.30-1.95)
Protestant	-.153	0.86(0.39-1.88)
Muslim	.074	1.08(0.49-2.36)
Traditional		
Region		
Tigray	-.132	0.88(0.61-1.26)
Affar	.302	1.35(0.94-1.95)
Amhara	.040	1.04(0.74-1.46)
Oromiya	.186	1.20(0.87-1.66)
Somali	.214	1.24(0.84-1.83)
Benishangul-Gumuz	.189	1.21(0.85-1.72)
S.N.N.P	.251	1.29(0.91-1.83)
Gambela	.098	1.10(0.72-1.68)
Harari	.058	1.06(0.74-1.52)
Addis Ababa	-.257	0.77(0.52-1.15)
Dire Dawa		
Educational level	***	
No education	.773	2.17(1.52-3.10)
Primary	.420	1.52(1.08-2.14)
Secondary	.360	1.43(0.97-2.12)
Higher		
Work status		
Not working	-.082	0.92(0.77-1.10)
Working		
Wealth indexes		
Poorest	.263	1.30(0.97-1.75)
Poorer	.127	1.14(0.84-1.54)
Middle	.341	1.41(1.04-1.91)
Richer	.323	1.38(1.03-1.85)
Richest		
Sex Preference		
Number of son	***	
0	-3.359	0.03(0.03-0.05)
1	-2.331	0.10(0.08-0.12)
2	-1.185	0.31(0.24-0.38)
3		
Number of daughters	***	
0	-3.457	0.03(0.02-0.04)
1	-2.248	0.11(0.08-0.13)
2	-1.101	0.33(0.27-0.42)
3		

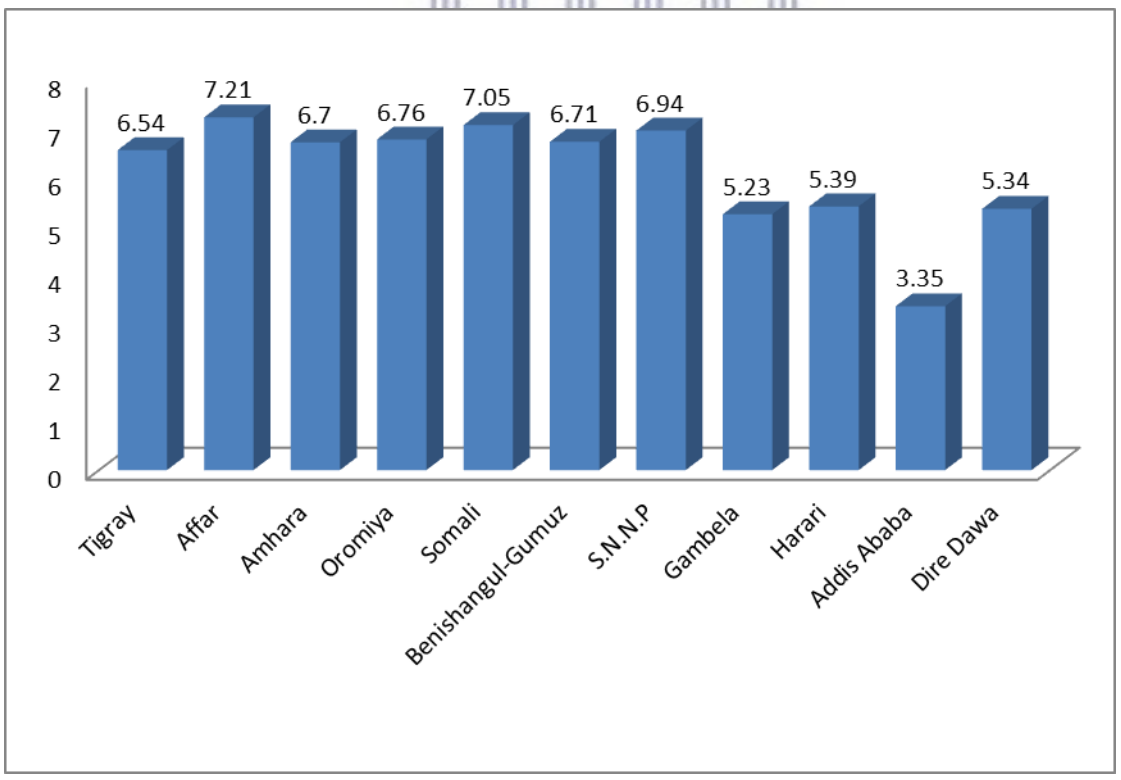
Source: Ethiopian Demographic and Health Survey, 2011.***<0.05(statistically significant)

Figure 1: Mean children ever born by Religion



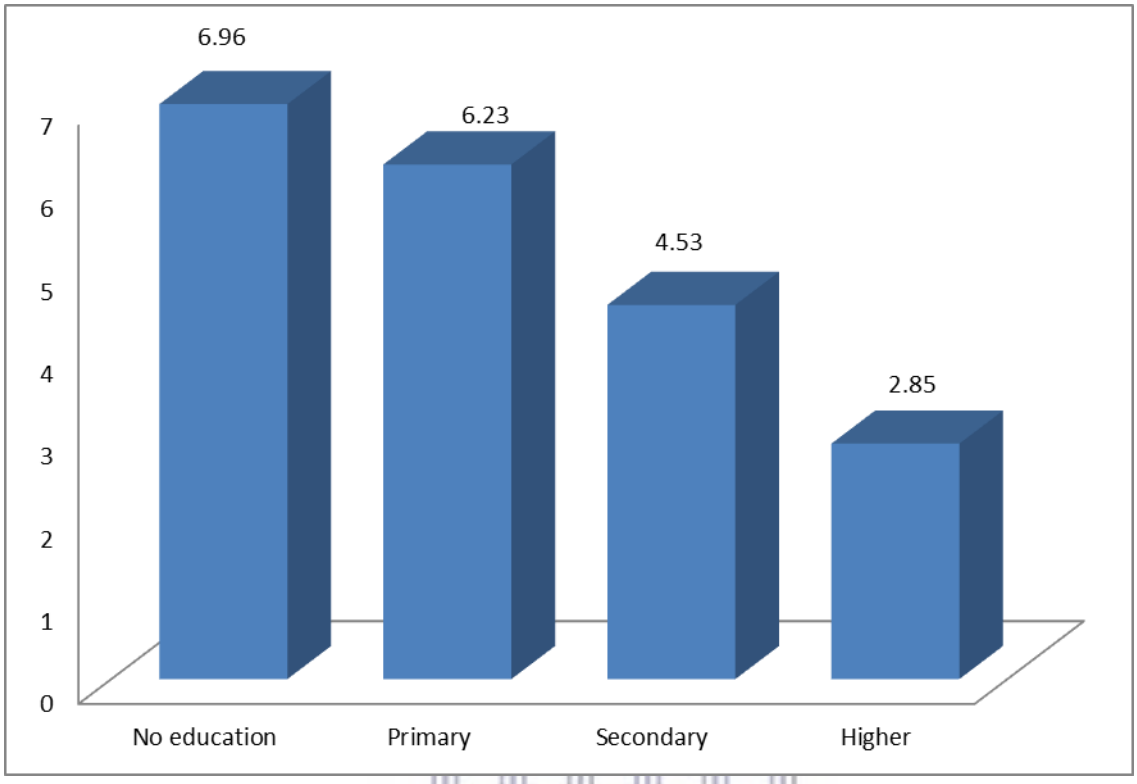
Source: Ethiopian Demographic health survey 2011

Figure 2: Mean children ever born by Region



Source: Ethiopian Demographic health survey 2011

Figure 3: Mean children ever born by Educational level



Source: Ethiopian Demographic health survey 2011

CHAPTER VIII

DISCUSSION

First chapter dealt with Introduction. Second chapter dealt with data and methods. From Chapter three to chapter seven deals with articles. Several statistical methods were used for data analysis. For the first paper titled "**Proximate Determinants of Fertility in Ethiopia: Comparative analysis of the 2005 and 2011 DHS"**, The Bongaarts model was applied to estimate the indices of the four main proximate determinants of fertility. For the second paper titled "**Determinants of Modern Contraceptive Method Use in Ethiopia: Based on EDHS 2005 and 2011",** Bivariate and generalized linear models (binary logistic regression) were used to determine the relative contribution of the demographic, socioeconomic, media exposure on family planning, and intimate partner violence variables on contraceptive use . For the third paper titled **"Religion and Fertility in Ethiopia**" , Bivariate, one-way ANOVA and generalized linear model (GLM, Poisson regression) were used to determine the relative contribution of the predictor variable. For data analysis of the fourth paper of my thesis "**Factors associated with age at first marriage to first birth interval in Ethiopia: Using Survival analysis.** " , Cox Proportional Hazard model is used to determine the significant factors contributing towards age at marriage to first birth interval. Lastly, in the fifth paper titled "**Age-specific fertility rate (35–49) and fertility behaviour among currently married women in Ethiopia**" , One-way ANOVA and multivariate analysis (a GLM) were performed to determine the relative contribution of demographic, socio-economic and sex preference on fertility behaviour.

The main findings of this research were threefold: First, we identified the magnitude and the Proximate determinants of fertility in Ethiopia. Second, we analysed the trends and contributing factors liked with determinants of fertility variables. And third, we studied the impact of culture (like religion) on fertility of Ethiopia.

8.1. Proximate Determinants of Fertility in Ethiopia

In 2005, the index of married women in urban areas was lower than in rural areas with values of 0.58 and 0.64, rural respectively. Whereas, in 2011, the index of proportions married was unfortunately the same in urban and rural areas with values for Cm of 0.75. This may be due to cultural factors in both urban and rural areas which contributed the same proportions. There was a considerable variation in the index of contraception between urban and rural areas; in 2005 the index of contraception was recorded by the higher inhibiting effect of fertility for urban women compared with rural women, whereas in 2011 the index of contraception was registered by the highest inhibiting effect of fertility for rural women than that of urban women. There was little variation in Ci, the index of postpartum infecundability.

8.2. Determinants of modern contraceptive use

Characteristics such as women's age, number of living children, total children ever born, place of residence, wealth indexes ,visited health facility ,media exposure on family planning (on radio and TV) and intimate partner violence (refuse to have sex and burns food) found significantly associated with modern contraceptive use in both 2005 and 2011. This was supported by previous studies in other countries (Douthwaite and Ward, 2005; Schoemaker, 2005; Iyer, 2002). Similarly, modern contraceptive use of rural women was significantly less than that of urban in both 2005 and 2011. This might be due to their less availability or acceptability of this method by the community, women's knowledge of family planning and the power of decision making are very low. In addition to this, Ethiopia is a patriarchy society, in rural areas majority of the decisions including family planning is taken by husband due to women's economic dependence, low educational level and existing culture (Bogale, Wondafrash, Tilahun and Girma 2011).

In Ethiopia, the odds of modern contraceptive use for all age group of women's have been dropped radically in 2011. As well as women's whose age groups falls between 25 and 39 were more likely use modern contraceptive than those of women that belongs to other age groups. More over in both 2005 and 2011 as the number of living children increases, the odds of modern contraceptive use increases too. This was also noted by Teye (2013) women who have many children living children are more likely to use modern contraceptives than those

with fewer children. This might be due to they have achieved already their desired number of children. If the number of living children increases, the expenses of household increase too. Thus, affording the household basic necessity such as food, shelter and clothes could be difficult. The Muslim religious teaching does not allow women to use contraception use as they belief that sinning against God, they said it Allah who are able to give child so why should we limit. It was also found by Agadjanian (2011) higher number of Catholic and Protestant Christians fellows were found to be using contraceptives compared to other religious groups.

On the other hand, women's educational status and wealth index were associated with modern contraceptive method use in 2005 and 2011. Richest women and educated women were more likely use modern contraception than other women. It might be due to educated women having better understanding on family planning than illiterate. A number of studies have shown a similar finding between educational status and modern contraceptive use (Iyer, 2002; Schoemaker, 2005). In 2005 and 2011, intimate partner violence was significantly associated with modern contraceptive use. In women who were not cause intimate partner violence , the higher number of them were uses modern contraceptive method compared with those of women who had experiencing intimate partner violence. This was also proved by (Dalal, Andrews, Dawad, 2012) the less number of women in Bangladesh who experienced intimate partner violence used contraceptives than those who did not experience such problems. This might be women who undergoing domestic violence are fear of doing something by themselves (are not confident), and they going to wait husband approval to use family planning.

8.3. Religion and Fertility

Many factors are linked with the increase of fertility level; especially religion plays a major role. In general, the impact of demographic and socioeconomic variables on fertility indicated that Muslim women's fertility levels were higher than those of Christians in both 2005 and 2011.There are two reasons why it has become high. First, the contraception use of Muslim women was lower than for Christians in both 2005 and 2011. Second, Ethiopia

is a patriarchal society; women are considered inferior to men (Haregewoin and Emebet, 2002), thus a married woman's decision-making about FP is lower compared to her husband.

Fertility of Christianand Muslim women with contraceptive non-use was significantly associated with age group and residence in both 2005 and 2011. Similarly, in contraception nonusers, fertility levels for both Christian and Muslim women weresignificantly associated with age group and residence in 2011.

Age of women was a significant determinant of fertility level as older women had higher fertility levels than younger women for Christians and Muslims. But, as the age of women increases, Muslims had higher fertility levels than Christians. This might be because Muslim women marry at younger ages than Christians. Our finding is similar to many other studies that find that older age at first marriage played an important role in the reduction in fertility (Sibanda et.al., 2003;Serbessa et.al., 2003).On the other hand, for both Christian and Muslim women, the findings have shown that rural women have higher fertility than urban women. The other reason could be that people who live in rural areas tend to marry at a younger age than those in urban areas (CSA, 2012).

Moreover, the results have shown that a woman's fertility is negatively associated with her level of education. Women with low levels of education were confirmed to be more likely to have more children than women who had tertiary education. Likewise, studies conducted in Nigeria (ADEBIMPE et.al., 2011) and Ethiopia (Gurmu and Mace, 2008) showed that women who had many years of education had significantly lower fertility as compared to those who had never been enrolled in any formal education system. Alene and Worku (2008) also reported that women who had at least a high school education showed nearly a two-thirds reduction in fertility compared to women with no education. Basu (2002) found that women's education has a positive impact on their reproductive decisions, access to different types of partners than less-educated women, and increased exposure to mass media. Thus, education gives awareness to women and makes them more responsive to their own health and the health of their children, which are negatively linked with the number of children a woman will have during her lifetime. Similarly, the findings have shown that women's wealth quintile affects fertility level. As the wealth indexes of women who follow the Christian religion increases, CEB decreases; thus, women in the richer and richest wealth

quintiles have fewer children than poorer and poorest women. This result is also supported by the findings of Adebimpe et al. (2011).For both Christians and Muslims, contraception nonusers who didn't hear about FP on TV as well as in newspapers had higher fertility levels than those who had heard. Muslim women who didn't hear about FP on TV were more likely to have higher CEB than Christians in 2005.

8.4. Age at first marriage to first birth interval

Religion is found to be the most significant factors influencing the variation in the young women's first birth interval. For both Muslim and Christ religious women, as age at first marriage increases, first marriage to first birth interval decreases. But, for all women aged 25 and above who are either Muslim or Christian, they have the same first birth interval. This is due to norms and culture of Ethiopia which encourage women to get first child immediately after marriage. On the other hand, regardless of age at first marriage of young women, a Muslim religious woman prefers to have her first child early than Christian. This was supported by previous studies in other countries that found that women religious afflictions were significantly linked with fertility (Latif, 2014; Alam, 2015). It might be due to the fact that different religious teachings play varying role on the issue such as the importance of family.

Moreover, there is a regional discrepancy of first birth interval in Ethiopia. As age at first marriage increases, first birth interval decreases by region. Somali and Oromiya region women were more likely to give first child early than other region women.

Furthermore, urban women with no education have shortest first birth interval compare with women of other educational level. Following as educational level of urban women increases, they delays first birth. Women's education is therefore an essential component of reproductive behavior. Our results agree with the findings of other studies (Gyimah, 2005; Rasekh ,Momtaz ,2007).

On the other hand, considering the whole population without restricting the place where they are staying, educational level increases with a decrease in first birth interval for both women of age at marriage (15-19 and 20-24). This was due to the fact that, as women educational level increases, the more they would be generating money. In addition to these, working women are statistically more likely to have shorter first birth interval than those not working as evident by Latif (2014) in his study.

8.5. Age-specific fertility rate (35–49) and fertility behaviour

Rural population accounts for 84 percent of the total population of Ethiopia and derive their income primarily from agriculture based activities (Dorosh and Schmidt, 2010). In Ethiopia Land Administration and Use Proclamation (proc. 456/2005) in 2005 declares that "peasant farmers and pastoralists engaged in agriculture for a living shall be given rural land free of charge." A person, above the age of 18 years may claim a land for agricultural activities. Women who want to involve in agriculture shall also have the right to get and use land (Ambaye, 2012).Thus, in rural areas a household who have many children above the age of 18 years will be benefited more by becoming ownership of land compared with those of having less children.

Furthermore, the findings have shown that the sex preferences of women are associated with their fertility. Parents' reproductive behaviour is more or less influenced by sex preference for children. This finding was supported by Arnold (1997); he found sex preference for children affects reproductive behaviours of women for countries such as in Nepal, India, Bangladesh, Egypt, Jordan and Tunisia. Nath (2012) found couple's desire for number of sons influences fertility differential. Likewise, Hussain (2000) also documented that the sex of surviving children is strongly correlated with subsequent fertility. It is because of birth spacing following male child is longer than that following female child. As the result, the preference for son affecting usage of family planning methods (Uprety ,Jha and Poudel,2011). Son preference for children also varies according to cultural background even within the country (Leone, 2003). Sons are generally preferred over daughters because of a complex link of economic and sociocultural factors. Children of a particular sex are often desired to provide certain benefits, such as financial, social or psychological benefits (El-Gilany and Shady, 2007). In Ethiopia, sons are supposed to have greater economic usefulness than daughters, since male children are able to provide support in agriculture and to work for social security. The other reason is that Ethiopia is a patriarchal society and sons are also valued for continuing the family name.

Chapter IX

Conclusion and Policy recommendation

9.1. Conclusion

This paper has tried to explore the contribution of the four main proximate determinants to fertility differentials in Ethiopia between the two periods of 2005 and 2011. The index of contraception (Cc) for urban and rural has dropped from 0.57 to 0.50 and 0.89 to 0.77 in respectively in 2011. Likewise, the index of post-partum infecundability for urban and rural areas has dropped slightly from 0.55 to 0.56 and from 0.58 and 0.55 respectively in 2011. But, index of marriage (Cm) has been increased for both urban and rural 0.58 to 0.75 and 0.64 to 0.75 respectively in 2011. The more the four indices of proximate determinants are lower, the more the fertility will be reduced. The findings have shown that two index of proximate determinants such as C_c and $C_i$have been improved in 2011. The index of marriage has not been improved and this means that if more people in both urban and rural areas are getting married at early age,the probability having children in life time will be increased.
The effects of women's religious affiliation, number of living children, and socioeconomic status on modern contraceptive use increased in 2011. Modern contraceptive method use was found to be higher in urban than rural areas. Higher socioeconomic status, family planning services, media exposure to family planning, and decreasing IPV will increase the use of modern contraceptive methods. Ethiopian government, nongovernmental organizations, and policy maker should work together to improve the determinate variables of contraceptive use for women. In addition, family planning interventions are needed about the availability and acceptance of methods, knowledge of family planning, and the power of decision making.

In Ethiopia, the fertility levels of women are high. Factors that contribute to increasing fertility levels are age, place of residence, religion, educational level, work status, wealth index, health facilities, and media exposure to FP. Among these factors religion plays a major role. Findings have shown that contraceptive uses of Christian women were higher than Muslims, which has a direct impact on their fertility. Thus, the fertility levels of Muslim women were higher than Christians. Muslim women have a significantly higher level of fertility than non-Muslim women who are less religious and hold weaker family values.

Therefore, programs that focus on women's educational level and work status must be amended as they are crucial to improve the utilization of FP among women, which would also help to reduce fertility. Similarly, more emphasis needs to be placed on messages conveyed via the mass media, addressing the advantages of small family size and FP. Mass media can present a wider range of knowledge and lead to adopting contraception. Furthermore, long-running programs focusing on promoting specific permanent contraception methods are needed for women to improve the fertility behavior.

The finding of multivariate analysis have shown that age at first marriage, religion, region and respondents ''education'' are the most important significant factors of first marriage to first birth interval in Ethiopia. The significant covariates by age at first marriage are religion, region, and educational level and work status. Not only increasing age at first marriage of women reduces fertility but also their socio-cultural factors contribute to differences in fertility behavior. In Amhara region, a common rural area where women get marriage at early age, to some extent for cultural reasons; the time of change to motherhood is delayed. On the other hand, in Muslim dominated region such as Somali, the time of transition to motherhood is early due to their religious belief. However, women who were residing in urban areas of Somali had very short first birth interval, it might be because they gets pregnant earlier before they got married. In addition to this, the socio-economic and cultural practices are the key factors that allow couples to enter into marital life late and give first birth soon. As a result of education, it is more likely that young women will not accept the traditional marriage norms and values that promote early marriage and early first birth. Educated women will prefer to delay their age at first marriage in order to further their education. While age at first marriage increases, couples frequently bear their first child almost immediately after marriage not only to balance for their late start but also to confirm maternal fertility. Increasing first marriage to first birth interval is more likely to reduce the total fertility rate of a young woman. Thus, in the increasing prevalence of contraceptive use and improvement in women's socio-economic situation is necessary to carry changes related with dropping fertility and improving maternal and child health through increasing first birth interval. Hence, in an attempt to decrease the fertility by increasing women age at first marriage, it is necessary that we have a look at their educational level, work status, wealth indexes and norms within which marriage takes place.

Factors that contribute to older women fertility levels are place of residence, educational level and sex preference. Among these factors education and sex presence plays a major role. More emphasis needs to be done on rural community attitude changes particularly on women. They believe that women are not able to carry out the work that needs more energy. Thus, they differentiate as these are the work of women and that are not the works which belongs them. Hence, the culture allows mostly agricultural works are being carried out by men. Continues teaching have to be delivered for rural community for they must value women and men equally in any categories of work.

9.2 Policy recommendation

The researcher suggests that the Ethiopian government, the international NGO's and policy-makers have to give attention to increase the prevalence of contraceptive use and to educate the society not to allow their children get married at an early age. The new policy should be formulated to focus on women's contraceptive use and on teaching about the risks of child marriage. Moreover, Family planning policy at the country level must endorse initiatives of religious leaders who work closely with the health institutes and support a decline in fertility. On the other hand, Ethiopia public health policy must amend a policy that includes minimal interval from first marriage to first birth of 36 months. Finally, the researcher suggests the government of Ethiopia must adopt agricultural program that will benefit women more, so as to improve their status. Therefore, when women income and education increases, they want to live quality life, thus they prefer to have few numbers of children.