Department of Statistics
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Trend and Determinants of Intention to Use Family Planning in Ethiopia

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A Thesis Submitted to the Department of Statistics in Partial Fulfillment of the Requirement for Degree of Master of Science in Statistics (Bio-statistics)

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June, 2021
Addis Ababa, Ethiopia

Addis Ababa University
School of Graduate Studies

This is to certify that the thesis prepared by Gete Bulbulu, entitled: Trend and determinants of intention to use family planning and submitted in partial fulfillment of the requirements for the Degree Master of Science in Statistics (Biostatistics) compiles with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Declaration

I, the undersigned, declare that the thesis is my original work, has not been presented for degrees in any other university and all sources of materials used for the thesis have been duly acknowledged.

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Date of submission: June, 2021

This thesis has been submitted for examination with my approval as a university advisor.

Advisor: Bedilu Alamirie (Ph.D) _____

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Acknowledgment

First of all I would like to thanks my God for being on the side of me in the efforts towards my successful completion. I would like to express my special thanks to my advisor Bedilu Alamirie (Ph.D), for his dedication, advice and positive suggestions. I would like to thanks gratefully also go to all members of my family for all the encouragement and support throughout my study. At the end, I would like to thank the Performance Monitoring for Action (PMA) for providing the data used in this study.

Abstract

Family planning (FP) is defined as the ability of individuals and couples to attain their desired number of children and the spacing and timing of their births. It is a means of promoting the health of women and families and part of a strategy to reduce the high maternal, infant and child mortality. The prevalence rates of contraceptive use tend to be higher in developed countries than in developing countries. Among developing countries, the rates of contraceptive use vary widely. Sub-Saharan Africa had the lowest prevalence rate of contraceptive use even when compared to other developing regions, such as those in Southeast Asia. Ethiopia is one of the sub-Saharan African countries with highly population growth rate. To reduce high population growth rate in Ethiopia, the intention to use for family planning status of women needs to be increased. The main objective of this study was to explore trend and identify determinant factors of intention to use of family planning in Ethiopia. The data from six survey year rounds of the Performance Monitoring for Action (PMA) surveys, which were undertaken from year 2014 to 2019, were used.

Multilevel (two-level) logistic regression models were employed to identify the major risk factors of intention to use for family planning. The results of the multilevel logistic regression revealed that, place of residence, marital status, age group, media exposure, discussion with partner about family planning, literacy and wealth index were found significant determinants on intention to use for family planning. Intention to use for family planning was 42.06%. The respondents having media exposure (AOR=1.262; 95% CI: 1.198, 1.330), literate (AOR=1.780; 95% CI: 1.679, 1.885 and single or unmarried (AOR=4.228; 95% CI: 3.955, 4.521) were more likely to had intention to use for family planning compared to their counterparts. Therefore, it is recommended that providers and programmers should continue the promotion increasing family planning knowledge through mass media.

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Acronyms

AIC: - Akaki's Information Criteria

OR: - Odds Ratio

CI: - Confidence Interval

EA: - Enumeration Area

FP: - Family planning

ICC: - Intra Class Correlation

LAPM: - Long acting and permanent contraceptives methods

MCH: - maternal and child health

MDG: - Millennium Development Goals

MLM: - Maximum likelihood method

MMR: - Maternal mortality ratio

PMA: - Performance Monitoring for Action

PPFP: - Postpartum family planning

UN: - United Nations

Chapter One

1. Introduction

Family planning (FP) is defined as the ability of individuals and couples to attain their desired number of children (Bongaarts, J. et al., 2012). Family planning is used to promote the health of women and families and part of a strategy to reduce the high maternal, infant and child mortality (UNFPA, 2020). Family planning is a very sensitive issue and studies on it are very limited in Ethiopia.

Globally, many women and couples want to avoid pregnancy.in the world wide among 1.9 billion women of reproductive age (15-49 years) in 2020, total of this 1.1 billion women are considered to have a need family planning, Of these women, 851 million are using a modern method of contraception and 85 million are using a traditional method. An additional 172 million women are using no method at all, despite their desire to avoid pregnancy, and thus are considered to have an unmet need for family planning (UN, 2020).

In the world, more women or their partners are using contraceptive methods to avoid unintended pregnancies today than in the past. Between 2000 and 2020, the contraceptive prevalence rate (percentage of women aged 15-49 who use any contraceptive method) increased from 47.7 to 49.0 percent. Whereas contraceptive use is currently lowest in sub-Saharan Africa, at 27.8 per cent, this level is projected to increase over the next decade to 32.9 percent. Most women who use contraception rely on modern methods, but the specific contraceptive methods used vary by region (UN, 2020).

In most low and middle income countries contraceptive use remains low even after delivery (Moore et al., 2015). Recent estimates from 21 developing countries including Ethiopia indicate that, only 31% of women within the first 2 years of delivery use a family planning method. Factors that are likely to influence contraceptive use after delivery include, client-level factor, partner dynamics reproductive and health system factors such as exposure to contraceptive messages during maternal and child health (MCH) care (Borda MR.et al., 2010 and Do M.et al.,2013). Family planning remains an integral component of maternal and child health (MCH) services in Ethiopia. Although knowledge on contraception is universal and the majority of

women patronise antenatal, postnatal and child health services in Ethiopia. MCH services provide opportunities to promote family planning due to the frequent encounter of women with the health system and hence increased exposure to family planning counseling during these periods (Eliason et al., 2013).

In general, the trend of the prevalence rates of contraceptive use to be higher in developed countries as compared in developing countries (Haub, C., 2013). Among developing countries, the rates of contraceptive use different place to place. Sub-Saharan Africa is one of the developing countries that had the lowest prevalence rate of contraceptive use even when compared to other developing regions, such as those in Southeast Asia. From 2020 to 2030, sub-Saharan Africa is expected to experience the largest increase among regions in the number of users of modern contraceptive methods, which could grow by 39 million or about 60 percent of its level in 2020. Like the global trend over the past two decades, the increasing number of women using modern contraceptive methods in sub-Saharan over the next decade will likely be driven both by a continued rise in the number of potential users (women of reproductive age) and by growth in the percentage of women aged 15-49 years who use modern contraceptive (UN, 2020). The unmet need in contraceptive use was high in Sub-Saharan Africa. It was estimated that 222 million women intended to avoid pregnancy, but were not able to use contraceptive methods (Singh, S., and J. E. Darroch. 2012).

Lack of access to family planning services and concerns about the side effects associated with modern contraceptive methods are the main reasons for the high unmet need of contraception in developing countries (Cleland, J. et al., 2014). The Guttmacher Institute's adding it up models estimated the short-term savings of meeting need for family planning. Using more recent data, it was found that every additional US dollar investment saved three US dollars (Sully, E. et al., 2020).

For a country like Ethiopia the rates of using contraceptives has shown an upward trend in recent decades but remained quite low despite recent efforts. According to Ethiopian Mini Demographic and Health Survey reported prevalence rates of contraceptive use was 14%, 29%, 35% and 41% in 2005, 2011, 2016 and 2019 respectively (EMDHS,2019). Lack of access to

family planning services and gender inequity rooted in traditional values could be the main reasons for the low rate of contraceptive use in Ethiopia.

1.1 Statement of problem

The government of Ethiopia at the London Summit on Family Planning on July 11, 2012 agreed to reach 55% family planning use coverage by 2020. In Ethiopia, despite the increase in contraceptive use coverage from time to time and according to EDHS report on family planning coverage is 41% (EMDHS, 2019). Thus, giving attention to the importance of family planning is important to reach the coverage. Fertility remains high and contraceptive use is low in many of sub-Saharan Africa countries. Ethiopia is one of sub-Saharan Africa known to have high fertility. However, for the few countries where a significant association was observed, couples were less likely to be using a method when the wife wanted to have more children and more likely to be using one when she wanted to stop childbearing. To ensure open and sustained use of contraception within a union, family planning programs must continue to involve men by helping them to understand the importance of fewer and well-spaced births for the health of women and their children (Bankole A.et al., 2011).

Unlike other family planning related studies, there few studies to identify determinant factors related with intention to use family planning in Debremarkos Town, Northwest Ethiopia (Abajobir, A., 2014). Further, these studies are limited to by using a single cross-sectional survey which could not be helpful to see the trend in intention to use family planning over time. Nowadays, it is common to see repeated cross-sectional surveys carried out in multiple rounds. Pooling such data for further analysis will improve the power of test due to an increased sample size and helpful to investigate trend over-time. To our knowledge, there is no study that considers repeated cross-sectional surveys to identify determinant factors related to intention to use family planning in Ethiopia.

1.2 Objective of the study

The aim of this study is to explore trend and identify determinant factors of intention to use of family planning in Ethiopia. Specifically, we aimed to

- To assess the trend in intention to use family planning looks like over different factors, and
- Identify client partner-level and other factors that influence intention to use family planning.

1.3 Significance of the Study

Examining factors that explain existing trends in intention to use family planning using repeated cross-sectional survey is important for health official to implement intervention mechanisms. In this study, a repeated cross-sectional data from six round year of reproductive health survey would be analyzed to establish the trends and identify determinant factors associated with in intention to use family planning among women aged 15–49 years. Findings from this study can serve as a resourceful tool in planning interventions to improve the contraception use in Ethiopia.

Identifying factors associated with contraceptive use among fecund, married reproductive age women who want no more children is crucial as the incidence of unmet need for contraceptives may be high among this group of women. Unmet need for family planning remains a useful tool for identifying and targeting women at high risk of unintended pregnancy (Casterline JB.et al., 2003). To our knowledge there is limited study done to explore determinant factors related in intention to use family planning in Ethiopia. Therefore, the aim of this study is scientific evidence is important for planner and decision makers. The results of this study are expected to be useful to governmental and nongovernmental organization to design appropriate intervention plan to improve utilization of family planning and give priority to the area that needs due attention.

1.4 Limitation of the Study

- There are various factors that are not included in the survey, like awareness and knowledge of the respondents.

Chapter Two

2. Literature Review

Several studies regarding the determinants of intention to use family planning are conducted across the world. Most of the studies and reports indicate that intention to use family planning is lower in Africa especially in Sub-Saharan Africa as compared with other countries. Family planning has been necessary used to the reaching of Millennium Development Goals (MDG) and is an important indicator for tracking progress on improving maternal health (Cates W J. et al.2010). Family planning is one of four pillars with antenatal care, safe delivery, and postnatal care that was introduced by the Safe Motherhood Initiative in1987 to reduce maternal mortality in developing countries.

According to Population Reference Bureau (2020) Ethiopia is the fast growing, second most populous country in Africa with 114.9 million in 2020. In Ethiopian Demography Health Survey (EDHS) 2016 report, Maternal mortality ratio (MMR) was 412 per 100,000 live births with an estimated 32% of all maternal deaths related to unsafe abortions. According to Ethiopia Demographic and Health Survey report in 2016 about 25% of currently married women had an unmet need for family planning (FP), 16% had a need for spacing, and 9% had a need for limiting. Ethiopian Federal Ministry of Health has been giving increased attention to the expansion of long acting and permanent contraceptives methods(LAPM), but the utilization and intention to use long acting and permanent contraceptives methods(LAPM) remained low (UNFPA, 2010).

A study conducted by Ahmed .et al.(2012) on maternal deaths averted by contraceptive use: an analysis of 172 countries and aimed to estimate the effect of contraceptive use on maternal mortality and the expected reduction in maternal mortality if the unmet need for contraception were met, at country, regional, and world levels. The findings of this study have shown that numbers of unwanted pregnancies and unmet contraceptive need were high in many developing countries. Thus, provide evidence that use of contraception is a substantial and effective primary prevention strategy to reduce maternal mortality in developing countries.

A study conducted by Eliason et al. (2013) on factors influencing the intention of women in rural Ghana to adopt postpartum family planning through using univariate and multivariate logistic regression analysis were applied to explore how knowledge of various family planning (FP) methods, past experience with their use and the acceptability of postpartum family planning (PPFP) to male partners and close relations influenced the intention of pregnant women to adopt postpartum family planning (PPFP). The findings of this study have shown that about 70% of pregnant women expressed the intention to adopt postpartum family planning (PPFP). The model reveals acceptability of PPFP by the pregnant woman (O.R. = 3.21, 1.64-6.26), were the strongest predictors of the intention to adopt PPFP.

A study conducted by Ross et al. (2001) on Contraceptive use, intention to use and unmet need during the extended postpartum period. Using Demographic and Health Surveys series between 1993 and 1996 are analyzed to assess intentions to practice contraception and unmet need for it, both in the first year after birth. The findings of this study have shown that for all countries, nearly 40% of women in the extended postpartum period intend to use a method within the next year. The regional averages differ very little, ranging only from 35% in the Middle East to 41% in Sub-Saharan Africa.

A study conducted in United State of America (USA) by Weisband et al. (2017) on postpartum intentions on contraception use and method choice among breastfeeding women attending a university hospital in Ohio. Using cross-sectional study using a convenience sample of 100 breastfeeding women before their discharge following delivery at a large university hospital in 2015 and logistic regression model was applied. The findings of this study have shown that the proportion of women who expressed an intention to use modern contraceptive methods was estimated 91% and the most commonly cited reason for the intended choice of contraceptive method was convenience (35%).

The findings of a study from Nigeria on Determinants of Intention to Use Post-Partum Family Planning among Women Attending Immunization Clinic of a Tertiary Hospital by Idowu A. et al (2015), revealed that most women in south western part of Nigeria had the intention of using Postpartum family planning (PPFP) and the odd for intention to use Post-Partum Family

Planning (PPFP) was expectedly lesser among women in the 40-49 age range compared to those in 20-29 age categories.

The findings of a study from Ethiopia, on Intention to use long acting and permanent contraceptive methods and factors affecting it among married women in Adigrat town, Tigray, Northern Ethiopia by Gebremariam A. et al (2014). Using logistic regression model to determine the factors and content analysis was done on the qualitative data. The result, suggested that the prevalence of intention to use long acting and permanent contraceptive methods was 48.4% while 14.6% participants were unsure of their intention.

Meskele M. et al. (2014)) studied Factors affecting women's intention to use long acting and permanent contraceptive methods in Wolaita zone, southern Ethiopia using binary logistic regression model was applied to identify determinant factors. The findings of this study have shown that Intention to use long acting and permanent contraceptive methods (LAPM) was low and nearly half of women had a negative attitude to use such methods.

Abajobir A.(2014) studied Intention to use Long Acting and Permanent Family Planning Methods among married 15–49 years women in Debremarkos Town, Northwest Ethiopia. Bivariate and multiple logistic regressions were applied to determine the factor affecting to use long-acting and permanent family planning. The findings of this study revealed that the age group one of the determinant factors for intention to use Long Acting and Permanent Methods. Those women who have knowledge of those Long Acting and Permanent Methods (LAPM) and currently using Long Acting and Permanent Methods (LAPM) were 4.4 times and 2.9 times more likely to have intention than those who didn't respectively.

Tekelab T.et al.(2015) studied Factors affecting intention to use long acting and permanent contraceptive methods among married women reproductive age groups in Western Ethiopia bivariate and multivariate logistic regression analysis were applied to identify the Factors affecting intention to use long acting and permanent contraceptive methods. The findings of this study revealed that the prevalence of intention to use Long Acting and Permanent Contraceptive Methods (LAPM) was 18.2%. The results of bivariate and multivariate shows that a significant positive association between intention to use long acting and permanent contraceptive methods and women's education (AOR=1.82, 95%CI = 1.09 – 3.04), women's occupation (AOR = 2.56,

95% CI = 1.47-4.46), joint fertility related decision (AOR = 2.76, 95% CI: 1.40-5.42), and discussion with health care provider about long acting and permanent contraceptive methods (AOR = 2.08, 95% CI: 1.40-3.09).

A study conducted by Dibaba Y. (2009) on Factors influencing women's intention to limit child bearing in Oromia, Ethiopia using a Logistic regression models. The regression result revealed that predictors of the desire to limit childbearing are age, education, wealth index, number of living sons, number of living daughters, experience of child death, knowledge and use of family planning services and exposure to media.

A study conducted by Hrusa, G.(2020) on quality of family planning counselling in Ethiopia: using ordinal logistic regression. The result of this study was the overall quality of counseling on family planning was low, with only 30% of women reporting receiving sufficient information during counseling. The ordinal logistic regression model results indicate education level, wealthiest quintile and residence is the major determinant factors.

Chapter Three

3. Methodology

3.1 Data

The data for this study were obtained from six survey year rounds of the Performance Monitoring for Action (PMA) surveys, which were undertaken from year 2014 to 2019 drawn by the Central Statistical Agency. The PMA surveys are repeated cross-sectional surveys based on a multistage stratified cluster sampling design. The primary sampling units or enumeration areas are selected by probability proportional-to-size method for which the sample selection probability depends on the size of population. The details of PMA2020 survey design and sampling techniques are described elsewhere (Fruhauf et al., 2018). PMA uses standard data collection procedures which are consistent across-rounds, and also consistent in content, allowing to pool the data and make comparisons over time. To assess trend over time and identify factors linked with the outcome variable, the pooled data from six survey year-rounds were analyzed.

Performance monitoring for action Cross-sectional survey used a two-stage cluster design with urban-rural, major regions as strata. A total of 265 enumeration areas (EAs) selected from the master sample frame of the Central Statistical Agency. A cross-section of 35 households is randomly selected from within each enumeration area. All women age 15–49 years old in the selected households are eligible for the cross-sectional survey.

3.2 Variables of the Study

3.2.1 Response Variable

The response variable in this study is intention to use family planning. Intention to use a family planning refers to all women who were found in the extended period who are not currently using any modern contraception but reporting intent to use any of modern contraceptive at some time in the future. Intention use to any family planning method coded as “1” and no intention coded as “0”. In order to see the effect of different factors on intention to use, the outcome variable for

the i^{th} women from the j^{th} EA, let y_{ij} is the response variable for the i^{th} woman from j^{th} EA, is given by

$$y_{ij} = \begin{cases} 1, & \text{Intention to use family planning} \\ 0, & \text{otherwise} \end{cases}$$

Where, i=1, …, I_j j=1, …,EA

3.2.2 Independent variables

Several variables that are considered that is associated with an intention to use family planning as suggested by the in the literature were included as predictor variables. These include marital status, wealth index, level of education, region, place of residence, age, ever pregnant, family planning discussion at home, survey year and media exposure are considered as a predictor variables.

Table 1: Description of the variables and coding

No	Variables	Category
1	Residence	1=Urban 2=Rural
2	Marital status	1=Married 2=Single/unmarried 3=Divorced
3	Education status	0=No 1=Yes
4	Ever_pregnant	0=No 1=Yes
5	Discussion with partner	0=No 1=Yes
6	Wealth index	1=Poor 2=Middle 3=Rich
7	Region	1=Tigray 2=Amhara 3=Oromia 4=SNNP 5=Addis Ababa 6=Others
8	Age	1=15 to 19

		2=20 to 24 3=25 to 49
9	Survey year	1=2014 2=2015 3=2016 4=2017 5=2018 6=2019

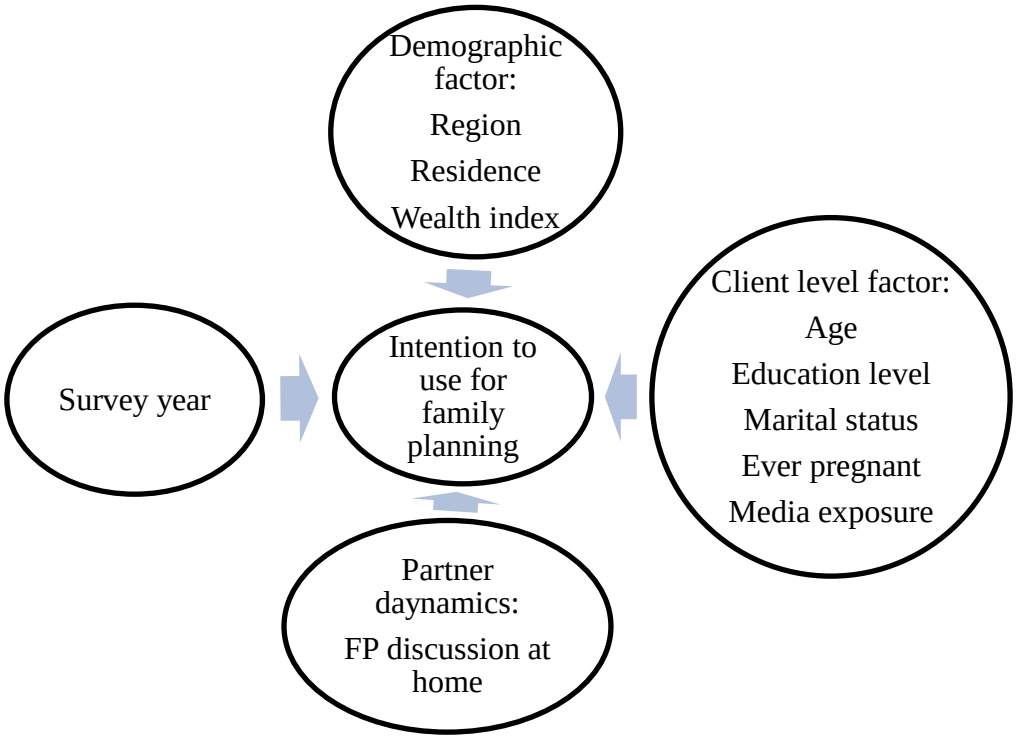


Figure 1: Conceptual framework diagram

3.3 Statistical Analysis

3.3.1 Weighted Percentage

An intention to use for family planning indicator survey data-sets are often complex in nature for two reasons: i) the use of stratified multistage cluster sampling to increase sampling and cost efficiency and ii) unequal probabilities of selection from target-populations for sampled elements, often as a result of oversampling of key subgroups. Thus, to avoid the expected bias due to varying selection probabilities, sampling weights were considered during percentage computation (Carle AC., 2009).

3.3.2 Multilevel Logistic Regression Model

When the outcome variable is categorical, logistic regression is a common choice. Logistic regression analysis studies the association between a categorical dependent variable and a set of independent (explanatory) variables. But the nature of data were used in this study is hierarchical; that means logistic regression model is not appropriate, therefore, for complex survey we use multilevel logistic regression model.

In multilevel modeling, the structure of data in the population is hierarchical, and a sample from such a population can be viewed as a multistage sample. In such survey, the clustering nature of the data induced by the design. Thus, data collected using such designs pose many challenges for model-based statistical inference.

Clustering sampling scheme often used to introduces multilevel dependency or correlation among the observations that can have implications for model parameter estimates. For multistage clustered samples, the dependence among observations often comes from several levels of the hierarchy. The problem of dependencies between individual observations also occurs in public health survey research, where the sample is not taken randomly but cluster sampling from geographical areas is used instead. In this case, the use of single-level statistical models is no longer valid and reasonable. Hence, in order to draw appropriate inferences and conclusions

from multistage stratified clustered survey data, we may require tricky and complicated modeling techniques like multilevel modeling.

As mentioned in the previous section, PMA data set used for this study is based on multistage stratified cluster sampling. The appropriate approach to analyzing the determinants of intention to use family planning data from this survey is therefore based on nested sources of variability. Here the units at lower level (level-1) are individuals who are nested within units at higher level (clusters: level-2).

Test of heterogeneity proportions

In the multilevel analysis, the first logical step is to test heterogeneity of proportions between groups. The most commonly used test statistic to check for heterogeneity of proportions between groups is the Chi-square test. The Chi-square test is given as follows:

$$\chi^2=\sum_{j=1}^{N} n_j \frac{(\widehat{p_j}-\widehat{p_.})}{\widehat{p_.}(1-\widehat{p_.})} \quad \text{..... (1)}$$

Where, $\widehat{p_j}= \frac{1}{n_j}\sum_{i=1}^{nj} y_{ij}$ is the proportion of successes in group j which is an estimate for the group-dependent probability P_j. Similarly, $\widehat{p_.} = \frac{l}{M}\sum_{j=1}^{M}\sum_{i=1}^{nj} y_{ij}$ the overall proportion of successes. N is the number of groups, n_j is the number of samples in the j^{th} group. The decisions were based on approximately Chi-square distribution with N-1 degrees of freedom.

Intercept only model

This is the simplest case of a multilevel model for a dichotomous outcome variable in which there are no explanatory variables at all. This model only contains random groups and random variation within groups. Thus, the logit link function is given by

$$\text{logit}(p_{ij}) = \beta_0 + U_{oj} \quad \text{.....(2)}$$

Where, U_{oj} denotes the random effect for the j^{th} enumeration area (EA).

Random intercept model

Is another multilevel model done by including the covariates and intercept is the only random effect. Random effect means the groups differ with respect to the average value of the response variable. This model assumes the slopes are fixed.

Let y_{ij} be the binary outcome variable, coded "0" or "1", associated with level-one unit nested within level two unit j. Also let p_{ij} be the probability that the response variable equals 1, $p_{ij}=pr(y_{ij}=1)$.

Like the ordinary logistic regression, p_{ij} is modeled using the logit link function. The two-level logistic regression model can be written as (Agresti, 2012)

$$\text{logit}(p_{ij}) = \log\left(\frac{p_{ij}}{1-p_{ij}}\right) = \beta_i+\beta_1 x_{ij1}+\beta_2 x_{ij2}+\ldots+\beta_k x_{ijk}+U_{0j} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(3)$$

Where, i=1,…, I_j, j=1, …, EA, β_i is intercepts for level two, $\beta_1,\ldots,\beta_k$ are the coefficients for k predictor variables, $x_{ij1},\ldots,x_{ijk}$ are explanatory variables, U_{0j} is the random effect at level 2 (EA), and distributed normally with mean zero and variance ${\delta_u}^2$, $U_{0j}\sim N(0, {\sigma_u}^2)$.

Random Coefficient Model

In this model the coefficients of the explanatory variables are considered as random. Random coefficients models treat covariate as well as the intercept as random variables that can explain unobserved heterogeneity in the effects of explanatory variables on the response variable. The logistic regression analysis, linear models are constructed for the log-odds. The multilevel analogue, random coefficient logistic regression, is based on linear models for the log-odds that include random effects for the groups or other higher level units.

Denote these variables by $X_h = X_{hij}$, i = 1, 2, . . . , I_j , h = 1, 2, . . . , k, j = 1, 2, . . . , EA. Since some or all these variables could be level-one variable, the success probability is not necessarily the same for all individuals in a given group. Therefore, the success now consider a model with group-specific regressions of logit of the success probability, logit(Pij) on a single level one explanatory variable X_1 is

$\text{logit}(p_{ij}) = \log(\frac{p_{ij}}{1-p_{ij}}) = \beta_i + \beta_{ij} X_{1ij}$ ……..(4)

The intercepts β_i as well as the regression coefficients, or slopes, β_{ij} are group-dependent. These group-dependent coefficients can be split into an average coefficient and the group-dependent deviation

$\beta_i = \beta_0 + U_{0j}$ and $\beta_{ij} = \beta_1 + U_{ij}$ …….(5)

Substituting (5) into (4), we have

$\text{logit}(p_{ij}) = \log(\frac{p_{ij}}{1-p_{ij}}) = (\beta_0 + U_{0j}) + (\beta_1 + U_{1j}) X_{1ij} = \beta_0 + \beta_1 x_{1ij} + U_{0j} + U_{ij} X_{1ij}$…….(6)

From (6) there are two random group effects, the random intercept U_{ij} and the random slope U_{1j}. It is assumed that the level-two residuals U_{0j} and U_{1j} have means zero given the value of the explanatory variable X. Thus β_1 is the average regression coefficient like β_0 is the average intercept. The part, $\beta_0 + \beta_1 X_{ij}$ of equation (6) are called the fixed part of the model and the other part, $U_{0j} + U_{ij} X_{1ij}$ is called the random part. The term $U_{ij} X_{1ij}$ can be regarded as a random interaction between group and explanatory variable X.

This model implies that the groups are characterized by two random effects: their intercept and their slope. These two group effects, $U_{0j}$and U_{ij} will not be independent, but correlated. The random intercept variance $\text{var}(U_{0j}) = \sigma_0^2$ the random slope variance $\text{var}(U_{ij}) = \sigma_1^2$and the covariance between the two random effects $\text{cov}(U_{0j}, U_{1j}) = \sigma_{01}$ are called variance components (Snijders and Bosker, 1999).

The model for a single explanatory variable discussed above can be extended by including more variables that have random effects. Suppose that there are k level-one explanatory variables X_1, X_2, . . . ,X_k, and considering the model where all x-variables have varying slopes and random intercept. That is

$\text{logit}(p_{ij}) = \log(\frac{p_{ij}}{1-p_{ij}}) = \beta_{0j} + \beta_{1j} X_{1ij} + \beta_{2j} X_{2ij} + \ldots + \beta_{kj} X_{kij}$ ……..(7)

Letting

$\beta_{0j} = \beta_0 + U_{hj}$ and $\beta_{hj} = \beta_h + U_{hj}$ for h= 1, …, k

$$\text{logit}(p_{ij}) = \log\left(\frac{p_{ij}}{1-p_{ij}}\right) = \beta_0 + \sum_{h=1}^{k} \beta_h X_{hij} + U_{0j} + \sum_{h=1}^{k} U_{hj} X_{hij} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

The first part of this model $\beta_0 + \sum_{h=1}^{k} \beta_h X_{hij}$ is the fixed part and the second part $U_{0j} + \sum_{h=1}^{k} U_{hj} X_{hij}$ is the random part of the model (Snijders and Boskers, 1999).

3.3.2.1 Parameter Estimation

The most common methods for estimating multilevel logistic models, used in this study, are based on likelihood approach by considering unequal probability selection. Complex survey designs often involve unequal selection probabilities of clusters and/or people within clusters. This survey includes design (sampling) weights to account for unequal selection probabilities. When estimating multilevel models that are based on complex survey data, sampling weights are incorporated into the likelihood estimates. When estimating multilevel models that are based on survey data, sampling weights are incorporated into the likelihood, producing a pseudo likelihood (Hosmer, D. and Lemeshow, S., 2000).

Weighting scheme

Because of the non-proportional allocation of the sample to different cluster and their urban and rural areas and the possible differences in response rates, a sampling weight must be used in all analyses using the PMA data to ensure the actual representativeness of the survey results. The sampling weights are based on sampling probabilities separately for each sampling stage and each cluster. The sampling weights are incorporated into the likelihood for estimation of parameters and their standard errors. We maximize the weighted pseudo likelihood with respect to the regression parameters.

Let y_{ij} be the response vector then the full log-pseudo likelihood is given by

$L_{w(y)} = \sum W_{ji} L_{wji}(y_{ij})$ …… (9)

Where, $L_{w(y)}$ is log-pseudo likelihood, W_{ji} is sampling weights for i^{th} woman from j^{th} EA and L_{wji} is weighted number of women in the j^{th} EA.

Intra-class Correlation

There exists a correlation between observations when they belong to the same cluster. The quantity of cluster and household variation was indicated as Intra-class Correlation Coefficient (ICC). For two levels binary data the ICC is often defined for each level separately.

$$ICC = \frac{\sigma_u{}^2}{\sigma_u{}^2 + \pi^2/_3} \quad \text{…….. (10)}$$

Where, $\frac{\pi^2}{3}$ =3.29 denotes the variation of lower (individual) level unit and $\sigma_u{}^2$ denote the variation between enumeration areas (Evans et al., 1993).

3.3.3 Model Selection and Diagnostics

3.3.3.1 Likelihood Ratio Test

A logistic regression model with *k* independent variables (the given model) is said to provide a better fit to the data, if it demonstrates an improvement over the model with no independent variables (the null model). The null hypothesis for overall fit of the model for *k* coefficients can be given by

$H_{0:}\ \beta_1 = \beta_2 = \ldots = \beta_k = 0.$

The likelihood ratio test is performed to test the overall significance of all coefficients in the model on the basis of the test statistic given by

$$G^2 = (-2\ln l_o)-(-2\ln l_1) = -2(\log (l_0-l_1)) \quad \ldots\ldots (11)$$

Where, l_0 is the likelihood of the null model and l_1 is the likelihood of the saturated model. The statistic G^2 plays the same role in logistic regression as the numerator of the partial F-test does in linear regression. If the p - value for the overall model fit statistic is less than the conventional 0.05, the null hypothesis is rejected and we conclude that there is evidence that at least one of the independent variables contributes to the prediction of the outcome (Hosmer, D. and Lemeshow, S., 2000).

3.3.3.2 Testing random effects

The significance of random effects is tested in multilevel logistic regression models. Since parameter space in the null hypothesis is constrained to be non-negative $(0,\infty)$ so one-sided tests is desirable for hypothesis testing which is similar to testing some variance components equal to zero.

The hypothesis tests $H_0:\sigma_u{}^2=0$ versus $H_a:\sigma_u{}^2>0$ is a constrained one-sided test. The distribution of the test statistic under the null hypothesis is a mixture of the $\chi_0{}^2$ (with all the probability mass at zero) and χ^2 with corresponding df on H_a, with each of the two components of the mixture having an equal probability of 0.5.

χ_{cal}^2 =2*(log link (under H_a) –log link (under H_0))…….. (12)

p-valeu = $\frac{1}{2} * (p(\chi^2(df\ under\ H_0) > \chi_{cal}^2)$ + p($\chi^2(df\ under\ H_a > \chi_{cal}^2)$)

The correct p-value can, therefore, be obtained by simply dividing a 'simple' p-value based on χ^2 with corresponding df by 2 (Austin et al., 2018).

3.3.3.3 Significant test

The Wald test can be used to assess the significance of individual coefficients in a given model. The Wald statistic is the ratio of the square of the regression coefficient to the square of the standard error of the coefficients. The Wald statistic is asymptotically distributed as a Chi-square distribution and each Wald statistic is compared with a Chi-square with 1 degree of freedom. The hypothesis test H_0: β_i =0 versus H_1: $\beta_i \neq 0$ where, i =1,…, k and β_i is coefficients

The Wald test statistic (W) is given by

W=$[\frac{\widehat{\beta_i}}{SE(\widehat{\beta_i})}]^2$ ……. (13)

Where, i=1, …, I_j

Measure of the influential points

A data point is influential if it unnecessary influences any parts of a regression analysis, such as the predicted outcome, the estimated slope coefficient, or the hypothesis test results. The two common measures of the influence of an observation are Cook's distance and DFBETAS.

Cook's distance

It is a measure of the influence of an observation on all fitted values. The Cook's distance statistic is given by

$D_i = \frac{(y_i - \hat{y}_i)^2}{(k+1)*MSE} [\frac{h_{ii}}{(1-h_{ii})^2}]$

Where y_i is the i^{th} response variables, $\hat{y}_i$ is the i^{th} fitted response variables, MSE is the mean square error, k is number of predictor and h_{ii} is leverage.

Cook's distance less than one show that an observation had no overall impact on the estimated vector of regression coefficients.

DFBETA(S)

DFBETAS are statistics that indicate the effect that deleting each observation has on the estimates for the regression coefficients. This is the standardized difference in the parameter estimated due to deleting each observation, and it can be used to assess the effect of an individual observation on each estimated parameter of the fitted model. Values of DFBETAS less than one imply no particular effects of an observation on the coefficient of a particular predictor variable, while DFBETA of a case greater than 1 implies the observation is an outlier (Cook and Weisberg, 1982).

Chapter Four

4. Result

4.1 Descriptive Results

Data from a total of 46,622 women aged 15–49 from six survey year were analyzed to identify trend and determinants of intention to use family planning. Table 2 presents distribution of sample characteristics of survey respondents. Across survey-year, above 55.58% of the respondents were adults (25-49 years). Out of these about 29.55% had intended to use family planning.

Table 2:-Distribution of sample characteristics of PMA survey respondents across survey years

Factor	Category	Survey year					
		2014(n=6,888)	2015(n=7,708)	2016(n=7,642)	2017(n=7,586)	2018(n=7,691)	2019(n=9,107)
		Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)
Residence	Urban	3,668 (53.25)	3,926(50.93)	3,875(50.71)	3,931(51.82)	4,004(52.06)	5,177(56.85)
	Rural	3,220(46.75)	3,782(49.07)	3,767(49.29)	3,655(48.18)	3,687(47.94)	3,930(43.15)
Marital status	Married	3,775(54.81)	4,330(56.18)	4,344(56.84)	4,327(57.04)	4,323(56.21)	5,579(61.26)
	Never married	2,197(31.90)	2,418(31.37)	2,378(31.12)	2,338(30.82)	2,420(31.47)	2,472(27.14)
	Divorced	916 (13.30)	960 (12.45)	920 (12.04)	921 (12.14)	948 (12.33)	1,056 (11.60)
Literacy	Yes	4,479(65.03)	5,007(64.88)	5,077(66.44)	5,088(67.07)	5,288(68.76)	5,975(65.61)
	No	2,409(34.97)	2,707(35.12)	2,565(33.56)	2,498(32.93)	2,403(31.24)	3,132(34.39)
Region	Tigray	1,179(17.12)	1,204(15.62)	1,164(15.23)	1,177(15.52)	1,114(14.48)	1,196(13.13)
	Amhara	1,304(18.93)	1,349(17.50)	1,322(17.30)	1,313(17.31)	1,394(18.13)	1,608(17.66)
	Oromia	1,040(15.10)	1,758(22.81)	1,765(23.10)	1,743(22.98)	1,799(23.39)	1,770(19.44)
	SNNP	1,616(23.46)	1,656(21.48)	1,615(21.13)	1,600(21.09)	1,602(20.83)	1,652 (18.14)
	Addis Ababa	916(13.30)	917 (11.90)	910(11.91)	901 (11.88)	985 (12.81)	884 (9.71)
	Others	833(12.09)	824 (10.69)	866 (11.33)	852 (11.23)	797 (10.36)	1,996(21.92)
Discussion_with partner	Yes	1,114(16.17)	1,326(17.20)	1,208(15.81)	1,243(16.39)	2,081(27.06)	2,340(25.69)
	No	5,774(83.83)	6,382(82.80)	6,434(84.19)	6,343(83.61)	5,610(72.94)	6,767(74.31)
Media exposure	Yes	3,691(53.59)	4,258(55.24)	4,173(54.61)	3,885(51.21)	4,036(52.48)	3,995(43.87)
	No	3,197(46.41)	3,450(44.76)	3,469(45.39)	3,701(48.79)	3,655(47.52)	5,112(56.13)
Age	15 to 19	1,662(24.13)	1,843(23.91)	1,765(23.10)	1,829(24.11)	1,759(22.87)	1,996(21.92)
	20 to 24	1,347(19.56)	1,560(20.24)	1,483(19.41)	1,382(18.22)	1,418(18.44)	1,667(18.30)

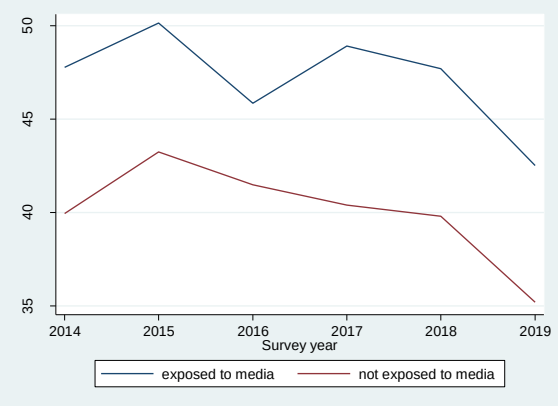
	25 to 49	3,879(56.32)	4,305(55.85)	4,394(57.50)	4,375(57.67)	4,514(58.69)	5,444(59.78)

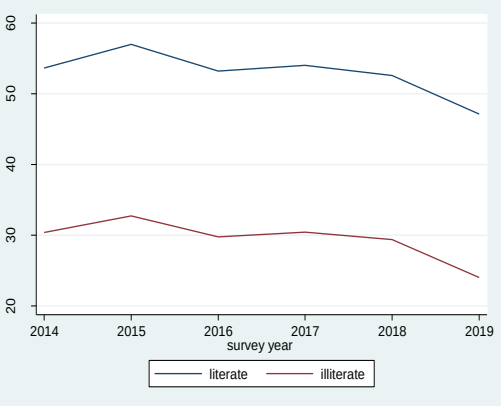
Table 3 presents percentages of intention to use for family planning by different factors across survey year. Compared with other survey year, the percentages of intention to use family planning were low in 2019 across all considered factors. The percentages of women who intended to use family planning were 42.16% in 2014, increased to 44.40% in 2015, and decline overtime and it was 37.31% in 2019.

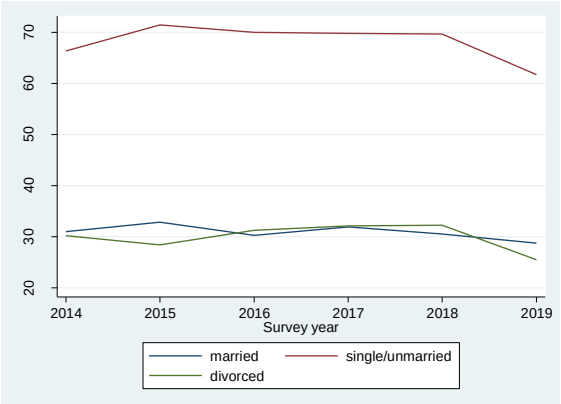
Table 3: Percentage (weighted) of intention to use for family planning across survey year by different factors women among in reproductive age group (15-49)

Factor	Category	2014(n= 6,888)	2015(n= 7,708)	2016(n= 7,642)	2017(n= 7,586)	2018(n=7,691)	2019(n= 9,107)
Total (%)		42.16	44.40	42.74	43.62	43.06	37.31
Residence	Urban	44.27	45.70	46.01	45.82	46.08	35.87
	Rural	39.75	43.05	39.37	41.26	39.79	39.21
Region	Tigray	44.78	44.10	43.13	46.13	43.90	40.64
	Amhara	40.95	43.51	39.41	40.90	42.54	38.74
	Oromia	44.81	48.41	45.16	46.18	43.64	37.18
	SNNP	47.90	48.55	49.04	48.38	47.57	44.61
	Addis Ababa	41.81	44.82	47.14	44.73	46.50	42.99
	Others	26.29	28.88	25.98	28.99	28.23	25.70
Wealth index	Poor	39.40	44.13	38.08	39.58	39.83	35.37
	Middle	39.66	42.18	40.78	42.11	43.68	36.79
	Rich	43.71	44.98	45.06	45.51	44.29	38.70
Literacy	Yes	50.46	52.79	50.66	51.51	50.89	45.19
	No	26.73	28.89	27.06	27.54	25.84	22.29
Age	15 to 19	62.58	70.81	67.20	65.55	68.11	58.47
	20 to 24	52.64	52.76	51.65	51.45	53.03	48.17
	25 to 49	29.78	30.06	29.90	31.98	30.17	26.23
Marital status	Married	30.99	32.84	30.25	31.94	30.53	28.75
	Never married	66.32	71.42	69.97	69.76	69.67	61.69
	Divorced	58.27	54.26	57.22	57.98	59.71	47.02
Media exposure	Yes	46.57	47.75	45.89	47.72	46.23	42.08
	No	37.07	40.26	38.94	39.31	39.56	33.59
Discussion with partner	No	42.95	45.97	44.37	44.99	52.76	42.50
	Yes	38.06	36.80	34.02	36.60	16.91	22.31

Figure 2 presents overall trends in intention to use family planning across survey year by different factors. The result reveals that, intention to use family planning increase from year 2014 to 2015 and start decline since 2015. Across survey year, the prevalence of intention to use family planning was lower in 25-49 age groups and, also the prevalence of intention to use for family planning was lower in the respondents with no exposed to media. Similarly the prevalence of intention to use family planning was higher for literate respondents as compared to the counterpart.







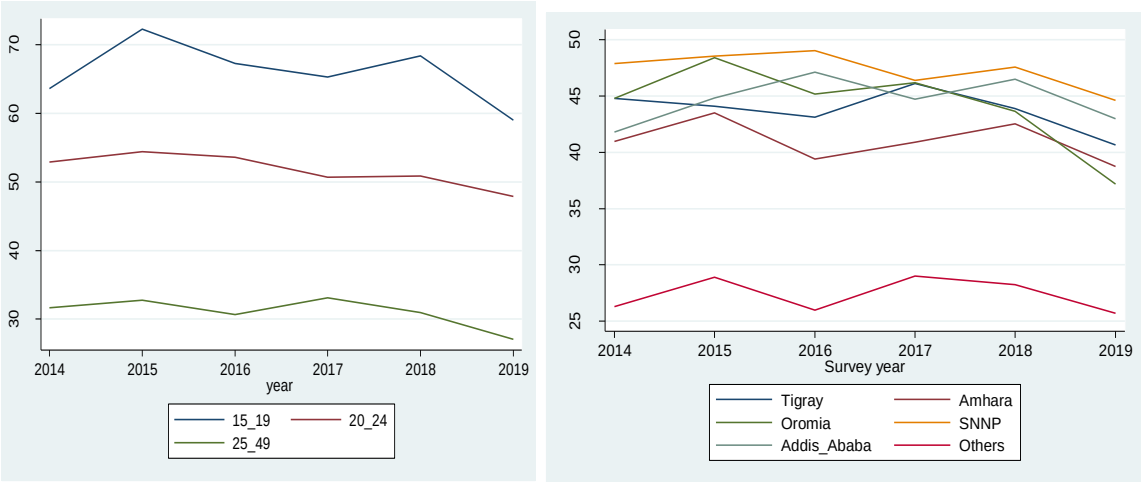


Figure 2: Trends of intention to use family planning by different factors.

4.2 Analytical Results

4.2.1 Results of Multilevel Logistic Regression Analysis

Two level multilevel logistic regressions were used to explore the effect of each independent variable on intention to use family planning by managing for the other independent variables. STATA Software was applied for the analyzing and the results are presents as follows. The chi-square test was applied to check out heterogeneity between enumeration areas. Thus, there is a verification of heterogeneity with respect to the EA's. The intercept only model revealed that the intercept $\widehat{\beta_0}$ =-0.364 interpreted as the odds of intention to use family planning in an average enumeration area.

Table 4: Estimate of only intercepts model

Factor	Coefficient	95% CI
Constant	-0.364	(-0.401 -0.327)
Random effect Var(EA)	0.322	

Table 5 below presents the estimates of the random intercept model. The result revealed that women who reported being literate (OR=1.780: 95% CI: 1.680-1.885), those who exposed to media (OR=1.262: 95% CI: 1.198-1.330), women who was ever pregnant (OR=4.491: 95% CI: 4.161-4.847) were significantly more likely to intended to use family planning respectively. The odds of intention to use family planning were 0.395 times less likely in 2019 as compared with the reference survey-year (2014).

Table 5: Estimates of the random intercept model

Factor	Category	Random intercept model			
		Coefficient	95% CI	OR	95% CI for OR
Residence	Ref. Rural				
	Urban	0.234	(0.148 0.319)	1.263	(1.159 1.376)
Region	Ref. Tigray				
	Amhara	0.051	(-0.084 0.185)	1.052	(0.919 1.204)
	Oromia	0.071	(-0.059 0.120)	1.073	(0.943 1.221)
	SNNP	0.143	(0.014 0.271)	1.154	(1.014 1.312)
	Addis	-0.247	(-0.40 -0.092)	0.781	(0.670 0.912)

	Ababa				
	Others	-0.762	(-0.908 -0.615)	0.467	(0.403 0.541)
Marital status	Ref. married				
	Single	1.442	(1.375 1.509)	4.228	(3.955 4.521)
	Divorced	0.055	(-0.015 0.124)	1.056	(0.985 1.132)
Literacy	Ref. No				
	Yes	0.576	(0.518 0.634)	1.780	(1.680 1.885)
Ever pregnant	Ref. No				
	Yes	1.502	(1.426 1.578)	4.491	(4.161 4.847)
Media exposure	Ref. No				
	Yes	0.233	(0.181 0.285)	1.262	(1.198 1.329)
Discussion with partner	Ref .No				
	Yes	-0.569	(-0.629 -.509)	0.566	(0.533 0.601)
Wealth index	Ref. Poor				
	Middle	-0.017	(-0.094 0.059)	0.983	(0.911 1.061)
	Rich	-0.176	-0.254 -0.098)	0.839	(0.776 0.907)
Age	Ref. 15 to 19				
	20 to 24	-0.095	(-0.165 -0.026)	0.909	(0.848 0.975)
	25 to 49	-0.667	(-0.735 -0.598)	0.514	(0.489 0.550)
Survey year	Ref. 2014				
	2015	0.093	(-0.041 0.228)	1.098	(0.960 1.256)
	2016	0.010	(-0.125 0.145)	1.010	(0.883 1.156)
	2017	0.048	(-0.089 0.185)	1.050	(0.915 1.203)
	2018	0.065	(-0.072 0.203)	1.067	(0.930 1.225)
	2019	-0.928	(-1.068 -0.788)	0.395	(0.344 0.455)
Random effect Var(EA)		0.329		0.329	

Table 6 below presents the estimates of the random coefficient model. The result revealed that Women who live in the urban areas were 35.1% more likely to intent to use family planning compared with those from the rural areas keeping for other variables in the model. The odds of intention to use family planning 1.156 times more likely in the women who resided in the SNNP region as compared with those residing in Tigray region controlling for other variables. Conversely, women who lived in Addis Ababa region were 0.822 times less likely to have intention to use family planning compared to women in Tigray controlling for other variables.

Table 6: Estimates of the random coefficient model

Factor	Category	Random coefficient model			
		Coefficient	95% CI	OR	95% CI for OR
Residence	Ref. Rural				
	Urban	0.301	(0.206 0.395)	1.351	(1.229 1.484)
Region	Ref. Tigray				
	Amhara	0.054	(-0.088 0.197)	1.055	(0.916 1.218)
	Oromia	0.057	(-0.080 0.194)	1.059	(0.923 1.212)
	SNNP	0.145	(0.010 0.281)	1.156	(1.010 1.325)
	Addis Ababa	-0.196	(-0.358 -0.035)	0.822	(0.699 0.966)
	Others	-0.799	(-0.958 -0.641)	0.450	(0.384 0.527)
Marital status	Ref. Married				
	Single	1.396	(1.329 1.464)	4.040	(3.776 4.322)
	Divorced	0.099	(0.028 0.170)	1.104	(1.028 1.185)
Literacy	Ref. No				
	Yes	0.594	(0.535 0.654)	1.812	(1.707 1.923)
Ever pregnant	Ref. No				
	Yes	2.065	(1.910 2.221)	7.890	(6.750 9.218)
Media exposure	Ref. No				
	Yes	0.243	(0.190 0.296)	1.275	(1.208 1.345)
Discussion with partner	Ref .No				
	Yes	-0.573	(-0.635 -0.511)	0.564	(0.530 0.600)
Wealth index	Rer. Poor				
	Middle	-0.011	(-0.089 0.068)	0.990	(0.915 1.070)
	Rich	-0.159	(-0.241 -0.077)	0.853	(0.786 0.926)
Age	Ref. 15 to 19				
	20 to 24	-0.084	(-0.155 -0.014)	0.919	(0.857 0.986)
	25 to 49	-0.637	(-0.707 -0.567)	0.529	(0.493 0.567)
Survey year	Ref. 2014				

	2015	0.086	(-0.053 0.225)	1.090	(0.949 1.252)
	2016	0.002	(-0.137 0.141)	1.002	(0.872 1.152)
	2017	0.041	(-0.101 0.182)	1.042	(0.904 1.200)
	2018	0.049	(-0.093 0.191)	1.051	(0.912 1.211)
	2019	-0.510	(-0.667 -0.354)	0.600	(0.513 0.702)
Random effect Var(EA)		0.353		0.353	
Var(Ever_pregnrt)		2.056		2.056	

Table 7:- Summary of multilevel logistic regression model selection criteria

Model	LL	AIC
Intercept only	-31013.75	62031.51
Random intercept model	-26461.72	52969.46
Random coefficient model	-26281.20	52610.41

The model with smaller value of AIC makes sure that the better fit model. Therefore random intercept model was better fit as compared to intercept only model. Similarly random coefficient model was better fit as compared to random intercept model and intercept only model depends on AIC values.

Goodness of fit of the fitted model

Likelihood ratio test is use to check the overall goodness of fit of the model. The log likelihood ratio test statistic is calculated from the above table is given by $G^2 = (-2\ln l_o)-(-2\ln l_1) = -2(\log (l_0-l_1)) = -2(-31013.75+26281.20) = 9465.1$, since log likelihood ratio test is Chi-square distributed with 10 degrees of freedom (LR $\chi 2$ =18.307, d.f=10). Depending on the result get we can decided that reject the null hypothesis and conclude that at least one of independent variables is significantly affect the outcome variable. Significance of individual coefficients was also tested using Wald test and marital status, literacy, media exposure, discussion with partner and age category were found statistically significant predictor variables.

Model Diagnostics

Model diagnostics for the better fitted random is done. Therefore we can do for random coefficient model and the results from dfbetas suggest that there was no influential observation that influences any part of the regression analysis, as the values of dfbetas shows are below one.

Testing the significance of random effects

Testing whether certain random effects should be included, we have performed hypotheses tests at 5% level of significance.

- H_o: the variance of the random effects is equal to zero Versus
- H_a: the random effect variance is greater than zero

The result reveal, the corresponding p-value= 0.000 less than 0.05, so we decide that rejecting the null hypothesis and conclude that the random effects is significant.

Intra Class Correlation

How much of variation in intention to use family planning among women reproductive age (15-49) group was attributable to the EA level factors, it is useful to see the intra-class correlation coefficient (ICC) =0.091, which indicates the proportion of variance of the intention to use family planning between EA. This means that around 9.1% of the variance in intention to use family planning is due to variation across (between) EA. whereas the remaining 90.9% attributable to individual level, i.e., within EA differences.

4.3. Discussion

This study intended to identify different factors that might explain observed variations in intention to use family planning and its trend over-time in Ethiopia. Based on the data provided by PMA, the prevalence of intention to use family planning in Ethiopia had shown an increase trend, from 2014 to 2015 survey year and decline trend start to 2015 to 2019 survey year. The prevalence of intention to use family planning among women was 42.06% in Ethiopia. This result was approximately similar to the finding in Adigrat town, Tigray, Northern Ethiopia which reported 48.4% by Gebremariam A.et al. (2014).

This study also revealed that the odds of intention to use family planning is more likely in the women who have formal education as compared to counterpart which is consistent with the finding of the study by Meskele, M. et.al (2014) which states that women who attained education were more likely to have the intention to use family planning compared to women who had no education. Another study conducted by Wuni, C. et al. (2018) suggested that discussion with partner was found significant on the intention to use family planning. The study revealed that the odds of intention to use family planning in less likely for women who had discussion about FP as compared to counterpart.

In line with our study findings, a study conducted in Debremarkos Town, Northwest Ethiopia by Abajobir A.(2014) demonstrates that age group was significantly related factors affecting women's intention to use family planning. In our study, age group of a woman was a determinant factor of intention to use family planning. The odds of intention to use family planning were 0.909 and 0.514 times less likely in the age groups of 20-24 and 25-49 respectively as compared to reference age group (15-19).

Exposure to mass media would be an effective way towards intention to use family planning. Exposure to mass media like radio, TV or newspapers is one of the determinants of intention to use family planning. This study also establishes that mass media exposure had an extreme effect on intention to use family planning. Those women who were exposed to mass media had intended to use family planning than those who were not exposed.

Among all factors, age group, literacy, marital status, wealth index, ever pregnant women's, discussion with partner and media exposure were found to be statistically significant associated to intention to use family planning. Women's literacy was found to be a basic determinant of intention to use family planning. In this study the odds of intention to use family planning 1.780 times more likely for women's who were literate women as compared to illiterate women. Women who were literate could afford to intend to use family planning. Literacy also exposed women to information, qualify women, made them more likely to be employed outside their home environment, and created more awareness of their own health. Literate women may increase their authority with husbands, and affect fertility and use of family planning. This finding is also consistent with the findings of the study conducted by Dibaba, Y., (2009).

Chapter five

5. Conclusion and Recommendations

5.1 Conclusion

The main purpose of this study was exploring the trends and identifying factors associated with intention to use family planning in Ethiopia using a repeated cross-sectional survey. The percentages of intention to use family planning were low in 2019 across all considered factors. The percentages of women who intended to use family planning were 42.16% in 2014, increased to 44.40% in 2015, and decline overtime and it was 37.31% in 2019. Trends in intention to use family planning increase from year 2014 to 2015 and start decline since 2015.

The multilevel modeling was used to identify factors associated with intention to use family planning and place of residence, marital status , literacy, ever pregnant women, discussion with partner, age, media exposure and wealth index are found to be significant predictors of intention to use family planning in Ethiopia. Place of residence, marital status, literacy, ever-pregnant and media exposure were positively associated while wealth index, age and discussion with partner were negatively associated with intention to use family planning in Ethiopia.

The results of this study revealed that the respondents having media exposure, being literate, unmarried and reside in rural were 1.262, 1.780, 4.228 and 1.265 times increase respectively the likelihood of intention to use family planning as compared to counterpart. Similarly, the respondents being adult, being rich and having discussion with their partner were 0.514, 0.839 and 0.566 time decreases respectively the likelihood of intention to use family planning as compared to counterpart.

5.2 Recommendations

Based on the findings, the following recommendations are redirected:

- Special attention should be given for family planning that will help to standardize the service delivery to achieve goal set of Ethiopia as a country.
- Providers and programmers should carry on with the promotion increasing family planning knowledge through mass media.

Reference

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Appendix

Table A: Chi-square test of association between each explanatory variables and the response variable

Factor	Chi square	Degrees of freedom	P-value
Region	743.9791	5	0.000
Residence	46.8591	1	0.000
Marital status	5.7e+03	2	0.000
Wealth index	82.5188	2	0.000
Literacy	2.4e+03	1	0.000
Ever pregnant	0.3580	1	0.550
Discussion with partner	881.1183	1	0.000
Media exposure	322.5381	1	0.000
Survey year	113.7146	5	0.000
Age	4.5e+03	2	0.000

Table B: Results of diagnostic checking for DFBETA

Factor	Category	Minimum	Maximum
Residence	Yes	-.024799	0 .0216277
Region	Amhara	-.0217776	.0181469
	Oromia	-.0217131	.0197654
	SNNP	-.0205905	.0182847
	Addis Ababa	-.0165661	.0284513
	Others	-.0217654	.0266334
Marital status	Single	-.0304468	.0208599
	Divorced	-.025984	.0306287
Wealth index	Middle	-.0214296	.0254921
	Rich	-.0268558	.0230925
Ever pregnant	Yes	-.0375718	.0237181
Discussion with partner	Yes	-.0214111	.0279954
Media exposure	Yes	-.0195442	.0209664
Survey year	2015	-.0197301	.0181772
	2016	-.0194709	.0178599
	2017	-.0193431	.0184069
	2018	-.0212391	.0179609
	2019	-.026542	.0305937
Age	20 to 24	-.0229033	.0187905
	25 to 49	-.0332338	.0251105

Figure A: trend of intention to use family planning by different factors