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Women's Empowerment in Decision Making and its Determinants on Contraceptives in Ethiopia: Insights from EDHS

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Abstract

Enhancing women's empowerment in decision-making is an important factor in securing a sustained life. Sustainable Development Goal (SDG-5) hereby addresses this issue with equal access to all and their representation in decision-making. Women's empowerment, the decision to use, and the decision not to use contraceptives are interrelated. But, there is limited research on the influence of women's empowerment on contraceptive use. Therefore, this study aimed to explore the role of women's decision-making empowerment in contraceptive use among reproductive-age women in Ethiopia, using data from the 2016 Ethiopian Demographic and Health Survey. The analysis included descriptive analysis, correlation analysis, binary logistic regression, and multinomial logistic regression. Out of the total women surveyed, only 34.12% reported using contraception, indicating that 65.88% are not using it. The logit model indicates that husband age & education, wealth, regional variation, religions, access to advice, access to information, and distance to health facilities are statistically significant in influencing the usage of contraceptives. Only 24% and 30% of women have decided to use, and not-to-use contraceptives respectively, without the influences of their husbands, joint and community influences. The multinomial logit model on decision to use also confirms that husband age, regional variation, and information access are statistically significant to explain women decision to use contraceptive. However, husband desire of children, place of residence (rural), women education and age are statistically significant in explaining women decision not to use contraceptives. The findings suggest that raising education level, household wealth, distance to health facilities, access to information and advice should be prioritized.

Keywords: Women's Empowerment, Contraceptive Use, Multinomial Logit Model, EDHS.

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Introduction

As of mid-2019, the global population had reached 7.7 billion, with an increase of one billion since 2007 and two billion since 1994 (UN, 2019). Predictions indicate that by 2030, the world population will increase to 9.7 billion, and 10.9 billion in 2100, with Sub-Saharan Africa which is responsible for much of the expansion (UN, 2019). To manage population size, 842 million women worldwide currently use modern contraceptives, which have been shown to improve health outcomes by enabling individuals and couples to achieve their reproductive goals, reduce unwanted and high-risk pregnancies, and lower maternal and new-born mortality rates (Ahinkorah et al., 2021). However, maternal deaths remain a significant problem, particularly in developing nations where 99% of all maternal deaths occur in developing nations, with Sub-Saharan Africa accounting for 66% of those deaths (Barros et al., 2015).

Contraception helps individuals and couples achieve their reproductive objectives and gives them the freedom to choose whether or not to have children. Contraceptive techniques are being used more frequently, which has improved health-related results and better educational and economic outcomes, especially for girls and women. Although there are modern and natural ways to use contraceptives, modern contraceptives are believed to be the most effective method for preventing unplanned pregnancy (UN,2019). Despite the benefits of modern contraceptives, there is still a significant unmet need for family planning, with 190 million women worldwide reporting that they do not use any method of contraception despite wanting to avoid pregnancy (UN, 2019). Ensuring access to resources and healthcare for women is crucial, as gender inequality impacts every aspect of women's lives (UN, 2019; Muluneh et al., 2021).

Empowering women and achieving gender equality is essential to achieving the fifth Sustainable Development Goal (Osborn et al., 2021). Men also play a vital role in empowering women, and research has shown that family planning practices, such as scheduling, delaying, and spacing pregnancies, are associated with improved childbirth outcomes (Kabeer, 1999). All women must equally participate in reproductive health services to meet this SDG objective. Women's empowerment is defined by their self-worth, their freedom of choice, their access to opportunities and resources, their ability to govern their own lives both within and outside the house, and their capacity to shape societal change. In light of this, empowering women in this way promotes

sustainable economies, benefits society, and advances humankind. For the women leaders to fulfil their aspiration of being significant and revolutionary in the field of family planning, this also emphasizes the significance of developing leadership competencies, self-empowerment, and continual learning. Since gender inequality is a severe issue on a global scale, finding solutions is essential in every aspect of women's lives, including education, work opportunities, marriage ages, and the number and spacing of children (UN, 2019; Muluneh et al., 2021).

Problem Statement and Objective Formulation

Studies conducted in Ethiopia have found that male dominance and limited spousal communication in family planning are major factors contributing to the non-use of contraceptives (Dennis et.al.,1999; Bhandari et.al.,2013; Dadi et.al.,2020). In low-income countries like Ethiopia, access to family planning services is often inadequate, particularly in developing regions (Assefa et.al.,2020). However, the government has taken significant steps to increase access, including increasing the number of medical facilities and trained staff. From 8% in 2000 to 41.4% in 2019, Ethiopia's contraceptive prevalence rate has been increasing, although it still varies widely by region (EPHI and ICF,2019). As women are not empowered well, they do not fully exercise free choices, the right to control fertility, right to make autonomous decisions on healthcare-seeking behaviour.

Several factors, including age, education, family size, spousal communication, number of living children, spousal approval, the intended number of children, residency, religion, knowledge, and attitudes, influence contraceptive use (Aynekulu and Buruh,2013; Lamaro and et.al.,2017; Kedir et.al.,2018). Women's empowerment, in particular, has been identified as a key determinant of contraceptive use in Ethiopia, but there is a lack of research comparing the factors influencing women's empowerment to use and not use contraceptives (Dadi et.al.,2020). There is also no clear picture of whether there is a symmetric decision to use as well as not to use such modern contraceptives. To address this gap, we propose a comparative analysis of women's empowerment related to contraceptive use. By examining how a single signal influences the decision-making process differently, we aim to provide new insights into the factors that influence women's decision-making around contraceptive use in Ethiopia.

The primary objective of our study is to examine the role of women's empowerment in contraceptive use among reproductive-age women in Ethiopia. More specifically, the study seeks to analyze the determinants of women's contraceptive use in Ethiopia analyze women's empowerment on their decision to use and not to use contraceptives; and investigate a comparative analysis of empowerment factors of women who used contraceptives and that of who did not use contraceptive to know their decision whether it is symmetric or not. Therefore, this study highly contributes to identifying the significant determinants of women's empowerment factor while using contraceptives and comparing these factors with cases where women decided not to use contraceptives. It is also important in the prescription of policies.

Review of Related Literature

The process of giving women the tools and chances they need to assert their rights, take part in decision-making, and take charge of their own lives is known as women's empowerment. Globally, women's empowerment has gained prominence as more and more governments and organizations realize how crucial gender equality is to sustainable development. This survey of the literature attempts to give a general overview of the idea of women's empowerment, its significance, and the obstacles that stand in the way of its implementation.

The first feminist movements of the 19th century was when the idea of women's empowerment first emerged. The earliest feminist movement concentrated on granting women's political rights, including the ability to vote. In the 1960s and 1970s, women's social and economic rights—such as access to school and equal pay for equal work—were the emphasis of the second wave of feminism. The intersections of gender, race, and class as well as the diversity of women's experiences were central to the third wave of feminism in the 1990s. Over the past few decades, a great deal of research on women's empowerment has been done. The political, social, economic, and cultural facets of women's empowerment have all been examined in these works.

The notion of women's empowerment is complex and includes many different aspects of social justice, gender equality, and women's rights. The academic literature on women's empowerment has garnered increasing attention in recent times, with a multitude of research being carried out to investigate various facets of this issue.

In the early 20th century, the concept of women empowerment was introduced in family planning to manage several socioeconomic turbulences. The major goal of the modern family planning movement was to free women from the negative social and health effects of unintended pregnancies. Early family planning programs were seen as a way to relieve the strain of rapid population increase on economic development when they were introduced to emerging nations in the 1950s. The goal of family planning has expanded in recent years to include both of these goals as well as the goal of enhancing the welfare and health of women**.** Earlier studies (Castro & Juarez, 1994) have looked at how women's status and roles affect their fertility and usage of contraception. Even though young women are viewed as family planning's beneficiaries, not enough time has been spent analyzing how they behave in this regard.

The research and literature about young women and family planning served as the foundation for the theoretical framework**.** Namely, the frameworks designed by Davis and Blake (1956), Bongaarts (1970s), Bulatao and Lee (1983), and Easterlin and Crimmins (1985) are worth mentioning. According to Davis and Blake (1956), background variables and indirect determinants, also known as proximate determinants, are the key factors that influence fertility. The factors that directly influence fertility are known as the proximate determinants, which include both biological and behavioral factors. Through these direct but indirect causes of fertility, such as socio-demographic and cultural factors. Contrary to indirect factors like money or education, fertility must vary if an intermediate fertility variable, such as the prevalence of contraception, changes (if the other intermediate fertility variables remain constant). The variability in fertility can be expressed by proximate determinants with relatively few or no errors if it is measured and modeled correctly. This model is predicated on the idea that reproduction entails three essential steps: sexual activity, conception, and successful gestation**.** The two approaches (rational decision-making and family structure theory**)** are founded on the idea that as society modernizes, changes take place, including changes in rational decision-making.

Bongaarts (1970s) created the modified set of proximate determinants of fertility in the late 1970s, which included four factors: postpartum infertility, induced abortion, marriage/cohabitation, and cohabitation. These four elements, according to Bongaarts, are the most crucial and help to make the model for calculating fertility rates and the relative contributions of each proximate determinant simpler. However, with recent considerable changes in population reproductive

behavior and research recommendations, several initial hypotheses have gradually lost their validity and need to be modified.

The Bulatao and Lee (1983) framework for the analysis of reproductive determinants is to provide a thorough and consistent list of the factors that influence human fertility and to specify how those factors interact. Although the current framework aims to be complete, because it integrates ideas and information from other fields, it could come out as more eclectic than unified. The current method is based on studies in economics and public health, psychology and anthropology, sociology, and statistics. Fertility research now involves a large group of social and biological specialists.

On the other hand, Easterlin and Crimmins's (1985) focus of the synthesis perspective is on a single couple in their reproductive years. The number of children the couple expects to have if they do not use contraception is the issue, not the number of births desired or demanded. There is a justification for using a contraceptive if the number of births needed exceeds the number of births that are possible. As a result, the model brings together three crucial components: the primary means by which couples bring actual reproductive outcomes into line with their reproductive desires, contraception, and the demand for reproductive outcomes. The Easterlin-Crimmins model is typically used to understand lifetime fertility or the behavior of ending or limiting reproduction, as well as their socioeconomic determinants. However, the model can also be used to understand the demand for spacing births.

On top of these frameworks, the Health Belief Model and the Health Promotion Model are the theoretical models of health behavior that have been established (Becker, 1974). Regarding the usage of contraception, these models have been put to the test. Several studies have demonstrated a substantial association between attitude and contraceptive intention and behavior (Boohene et al., 1991; Bongaarts & Johansson, 2000). By modifying some concepts from the Health Belief Model and Easterlin's supply and demand theory (Easterlin, 1975) of fertility regulation, it is important to explore some beliefs of young women regarding contraception. This is because of the importance of the attitude/belief behavior relationship and its relevance to preventive strategies like sexual and reproductive health services.

Finally, the socio-ecological theory of Bronfenbrenner (1992) offers a useful framework for comprehending how influences at the community level may influence women's contraceptive behavior. According to this conceptual framework, a woman's decision to utilize contraception is influenced by her characteristics, household dynamics, and the environment.

Method of the Study

Data from the 2016 Ethiopian Demographic and Health Surveys were used for the analysis**.** Ethiopia has a total population of 122 million in 2023, with a sex ratio of 0.99:1. Ethiopia has a three-tiered system for delivering healthcare. A district hospital, health centers, and their satellite health posts make up the first level, which is the primary level. A general hospital makes up the second level of the tier, while a specialty hospital makes up the third. Both of these hospitals only provide curative medical care (EDHS,2016). After getting consent from the DHS program office for the 2016 Ethiopian Demographic and Health Survey, the fourth comprehensive survey, the MEASURE DHS database, which can be found at http:// dhspr ogram. com/ data/, was used for the dataset used in this work.

Research design is the framework of research methods and techniques chosen by a researcher to conduct a study. The design allows researchers to sharpen the research methods suitable for the subject matter and set up their studies for success. This research therefore employs an explanatory research design. Explanatory research is a study method that investigates why something happens when there is limited information available. It can help us gain a better grasp of a subject, determine how or why a particular phenomenon occurs, and forecast future events. Explanatory research can alternatively be defined as a "cause and effect" paradigm in which patterns and trends in current data that have not before been explored are investigated. As a result, it is frequently seen as a sort of causal research.

The process of choosing the best regression model involves identifying which independent variables to include and exclude in a regression equation. This is known as model specification. Model selection is an essential stage in statistics. If the incorrect model is chosen, it provides erroneous information and the findings are invalidated.

Table 1:

Variable Definition and Type

No.	Variable	Code in EDHS	Explanation	Type
1	Usage of Contraceptive	V632_1	Usage of contraceptive method (a dummy variable 1 for those using and 0 for those not using contraceptives)	Dependent Variable, Dummy
2	Decision makers for using contraception	v632	Decision maker for using contraception (mainly respondent, mainly husband, partner, joint decision, and others)	Dependent Variable, categorical
3	Decision maker for not using contraception	v632a	Decision maker for not using contraception (mainly respondent, mainly husband, partner, joint decision, and others)	Dependent Variable, categorical
4	Husband/ partner's Age	v730	Husband/partner's age	Independent, Continuous
5	Husband/partner's Education Level	v715	Husband/partner's total number of years of education	Independent, Continuous
6	Husband/ Partner's Occupation	v705	Husband/partner's occupation (grouped) (did not work, technical or managerial, clerical, sales, agricultural employ, service, skilled manual, unskilled manual, others, do not know)	Independent, Categorical
7	Husband's Desire for Children	v621	Husband's desire for children	Independent, Continuous
8	Wealth Index combined	v190	Wealth index combined (Poorest, Poorest, middle, richer, richest)	Independent, Categorical
9	Types of Place Residents	v102	Type of place of residence (rural or urban)	Independent, categorical
10	Region	v101	Region (Tigray, Afar, Amhara, Oromia, Somali, Benishangul, SNNPR, Gambella, Harari, Addis Ababa, Dire Dawa)	Independent, categorical
11	Number of living Children	v218	Number of living children (from 0 to 12)	Independent, Continuous
12	Religion	v130	Religion (Orthodox, Catholic, Protestant, Muslin, Traditional, and Others)	Independent, categorical
13	Education level, women	v133	Education	Independent, Continuous
14	Age, women	V012	Age of respondent	Independent, continuous
15	Getting advice at the health center	V395	at the health facility, told of family planning	Independent, categorical
16	Access to Information	S815e	heard about family planning at community events/conversations?	Independent, categorical
17	Distance to health facilities	V467d	getting medical help for self: distance to the health facility	Independent, categorical

Source: EDHS, 2016 and Literature Review

Data was extracted and decoded using STATA software version 14. Descriptive statistics, Logit, and Multinomial Logit models are used to examine the usage of contraceptives and the empowerment of women.

The literature on the logit model is more extensive than that on the probit model. The logit model is likewise heartier to outliers as it utilizes a strategic capability however Probit model is more sensitive to outliers. In addition to this, the logit model is utilized to show the chances of progress of an occasion as an element of free factors, while the probit model is utilized to decide the probability that a thing or occasion can be categorized as one of a scope of classifications by assessing the likelihood that perception with explicit highlights will have a place with a specific classification. Therefore, the study employs logit model specification and estimation techniques.

Our model must adhere to the logistic regression assumptions for our study to be reliable. Invalid statistical conclusions may result when the logistic regression analysis assumptions are not met, since they may result in biased coefficient estimates or very large standard errors for the logistic regression coefficients. Therefore, before drawing any statistical conclusions from our model, we must ensure that it fits the data sufficiently well and look for relevant observations that might have an impact on the estimates of the coefficients. For our model, we used 3 diagnostic tests

Link test: - The specification problem can be verified after the logit or logistic command. Accordingly, it should be impossible to identify any new predictors that are statistically significant unless by chance the model is properly stated. Considering that the value of the variable_hatq is what the model predicts, it ought to be a statistically significant predictor. Unless the model is fully mis-specified, this will be the case. The variable_hatq, on the other hand, shouldn't have much predictive potential unless through chance provided our model is properly described. As a result, the linktest is significant if _hatsq is significant. This typically indicates that we have either forgotten to include a relevant variable or that our link function has been incorrectly defined.

The Hosmer and Lemeshow goodness-of-fit: - The Hosmer and Lemeshow goodness-of-fit test is another frequently used model fit test. The anticipated frequency and observed frequency should roughly match, and the closer the match, the better the fit, according to Hosmer and Lemeshow's goodness-of-fit test. A good fit as determined by Hosmer and Lemeshow test will produce a big p-value, much like a test of association of a two-way table. When two or more independent variables in the model are roughly determined by a linear combination of other independent

variables in the model, this is referred to as multicollinearity (or collinearity for short). The multicollinearity can be found using the Collin program. Tolerance (a measure of the amount of collinearity that a regression analysis can tolerate) and VIF (variance inflation factor—a measure of the amount of inflation of the standard error that could be caused by collinearity) are two often used metrics.

Regarding the multicollinearity tests, the rule states that VIF equal to 1 = variables are not correlated; VIF between 1 and 5 = variables are moderately correlated; and VIF greater than 10 = variables are highly correlated. Therefore, the study conducted all these tests and found no violation of assumptions.

The result, Discussion and Analysis

Descriptive Analysis

A total of 15683 women in the reproductive age group (15-49) were included in the study. Their education level range between 0-22 with a mean of 4.08. The number of children in the household ranges between 0-12 with a mean number of children being 2.32. The other important factor is the husband's age which ranges between 15-95 and the husband's desire for children ranges between 1-8 with a mean of 3.27 and the husband's education level ranges between 0-22 with a mean level of education of 4.38, indicating they are at a primary level of education.

Table 2:

Descriptive Analysis for Continuous Variables

No.	Variable	Obs.	Mean	Std. Dev.	Min	Max.
1.	Husband Age (v730)	9824	38.71264	11.34675	15	95
2.	Husband Education level (v715)	9711	4.384512	5.167496	0	22
3.	Husband's Desire of Children (v621)	9795	3.275753	2.913255	1	8
4.	Number of living Children (v218)	15683	2.325639	2.472988	0	12
5.	Education level, women (v133)	15683	4.082084	4.734049	0	22
6.	Age, women (v012)	15683	27.93732	9.159282	15	49

Source: Stata Results based on EDHS 2016

Table 3 also presents the frequency distribution for each categorical variable. The recurrence of a value is the times it happens in a dataset. The pattern of a variable's frequencies is called a frequency distribution. It's the times every conceivable worth of a variable happens in a dataset.

Table 3:

Descriptive Analysis for Categorical Variables

No.	Variable	Obs.	Categories0	Frequency	Percent
1.	Usage of Contraceptive (v632_1)	8,734	Not Using, 0	5,754	65.88
			Using, 1	2,980	34.12
2.	Decision maker for using contraception (v632)	2,980	Mainly Respondents	726	24.36
			Mainly Husband, Partner	145	4.87
			Joint Decision	2,104	70.60
			Other	5	0.17
3.	Decision maker for using contraception (v632a)	5,754	Mainly Respondents	1,754	30.48
			Mainly Husband, Partner	588	10.22
			Joint Decision	3,256	56.59
			Other	156	2.71
4.	Wealth Index combined (v190)	15683	Poorest	3,894	24.83
			Poorer	2,046	37.88
			Middle	2,002	12.77
			Richer	2,042	13.02
			Richest	5,699	36.34
5.	Types of Place Residents (v102)	15,682	Urban	5,248	34.10
			Rural	10,335	65.90
6.	Region (v101)	15,682	Tigray	1,682	10.72
			Afar	1,128	7.19
			Amhara	1,719	10.96
			Oromia	1,892	12.06
			Somali	1,391	8.87
			Benishangul	1,126	7.18
			SNNPR	1,849	11.79
			Gambella	1,035	6.60
			Harari	906	5.78
			Addis Ababa	1,824	11.63
			Dire Dawa	1,131	7.21
7.	Religion (v130)	15,413	Orthodox	6,413	40.89
			Catholic	91	0.58
			Protestant	2,814	17.94
			Muslim	6,209	39.59
			Traditional	84	0.54
			Other	72	0.46
8.	Husband/ Partner's Occupation (v705)	9,824	Did not work	1,008	10.26
			Professional/technical	774	7.88
			Clerical	92	0.94
			Sales	782	7.96
			Agricultural employee	4,891	49.79
			Services	432	4.40
			Skilled Manual	888	9.04
			Unskilled Manual	366	3.73
			Others	441	4.49
			Don't know	150	1.53
9.	Getting advice at health Center (V395)	6770	Yes	2,283	33.72
			No	4,487	66.28
10.	Access to Information (S815e)	15,683	Yes	5,459	34.81
			No	10,224	65.19
11.	Distance to health facilities (V467d)	15,683	Big problem	7,011	44.70
			Not a big problem	8,672	55.30

Source: Stata Results based on EDHS, 2016

Of the total 8734 women, about 34.12% of them utilize contraceptives, and the rest 65.88% don't use contraceptives. This implies that family planning promotion policies must consider the different reasons for the non-use of contraceptive methods identified in each country as well as the contextual differences regarding women of reproductive age (such as social norms and barriers that prevent women from accessing and using contraceptives).

Both contraceptive users and non-users were surveyed to understand how they make decisions regarding contraceptive use. It was found that decision-making involved women, husbands, joint decision-making, and others in both groups. Among contraceptive users, joint decision-making accounted for 70.6%, followed by decisions made mainly by women (24.36%), decisions mainly by husbands (4.87%), and decisions made by others (5%). Among non-users, joint decision-making was the most prevalent (56.59%), followed by decisions made mainly by women (30.48%). Decisions mainly made by husbands accounted for 10.22%, and decisions made by others accounted for 2.71%. The effectiveness of group decision-making compared to individual decision-making depends on various factors. Group decision-making can benefit from diverse perspectives and experiences, leading to more creative and better choices. However, it can also suffer from interaction losses, where groups may not outperform their best member (Simons et al., 1999).

The family wealth index is another significant factor, with approximately 36.34% of respondents falling into the richest wealth category and 24.83% in the poorest. The remaining groups, including the poorer, richer, and middle, have similar figures. In terms of residence, around 65.90% of respondents live in rural areas, while the remaining 34.10% reside in urban areas. Regional distribution shows the highest number of women from Oromia (12.06%), followed by SNNPR (11.79%) and Addis Ababa (11.63%). The lowest number of participants came from Harari (5.78%). In terms of religion, the majority of women were Orthodox followers (40.89%), followed by Muslims (39.59%) and Protestants (17.94%).

The distribution of husbands' occupations includes ten categories. The largest group consists of agricultural employees (49.79%), followed by those who do not work (10.26%) and skilled manual workers (9.04%). Approximately 1.53% of women did not know their husband's occupation. From the above findings, it is evident that decision-making regarding contraceptive use involves multiple

stakeholders, including women, husbands, joint decision-making, and others. The family wealth index, place of residence, region, religion, and husbands' occupations also play significant roles in understanding contraceptive usage patterns. These findings can help inform targeted interventions and family planning programs to improve contraceptive adoption and usage among women in Ethiopia.

Binary Logistic Regression for Usage of Contraceptive

The Logistic model of Usage contraceptive considers the husband's age, husband education, husbands' occupation, husband desire for a child, household wealth index, respondent's place of residence, respondent's region, number of living children in the household, respondent's religion, women's education, and women's age as determining factors. The Stata result provides the following to assess how the model is good: It employs 8,601 observations with LR chi2(35) = 807.31; Prob > chi2 = 0.0000; Log likelihood = -2491.2539; Pseudo R2 = 0.1394.

Prob > chi2 – This is the probability of obtaining the chi-square statistic given that the null hypothesis is true. In other words, this is the probability of obtaining this chi-square statistic (807.31) if there is no effect of the independent variables, taken together, on the dependent variable. This is, of course, the p-value, which is compared to a critical value, perhaps .05 or .01 to determine if the overall model is statistically significant. In this case, the model is statistically significant because the p-value is less than 0.05. Logistic regression does not have an equivalent to the R-squared that is found in OLS regression; however, many people have tried to come up with one. There are a wide variety of pseudo-R-square statistics. Because this statistic does not mean what R-square means in OLS regression (the proportion of variance explained by the predictors), we suggest interpreting this statistic with great caution.

Note that reference categories for the regression analysis are as follows: 1 decision to use contraceptive =husbands' decision; 2 decisions not to use contraceptive= husbands' decision; 3 residences=urban; 4 regions= Amhara; 5 religions=Orthodox; 6 husbands' occupation= didn't work, and 7 wealth indexes=poorest.

Table 4:

Model I: General Binary Logistic Regression for Usage of Contraceptive

v632_1	Coef.	Std. Err.	Z	P>z	[95% Conf. Interval]	
v730, Husband age	-0.0111	0.0054	-2.0500	0.0400	-0.0218	-0.0005
v715, Husband's education	-0.0109	0.0104	-1.0600	0.2910	-0.0313	0.0094
v705						
Profession	0.8108	0.2033	3.9900	0.0000	0.4123	1.2093
clerical	0.7025	0.3441	2.0400	0.0410	0.0282	1.3769
sales	0.9291	0.1941	4.7900	0.0000	0.5487	1.3095
agriculture.	0.8469	0.1705	4.9700	0.0000	0.5129	1.1810
services	1.0334	0.2230	4.6300	0.0000	0.5963	1.4705
skilled manuf.	1.0000	0.1898	5.2700	0.0000	0.6280	1.3721
unskilled manuf.	0.8809	0.2332	3.7800	0.0000	0.4237	1.3380
others	0.8050	0.2227	3.6100	0.0000	0.3684	1.2415
don't know	0.2755	0.4164	0.6600	0.5080	-0.5406	1.0915
v621	-0.0498	0.0123	-4.0500	0.0000	-0.0739	-0.0257
v190						
poorer	0.4607	0.1310	3.5200	0.0000	0.2039	0.7175
middle	0.8161	0.1302	6.2700	0.0000	0.5609	1.0714
richer	1.0129	0.1325	7.6400	0.0000	0.7532	1.2727
richest	1.2616	0.1577	8.0000	0.0000	0.9525	1.5707
v102						
rural	-0.2796	0.1402	-1.9900	0.0460	-0.5544	-0.0048
v101						
Tigray	-0.7136	0.1349	-5.2900	0.0000	-0.9781	-0.4492
Afar	-1.4032	0.2126	-6.6000	0.0000	-1.8199	-0.9865
Oromia	-0.5566	0.1482	-3.7500	0.0000	-0.8472	-0.2661
Somali	-2.4058	0.3378	-7.1200	0.0000	-3.0678	-1.7438
Benishangul	-0.4393	0.1561	-2.8100	0.0050	-0.7453	-0.1333
SNNPR	-0.0036	0.1598	-0.0200	0.9820	-0.3168	0.3097
Gambella	-0.7690	0.1797	-4.2800	0.0000	-1.1212	-0.4168
Harari	-0.8201	0.1880	-4.3600	0.0000	-1.1886	-0.4516
Addis Ababa	-0.4956	0.1662	-2.9800	0.0030	-0.8214	-0.1699
Dire Dawa	-0.8697	0.1822	-4.7700	0.0000	-1.2268	-0.5126
v218	0.0446	0.0243	1.8300	0.0670	-0.0031	0.0923
v130						
catholic	0.2468	0.4232	0.5800	0.5600	-0.5827	1.0763
protestant	0.0109	0.1223	0.0900	0.9290	-0.2289	0.2507
muslin	-0.4394	0.0988	-4.4500	0.0000	-0.6330	-0.2458
traditional	-1.0841	0.6461	-1.6800	0.0930	-2.3505	0.1823
other	-0.8347	0.5416	-1.5400	0.1230	-1.8963	0.2268
v133, education	0.0166	0.0111	1.5000	0.1330	-0.0051	0.0383
v012, age	-0.0410	0.0085	-4.8400	0.0000	-0.0577	-0.0244
v395, advice at a health center						
yes	0.2930	0.0731	4.0100	0.0000	0.1498	0.4363
s815e, Information access						
yes	0.1090	0.0715	1.5200	0.1280	-0.0312	0.2491
v467d, distance to health facilities						
not a big	-0.0833	0.0786	-1.0600	0.2890	-0.2373	0.0706
_cons	0.5071	0.3080	1.6500	0.1000	-0.0966	1.1107

Source: Stata Results based on EDHS, 2016

In the above logit model, the result suffers specification error and model goodness of the Hosmer-Lemeshow Chi2 test. This may have occurred due to a lack of an interaction term, improper transformation of predictor, and only a linear term being used as a predictor in the model. To address this, a Stata program called boxtid can be used. It is a user-written program that one can download from the internet by typing "search boxtid". Boxtid stands for Box-Tidwell model, which transforms a predictor using power transformations and finds the best power for model fit based on maximal likelihood estimate. However, this does not give a lasting solution so that respecifing the model as follows can be part of the solution.

Table 5:
Model II: Binary Logistic Regression for Usage of Contraceptive with Options

Regression	**Coef.**	**Std. Err.**	**Z**	**P>z**	**[95% Conf. Interval**	
v730, Husband age	-0.0197	0.0037	-5.3700	0.0000	-0.0269	-0.0125
v715, Husband's education	-0.0160	0.0068	-2.3400	0.0190	-0.0294	-0.0026
v621, Husband Desires Children	-0.0415	0.0086	-4.8100	0.0000	-0.0585	-0.0246
v190, Wealth Index						
Poorer	1.2162	0.0869	13.9900	0.0000	1.0458	1.3866
Middle	1.5345	0.0871	17.6200	0.0000	1.3638	1.7052
Richer	1.6998	0.0883	19.2600	0.0000	1.5268	1.8727
Richest	1.9852	0.1087	18.2600	0.0000	1.7720	2.1983
v102, Place of residents						
Rural	0.0874	0.0942	0.9300	0.3530	-0.0971	SX0.2720
v218, Number of Children	0.0016	0.0154	0.1000	0.9200	-0.0287	0.0318
v133, Education Level	0.0473	0.0080	5.9100	0.0000	0.0316	0.0631
v012, Age	-0.0127	0.0056	-2.2600	0.0240	-0.0237	-Q0.0017
Cons	-0.9225	0.2294	-4.0200	0.0000	-1.3721	-0.4730
Marginal Effect	**Dy/dx**	**Std. Err.**	**z**	**P>z**	**[95% Conf. Interval**	
v730, Husband age	-0.004	0.001	-5.40	0.00	-0.006	-0.003
v715, Husband's education	-0.004	0.001	-2.91	0.00	-0.007	-0.001
v621, Husband Desires Children	-0.009	0.002	-4.81	0.00	-0.013	-0.005
v190, Wealth Index	0.105	0.005	22.41	0.00	0.096	0.114
v102, Place of residents	0.075	0.017	4.52	0.00	0.042	0.107
v218, Number of Children	0.000	0.003	-0.14	0.89	-0.007	0.006
v133, Education Level	0.010	0.002	5.80	0.00	0.007	0.013
v012, Age	-0.003	0.001	-2.15	0.03	-0.005	0.000
Cons	-0.004	0.001	-5.40	0.00	-0.006	-0.003

Source: Stata Results based on EDHS 20116

The results presented in Table 5 demonstrate that the logistic model used for contraceptive usage is a good fit for the data. The Hosmer-Lemeshow Chi2 test, with a probability of 0.0619, indicates that the model is statistically insignificant, allowing us to accept the null hypothesis, which states that the model is appropriate. Additionally, the model specification test, performed using the linktest at a 10 percent significance level, confirms that the logistic model does not have any significant problems.

The Multicollinearity test also yields satisfactory results, indicating that the model does not suffer from linear correlations among explanatory variables. Therefore, the study finds that, except for the number of children and being from a rural area, all other variables, including husband's age, husband's total years of education, husband's desire for children, socioeconomic status (poorer, middle, richer, and richest categories), respondent's age, and women's education, are individually statistically significant in explaining the variation in contraceptive usage. However, it is worth noting that the husband's age, the woman's age, education level, and the husband's desire for children have a negative influence on the probability of using contraceptives. These factors appear to decrease the likelihood of contraceptive usage. On the other hand, variables such as the husband's education, socioeconomic status, rural residence, and the respondent's age and education have a positive impact on the likelihood of contraceptive usage.

Overall, the study highlights significant factors that influence contraceptive usage in the population. The model's good fit with the data and the absence of significant problems in the model specification and multicollinearity tests provide confidence in the validity of the findings. Understanding these factors can guide targeted interventions to improve family planning services and promote contraceptive usage among the population. Tables 7 and 8 present the model of the probability of contraceptive use concerning various religions, access to information, advice, distance, and regions as follows.

Table 7:
Model III: Logistic Regression for Usage of Contraceptive with Religions

V632_1	Coef.	Std. Err.	z	P>z	[95% Conf. Interval	
v130						
catholic	-.3224863	.2791657	-1.16	0.248	-.8696411	.2246685
protestant	-.3657192	.0618737	-5.91	0.000	-.4869894	-.244449
muslin	-1.37157	.0543351	-25.24	0.000	-1.478065	-1.265076
traditional	-2.531762	.519702	-4.87	0.000	-3.550359	-1.513164
other	-1.308769	.3561881	-3.67	0.000	-2.006885	-.6106535
_cons	-.0522071	.0350565	-1.49	0.136	-.1209167	.0165024

Source: Stata Results based on EDHS 20116

Table 8:
Model IV: Logistic Regression for Usage of Contraceptive with Regions and Access

V632_1	Coef.	Std. Err.	z	P>z	[95% Conf. Interval	
v101						
Tigray	-0.5538	0.1217	-4.5500	0.0000	-0.7922	-0.3153
afar	-1.7710	0.1795	-9.8700	0.0000	-2.1228	-1.4193
Oromia	-0.5184	0.1291	-4.0200	0.0000	-0.7714	-0.2654
Somali	-2.6660	0.3126	-8.5300	0.0000	-3.2787	-2.0533
Benishangul	-0.5495	0.1412	-3.8900	0.0000	-0.8261	-0.2728
SNNPR	0.1343	0.1282	1.0500	0.2950	-0.1169	0.3855
Gambella	-0.6571	0.1463	-4.4900	0.0000	-0.9439	-0.3703
Harari	-0.5201	0.1585	-3.2800	0.0010	-0.8308	-0.2094
Addis Ababa	0.1629	0.1315	1.2400	0.2150	-0.0948	0.4206
Dire Dawa	-0.5205	0.1496	-3.4800	0.0010	-0.8136	-0.2273
v395, getting advice at a health center						
yes	0.2893	0.0686	4.2200	0.0000	0.1549	0.4237
s815e, information access						
yes	0.1179	0.0668	1.7700	0.0770	-0.0130	0.2488
v467d, distance to health facilities						
not a big	0.3122	0.0694	4.5000	0.0000	0.1762	0.4482
_cons	-0.2266	0.1062	-2.1300	0.0330	-0.4347	-0.0186

Source: Stata Results based on EDHS 20116

In both model options, it is shown that followers of all religions have less likelihood of using contraceptives in comparison with followers of Orthodox, but being Catholic is statistically insignificant. In the same manner, except Addis Ababa and Southern region, where it is statistically

significant and more likely to use contraceptives compared to Amhara region, all regions are also statistically significant and have less likelihood than the Amhara region in terms of usage of contraceptives. This result is also backed by the 2007 Population and Housing Census in Ethiopia. It shows that the birth rate is declining in the Amhara region and to concertize, the total fertility declined from 6.8 births per woman in 1990 to 3.9 births per woman in 2019, a 43% change[34]. Indeed, the complex web of traditional culture, regional differences, and rural community structure strongly influences the lagging rural fertility transition, in Ethiopia. In addition to this, access to advice, access to information, and distance to health facilities are statistically significant in influencing the usage of contraceptives.

Multinomial Logistic Regression on Decision to Use Contraceptives

Following the large data set the study uses, it may be sufficient to simply use Wald tests in such cases to test for independent variables. Remember, a Wald test only requires the estimation of the constrained model. In Stata, we could just do this with a series of test commands. Again, mlogtest, using the Wald parameter, can automate the process and the study can find that those variables have significant effects as the same presented in the P value shown above. On top of this, the study also employs a test for combining dependent categories If none of the IVs significantly affects the odds of outcome m versus outcome n, we say that m and n are indistinguishable for the variables in the model. If two outcomes are indistinguishable for the variables in the model, you can obtain more efficient estimates by combining them. Using Stata command mlogtest, lrcomb, the study finds that there is a dependence with the 4th category (decision made by external or community). Therefore, the study combines it with joint decisions. Finally, it checks the Independence of Irrelevant Alternatives (IIA) Tests: Even though it is possible to manage the above two tests, the model and data set could not satisfy the IIA test as they are. Therefore, the study tries to eliminate the most statistically insignificant variables to the interest of IIA test in the case of the decision and found that the final model choice satisfies all tests above as follows.

[3] https://ndmc.ephi.gov.et/amhara/#:~:text=Total%20fertility%20declined%20from%206.8,are%20the%20leading%20three%20causes.

[4] https://efaidnbmnnnibpcajpcglclefindmkaj/https://www.ethiopianreview.com/pdf/001/Cen2007_firstdraft(1).pdf

The results of the study reveal significant factors that influence women's decision-making regarding contraceptive use compared to decisions made by their husbands. Interestingly, the older the husband, the more empowered women feel in making decisions about contraceptive use. However, a larger number of children reduces women's likelihood of deciding to use contraceptives at a 10 % level of significance.

Table 9:

Multinomial Logistic Regression for Decision to Use against Husband decision

V632T	Women Decision		Joint and Other Decision	
v730, Husband age	0.0758	0.0030	0.0410	0.0960
v715, Husband Education	-0.0291	0.4260	-0.0143	0.6780
v621, Husband Desire of Children	0.0539	0.2340	-0.0509	0.2380
v190, Wealth Index				
poorer	0.1641	0.7630	0.0071	0.9890
middle	-0.5112	0.3110	-0.2524	0.5900
richer	-0.4072	0.4340	0.0382	0.9370
richest	-0.0993	0.8690	-0.0106	0.9850
v102, Place of residence				
rural	-0.4771	0.3350	0.0681	0.8840
v101, region				
Tigray	-0.7317	0.3410	-0.8332	0.2680
afar	-0.6887	0.5760	-0.6423	0.5920
Oromia	-1.7690	0.0120	-1.5218	0.0250
Somali	-1.9173	0.1780	-1.6853	0.1850
Benishangul	-2.2648	0.0010	-1.9667	0.0030
SNNPR	-1.6973	0.0120	-1.7585	0.0070
Gambella	-2.0207	0.0060	-2.1523	0.0020
Harari	-1.7268	0.0230	-2.5756	0.0010
Addis Ababa	-1.4587	0.0610	-1.4489	0.0560
dire Dawa	-1.0804	0.2010	-1.5078	0.0670
v218, Number of Children	-0.1802	0.0900	-0.1104	0.2730
v133, Education	0.0571	0.1790	0.0775	0.0560
v012, Age	0.0097	0.7960	0.0039	0.9130
V395, access to advice				
yes	0.2504	0.3640	0.3308	0.2040
S815e, access to information				
yes	0.6257	0.0210	0.3582	0.1630
V467d, distance				
Not a big problem	-0.3146	0.2910	-0.0732	0.7930
_cons	0.6699	0.5600	2.7410	0.0130

Source: Stata Results based on EDHS 20116

Regarding regional variations, except for the regions of Afar, Tigray, Dir Dawa, and Somali, women from other regions show statistically significant negative influences on their decision to use contraceptives compared to women from the Amhara region. However, wealth index, places of residence, and religions do not significantly explain women's decisions to use contraceptives compared to their husband's decisions. In addition to this, access to information has also a positive

effect and is statistically significant in showing the variation in women's decision to use contraceptives. The joint decision-making for contraceptive use shows that husband age, service in occupation, and women's education are statistically significant and positively influence their joint decisions. Living in regions other than Amhara hurts joint decision-making, indicating that these regions have a stronger impact on joint decisions compared to the Amhara region. However, religion and wealth index do not significantly affect joint decision-making.

Multinomial Logistic Regression on Decision Not-to-Use Contraceptive

In the equation of decision not to use contraceptives, husband's desire for children, middle family wealth index**,** living in a rural area, living in Afar, Oromia, Addis Ababa, Benishangul, SNNP, and Gambella; being Muslim and traditional followers, women's education and age are statistically significant in explaining the variation of women decision not-to-use contraceptive in comparison with husband decision.

Table 10:
Multinomial Logistic Regression for Decision Not-to-Use against Husband

	Women Decision		Joint and Other Decision	
V632aT				
v730, Husband age	-0.0117	0.2580	-0.0159	0.1040
v715, Husband Education	-0.0268	0.2590	-0.0117	0.6010
v705, Husband Occupation				
professional/tech./manag.	0.0662	0.8680	0.0413	0.9130
clerical	-0.5706	0.4530	-0.4884	0.4940
sales	-0.3837	0.3270	-0.1919	0.6010
agricultural - employee	-0.1170	0.6690	0.0331	0.8980
services	0.3002	0.5200	-0.1952	0.6690
skilled manual	-0.2549	0.5130	-0.3170	0.3930
unskilled manual	0.4380	0.4020	0.4387	0.3820
others	0.1098	0.8100	0.2179	0.6180
don't know	0.9591	0.2260	0.2307	0.7710
v621, Husband desire of Children	0.0586	0.0320	0.0025	0.9240
v190, Wealth Index				
poorer	0.1450	0.5710	0.2983	0.2170
middle	0.5183	0.0830	0.6728	0.0180
richer	0.2260	0.4360	0.2702	0.3260
richest	0.4302	0.2440	0.5447	0.1210
v102, Place of residence				
rural	0.6146	0.0710	0.4270	0.1870
v101, region				
Tigray	-0.7571	0.1720	-0.5941	0.2780
afar	-0.9484	0.0970	-0.3592	0.5180
Oromia	-1.3830	0.0110	-0.8472	0.1100
Somali	-0.6397	0.3060	0.1123	0.8520
Benishangul	-2.3844	0.0000	-1.8284	0.0000
SNNPR	-1.5249	0.0070	-1.2107	0.0280
Gambella	-1.4500	0.0150	-1.5582	0.0070
Harari	-0.8471	0.1530	-1.2610	0.0310
Addis Ababa	-0.7992	0.2430	-0.3764	0.5740
dire Dawa	-0.8461	0.1590	-0.4706	0.4200
v218, Number of Children	-0.0544	0.2670	-0.0372	0.4240
v130, Religion				
catholic	12.2368	0.9790	11.9500	0.9790
protestant	-0.2419	0.4850	-0.3148	0.3400
Muslin	-0.8816	0.0020	-0.7921	0.0030
traditional	-1.2144	0.0460	-1.6285	0.0060
other	-0.0201	0.9860	-0.0483	0.9660
v133, Education	0.0678	0.0240	0.0647	0.0240
v012, Age	0.0555	0.0020	0.0439	0.0110
V395, access to advice				
yes	0.0803	0.6640	0.1233	0.4820
S815e, access to information				
yes	0.1466	0.4020	0.3377	0.0420
V467d, distance				
Not a big problem	0.0121	0.9450	0.1072	0.5230
cons	0.9715	0.2060	1.7417	0.0190

Source: Stata Results based on EDHS 20116

Summary, Conclusion, and Recommendation

Only 34.12% of them use contraceptives, leaving 65.88% of them not using. A low rate of contraceptive usage was discovered, and several characteristics linked to contraceptive non-use may assist direct intervention efforts. Joint decision-making accounted for 70.6% of those taking contraceptives, followed by respondents (decisions made by the women) at 24.36%, husbands' decisions at 4.87%, and other's decisions at 0.17%. However, among those who do not use contraceptives, joint decision accounts for the majority of cases (56.59%), followed by respondent's (mostly women's) decisions (30.48%). Husbands or spouses and others make up the remaining 10.22% and 2.71%, respectively.

The contraceptive usage model shows that aside from the number of children and being from a rural area, all other variables, such as the respondent's age, husband's age, the respondent's and husband's total number of years of education, the husband's desire for children, those who are poorer, middle-class, richer, and richest, and the respondent's age, are individually statistically significant in explaining the variation in contraceptive usage. However, the likelihood of usage of contraceptives is negatively impacted by the age of the husband, the age of the wife, the husband's education, and the desire for children. Compared to Orthodox believers, followers of all other religions are less likely to use birth control, while Catholicism is statistically negligible. All other regions except Addis Ababa are less likely to use contraceptives than the Amhara region.

A husband's desire for children is a significant factor influencing both women who decide to use contraceptives and those who decide not to use contraceptives. As the husband's desire for children increases women who decide to use contraceptives are more likely to decide to use contraceptives than a decision made by the husband and as the husband's desire for children increases, women who decide not to use contraceptives are more likely to decide not to use contraceptive than a decision made by husbands. This shows that women's decisions are symmetrical to men's desires for children and that they are more powerful or empowered than men's decisions. Except for SNNPR and Addis Ababa, all other regions have a statistically significant impact on the likelihood of contraceptive usage, except Catholics, all religions are statistically significant and have less likelihood of contraceptive usage. In addition to this, distance to health facilities with not a big problem is statistically significant, and positive impact on the usage of contraceptives.

The multinomial logistic model for examining women's decisions to use as well as decisions not to use contraceptives results in meaningful findings. Husband age has a statistically significant and positive impact on women's decision to use contraceptives, but it does not have such impact in the case of women's decision not to use contraceptives. Service occupation has a significant and negative impact on women's decision to use, but not have same decision not to use. A husband's desire for children has a positive and statistically significant impact in case of decision not to use, but it has no such impact on the decision to use. Middle wealth index, place of residence (rural), women's education, and age have positive and statistically significant impacts on the decision not to use, but all these do not have an impact in the case of a decision to use. Except for Tigray, Afar, and Somalia, all regions have a significant impact on the decision to use; but in the case of the decision not to use, only Afar, Oromia, Benishangul, SNNPR, and Gambella have a statistically significant impact at a different level of significance. Religions matter in the case of the decision not to use contraceptives in Muslim and traditional religions. None of them have a significant impact on the decision to use contraceptives. Finally, only access to information has a statistically significant and positive impact on the decision to use contraceptives.

There is no common determining factor that influences the decision to use and the decision not to use, indicating asymmetric in terms of policy variable choice. However, there is some commonality in terms of regional variation that plays the same role in the decision process of women on contraceptives. Based on the above conclusion, the study provides the following recommendations:

- Raising the educational level of the wife as well as the husband: Growing opportunity costs for women to have children are expected to hasten the drop-in fertility as education levels rise. The opportunity costs of motherhood are also said to be higher for educated women due to their increased position and access to possibilities. Additionally, it is asserted that parental education raises awareness of family planning and alters attitudes toward having many children.
- Increasing household wealth: - In general, wealthier women in developing countries use long-term and permanent contraceptive methods rather than short-term methods because wealthier women do not have financial constraints.

- Access to information and advice: - The right to information gives women access to information held by health professionals. This includes the right to request and receive information and the duty of healthcare providers to proactively provide information. Access and advice help women find the best support for them.
- Distance to health facilities: - The journey a patient makes to receive treatment has long been recognized as a key factor in healthcare. The distance factor is particularly important in rural areas, where most patients are likely to travel for treatment and where there are alternative contraceptives that work and are generally more readily available.
- Religion and regional programs: - Religious and cultural factors can influence the acceptance and use of contraceptives in very different ways among couples of different religious backgrounds. Within religions, different sects may interpret religious teachings on that subject differently, and single women and their partners may ignore religious teachings. Cultural factors in each region are equally important in determining family size and contraception, claiming usage of contraceptives across religions and regions should be balanced.

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