

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 17,817 household was selected for the 2005 and 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 Y_i and independent variables $X_i = (x_{i1}, \dots, x_{ip})$ for $i=1, \dots, n$

Random Component (the outcome): binomial distribution

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

$$F(y_i; \theta, \phi) = \exp\left\{ \frac{\theta y - b(\theta)}{a(\phi)} + c(y, \phi) \right\}$$

Here θ and ϕ are a dispersion parameter $b(\theta)$, $a_i(\phi)$ and $c(y_i, \phi)$ are known function.

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

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

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

Link function (the function, $g(\cdot)$ that “links” the systematic component to the random component):

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

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 model 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 Y_i = (the number of children ever born) and independent variables X_i = (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, Y_i , $1 \leq i \leq n$ independent with density from the exponential family

$$f(y_i; \theta, \phi) = \exp\left\{\frac{\theta y_i - b(\theta)}{a(\phi)} + c(y_i, \phi)\right\}$$

Here θ and ϕ are a dispersion parameter $b(\theta)$, $a_i(\phi)$ and $c(y_i, \phi)$ are known function

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

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

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

Link function (the function, $g(\cdot)$ that “links” the systematic component to the random Component)

$$g(\mu_i) = \ln \mu = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k = \frac{y_i \theta_i - b(\theta_i)}{a_i(\phi)} + c(y_i, \phi) \text{ which is the “ natural parameter of$$

“ 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

$$\ln(\mu_i) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k \text{ or } e^{\alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k} = \mu = e^{\left(\frac{y_i \theta_i - b(\theta_i)}{a_i(\phi)} + c(y_i, \phi)\right)} \text{ This is often referred to as “Poisson log linear model” .}$$

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

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

Where,

d_j = number of women having births at time t_j

n_j = number of women just prior to t_j exposed to the risk of having birth

t_j = 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:

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

Where, $X=(X_1, X_2, \dots, X_p)$ 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

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



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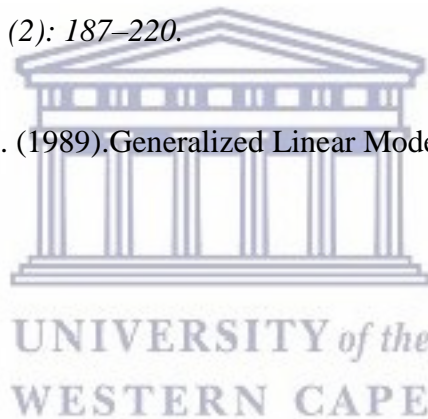
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CHAPTER III

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

¹YISHAK 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 $TFR = C_m \times C_c \times C_i \times C_a \times TF$. 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.

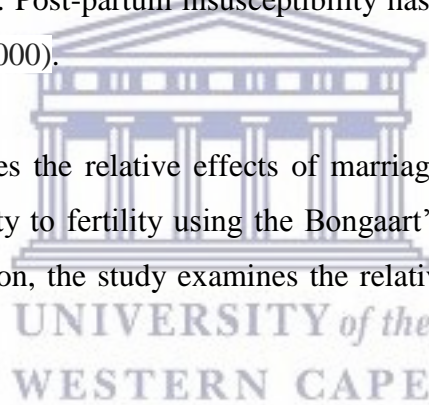
3.1 Introduction

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, Bongaarts and 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).

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

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:

$$C_m = TFR/TMR; \text{ where, } TMR = \text{Total marital fertility rate.} \quad (ii)$$

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

(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.

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

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

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:

$$\text{Total Fertility Rate (TFR)} = C_m * \text{TM}; \quad (\text{vi})$$

$$\text{Total Marital Rate (TM)} = C_c * C_a * \text{TN}; \quad (\text{vii})$$

$$\text{Total Natural Marital Fertility Rate (TN)} = C_i * \text{TF} \quad (\text{viii})$$

Operational definition

Age specific fertility rate (ASFR)

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

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

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: $5(\sum ASFR) / 1000$, where ASFR is each five-year age-specific fertility rate.

Total fecundity rate

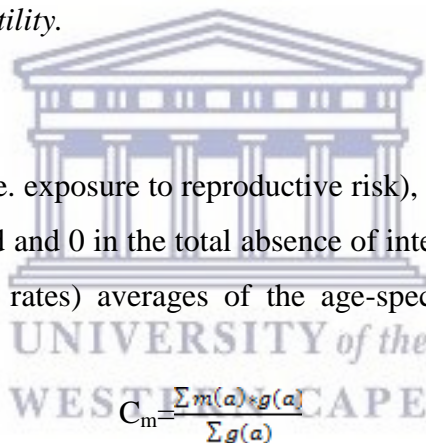
Fecundity is the capacity to reproduce; fertility, on the other hand, is the actual reproductive performance. Total fecundity rate is equal to the total natural marital fertility rate in the absence of lactation (Bongaarts, 1978).

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:



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

Where $m(a)$ =age-specific proportion of currently married women and $g(a)$ =age-specific marital fertility rates. The index C_m gives the proportion by which TFR is smaller than TM as the result of non-marriage; $C_m = 0$ if nobody is married and $C_m = 1$ 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

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

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

Thus, the urban index of marriage is 0.75

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

Rural

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

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

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

Index of contraception

Index of contraception, C_c , 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:

$$C_c = 1 - 1.08 \times e \times u$$
, 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).

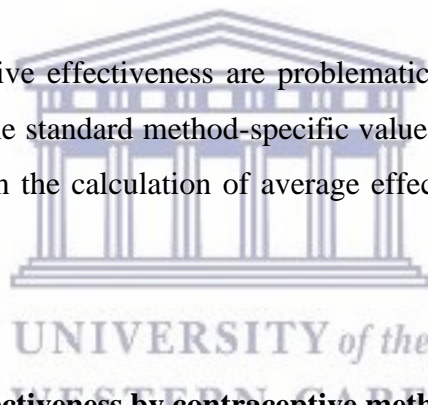


Table 2 Estimated use of effectiveness by contraceptive method for developing countries

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, $e = \frac{u(m) \times e(m)}{e(m)}$.

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 $TNM = C_i * TF$; 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:

$$\begin{aligned} & [\text{TF-TFR (estimated)}] \times \log C_m / (\log C_m + \log C_c + \log C_a + \log C_i). \\ & = (13.2-2.4) * \frac{\log 0.58}{\log 0.58 + \log 0.57 + \log 0.55} = 3.45 \end{aligned}$$

The fertility inhibiting effect of contraception is obtained as:

$$\begin{aligned} & [\text{TF-TFR (estimated)}] \times \log C_c / (\log C_m + \log C_c + \log C_i). \\ & = (13.2-2.4) * \frac{\log 0.57}{\log 0.58 + \log 0.57 + \log 0.55} = 3.56 \end{aligned}$$

The fertility inhibiting effect of lactational infecundability is obtained as:

$$\begin{aligned} & [\text{TF-TFR (estimated)}] \times \log C_i / (\log C_m + \log C_c + \log C_i). \\ & = (13.2-2.4) * \frac{\log 0.55}{\log 0.58 + \log 0.57 + \log 0.55} = 3.80 \end{aligned}$$

Rural

The fertility inhibiting effect of marriage is obtained as:

$$\begin{aligned} & [\text{TF-TFR (estimated)}] \times \log C_m / (\log C_m + \log C_c + \log C_i). \\ & = (18.20-6.00) * \frac{\log 0.64}{\log 0.64 + \log 0.89 + \log 0.55} = 4.70 \end{aligned}$$

The fertility inhibiting effect of contraception is obtained as:

$$\begin{aligned} & [\text{TF-TFR (estimated)}] \times \log C_c / (\log C_m + \log C_c + \log C_i). \\ & = (18.20-6.00) * \frac{\log 0.89}{\log 0.64 + \log 0.89 + \log 0.55} = 1.22 \end{aligned}$$

The fertility inhibiting effect of lactational infecundability is obtained as:

$$\begin{aligned} & [\text{TF-TFR (estimated)}] \times \log C_i / (\log C_m + \log C_c + \log C_i). \\ & = (18.20-6.00) * \frac{\log 0.58}{\log 0.64 + \log 0.89 + \log 0.55} = 5.73 \end{aligned}$$

Inhabiting effect of each index by place of residence in 2011

Urban

The fertility inhibiting effect of marriage is obtained as:

$$[\text{TF-TFR (estimated)}] \times \log C_m / (\log C_m + \log C_c + \log C_a + \log C_i).$$

$$= (7.02-2.64) * \frac{\log 0.75}{\log 0.75 + \log 0.50 + \log 1 + \log 0.56} = 0.81$$

The fertility inhibiting effect of contraception is obtained as:

$$[\text{TF-TFR (estimated)}] \times \log C_c / (\log C_m + \log C_c + \log C_a + \log C_i).$$

$$= (7.02-2.64) * \frac{\log 0.50}{\log 0.75 + \log 0.50 + \log 1 + \log 0.56} = 1.95$$

The fertility inhibiting effect of lactational infecundability is obtained as:

$$[\text{TF-TFR (estimated)}] \times \log C_i / (\log C_m + \log C_c + \log C_a + \log C_i).$$

$$= (7.02-2.64) * \frac{\log 0.56}{\log 0.75 + \log 0.50 + \log 1 + \log 0.56} = 1.63$$

Rural

The fertility inhibiting effect of marriage is obtained as:

$$[\text{TF-TFR (estimated)}] \times \log C_m / (\log C_m + \log C_c + \log C_a + \log C_i).$$

$$= [17.30-5.46] * \frac{\log 0.75}{\log 0.75 + \log 0.77 + \log 0.55 + \log 1} = 3.00$$

The fertility inhibiting effect of contraception is obtained as:

$$[\text{TF-TFR (estimated)}] \times \log C_c / (\log C_m + \log C_c + \log C_a + \log C_i).$$

$$= [17.30-5.46] * \frac{\log 0.77}{\log 0.75 + \log 0.77 + \log 1 + \log 0.55} = 2.70$$

The fertility inhibiting effect of lactational infecundability is obtained as:

$$[\text{TF-TFR (estimated)}] \times \log C_i / (\log C_m + \log C_c + \log C_a + \log C_i).$$

$$= [17.30-5.46] * \frac{\log 0.55}{\log 0.75 + \log 0.77 + \log 1 + \log 0.55} = 6.17$$

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: $\ln(\text{TF}) - \ln(\text{TFR}) = \ln(C_i) + \ln(C_c) + \ln(C_m)$, 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:

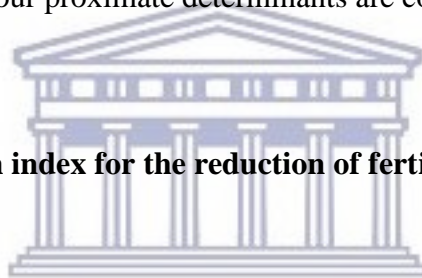
$$C_c = \frac{100 \ln(C_c)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} \text{ (% reduction of } C_c \text{)}$$

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

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

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

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

$$C_m = \frac{100 \ln(C_m)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} = \frac{100 \ln 0.58}{\ln 0.57 + \ln 0.55 + \ln 0.58 + \ln 1} = 32$$

$$C_c = \frac{100 \ln(C_c)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} = \frac{100 \ln 0.57}{\ln 0.57 + \ln 0.58 + \ln 0.55 + \ln 1} = 33$$

$$C_i = \frac{100 \ln(C_i)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} = \frac{100 \ln 0.55}{\ln 0.57 + \ln 0.58 + \ln 0.55 + \ln 1} = 35$$

Rural

$$C_m = \frac{100 \ln(C_m)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} = \frac{100 \ln 0.64}{\ln 0.64 + \ln 0.89 + \ln 0.58 + \ln 1} = 40.30$$

$$C_c = \frac{100 \ln(C_c)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} = \frac{100 \ln 0.89}{\ln 0.89 + \ln 0.58 + \ln 0.64 + \ln 1} = 10.50$$

$$C_i = \frac{100 \ln(C_i)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} = \frac{100 \ln 0.58}{\ln 0.89 + \ln 0.58 + \ln 0.64 + \ln 1} = 49.20$$

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

Urban

$$C_m = \frac{100 \ln(C_m)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} = \frac{100 \ln 0.75}{\ln 0.50 + \ln 0.56 + \ln 0.75 + \ln 1} = 18.43$$

$$C_c = \frac{100 \ln(C_c)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} = \frac{100 \ln 0.50}{\ln 0.50 + \ln 0.56 + \ln 0.75 + \ln 1} = 44.41$$

$$C_i = \frac{100 \ln(C_i)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} = \frac{100 \ln 0.56}{\ln 0.50 + \ln 0.56 + \ln 0.75 + \ln 1} = 37.15$$

Rural

$$C_m = \frac{100 \ln(C_m)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} = \frac{100 \ln 0.75}{\ln 0.77 + \ln 0.55 + \ln 0.75 + \ln 1} = 25.08$$

$$C_c = \frac{100 \ln(C_c)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} = \frac{100 \ln 0.77}{\ln 0.77 + \ln 0.55 + \ln 0.75 + \ln 1} = 22.80$$

$$C_i = \frac{100 \ln(C_i)}{\ln(C_c) + \ln(C_i) + \ln(C_m) + \ln(C_a)} = \frac{100 \ln 0.55}{\ln 0.77 + \ln 0.55 + \ln 0.75 + \ln 1} = 52.12$$

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

Fertility inhibiting effects (EDHS2005)				
Proximate determinants	(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:

$$\text{TFR (2011)/TFR (2005)} = C_m (2011)/C_m (2005) + C_i(2011)/C_i (2005) + C_a (2011)/C_a (2005) + C_c (2011)/C_c (2005) + \text{TF (2011)/TF (2005)}.$$

$$P_f = P_m + P_i + P_a + P_c + P_t + I$$

Where, $P_f = [\text{TFR (2011)/TFR (2005)}] - 1 =$ Proportional change in TFR between 2005 and 2011.

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

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

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

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

$P_t = [\text{TF (2011)/TF (2005)}] - 1 =$ 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 P_m , P_i , P_a , P_c and P_r from P_f . 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 $[TFR(2011) - TFR(2005)] \times TFR(2005)$ i.e. $[TFR(2011) - TFR(2005)] = TFR(2005) \times [P_m + P_i + P_a + P_c + P_r + I]$.

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 (P_m)	29.31	17.20	299.08	-191.11
Contraception Practices (P_c)	-12.28	-13.48	-125.30	149.78
Duration of post-partum infecundability (P_i)	1.82	-5.17	18.57	57.44
Other Proximate determinants (P_t)	-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 C_c and C_i 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 C_c 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 C_m of 0.75. This may be due

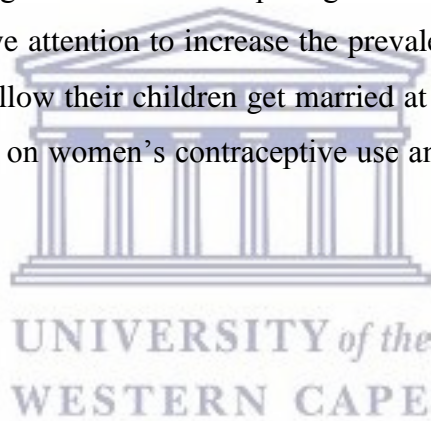
to cultural factors in both urban and rural areas which contributed the same proportions. There was a considerable variation in the index of contraception between urban and rural areas; in 2005 the index of contraception was recorded by the higher inhibiting effect of fertility for urban women compared 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 C_i , 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 (C_c) 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 (C_m) 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.



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CHAPTER IV

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

¹YISHAK 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 (Ojaka, 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.

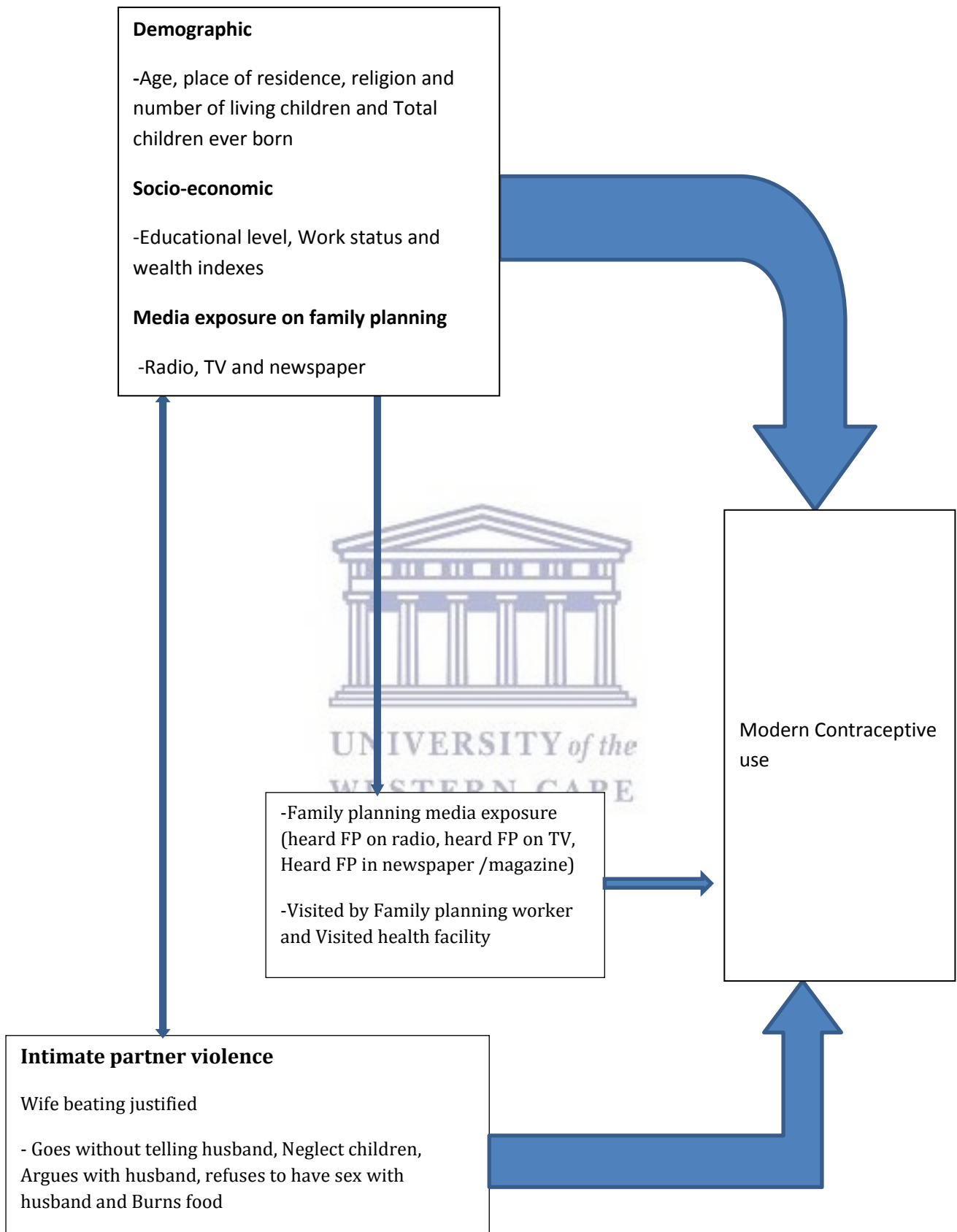
The work status of women has also been linked to knowledge and use of contraceptives. For example, contraceptive use in Malawi is influenced by work status, as women who are not working are less likely to use contraceptives than women who are working (Palamuleni, 2013). The finding is supported by another 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 importance, 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 model 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, \dots, x_n .

Link function (the function, $g(\cdot)$ that “links” the systematic component to the random Component)

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

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

Recall, the function

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

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

Demographic variables	Modern contraceptive Method				Chi-square (x^2 , sig)
	2005		2011		
	Weighted using	Not using	Weighted using	Not using	
Age groups					(32.98, 0.000)
15-19	9.7	5.6	7.8	6.3	(75.10, 0.00)
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)
Urban	5.5	22.9	10.3	30	(442.68,0.000)
Rural	94.5	77.1	89.7	70	
Religion					(49.03, 0.000)
Orthodox	42.6	59.2	39.0	53.5	(193.63,0.000)
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)
Zero	9.6	4.9	10.2	7.3	(77.81, 0.005)
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)
Zero	6.6	3.6	9.3	6.9	(100.04,0.000)
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		Chi-Square	2011		Chi-Square
	Weighted not using	Weighted using	(X ² ,Sig)	Weighted not using	Weighted using	
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					Chi-Square (X ² , Sig)
	2005		Chi-Square (X ² , Sig)	2011		
	Weighted not using	using		Weighted not using	using	
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		
1 girl-0 boy	63.57	64.25
1 boy-0 girl	56.9	59.55
Two children		
2girls-0 boy	46.77	46.15
1 girl-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	95% CI		Weighted	95% CI	
	Ex(B)	Lower	Upper	Ex(B)	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.

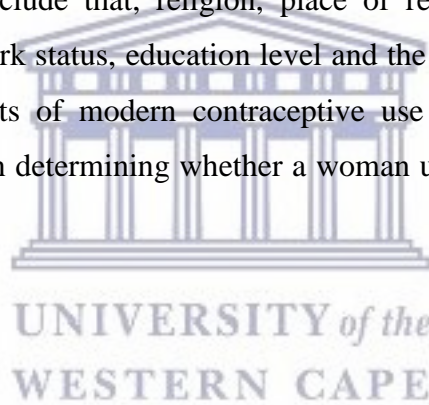


Table 6: Generalized linear model (binary logistic regression) showing the effect of socioeconomic, family planning service, media exposure on family planning and intimate partner violence on modern contraceptive method use for currently married women in 2005 and 2011.

Variables	2005			2011		
	Weighted Ex(B)	95% CI Lower	Upper	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 socioeconomic 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.



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CHAPTER V

Religion and Fertility in Ethiopia

¹YISHAK 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.

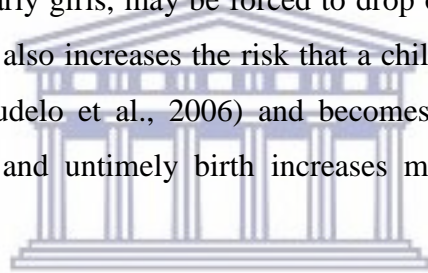
Keywords: Children ever born; Surviving children; Christian; Muslim; Family Planning; Ethiopia

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

Random Component (the Outcome): Poisson distribution

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

$$f(y_i; \theta, \phi) = \exp\left\{\frac{\theta y_i - b(\theta)}{a(\phi)} + c(y_i, \phi)\right\}$$

Here θ and ϕ are a dispersion parameter $b(\theta)$, $a(\phi)$ and $c(y_i, \phi)$ are known functions, confirming $Y_i \sim \text{Poisson}(\mu_i)$ ($\mu_i = b(\theta_i)$) Poisson distribution belongs to the exponential.

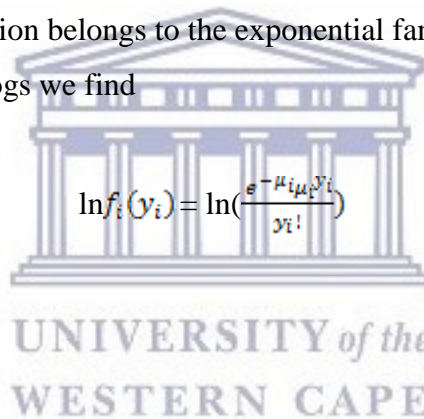
The probability density function (p.d.f.) is

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

For $y_i = 0, 1, 2, \dots$ The moments are

$$E(y_i) = \text{Var}(y_i) = \mu_i$$

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



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

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

$$\ln f_i(y_i) = \frac{y_i \theta_i - b(\theta_i)}{a_i(\phi)} + c(y_i, \phi) \quad \text{or} \quad f_i(y_i) = e^{\left(\frac{y_i \theta_i - b(\theta_i)}{a_i(\phi)} + c(y_i, \phi)\right)}$$

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

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

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

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

$$g(\mu) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k = \eta_i = \ln(\mu_i) = \mu_i = \ln(y_i!) \text{ Poisson predictor}$$

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

Link function (the function, $g(\cdot)$ that “links” the systematic component to the random Component)

$$g(\mu_i) = \ln \mu = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k = \frac{y_i \theta_i - b(\theta_i)}{a_i(\theta)} + c(y_i, \theta)$$
 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

$$\ln(\mu_i) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k \text{ or } e^{\alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k} = \mu = e^{\frac{y_i \theta_i - b(\theta_i)}{a_i(\theta)} + c(y_i, \theta)}$$

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

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

Variables	Contraceptive non-use and use(2005) by religion			
	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

Variables	Contraceptive non-use and use (2011)			
	Christian (non-use) (use)	Christian	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)		Contraceptive non-use (2011) Mean	
	Mean CEB		CEB	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***	F=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. ***= $p < 0.05$ (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)		Contraceptive use (2011)	
	Mean CEB		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=0.75	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)

Variables	Contraceptive (non-use) 2005		Contraceptive(non-use) 2011	
	Christian	IRR(95% CI) Muslim	IRR(95% CI) 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).

Variables	Contraceptive (use) 2005		Contraceptive(use) 2011	
	Christian	IRR(95% CI) 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	***	0.818(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

¹YISHAK 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 & Gurm 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.

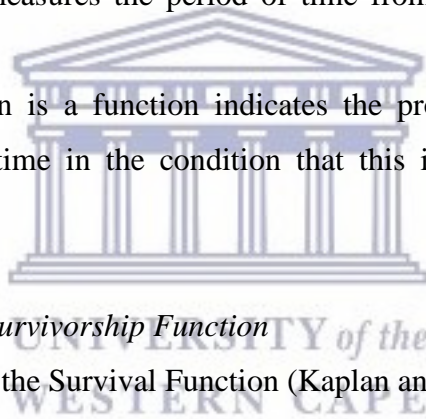
As the dependent variable is first birth interval, clearly, throughout an interval women may either have a birth (event) and event of interest did not happen while women were under observation (censored). It is right censored (fixed type I censoring) which means everyone who does not have an event observed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

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

Where,

d_j = number of women having births at time t_j

n_j = number of women just prior to t_j exposed to the risk of having birth

t_j = 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:

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

Where, $X = (X_1, X_2, \dots, X_p)$ 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 $\frac{h(t, X)}{h_0(t)}$. The log of the hazard ratio is a linear combination of parameters

which is

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

6.3. Results

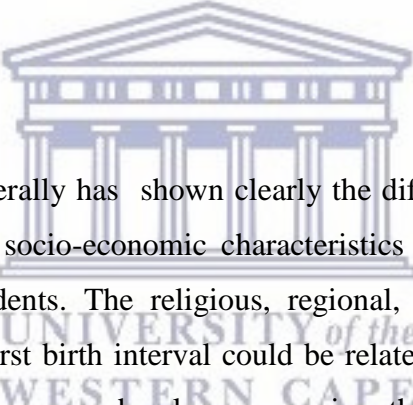
Table 1 presents the socio-economic and demographic characteristics for timing of first motherhood (in months) by age at marriage. Marriage to first birth interval is significantly associated with place of residence, religion, region and educational level for both women of age at marriage 15-19 and 20-24. 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 months) 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 affiliations 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.

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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)		Age at first marriage (20-24)		Age at first marriage (25+)	
	Median ST for Birth Interval (in months)	95% of CI	Median ST for Birth Interval (in months)	95% of CI	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)

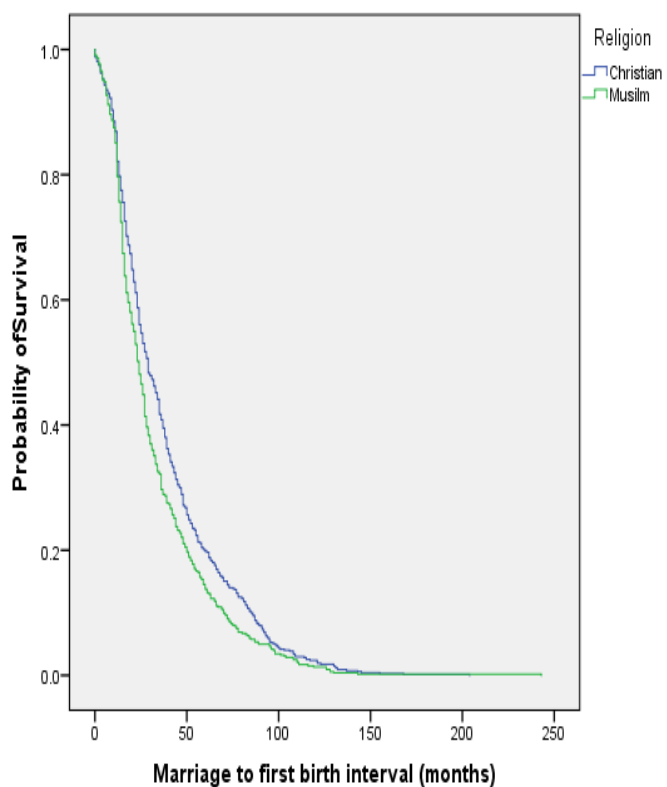


Figure 2(Age at marriage 20-24)

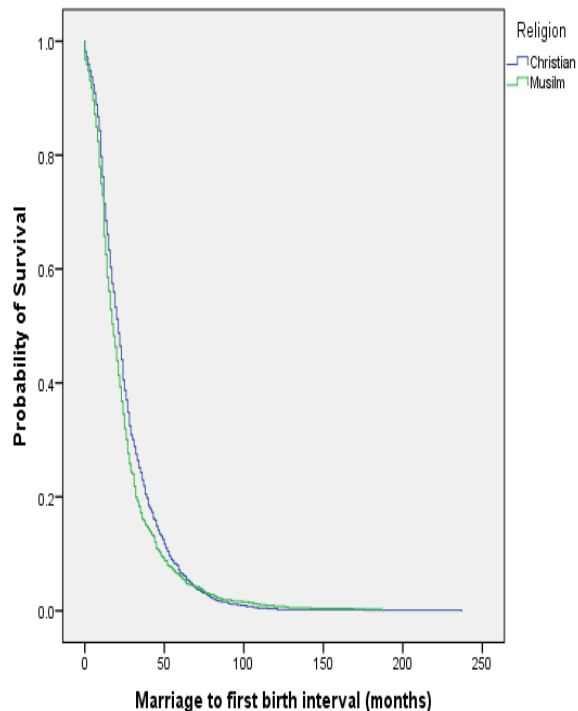


Figure 3(Age at marriage 15-19)

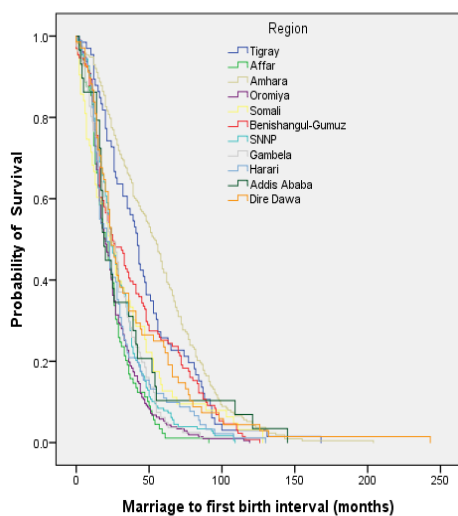


Figure 4(Age at marriage 20-24)

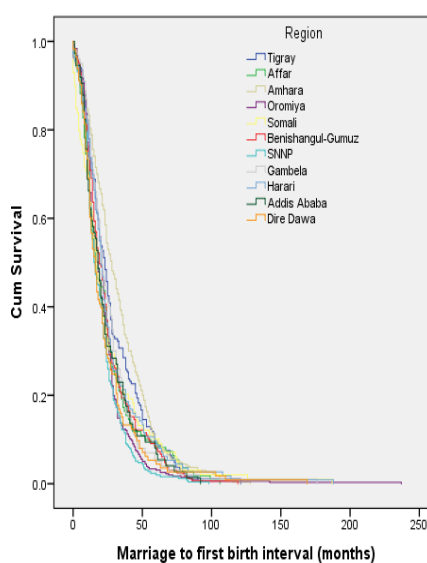


Figure 5(Age at marriage 15-19)

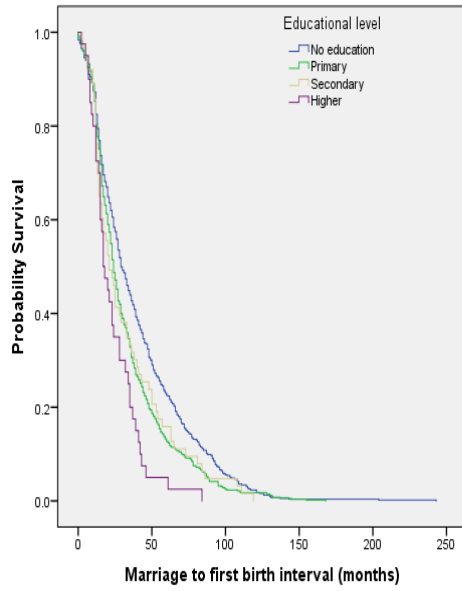


Figure 6(Age at marriage 20-24)

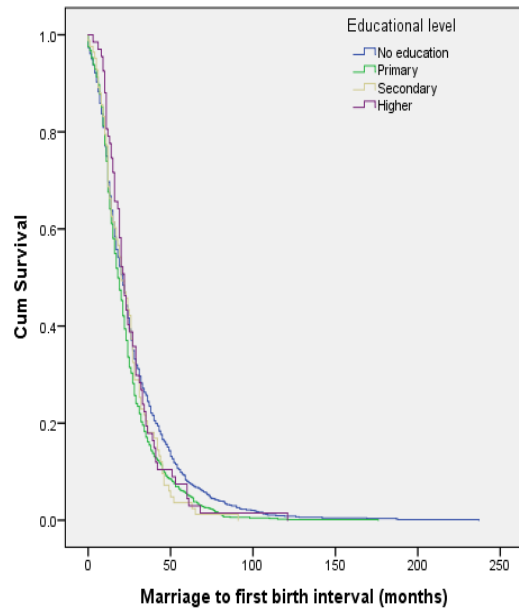


Figure 7 (Age at marriage 15-19)

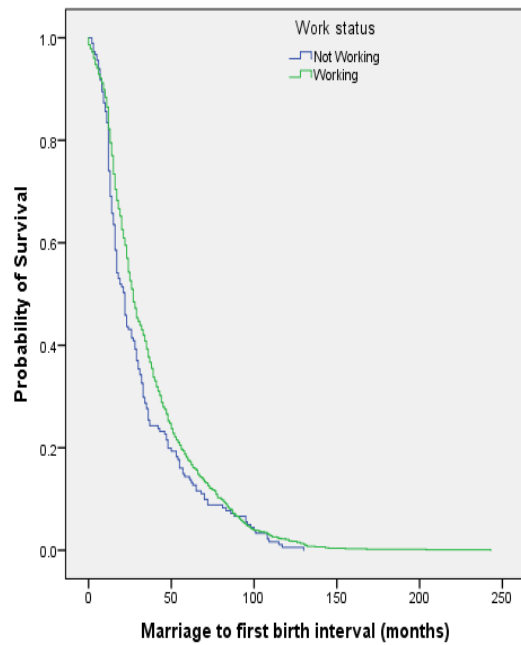
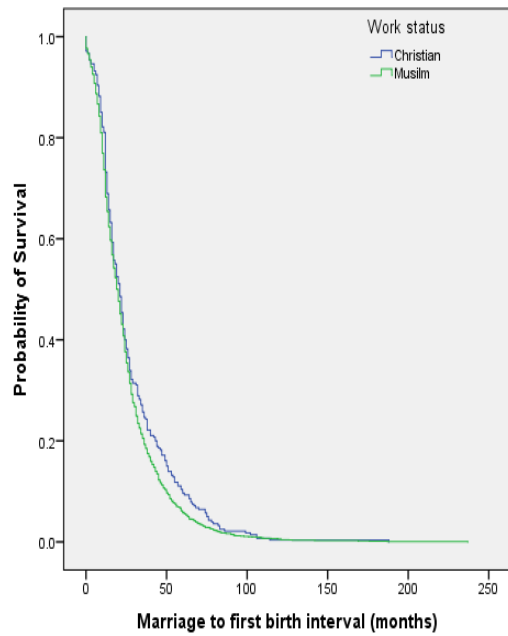


Figure 8 (Age at marriage 20-24)



CHAPTER VII

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

¹YISHAK 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).

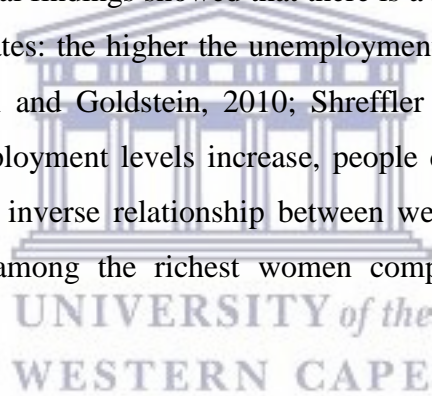
For a high fertility rate, the main reasons might be early age at first marriage, desire for more children, and extremely low contraceptive use (Gibson and Labour, 2002). Agriculture is the backbone of the Ethiopian economy. Because the major economic sector depends on it, most families want to have 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.



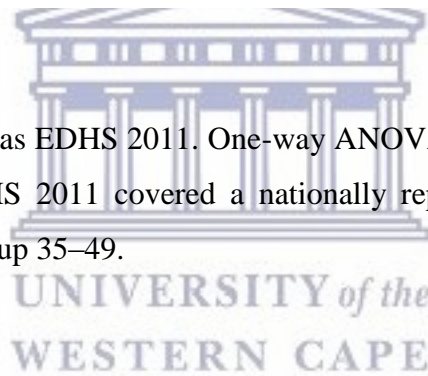
In addition to these factors, a strong preference for sons may be a barrier for drops in fertility if couples continue having children after attaining their overall family size goal because they are not satisfied with the sex composition of their children. But research on the association between son 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; Bhat and Zavier 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 model 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 $Y_i = (\text{CEB})$ and independent variables $X_i = (\text{place of resident, region, religion, educational level, work status, wealth indexes and sex preference})$ for $i = 1, \dots, n$.

Link Function (the function, $g(\cdot)$ that “links” the systematic component to the random component),

$$g(\mu_i) = \ln \mu = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k - \frac{y_i \theta_i - b(\theta_i)}{a_i(\phi)} + c(y_i, \phi),$$

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

$$\ln(\mu_i) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k \text{ or } e^{\alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k} = \mu = e^{\left(\frac{y_i \theta_i - b(\theta_i)}{a_i(\phi)} + c(y_i, \phi) \right)}$$

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.



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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)

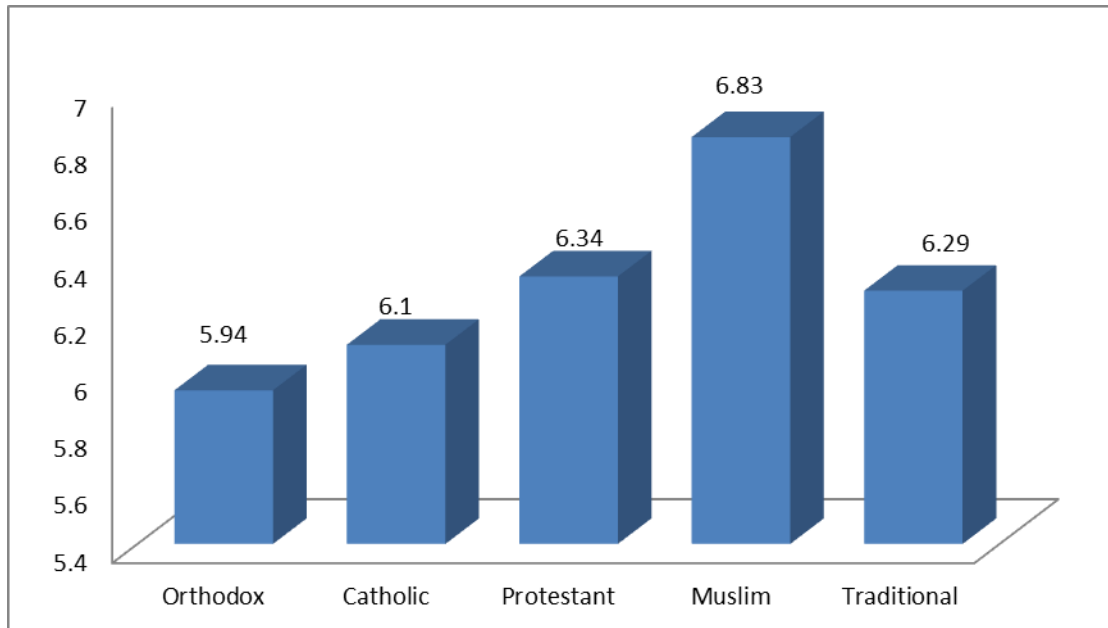
Source: Ethiopian Demographic Health Survey, 2011. ***<0.05 (Statistically significant).

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		

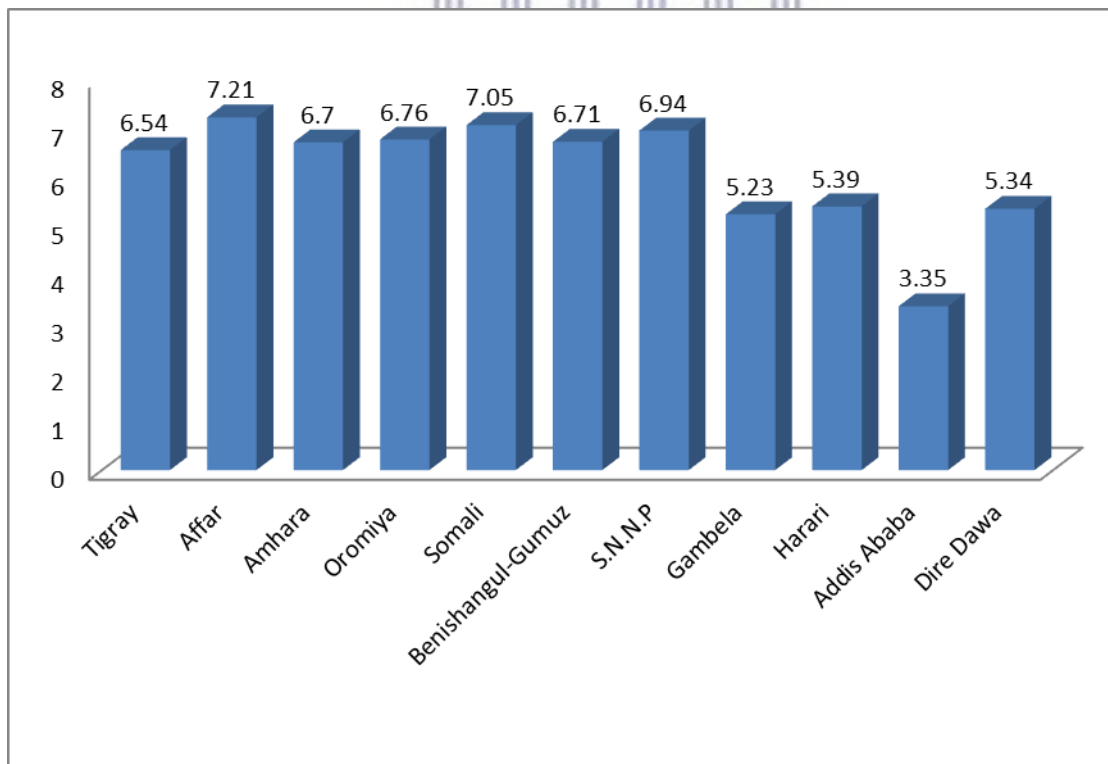
Source: Ethiopian Demographic and Health Survey, 2011.***<0.05(statistically significant)

Figure 1: Mean children ever born by Religion



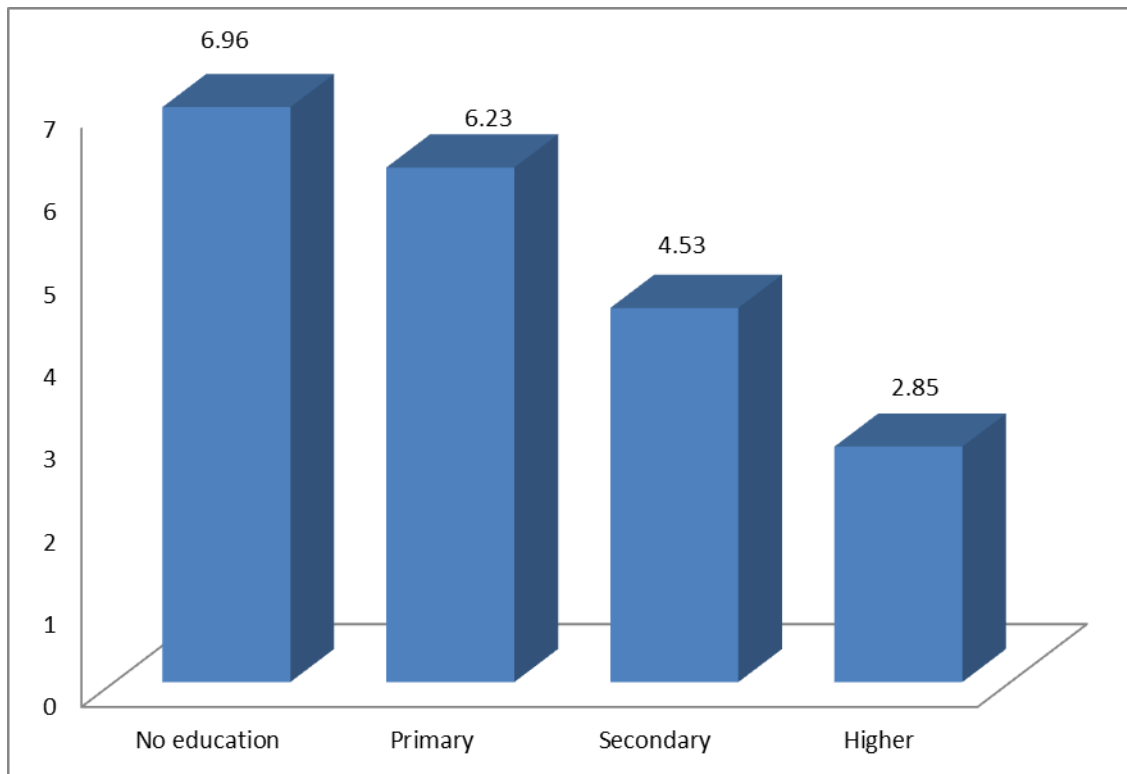
Source: Ethiopian Demographic health survey 2011

Figure 2: Mean children ever born by Region

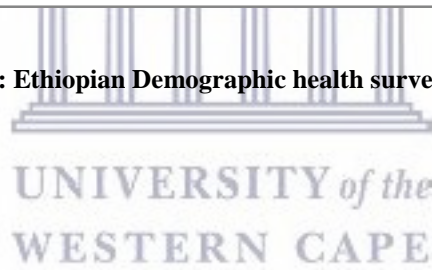


Source: Ethiopian Demographic health survey 2011

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 linked 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 C_m 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 C_i , 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 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.

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 (C_c) 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 (C_m) 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.