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## Trends and predictors of modern contraceptive use among married women: Analysis of 2000–2016 Ethiopian Demographic and Health Surveys

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## ABSTRACT

**Objectives:** Accessing family planning is a key investment in reducing the broader costs of health care and can reduce a significant proportion of maternal, infant, and childhood deaths. In Ethiopia, use of modern contraceptive methods is still low but it is steadily increasing. Identifying the contributing factors to the changes in contraceptive use among women helps to improve women's contraceptive use and helps to plan strategies for family planning programs. Thus, the current study aimed to analyze the trends and predictors of changes in modern contraceptive use over time among married women in Ethiopia.

**Data source and study design:** Secondary data analysis of the national representative data of 2000–2016 Ethiopian Demography and Health Survey was employed.

**Methods:** This secondary data analysis was considered using 2000 through 2016 Ethiopian Demographic and Health Surveys. The study used data from the four DHSs conducted in Ethiopia (2000–2016). The data from all EDHS was collated so as to follow the trends throughout the period considered for the survey. Married women aged 15–49 years with sample sizes of 36,721 (9,203 in 2000, 8,438 in 2005, 9,478 in 2011, and 9,602 in 2016) were included. The analysis involved three levels, including trend analysis (to see changes from 2000 to 2005, 2005–2011, 2011–2016 and 2000–2016). Bivariate and multivariate analysis were also considered to identify predictors of modern contraceptive use. Data was extracted from the EDHS datasets for which authorization was obtained from the DHS Program/ICF International using a data extraction tool. SPSS 24 was employed for data management and analysis.

**Results:** Among married women of reproductive age, modern contraceptive prevalence increased from 6.2% in 2000 to 35.2% in 2016. This 5-fold increment in modern contraceptive use was due to being in the age group of 25–29 years (AOR = 1.4; 95%CI (1.1, 1.7)), having two children (AOR = 1.3; 95%CI (1.1, 1.6)), the richest wealth category (AOR = 3.0; 95% CI (2.5, 3.5)), currently working (AOR = 1.3; 95%CI (1.2, 1.5)) and attending secondary and above education (AOR = 1.2; 95%CI (1.1, 1.6)) were found to be predictors.

**Conclusions:** Over the past 15 years, an annual average of a 1.9% point increment has been observed in modern contraceptive use, but the country lags behind the SDGs's 2030 target of achieving zero unmet needs for contraception. Program interventions, and continued education of women, are mandatory, as education is one of the major factors contributing to increasing contraceptive use.

**Abbreviations:** AJO, African Journals Online; BMC, Biomed Central; CDC, Center for disease Control and Prevention; CPR, Contraceptive Prevalence Rate; DHS, Demographic and Health Surveys; EDHS, Ethiopian Demographic and Health Surveys; EHNRI, Ethiopian Health and Nutrition Research Institute; EMDHS, Ethiopian Mini Demographic and Health Surveys; FMOH, Federal Ministry of Health; HIV, Human Immuno-Deficiency Virus; ICPD, International Conference on Population and Development; IUD, Intra-uterine device; LAM, Lactational amenorrhoea method; SPSS, Statistical Package for Social Sciences; UNFPA, United Nations Fund for Population; VIF, Variance Inflation Factor.

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## 1. Background

Family planning refers to the use of different methods of fertility control which will help individuals or couples to have the number of children they want at the time convenient for them [1] and it is a basic human right as endorsed by the International Conference on Population and Development (ICPD) in Cairo in 1994 [2]. Pioneered by the Family Guidance Association of Ethiopia in 1966, modern family planning services in Ethiopia were provided by a one-room clinic managed by a single nurse, which then gradually spread over different parts of the country. Then the Federal Ministry of Health (FMOH) of Ethiopia began to enhance this through the provision of family planning, maternal and child health services in its health facilities. In 1993, Ethiopia adopted a population policy, following which local and international institutions were interested in partnering with the government in providing and expanding family planning services and programs [13]. The total fertility rate in the country was reduced from 7.7% in 1990 to 4.6% in 2017, but it is still two folds in light of the world fertility rate [14].

Family planning consists of traditional or natural methods including; Withdrawal, rhythm (periodic abstinence), and lactational amenorrhea method (LAM) which usually have low efficacy where about quarter (24%) of the women have unintended pregnancies within a year, however modern methods, have higher effectiveness and lower rates of unintended pregnancies, include; male and female sterilization, intra-uterine devices (IUD's), implants, injections, pills, emergency contraception, vaginal barrier, and mechanical male and female condoms [7–9]. Currently, 41% and 1% of married women use modern and traditional contraceptive methods of family planning, respectively [15].

In the world, every day, about 830 women die due to complications during pregnancy and childbirth. About 300,000 maternal deaths occurred in 2015 from preventable causes of pregnancy and childbirth. Almost all (99%) of maternal deaths occur in developing countries and, of all these, women living in rural areas and in poorer communities share the highest proportion [10]. Among sub regions of the world, more than half of the maternal deaths occur in Sub-Saharan Africa and 33% occur in South Asia [10,11]. Most of the maternal mortalities and morbidities in the world occur due to unintended pregnancy. In the developing world, 43% are unintended. Annually, about 89 million unintended pregnancies, 48 million abortions, 10 million miscarriages, and 1 million stillbirths are estimated to occur in developing countries. While they can be prevented through the use of contraceptives, unintended pregnancies result in a high financial and societal impact from the very high medical costs required to treat morbidities and the workforce reductions, particularly among females [10,16].

Prior to 50 years ago, the prevalence of modern contraceptives among women of reproductive age was 24%; in 2019, it has risen to 63%, with 58% of all women of reproductive age reporting that they or their partners used at least one modern contraceptive method [17]. Of any method of family planning among women of reproductive age varies significantly, ranging from 9% (Chad) to 83% (Finland and China). On the other hand, the use of modern contraceptive methods ranges from 7% (South Sudan and Chad) to 82% (China) [14]. When countries are grouped based on their economic status, they have varying contraceptive prevalence rates (CPR), with 61%, 57%, and 37% of reproductive age women using at least one of the modern contraceptive methods in the more developed, less developed, and least developed countries, respectively. CPR is generally lower among the poorest and higher among the richest. These huge differences in the CPR between the more developed and least developed countries in the world are the result of differences in access to, availability of, and demand for modern methods of contraception [8,17].

The prevalence of modern contraceptive use has been increasing globally, and it is expected to increase in the near future, which highly contributes to the growth of the population of women of reproductive ages. In 2017, there were a total of 775 million married (in-union) women who used modern contraceptives. By 2030, this number will

reach 793 million, increasing by 18 million, much of which will be in Africa. However, while the prevalence of contraceptive use is increasing, there is still a significant unmet need, with one in every ten married (in union) women who want to stop or delay childbearing not using any method of contraception. This unmet need is disproportionately higher in African countries (21%) compared to other regions [9].

The use of modern contraceptives in Ethiopia increased from zero in 1966 to 35% (married women) in 2016 and 41% in 2019 [15]. The potential demand for family planning in 2016 was 58%, more than 22% of which was not met. Though the unmet need for family planning in Ethiopia has shown a decline from 37% in 2000 to 22% in 2016, it remained high at 21% in 2019 [7,17]. Both the CPR and unmet needs for family planning in Ethiopia seem to lag behind the 2030 target of increasing the contraceptive prevalence rate to 55% and reducing the unmet needs to 10% [18].

As part of the SDGs, the United Nations Fund for Population (UNFPA) and its many partners have issued a clarion call for three zeros by 2020 (no unmet need for contraception, no preventable maternal deaths, and no violence or harmful practices against women and girls). To realize these 3 zeros, countries, including Ethiopia, need to plan strategically based on correct evidence, which is still lacking [17]. Ethiopia, as a signatory country to the ICPD, has a commitment to the SDGs. In order to meet such commitments, the FMOH has developed a 20-year, four-phased Health Sector strategy, which is currently in its first phase and will conclude in 2020. The FMOH has been working with various stakeholders to achieve its planned targets of improving CPR to 55% and reducing the unmet needs for family planning to 10% by 2020. According to reports, both targets are lagging far behind the plan, with CPR remaining at 41% and unmet need for family planning at 21% in 2019 [7,9].

Various factors such as age at marriage, income, educational status, knowledge and attitude towards contraceptive use, religion, residence, and exposure to the media, family size, experience of child death [23], and poor access to contraceptives were identified in different countries in various settings [23–31]. Therefore, given the high maternal mortality ratio, much of which could have been averted through contraceptive use, the higher unmet need for family planning, and the lowest CPR, complemented by such a lack of evidence about the changes or trends and factors affecting contraceptive utilization in Ethiopia, it requires a robust study to examine the trends over time and identify its predictors. Therefore, this study used data from the 2000, 2005, 2011, and 2016 EDHS and examined the trends over time and predictors of modern contraceptive use among married women in Ethiopia.

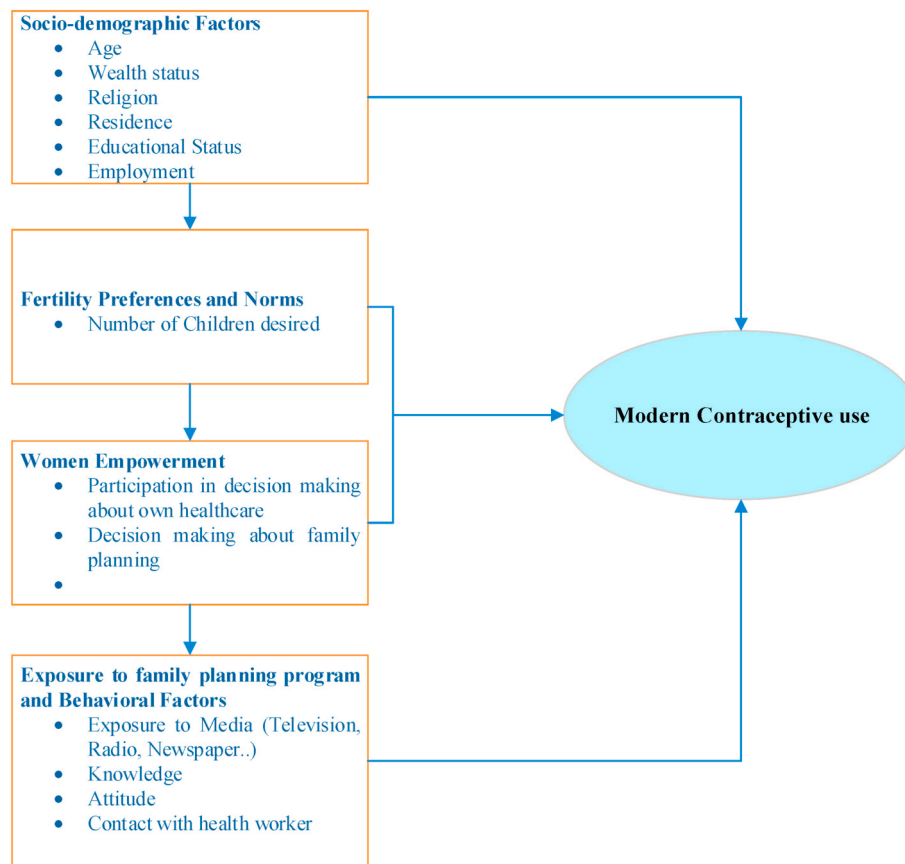
## 2. Conceptual Framework

For the study of the trends and predictors of modern contraceptive use among married women the conceptual framework of Andersen-Newman healthcare utilization model is used, shown in (Fig. 1). This is quite a complete framework on determinants of health care utilization. As our paper is only focusing on predictors of modern contraceptive use among married women, and only specific determinants, we have made an adjustment of this study for our own conceptual framework, shown in (Fig. 1). It demonstrates that the study focuses on the role of the four determinants on trends of modern contraceptive use. In the upper part sociodemographic risk factors (age, wealth status, religion, residence, educational status, and employment) are presented and below the three risk factors including fertility preference and norms, women empowerment and exposure to family planning program and behavioral exposure.

## 3. Methods

### 3.1. Data source and design

We used secondary data analysis of the national representative data



**Fig. 1.** Conceptual Framework showing the relationship between contraceptive use and factors, based on Andersen and Newman Model of Health Service Utilization (2003).

of 2000–2016 Ethiopian Demography and Health Survey (EDHS). In 2000–2016 EDHS, a two stage stratified cluster sampling technique has been employed.

### 3.2. Study area and period

The nationally representative secondary analysis of survey study was conducted using 2000 through 2016 EDHS. Ethiopia is a Federal Democratic Republic structured into 9 regional states and two city administrations. It has a total area of 1,100, 000 km<sup>2</sup>. Regional states are divided into zones, and zones are subdivided into districts, and districts into kebeles, the lowest administrative units [46]. These DHS were conducted in all the geographic areas of the country. In terms of its population size, Ethiopia is the second most populous nation in Africa, with more than 112 million people (56,010, 000 females and 56, 069, 000 males) in 2019 [47]. Women of reproductive age represent 21% of the population in the country. According to the Mini Ethiopian Demographic and Health Survey (EMHDS) conducted in 2019, the under-five mortality rate has been reduced to 55 from 123 in 2005 and infant mortality has declined from 77 in 2005 to 43 in 2019. Similarly, the use of modern contraceptive methods has shown an increase from 14% in 2005 to 41% in 2019. Addis Ababa City Administration and Amhara Regional states have the highest proportion (50%) of women using modern contraceptive methods and the Somali region has the lowest (3%) [15].

### 3.3. Source and study population

In this study, our data was restricted to married and non-pregnant women of the reproductive age group. Based on these criteria, our sample sizes from the four EDHS were 9,203 women in 2000 (9,653

weighted cases), 8,438 in 2005 (8,914 weighted cases), 9,478 in 2011 (9,594 weighted cases), 9,602 in 2016 (10,014 weighted cases).

### 3.4. Sample size and sampling technique

The four DHS of Ethiopia surveyed a total of 15,367, 14,070, 16,515, and 15,683 women in 2000, 2005, 2011, and 2016, respectively. The selection of samples for these secondary survey analysis was conducted using a two-stage sampling procedure. The first stage involved the selection of enumeration areas from the rural and urban strata in the 9 regional states and the two city administrations. The selection of enumeration areas for these surveys was conducted using the list of enumeration areas as a sampling frame designated by the Central Statistics Agency of Ethiopia for the Household and Population Census. The second stage involved the selection of a fixed number of households from each enumeration area using a systematic sampling, and all women 15–49 years eligible for the surveys were selected for the woman's questionnaire that collected information on family planning and other topics. Therefore, a total of 38,175 married women aged 15–49 years (9,653 from 2000, 8,914 from 2005, 9,594 from 2011, to 10,014 from the 2016 DHS of Ethiopia) were used for this study (Fig. 2).

### 3.5. Study variables

A response variable is the current use of modern contraceptive methods. Modern contraceptive methods in this study included female sterilization, injectable, implants, pills, Intrauterine devices (IUD), and condoms. In the four EDHS, the current use of modern contraceptives was labeled with four responses (no method, folkloric, traditional, and modern methods). However, the response variable in this study was recorded as a dichotomous variable, Yes or No, where "Yes" was for those

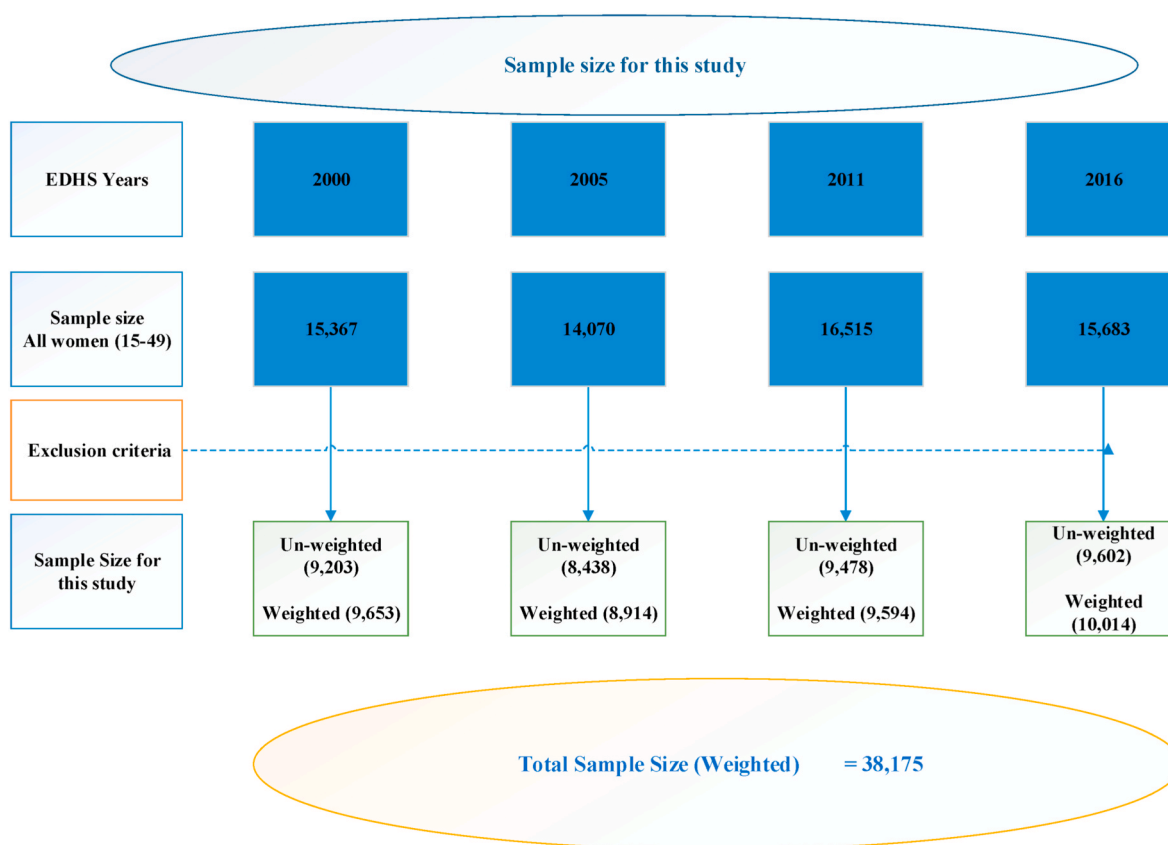


Fig. 2. Sample size and Sampling procedure for the study on the trend and predictors of modern contraceptive use using the four EHDS, 2020.

who currently used modern contraceptive methods and "No" for those who were not using modern contraceptive methods.

Demographic Health Survey (DHS) employees a standard tool and hence questions used across different periods are similar. Explanatory variables used in the current analysis were checked for any possible variations before using them in our study. Merging of similar variables from the four surveys into one was then conducted using Integrated Public Use Microdata Series (IPUMS).

Explanatory variables having in common variables from different data sets which were collected at different times from the same population were selected and merged. Explanatory variables include socio-demographic factors: the age of the women, parity, place of residence, religion, wealth index, educational attainment, occupational status. And, women empowerment: participation in decision-making on family planning use and health care; fertility norms and preferences: number of children desired, age at first marriage or cohabitation; exposure to family planning messages and the media: being visited by a health worker, knowledge about contraceptives, attitude towards contraceptive methods, and access to the media, such as radio, television, and newspapers.

### 3.6. Operational definition

**Contraceptive prevalence** is the proportion of women who are currently using, or whose sexual partner is currently using, at least one method of contraception, regardless of the method being used. **Modern Contraceptive Methods:** In this study include female sterilization, the intrauterine contraceptive device (IUD), implants, injectable, pill, male condoms, female condoms, emergency contraception, standard day's method, and lactational amenorrhea method (LAM) [15]. **Traditional methods** of family planning include rhythm, withdrawal and other folk methods [15].

### 3.7. Data collection tools, techniques and procedures

This study used secondary data from the previous four consecutive EDHS for the years 2000, 2005, 2011, and 2016 that were conducted by the Central Statistical Agency in collaboration with the Ministry of Health and other partners providing technical and financial support [7, 48–50]. In this study, our data are restricted to married and non-pregnant women aged 15–49. Based on these criteria data was extracted from the EDHS datasets in the DHS Program following authorization by the DHS program. Extraction of the required variables for this study was guided by a data extraction tool composed of questions selected from the woman's questionnaire, focusing on the factors affecting the use of modern contraceptive methods among married women of reproductive ages.

### 3.8. Data processing and analysis

The data was cleaned and analyzed using SPSS software version 24. The analysis of data for this study involved three levels, including trend analysis, bivariate, and multivariate analysis. The trend in modern contraceptive use was analyzed using descriptive analyses, stratified by residence, educational status, wealth quantile, and age of the respondents and other selected characteristics. The trend was examined separately for the periods 2000–2005, 2005–2011, 2011–2016, and 2000–2016.

The second type of analysis was bivariate analysis that was used for testing the presence of significant association between the response and independent variables. For this study, the dependent variable (current use of modern contraceptives) was coded into dichotomous response categories (Yes or No) and a binary logistic regression was run to identify the factors that have a significant association with modern contraceptive use in the unadjusted model. To identify the predictors of



modern contraceptive use, a multivariate analysis was conducted and the final logit model was built with AOR using a backward stepwise method where the variables that had a p-value of  $<0.05$  using the likelihood test were maintained in the model while other variables were removed. Multicollinearity with variance inflation factor was less than ten was checked before multivariable logistic regression analysis was done.

To account for the variations due to study design, stratification and sampling procedures, all the figures used in this study were computed from weighted samples. Weighted data were analyzed with a complex survey sampling analysis technique. Significance tests and associations were based on these assumptions, and AOR with 95%CI was used to measure the significant associations between the response and the explanatory variables in this study.

### 3.9. Ethical consideration

The four EDHS were conducted with ethical approval obtained from the former Ethiopian Health and Nutrition Research Institute (EHNRI) Review Board, the National Research Ethics Committee at the Ministry of Science and Technology, ICF International's Institutional Review Board, and the Center for Disease Control and Prevention (CDC). Details of the ethical clearance and approval processes followed during these four EDHS can also be found in the published reports of these surveys [7, 48–50]. The authors have submitted a proposal to the DHS Program/ICF International and permission was granted to download and use the data for this study. The DHS Program authorized data access and data was used solely for the purpose of the recent study.

## 4. Results

### 4.1. Characteristics of the sample

This section presents the background characteristics of respondents that participated in the last four EDHS. All married women of reproductive age, 15–49 years, were represented in the consecutive surveys. This study used a total of 38,175 respondents (9,653, 8,914, 9,594, and 10,014 from 2000, 2005, 2011, and 2016, by the DHS of Ethiopia, respectively). Around half of the respondents (48% in 2000, 47.8% in 2005, 48.6% in 2011 and 45.7% in 2016) were younger than 30 years old during the surveys, and the percentage of respondents older than 30 years decreased as age increased.

With regard to residence, more than 8 in 10 of these respondents live in rural areas (86.2%). The majority of the respondents reported that they follow one of the four main religions: Orthodox Christianity (44.7%), Muslims (32.4%), Protestants (19.6%), and Catholics (0.9%). Across the four surveys, respondents were profiled by the number of children born to them. As a result, it was discovered that the majority of respondents had given birth to at least one child, and some (22% of them) had given birth to at least six children. Very few (7%) among all the respondents did not bear a child. In general, the mean number of children born to respondents (4.2, 4.3, 4.1, and 4.0 in 2000, 2005, 2011, and 2016 EDHS, respectively) showed a relatively stable trend across the four survey periods.

Concerning occupation, respondents who reported that they were not working during the survey periods ranged from 36.9% in 2000 to 68.7% in 2005, the highest across the four survey periods and reduced to 52% in 2016. Agriculture, sales, and skilled manual work were the top 3 types of occupations that the respondents were engaged in. The proportion of women working in agriculture fell from 43.6% in 2000 to 23.5% in 2016. In contrast, the proportion of women working in sales increased from 8.8% in 2000 to 15.5% in 2011, but fell to 13.1% in 2016. Besides their occupations, the respondents were also asked about what occupations their husbands/partners had. Accordingly, less than one percent of the respondents reported that their partners were working during the time of the first three surveys, while 7.8% of the husbands

of the respondents in 2016 were reported to be unemployed/not working. The majority of the husbands worked in agriculture, with sales and skilled manual labor coming in second and third. Across the four surveys, the proportion of husbands that were engaged in agriculture showed a decreasing trend (82.5% in 2000 to 62.5% in 2016), while sales work, skilled manual labor, and professional occupations have become more preferred by husbands (Table 1).

Regarding to educational status, the majority of the women had no formal education. According to the 2000 EDHS, 83.3% of women and 65.8% of their husbands did not complete high school. The proportion of both women and their husbands who have no formal education has been reduced over time to 61.8% and 46.4% for women and husbands, respectively. In addition to this, throughout the past 15 years that the four surveys cover, there have been significant improvements in the proportion of women (from 11.7% in 2000 to 28.1% in 2016) and their partners (from 23.3% in 2000 to 37.2% in 2016) who attended primary education. Steady increases were also observed in the percentage of both women and their partners who attended secondary and higher level education, according to the four consecutive DHSs of Ethiopia (Table 1).

### 4.2. Women empowerment/participation in decision making

Participation in making decisions regarding key issues at the household level could have an influence on contraceptive utilization by married women. Therefore, respondents were asked about their participation in decision-making on various issues, including making large household purchases, visiting family or relatives, and about the decision to seek healthcare. Furthermore, women who reported using family planning methods were asked who in their household makes the decision about using family planning methods. Accordingly, among the three key decisions, a higher percentage of women had a say regarding visits to family or relatives, followed by the decision regarding women's healthcare across the three surveys.

This study also analyzed the number of decisions that women participate in, and significant percentage point increases were observed in the proportion of women who in three of the key decisions from 2000 to 2016. In the 2005 EDHS, 37.5% of the respondents were identified to participate in all the three decisions, while this proportion reached 62.3% in 2016 by increasing 25% points in 10 years.

Moreover, respondents were asked about who in the household decided on the use of family planning methods. There is an encouraging finding that across the four surveys, the majority of the women reported that decisions about the use of family planning were made jointly by the women and their husbands/partners (65.7% in 2000 and 73.4% in 2016). Moreover, the proportion of respondents whose husbands were the sole decision makers regarding the use of family planning decreased from 10.1% in 2000 to 5.5% in 2016.

### 4.3. Fertility preference/norms

Fertility preference is characterized by the total number of children desired, family size concordance, age of women at first marriage, and who decides on the use of family planning. A significant proportion of the respondents across the four surveys reported that they wanted to have four or more children. In 2016, 32.2% of all women polled desired to have more than six children, and 27.2% desired to have four children. In the same survey period, very few (10.5%) of the women desired to have between 2 and 3 children.

Family size concordance was also assessed across the four surveys and, among all the respondents, 51.4% of them reported that the number of children they wanted to be coincided with their husbands' desire, while a significant proportion of the husbands of the surveyed women (40.8%) wanted more children than the women. After 15 years (in 2016), this proportion had slightly decreased, but a large percentage (35.7%) of husbands were reported to want more children than women, while 54.1% of married couples wanted the same number of children.

**Table 1**

Percentage distribution of respondents by socio-demographic characteristics according to the 2000, 2005, 2011, and 2016 Ethiopian DHSSs.

Characteristics		2000 (N = 9,653)	2005 (N = 8,914)	2011 (N = 9,594)	2016 (N = 10,014)	Total
Respondents' residence	Urban	11.6	10.3	17.1	15.8	13.8
	Rural	88.4	89.7	82.9	84.2	86.2
Women's occupation	Not currently working	36.9	68.7	43.6	52	50.0
	Agriculture	43.6	19.5	29.1	23.5	29.1
	Sales worker	8.8	7.6	15.5	13.1	11.4
	Skilled manual worker	8	1.6	7.1	3.7	5.1
	Household, domestic, and services	1	0.1	0.5	2.5	1.1
	Professional/technical	0.8	1.1	1.6	2.2	1.4
	Clerical worker	0.4	0.2	1	0.6	0.5
	Unskilled manual worker	0.4	0.9	0.6	0.8	0.7
	Other	0.1	0.3	1	1.6	0.7
Partner's occupation	Not currently working	0.4	0.7	0.8	7.8	2.5
	Agriculture	82.5	84	76.1	62.5	76
	Sales	5.4	6.2	8.1	6.9	6.7
	Skilled manual	4.4	2.8	6.4	6.8	5.2
	Professional/technical	2.9	2.7	4.1	5.2	3.8
	Household/domestic services	1.9	0.7	1.6	3.1	1.9
	Unskilled manual	1.3	2.1	1.2	3	1.9
	Clerical	0.8	0.2	1.1	0.6	0.7
	Other	0.2	0.6	0.6	4	1.3
Total number of children ever born/Parity	None	7.9	6.4	7.2	6.4	7.0
	1	16	14	14.3	15.7	15.1
	2	17	15.2	16.9	15	16.0
	3	14.6	14.5	14.9	14.6	14.7
	4	13.1	14.7	12.8	13.3	13.4
	5	11.2	11.8	11.6	11.9	11.6
	6+	20.2	23.3	22.2	23.1	22.2
	Mean number of children	4.2	4.3	4.1	4.0	4.2

The age of the first marriage was divided into two groups that were before and after the age of 18. As a result, according to all the surveys, the majority of women marry before the age of 18. In the last 15 years, the proportion of women who married before the age of 18 has decreased, from 72.7% in 2000 to 63.0% in 2016. Though the proportion of women who got married before 18 showed a decreasing trend over the years, half of the women surveyed in 2016 married before their 17th birthday.

#### 4.4. Exposure to FP program and behavioral factors

Married women aged 15 to 49 were polled on how often they read newspapers, watched television, and listened to the radio in a week. Radio was the most frequently cited source of information by the respondents. About 8 in 10 (78%) of the respondents in 2016 had no access to at least one of the three media over a one-week period before the survey. Though the majority of the respondents still had no access to the media, there were some improvements observed. The percentage of respondents that listened to radio increased from 9.1% (95%CI; 8.5%, 9.7%) in 2000 to 15.0% (95%CI; 14.3%, 15.7%) in 2016, and there was also a steady increase among those who watched television.

Similarly, the proportion of people reading newspapers is still very low, lingering at 2.2% in 2016, as opposed to the significant improvement in the literacy rate among women over the past 15 years (Table 1). According to the surveys, an insignificant proportion of women (1.1% in 2011 and 0.9% in 2016) had access to three forms of media, and 21% of them accessed 1–2 forms of media at least once a week in 2016.

All married women of reproductive age were asked in the previous four EDHS if they were visited by a family planning worker and also if they received family planning messages from various sources such as printed media, electronic media, and community meetings. As a result, community meetings and radio are the most common sources of family planning messages for married women, and health worker visits are mentioned as one of the most common sources of family planning. Community meetings as a source of family planning messages have shown percentage increments between the 2000 and 2005 surveys (from

37.1% in 2000 to 46.8% in 2005), while this decreased to 37.3% (95% CI; 36.3, 38.2) in 2011.

Television is the other most commonly cited source of family planning messages for married women, and the percentage of women who have been exposed to FP messages through this media has increased significantly throughout the last 15 years. Family planning messages reached through television have shown significant improvements throughout the survey periods (from 2.3% (95%CI; 2.0, 2.6) in 2000 to 13.6% (95%CI; 12.9, 14.3) in 2016).

Moreover, 2% of married women in 2016 reported that they received family planning messages via voice messaging through mobile phones, a newly introduced source of information. In general, the percentage of married women who were exposed to family planning messages through various sources has shown a 10% point increment between the first two surveys (from 38%, (95%CI; 37, 39) in 2000 to 48.8% (95%CI; 47.7, 50) in 2005) and remained the same after 5 years at 48.1% (95%CI; 46.9, 49.3) in 2011.

Examining married women's knowledge of FP methods, the majority of them reported that they knew at least one of the modern contraceptive methods. The proportion of married women who knew one of the modern contraceptives increased from 85.2% in 2000 to 98.6% in 2016, while the proportion of women who did not know about family planning methods decreased from 14% to 1.3%.

#### 4.5. Trends in modern contraceptive use

This section presents trends in modern contraceptive use during the period 2000–2016. The use of modern contraceptive methods among married women in Ethiopia has shown a significant improvement over the survey periods, from 6.2% in 2000 to 35.2% in 2016 (Fig. 3). There was a significant percentage point increase in modern contraceptive use between all the consecutive surveys, ranging from 7.5% from 2000 to 2005 to a 12.7% increment in 2005–2011, the highest increment in a 5-year period. These percentage changes observed in contraceptive use behavior among married women in Ethiopia are significant, as confirmed through the confidence intervals computed for each survey

**Table 2**

Trends of modern contraceptive use among married women ages 15–49 years by socio-demographic characteristics Ethiopia DHS 2000–2016.

Characteristics		2000	2005	2011	2016	Changes in Modern Contraceptive Use Over time (in percentage points)			
		% [95%CI]	% [95%CI]	% [95%CI]	% [95%CI]	2005–2000	2011–2005	2016–2011	2016–2000
Woman's occupation	Not currently working	5.3[4.8,5.9]	11.6 [11.1,12.2]	23.3 [22.5,24.1]	31.1 [30.4,31.8]	6.3*	11.7*	7.8*	25.8*
	Professional/technical	44.2 [38.7,48.9]	53.6 [49.6,57.3]	63.2 [60.7,65.8]	50.1 [47.5,52.9]	9.4	9.6	−13.1*	5.9
	Clerical	33.8 [27.5,42.8]	29.2 [15.4,39.4]	42.3 [37.9,47.1]	46.3[40.9,52]	−4.6	13.1	4	12.5
	Unskilled manual	21.9 [14.3,29.9]	23.1[18,28.7]	31.3 [25.6,38.7]	38.3 [33.3,43.6]	1.2	8.2	7	16.4*
	Household/domestic	19[14,23.6]	22.7 [9.3,43.4]	54.4[48.4,59]	32.1 [29.2,35.2]	3.7	31.7	−22.3*	13.1*
	Sales	10.9 [9.5,12.4]	24.4 [22.5,26.2]	33.4 [32.2,34.7]	42.9 [41.6,44.1]	13.5*	9*	9.5*	32*
	Skilled manual	10.1 [8.7,11.7]	31.0 [27.1,35.3]	34.1 [32.2,35.9]	47.3 [45.1,49.5]	20.9*	3.1	13.2*	37.2*
	Agriculture	4.4[3.6,5.2]	12.5 [11.4,13.6]	22.7 [21.8,23.7]	36.3 [35.3,37.3]	8.1*	10.2*	13.6*	29.9*
	Partner's occupation	Not currently working	14.5 [9.2, 24]	11.0 [6.6,17.7]	21.5 [16.3,27.2]	22.4 [20.7,24.2]	−3.5	10.5	0.9
Clerical		31.2[26,36.7]	35.4 [22.7,44.4]	42.0 [37.9,46.6]	62.3 [58.7,66.8]	4.2	6.6	20.3*	31.1*
Professional/technical		27.3 [24.5,30.4]	42.1 [39.2,44.9]	47.4 [45.2,49.4]	42.1[40.1,44]	14.8*	5.3	−5.3	14.8*
Skilled manual		21.3[19,23.7]	37.5 [34.7,40.6]	44.3 [42.6,46.1]	47.7 [46.1,49.3]	16.2*	6.8	3.4	26.4*
Unskilled manual		20.8 [16.5,25.1]	31.4 [28.1,35.1]	48.2 [44.3,52.1]	37.4 [34.8,40.2]	10.6*	16.8*	−10.8*	16.6*
Sales		19.4 [17.4,21.6]	31.6 [29.5,33.7]	44.0 [42.5,45.6]	43.5 [41.9,45.2]	12.2*	12.4*	−0.5	24.1*
Household/domestic		10.2 [7.5,13.8]	29.8 [24.2,36.3]	44.9 [41.3,48.3]	44.2 [41.6,46.6]	19.6*	15.1*	−0.7	34*
Agriculture		3[2.7,3.4]	10.0 [9.5,10.5]	21.2 [20.6,21.8]	33.5 [32.8,34.1]	7*	11.2*	12.3*	30.5*
Total number children ever born		0	3.5[2.6,4.7]	8.40 [6.8,10.2]	23.7 [21.9,25.6]	36.7 [34.7,38.4]	4.9*	15.3*	13*
	1	5.1[4.3,6]	14.3 [13.1,15.7]	31.8 [30.5,33.1]	41.4 [40.3,42.6]	9.2*	17.5*	9.6*	36.3*
	2	5.9[5.1,6.9]	15.9 [14.7,17.2]	33.6 [32.3,34.7]	42.5 [41.4,43.7]	10*	17.7*	8.9*	36.6*
	3	8.5[7.4,9.5]	15.7[14.4,17]	28.3[27,29.6]	38.1 [36.9,39.4]	7.2*	12.6*	9.8*	29.6*
	4	5.2[4.3,6.3]	12.2[11,13.5]	27.4[26,28.8]	37.2 [35.9,38.5]	7*	15.2*	9.8*	32*
	5	6[4.9,7.2]	13.7 [12.4,15.2]	23.5[22.1,25]	31.1 [29.7,32.5]	7.7*	9.8*	7.6*	25.1*
	6+	7.3[6.4,8.2]	13.0[12,14]	18.5 [17.5,19.6]	24.9 [23.9,25.9]	5.7*	5.5*	6.4*	17.6*

\* Indicates that the difference in modern contraceptive use between the respective surveys is statistically significant with p-value &lt; 0.05.

year (Fig. 3).

#### 4.6. Sociodemographic characteristics and trends of modern contraceptive use

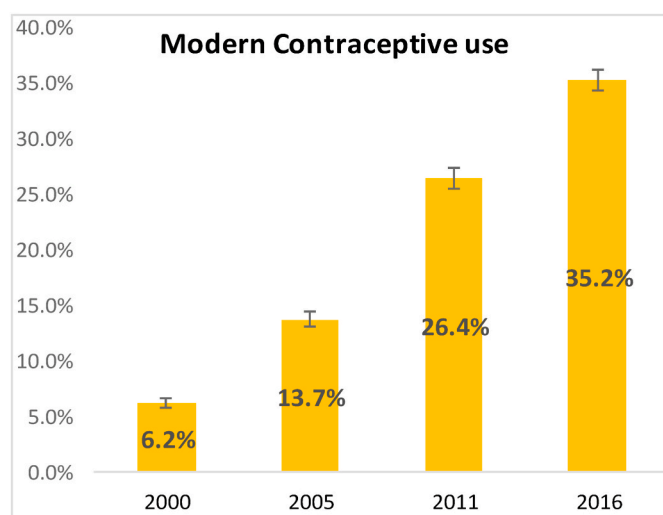
To see the changes in the use of modern contraceptives over time, this study divided the survey periods into four phases: 2000 to 2005, 2005 to 2011, 2011 to 2016, and 2000 to 2016 (as an overall change). Changes in modern contraceptive use vary by sociodemographic characteristics (Fig. 4). Women in rural areas had higher changes in contraceptive use over the 15-year period, increasing by 29.3% points from 3.2% (95% CI: 2.9, 3.6) in 2000 to 32.5% (95%CI: 32, 33.1) in 2016. The highest (11.2% point) increment in modern contraceptive use among rural women was observed between 2005 (10.5%) and 2011 (21.7%). Similarly, the utilization of modern contraceptives among urban women has increased by 21% points, from 28.5% in 2000 to 49.5% in 2016. While there were some changes over time in the first two phases, there was no significant change in contraceptive utilization among urban women between the 2011 and 2016 survey periods (Fig. 4).

The prevalence of modern contraceptive use was found to be highest

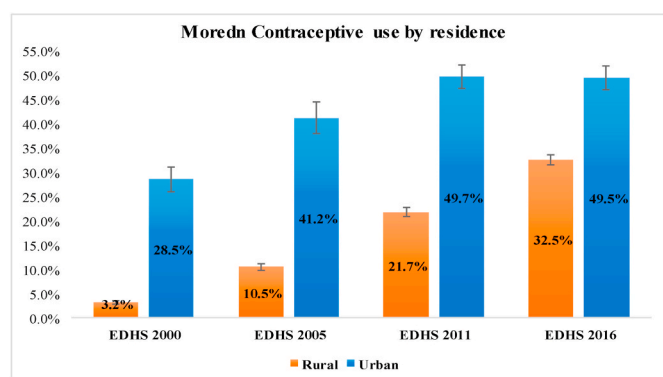
among women in the richest wealth quintile, 47% (95% CI: 46, 47.9). With regard to the trends of contraceptive use by wealth index, over a 15-year period, the least increment (16.7% points) was observed among women from the poorest households, while this increased by 35.2 and 36.8% points among the middle and richer groups in the wealth quintiles. Overall, there were significant changes in modern contraceptive use from phase to phase across all the wealth quintiles except the richest group, that didn't show a significant change between the 2011 and 2016 survey periods.

Trends in contraceptive use among women following different religions show significant increments over time, as revealed. According to the EDHS 2000, less than one out of every ten women used modern contraception. In 2016, this proportion increased to more than 4 in 10 women who followed the Orthodox 44.1% (95% CI: 43.4, 44.8), Catholic (43.0%; 95% CI: 37.2, 47.6) and Protestant faiths 42.3% (95% CI: 41.3, 43.2). Though the proportion of Muslim women who use modern contraception is the lowest compared to other faiths, it has increased more than threefold in 15 years (from 5% in 2000 to 21.3% in 2016).

The trend of modern contraceptive use at the age of women showed significant increments across the four survey periods. Women aged



**Fig. 3.** Trends in modern contraceptive use among married women of reproductive ages (15–49 years) according to EDHS 2000–2016.



**Fig. 4.** Trends of modern contraceptive use among married women of reproductive ages (15–49 years) by residence of women according to EDHS 2000, 2005, 2011 and 2016.

between 20 and 29 years were found to be the top among the age groups in modern contraceptive use. 40% (95% CI: 39.2, 41.1) of all women aged 25–29 used modern phones, a 32.5% increase from the proportion in 2000 (7.7%; 95% CI: 6.9, 8.6). Women in the age group of 45–49 had the lowest contraceptive utilization rate at 19.1% (95%CI: 17.5, 20.9) in 2016.

Women working in professionals (50.1%; 95% CI: 47.5%, 52.9%), skilled manual (47.3%, 95% CI: 45.1, 49.5%), and clerical work (46.3%; 95% CI: 40.9%, 52%) had the highest uptake of modern contraceptives in 2016 compared to women not working, working in agriculture (36.3%), and working in unskilled manual work (32.1%). Over the 15-year period, however, there was no statistically significant change in modern contraceptive use among women working in professional/managerial and clerical jobs, whereas women working in skilled manual labor and agriculture had the highest increases (37.2 and 29.9% points, respectively) (Table 5).

#### 4.7. Media exposure and access to FP messages and trends of contraceptive use

Statistically significant changes in modern contraceptive use were observed across all EDHSs. The proportion of women who had exposure to the media and access to family planning messages from different sources was higher compared to those women who had no access to the

media and FP messages (Table 3). With regard to the trends of contraceptive utilization over time, the highest increments (33.5 and 31.4% points) were observed among women who were exposed to three of the media (newspaper, radio and television) at least once a week and those women who had accessed FP messages from various sources, respectively. The highest increments in the use of modern contraceptives happened in the years between 2005 and 2011 as compared to other surveys. Modern contraceptive use among women who read newspapers increased by 24.4% points from 32.9% (95% CI: 27.9%, 38.9% in 2005 to 57.3% (95%CI: 54.7%, 59.6% in 2011), though the overall change due to this variable in the 15-year period was not statistically significant (Table 3).

#### 4.8. Trends in modern contraceptive method mix

Among the different types of modern contraceptive methods, five are the most commonly used methods, including injections, pills, implants, an Intrauterine device (IUD), and periodic abstinence. In the 2000 EDHS, injections (38.2%), pills (31.1%), and periodic abstinence (18.2%) were the top 3 methods used by Ethiopian women. However, the percentage of women using pills and periodic abstinence went down to 5.1% and 1.4% in 2016, while implants rose to 22% in 2016, increasing by 10% points from 2011 when it was reported for the first time in the EDHS. Injections have appeared as the most frequently used modern contraceptive method by married women in the last 15 years of surveys (Fig. 5).

#### 4.9. Bivariate analysis of the relationships between factors and modern contraceptive use

##### 4.9.1. Sociodemographic factors and modern contraceptive use

Analysis of modern contraceptive use among women of reproductive age groups by sociodemographic characteristics showed a statistically significant relationship (Table 4). Accordingly, women who live in urban areas were 2 times more likely to use modern contraceptives than their rural counterparts (COR = 2.0, 95%CI = 1.8–2.3). With regard to age, women between 20 and 34 years old are more likely to use modern contraceptives than women at the ages of 15–19. Furthermore, women aged 45–49 were less likely to use contraception (19.1%) than women aged 15–19 (31.5%, P-value 0.05). On the other hand, this study revealed that there was no statistically significant difference between women aged 15–19 and among women aged between 35 and 44 years (p-value > 0.05) (Table 2).

This study also found a statistically significant relationship between women's and their partners' occupational status and modern contraceptive use (p-value 0.05). Of all the respondents, about half (50.1%) of married women who were working in managerial/professional/technical occupations were using modern contraceptives, while less than one third (31.1%) of married women not employed/not working during the survey period were reported to be using modern contraceptive methods. Married women who were engaged in clerical, sales, agriculture, and skilled manual work were more likely to use modern contraceptive methods and, on the other hand, married women who were engaged in domestic/household and unskilled manual work did not show a significant difference in their use of modern contraceptive methods as compared to those women not working (p-value > 0.05) (Table 4). Furthermore, the occupation of women's partners/husbands is statistically associated with the use of modern contraceptives. Married women whose husbands were engaged in clerical, professional/managerial, sales and other occupations were more likely to use contraceptives than their counterparts whose partners were not currently working.

An examination of the relationship between modern contraceptive use and the age of women at their first marriage/cohabitation showed that there was no statistically significant association. Women who married before the age of 18 used modern contraceptives at a rate of 35.1%, while women who married after the age of 18 used modern

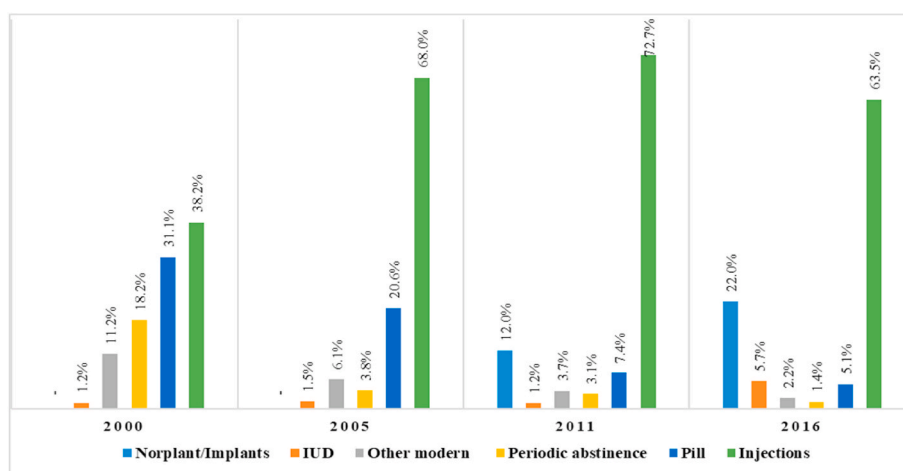


**Table 3**  
Trends of modern contraceptive use among married women of reproductive ages by media exposure and access to family planning messages Ethiopia DHS 2000–2016.

Characteristics	2000	2005	2011	2016	Changes in Modern Contraceptive Use Over time (in percentage points)				
	% [95%CI]	% [95%CI]	% [95%CI]	% [95%CI]	2005–2000	2011–2005	2016–2011	2016–2000	
Read newspaper	34.0 [28.4,39.2]	32.9 [27.9,38.9]	57.3 [54.7,59.6]	46.5 [43.6,49.4]	-1.2	24.4*	-10.8*	12.4	
Watch television	28.0 [25.1,31.9]	43.5 [41.3,45.9]	47.4 [46.2,48.7]	45.6 [44.3,46.8]	15.2*	3.9	-1.8	17.3*	
Listen to radio	17.5 [15.9,19.1]	27.0 [25.5,28.5]	36.6 [35.5,37.7]	43.1 [41.9,44.2]	9.5*	9.6*	6.5*	25.6*	
Media Exposure to radio, newspaper, and TV	None of them	4.7[4.4,5.1]	11.0 [10.5,11.5]	22.2 [21.6,22.8]	32.8 [32.2,33.4]	6.3*	11.2*	10.6*	28.1*
	1-2 of them	18.7 [17.2,20.3]	29.9 [28.6,31.3]	37.9 [36.9,38.8]	43.3 [42.3,44.3]	11.2*	8*	5.4*	24.6*
	Three of them	21.1 [11.5,30.2]	29.3 [22.8,38.7]	52.4 [48.5,56.3]	54.6 [50.3,58.2]	8.2	23.1*	2.2	33.5*
Visited by family planning worker	18.0 [14.7,21.6]	20.3 [18.4,22]	32.2 [31,33.3]	40.9 [40.1,41.8]	2.3	11.9*	8.7*	22.9*	
Heard FP message on radio	18.5 [17.2,19.8]	25.9 [24.9,27]	36.4 [35.5,37.3]	43.9 [42.9,44.8]	7.4*	10.5*	7.5*	25.4*	
	32.6 [29.3,35.7]	43.7 [41.8,45.6]	47.8 [46.7,49]	45.1 [43.9,46.3]	11.1*	4.1	-2.7	12.5*	
Heard FP message on television	25.4 [21.6,28.8]	43.5 [41.1,45.9]	47.2 [45.2,49.3]	49.4 [47.2,51.8]	18.1*	3.7	2.2	24*	
	32.2 [29.3,35.5]	42.8 [40.2,45.1]	47.2 [45.2,49.1]		10.6*	4.4			
FP message in voice/text message on phone **				42.1 [38.9,45.2]					
FP message from Community meetings	9.0[8.3,9.7]	18.0 [17.2,18.8]	30.0 [29.2,30.9]		9*	12*			
	10.1 [9.4,10.8]	18.8 [18,19.5]	31.3 [30.6,32.1]	41.5 [40.7,42.2]	8.7*	12.5*	10.2*	31.4*	
Know modern contraceptive method	7.2[6.8,7.7]	15.7 [15.1,16.2]	27.3 [26.7,27.8]	35.7 [35.2,36.2]	8.5*	11.6*	8.4*	28.5*	

<sup>1</sup> \*\* Denotes that data for these variables were not available from respective surveys.

<sup>2</sup> Sources of family planning messages include Health Workers, Radio, Television, Newspaper, Posters, Voice Messages through mobile phones, and Community meetings.



**Fig. 5.** Percent distribution of currently married women age 15–49 by current use of modern contraceptive methods according to EDHS 2000, 2005, 2011, and 2016.

contraceptives at a rate of 35.4% (p-value > 0.05).

Modern contraceptive use shows a statistically significant association with the household wealth index. The proportion of married women who use modern contraceptives has increased as the wealth index of households has improved. Among all household respondents, 19.4% of the poorest and 31.3% of poor women use modern contraception. Respondents from the wealthiest households (47%) were 3.7 times more likely to use modern contraception than those from the poorest households (19.4%). Affiliation with religions was also found to have a significant association with modern contraceptive use among married women. Among all respondents, Muslim religious adherents were less

likely to use modern contraception (21.4%) than Orthodox (44.1%), Catholic Christianity (43.0%), and Protestants (42.3%). Respondents who belong to Orthodox Christianity were 2.9 times more likely to use modern contraceptives than their counterparts who practice Islamic faith (P-value < 0.05) (Table 4).

The education level of both women and their husbands/partners had a statistically significant relationship with contraceptive use by women (p-value 0.05). As women's education levels rise, so does the proportion of women who use modern contraceptives. Modern contraceptive use ranged from 30.9% among women who had no education to 50.9% and 50.4% among women who had completed secondary and higher level

**Table 4**Relationship between *Independent variables* and modern contraceptive use among women of reproductive ages using the 2016 EDHS.

Characteristics		Modern Contraceptive use (%)	COR	95% CI for COR		P-value	
				Lower	Upper		
<b>Sociodemographic Characteristics</b>							
Residence	Rural (ref)	32.5					
	Urban	49.5	2.0	1.8	2.3	0.000	
Age	15-19 (ref)	31.5					
	20-24	38.2	1.3	1.1	1.6	0.005	
	25-29	40.2	1.5	1.2	1.8	0.000	
	30-34	36.7	1.3	1.0	1.5	0.023	
	35-39	33.7	1.1	0.9	1.4	0.355	
	40-44	32.8	1.1	0.9	1.3	0.602	
Religion	45-49	19.1	0.5	0.4	0.7	0.000	
	Muslim (ref)	21.4				0.000	
	Catholic	43.0	2.8	1.7	4.4	0.000	
	Orthodox	44.1	2.9	2.6	3.2	0.000	
Total number children ever born	Protestant	42.3	2.7	2.4	3.0	0.000	
	0 (ref)	36.7					
	1	41.4	1.2	1.0	1.5	0.039	
	2	42.5	1.3	1.1	1.5	0.012	
	3	38.1	1.1	0.9	1.3	0.532	
	4	37.2	1.0	0.8	1.2	0.814	
	5	31.1	0.8	0.6	1.0	0.016	
Woman's Occupation	6+	24.9	0.6	0.5	0.7	0.000	
	Not currently working (ref)	31.1					
	Professional/technical	50.1	2.2	1.7	2.9	0.000	
	Clerical worker	46.3	1.9	1.1	3.2	0.015	
	Sales worker	42.9	1.7	1.5	1.9	0.000	
	Agriculture	36.3	1.3	1.1	1.4	0.000	
	Household, domestic, and services	32.1	1.0	0.8	1.4	0.740	
	Skilled manual worker	47.3	2.0	1.6	2.5	0.000	
	Unskilled manual worker	38.3	1.4	0.9	2.2	0.171	
	Partner's occupation	Not currently working (ref)	22.4				
Professional/technical		42.1	2.5	2.0	3.2	0.000	
Clerical		62.3	5.7	3.3	9.9	0.000	
Sales		43.5	2.7	2.1	3.4	0.000	
Agriculture		33.5	1.7	1.5	2.1	0.000	
Household/domestic service		44.2	2.7	2.1	3.6	0.000	
Skilled manual		47.7	3.2	2.5	4.0	0.000	
Unskilled manual		37.4	2.1	1.6	2.8	0.000	
Household wealth index in quintiles		Poorest (ref)	19.4				
		Poor	31.3	1.9	1.6	2.2	0.000
	Middle	37.1	2.5	2.1	2.8	0.000	
	Richer	40.4	2.8	2.4	3.3	0.000	
	Richest	47.0	3.7	3.2	4.2	0.000	
Highest educational level	No Education (ref)	30.9					
	Primary	39.0	1.4	1.3	1.6	0.000	
	Secondary	50.9	2.3	2.0	2.7	0.000	
	Higher	50.4	2.3	1.8	2.8	0.000	
Husband's educational level	No Education (ref)	29.7					
	Primary	37.8	1.4	1.3	1.6	0.000	
	Secondary	43.4	1.8	1.6	2.1	0.000	
	Higher	48.3	2.2	1.9	2.6	0.000	
<b>Women's Empowerment (Participation in Decision Making)</b>							
Final say on making large household goods' purchases	No (ref)	30.1					
	Yes	37.6	1.4	1.3	1.5	0.000	
Final say on visits to family or relatives	No (ref)	28.9					
	Yes	36.5	1.4	1.3	1.6	0.000	
Final say on woman's health care	No (ref)	29.0					
	Yes	36.6	1.4	1.3	1.6	0.000	
Number of decisions that women participate in	None (ref)	26.6					
	One - two of them	32.8	1.3	1.1	1.6	0.000	
	Three of the decisions	37.8	1.7	1.4	1.9	0.000	
<b>Fertility Preference</b>							
Age at first marriage	Less than 18 (ref)	35.1					
	18 and above	35.4	1.0	0.9	1.1	0.711	
Ideal number of children	0 (ref)	23.7					
	1	58.1	4.5	2.4	8.2	0.000	
	2	55.6	4.0	3.2	5.1	0.000	
	3	50.0	3.2	2.5	4.1	0.000	
	4	47.0	2.9	2.4	3.4	0.000	
	5	34.6	1.7	1.4	2.1	0.000	
	6+	25.6	1.1	0.9	1.3	0.287	
Decision-maker for using FP	Mainly husband (ref)	100.0					
	Mainly Woman	99.2	0.1	0.0	33.3	0.382	
	Joint decision	97.9	0.0	0.0	12.2	0.238	

(continued on next page)

**Table 4** (continued)

Characteristics		Modern Contraceptive use (%)	COR	95% CI for COR		P-value
				Lower	Upper	
Family size concordance	Husband and wife want same (ref)	40.8				
	Husband wants more	29.8	0.6	0.6	0.7	0.000
	Husband wants fewer	36.9	0.8	0.7	1.0	0.050
<b>Exposure to mass media and FP messages</b>						
Heard FP message from one of the sources*	No (ref)	31.1				
	Yes	41.5	1.6	1.4	1.7	0.000
Reads newspaper	No (ref)	35.0				
	Yes	46.5	1.6	1.2	2.1	0.000
Watches television	No (ref)	33.8				
	Yes	45.6	1.6	1.4	1.9	0.000
Listens to radio	No (ref)	33.8				
	Yes	43.1	1.5	1.3	1.7	0.000
Media Exposure to radio, newspaper, and TV once in a week	None of them (ref)	32.8				
	1-2 of them	43.3	1.6	1.4	1.7	0.000
	Three of them	54.6	2.5	1.6	3.7	0.000

\* Information sources include health worker, radio, television, newspaper, poster, voice message, and community meetings/events.

**Table 5**

Final Logit model with predictors of Modern Contraceptive use among women of reproductive age [15–49] using the 2016 EDHS.

Characteristics		AOR	AOR (95% CI)	P-value
Age	15-19 (ref)			0.000
	20–24	1.2	[0.9, 1.5]	0.070
	25–29	1.4	[1.1, 1.7]	0.009
	30–34	1.3	[1, 1.7]	0.019
	35–39	1.3	[1, 1.7]	0.039
	40–44	1.3	[1, 1.7]	0.043
Number children/Parity	0 (ref)			0.000
	1	1.2	[1, 1.5]	0.080
	2	1.3	[1, 1.6]	0.033
	3	1.1	[0.9, 1.3]	0.517
	4	1.1	[0.9, 1.4]	0.450
	5	0.9	[0.7, 1.1]	0.207
Household wealth index in quintiles	6+	0.7	[0.6, 0.9]	0.003
	Poorest (ref)			0.000
	Poor	1.8	[1.6, 2.1]	0.000
	Middle	2.4	[2.1, 2.8]	0.000
	Richer	2.7	[2.4, 3.2]	0.000
Occupational status	Richest	3.0	[2.5, 3.5]	0.000
	Not working (ref)			0.000
Educational level	Working	1.3	[1.2, 1.5]	0.000
	No Education (ref)			0.031
	Primary	1.1	[1, 1.2]	0.147
	Secondary and above	1.2	[1.1, 1.6]	0.001

education, respectively. Similarly, educational levels of partners’/husbands’ were also statistically associated with contraceptive use among married women. Married women who went to primary, secondary, and higher education levels were found to be 1.4, 1.8, and 2.2 times more likely to use modern methods than women whose husbands did not go to school (Table 4).

An examination of the relationship between the total number of children ever born to a woman and the use of modern contraceptives among married women indicated a statistically significant association. Women with 1–2 children were more likely to use modern contraceptives than those with no children. Women with one child and two children were 1.2 and 1.3 times more likely to use contraceptives compared to those with no children (P-value <0.05). In contrast, women with 5–6 or more children were 0.8 and 0.6 times found to be less likely to use modern contraceptives than women who have no children. On the other hand, a statistically significant difference was not found in modern contraceptive use between women who have three or four children and those with no children (Table 4).

#### 4.9.2. Women empowerment (participation in decision making)

Women who are reported to have participated in various decisions are more likely to use modern contraceptive methods than women who have had no say in such matters. The proportion of women who said they had a say in the purchase of large household goods who used modern contraception was 7.5% higher (37.6%) than those who did not participate in a similar decision (30.1%) (P-value 0.05). The study also showed that the use of modern contraceptives by women has increased with the number of decisions in which women participate. Women that participated in three major decisions, including the purchase of large household goods, the decision to visit their family/relatives, and a decision regarding the healthcare of women, were 1.7 times more likely to use modern contraceptives than their counterparts who participated in none of the decisions (Table 4).

#### 4.9.3. Fertility preference/norms and modern contraceptive use

Analysis of factors of fertility preference against modern contraceptives revealed that modern contraceptive use is not influenced by who decides whether or whether to use family planning methods. All the respondents where the husband is the one who decides about using family planning used modern contraceptives and similarly almost all (99.2%) of the respondents who had the role of making the decision themselves alone were using contraceptives (p-value 0.382) (Table 4).

The total number of children that women expect to have in their lives was examined for their relationship with modern contraceptive use. During the survey period, the proportion of women who used modern contraception increased as the ideal total number of children they wanted to have in their lifetime decreased. More than half of the women (58.1%) who wanted to have only one child used modern contraception, while only a quarter (25.6%) of the women planning to have six or more children did (Table 4).

The husband’s desire for children was examined if it had an influence on the use of modern contraceptives by married women. Accordingly, there is a significant difference in modern contraceptive use among married women when their husbands desire more children and when both desire the same number of children. Women with husbands who want more children are 0.8 times less likely to use modern contraception than women with husbands who want the same number of children as other women (P-value 0.05). Nonetheless, there was no statistically significant difference in the use of modern contraceptives between women whose husbands want fewer children than those with a husband wanting the same number of children with the woman (Table 4).

#### 4.9.4. Exposure to mass media and access to family planning messages

Statistically significant differences were observed between women who were exposed to family planning and those who were not. Women who were exposed to family planning messages from a variety of sources

were 1.6 times more likely to use contraception than those who were not (p-value 0.05). Reading newspapers, watching television and listening to the radio at least once a week are all significantly associated with modern contraceptive use among married women. Those women who reported that they read newspapers or watched television at least once a week were 1.6 times more likely to use modern contraceptives than those who did not. Similarly, married women who reported listening to the radio at least once a week prior to the survey period were 1.5 times more likely to use modern contraceptives than their counterparts who did not (P-value 0.05). Women who were exposed to all three media (newspaper, television, and radio) at least once a week had a much higher chance (2.5 times more likely) of using contraception than those who were not exposed to these media at all (P-value 0.05).

#### 4.9.5. Predictors of modern contraceptive use

This study revealed that the utilization of modern contraceptives is significantly influenced by the age, parity, wealth index, occupational status, and educational level of women. Women aged 25–44 years had a higher likelihood of using modern contraceptives than women aged 15–19 years (AOR = 1.4, 1.3–1.5; P-value 0.05), but older women (45–49 years) had a lower likelihood of using modern contraceptives than the young (15–19 years) (AOR 0.6, 0.5–0.8, p-value = 0.02).

Women's educational level is also a strong predictor of their use of modern contraceptives. This study found that women with secondary education had 20% higher odds of using modern contraceptives (AOR = 1.2, 1.1–1.6, p-value = 0.02) than those women with no education. Conversely, the odds of using modern contraceptives were not significantly different between women who had no education and those with primary levels of education (P-value > 0.05). The odds of using modern contraceptives increased with increasing wealth index, with women from the poorest households having three times the odds of using modern contraceptives. Similarly, richer women had 2.7 times higher odds of using modern contraceptives than those women in the poorest households (p-value <0.05). Poor women also had 80% higher odds of modern contraceptive use as compared to the poorest women (Table 5).

Parity and the use of modern contraceptives among married women indicated a statistically significant association in the adjusted logit model. In the bivariate analysis, women that had 3–4 children were the only categories that did not show a significant difference in the odds of using modern contraceptives compared to those women that had no children. In the adjusted model, however, the odds of using modern contraceptives were significant only for women who had 2 (AOR = 1.3, 95%CI = 1.1–1.6) and ≥6 children (AOR = 0.7, 95%CI = 0.6–0.9). Women who had 1 or 3–5 children did not show a significant difference in the odds of using modern contraceptives as compared to women who had no children. The predictors of modern contraceptive use were being in the age group of 25–29 (AOR = 1.4, 95%CI = 1.1–1.7), having two children (AOR = 1.3, 95%CI = 1.1–1.6), the richest wealth category (AOR = 3.0; 95%CI = 2.5–3.5), currently working (AOR = 1.3, 95%CI = 1.2–1.5) and attending secondary and above education (AOR = 1.2, 95%CI = 1.1–1.6) (Table 5).

## 5. Discussion

The use of modern contraceptives in Ethiopia has shown steady improvement over the past 15 years (2000–2016). In this period, the proportion of women who used modern contraceptives showed a five-fold increment, from 6.2% to 35.2%. In each of the 15 years, there was an average of a 1.9% increment in the proportion of married women who used modern contraceptives in the country. Ethiopia, with the prevalence of modern contraceptive use in 2016 (35.2%), ranks 3rd among East African countries, following Kenya (53.2%) and Rwanda (47.5%). From 2000 to 2015, the prevalence of modern contraceptives among married women increased by an annual average of 2.8% points in Rwanda and 1.4% points in Kenya [51,52]. Based on this study and with such a linear increment, the prevalence of modern contraceptive use in

Ethiopia is estimated to reach 42.8% by the end of 2020. This rate of increment is, however, far below the expected annual (5%) growth to attain the Ethiopian Government's plan of increasing the utilization rate to 55% by the end of 2020 [7,9]. The reasons for the lower prevalence of modern contraceptive use in Ethiopia as compared to Kenya and Rwanda could be attributed to the lack of access to family planning services and the poor health infrastructure, training for health professionals, and cultural variations between the countries. This study revealed that the age of women, parity, wealth index, occupational status, and educational level are the predictors of modern contraceptive use among married women in Ethiopia.

Over a 15-year period, modern contraceptive use increased by 35.2 and 36.8% points among the middle and richer groups in the wealth quintiles, respectively. Women from the richest quintile had 3 times higher odds of using modern contraceptives compared to women from the poorest quintile. These findings are supported by studies conducted in Malawi, Rwanda and Nepal where an increasing trend of modern contraceptives was observed across the wealth quintiles over a 10-year period. The DHS study in Malawi showed that contraceptive use among married women in the poorest quintile increased from 20% in 2000 to 35% in 2010, and among women in the richest quintile, it increased from 36% in 2000 to 48% in 2010. In addition to this, the study revealed that women in the rich quintile were more likely to use modern contraceptives compared to those in the poorest quintiles [35]. The DHS analytical study in Rwanda and Nepal also supports our findings that women in the richest quintiles in Rwanda and Nepal respectively were 1.6 and 1.4 times more likely to use modern contraceptives compared to women in the poorest wealth quintile [36]. This could be because women in the wealthiest quintiles have better access to education, are more likely to be exposed to mass media and messages about contraception, and are thus more likely to use contraception than women in the poorest quintiles.

The age of women has significantly influenced modern contraceptive use by married women in Ethiopia. Women aged 25–44 years had a higher likelihood of using modern contraceptives than women aged 15–19 years (AOR = 1.4, 1.3–1.5, P-value 0.05). Older women (45–49 years) had lower odds of using modern contraceptives compared to young ones aged 15–19 years (AOR = 0.6, 0.5–0.8, p-value = 0.02). These findings are supported by a study conducted in Ghana where women between the ages of 20–44 years were more likely to use modern contraceptives compared to young women, aged 15–19 years, and older women (45–49 years). The study in Ghana revealed that women in the age groups 20–24, 25–29, 30–34, 35–39, and 40–44 years respectively were 2.63, 2.31, 1.94, 1.49, 1.44 times more likely to use modern contraceptives than older women in the age group 44–49 years [53]. Furthermore, a Nepalese study that looked at the contextual influence of rural women on modern contraception use found that the odds of using modern contraception were 26% higher (AOR = 1.26, 95%CI = 1.04–1.54) among women 25–34 years old compared to those 15–24 years old. Similarly, the study indicated that women above the age of 44 years had lower odds of using modern contraceptives (AOR = 0.36, 95%CI = 0.25–0.52) compared to younger ones (15–24 years). On the contrary, there was no statistically significant difference in the odds of modern contraceptive use between women aged 15 to 24 and those aged 35 to 44 [36]. Such a discrepancy between our findings and the study in Nepal could be due to the fact that the study in Nepal was conducted on rural women alone, while our study analyzed data from both rural and urban women.

Parity and the use of modern contraceptives among married women indicated a statistically significant association in the adjusted logit model. In our study, women with two children had a higher likelihood of using modern contraception (AOR = 1.3; 95% CI = 1.1–1.6), while women with six children had a 30% lower likelihood of using modern contraception (AOR = 0.7, 95% CI = 0.6–0.9) than those with no children. Current findings are different from the results of different studies which found that modern contraceptive use increased with parity [29,

54,55]. This might be because women who have high parity could be in the older age groups and have no formal education, which can impact on the use of modern contraceptives.

Educational status is also one of the strongest predictors of modern contraceptive use by married women. In this study, women with secondary education had 20% higher odds of using modern contraceptives than women with no education. Similar to this finding, a study in Ghana revealed that there was less likelihood of using modern contraceptive methods among women with no formal education relative to women with some formal education (AOR = 0.57, 95% CI = 0.37–0.87) [41]. In agreement with this, a study in Nigeria also revealed that contraceptive utilization among women who had secondary and above education was 7 times higher (AOR = 7.7, 95%CI = 1.5–10.5) than their counterparts who had no education [30]. This could be because women that attended secondary school and above have better exposure to reproductive health information including contraceptive methods, offer them better level of income and autonomy which will enable women to make informed choices and hence more likely to plan their family using modern contraceptives than their counterparts.

In this study, modern contraceptive use was significantly influenced by the occupational status of women. Those women who were engaged in any occupation during the survey period were 77% less likely to use modern contraceptives as compared to their counterparts. Similar to this finding, a further analysis of the DHS of Rwanda and Nepal found that employed women had the highest levels of contraceptive use compared to those who were not employed [36]. This could be due to the fact that women engaged in various occupations will be exposed to different people or workmates at their work place, which in turn might offer an opportunity to share information and experience of birth spacing and the use of modern contraceptives, which could be translated into practice. In contrast, a case control study in Ghana revealed that the employment status of women was not significantly associated with modern contraceptive use [41]. This could be due to the variations in study design and sample size used in the case control study conducted in Ghana and in our study, which used a nationally representative sample size.

### 5.1. Strength and limitations

This study had a number of strengths. First, the study utilized large datasets representing the whole country, and thus the findings were based on adequate statistical power. Second, calculations were done after the data was weighted for sampling probabilities and non-response. Complex sampling procedures were also considered during testing of statistical significance through considering all married women in the reproductive age group. Third, analytic techniques were applied to understand the sources of change in modern contraceptive use, and important variables such as women's decision-making, representing women's autonomy, were involved.

This study highlighted important findings to support the family planning program in Ethiopia, but it is not without limitations, which could affect the conclusions based on some findings. Due to a lack of data, important variables such as cultural issues, infrastructure, service quality and availability, and policies in Ethiopia were not included in the trend analysis. However, some contribution of this variable can be represented during the trend analysis.

## 6. Conclusion

Modern contraceptive use has slowly improved during Ethiopia's DHS 2000-Ethiopia is ranked third among East African countries. Over the past 15-year period, an annual average of 1.9% point increment was observed in modern contraceptive use among married women in the country. However, this rate of increment is very slow compared to the expected 5% annual growth to achieve the 2020 target for the country. At this rate, the country may also lag behind the SDGs' target of

achieving zero unmet needs for contraception by 2030.

There have been significant changes in the use of modern contraceptives by Ethiopian women living in rural areas. However, women in rural Ethiopia still have a lower rate of modern contraceptives as compared to their urban counterparts. In addition to this, modern contraceptive use among women in urban Ethiopia didn't show significant change between 2011 and 2016. Moreover, women following the Islamic faith are less likely to use contraceptives than those following Christianity.

Exposure to family planning messages, participation in decision-making, and the number of children desired, though not found significant in the final logit model, had an influence on the use of modern contraceptives. Among the available modern contraceptive methods, short-term options, including injections and pills, are the most common methods used by married women in Ethiopia. This study found that utilization of modern contraceptives is significantly influenced by age, parity, wealth index, occupational status, and educational level of women. The use of modern contraceptives was higher among women in the highest income bracket, who worked in some occupations, had completed secondary and higher education, had two children, and were between the ages of 25 and 29. Modern contraceptives, on the other hand, are less common among women who have had more than six children compared to those who have had no children. Similarly, older and elderly women are less likely to use modern contraception. In general, being in the age group of 25–29, having two children, being in the richest wealth category, currently working, and attending secondary and higher education are predictors of modern contraceptive use.

## Ethics approval and informed Consent

The 2000, 2005, 2011, and 2016 Ethiopia Demographic and Health Surveys were conducted under the scientific guidance of EHNRI Review Board, the National Research Ethics Committee at the Ministry of Science and Technology, ICF International's Institutional Review Board, and CDC. ICF International through the Ethiopia DHSs program approved and authorized to download and use the survey data and provided technical assistance.

## Consent for publication

It is not applicable.

## Data availability

Data are not owned by the authors. Data are available from the Ethiopian DHS Program (<https://dhsprogram.com/Data/>).

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## Authors' contributions

Conceived and designed the research: WM, AH, WW, and TB. Performed the experiments: WM, AH, WW, and TB. Analyzed the data: WM, AH, WW, and TB. Contributed materials/analysis tools: WM, WW, and TB. Wrote the paper: WM, WW, and TB.

## Declaration of competing interest

The authors have declared that no conflicting interests exist.



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## References

- [1] WHO (World Health Organization), Family planning/Contraception - Key Facts. [www.who.int](http://www.who.int), World Health Organization, [cited 2019 Jul 1]. Available from: <https://www.who.int/en/news-room/fact-sheets/detail/family-planning-contraception>.
- [2] Center for Reproductive Rights, ICPD AND HUMAN RIGHTS [Internet], 2013. Available from: [www.reproductiverights.org](http://www.reproductiverights.org).
- [7] Central Statistical Agency (CSA) [Ethiopia] and ICF, Demographic and Health Survey of Ethiopia, Addis Ababa, Ethiopia, and Rockville, Maryland, USA, 2016.
- [8] H.T. Debas, P. Donkor, A. Gawande, D.T. Jamison, M.E. Kruk, E.D.I.T. THIRD, Dean T. Jamison, CNM. Essential Surgery. Disease Control Priorities, in: Nugent Rachel, Gelband Hellen, Susan Horton, R.L. Prabhat Jha (Eds.), World Bank, Washington, DC, 2015, p. 445.
- [9] United Nations, Department of Economic, P.D. Social Affairs, World Family Planning 2017 - Highlights, ST/ESA/SER.A/414, New York, 2017.
- [10] [Internet] WHO, Maternal mortality [cited 2019 Jul 15]. Available from: <https://www.who.int/news-room/fact-sheets/detail/maternal-mortality>, 2018.
- [11] L. Say, D. Chou, A. Gemmill, Ö. Tunçalp, A. Moller, J. Daniels, et al., Global causes of maternal death : a WHO systematic analysis, *Lancet* 2 (2014) 323–333.
- [13] Federal Democratic Republic of Ethiopia Ministry of Health October, NATIONAL guideline for family planning federal democratic Republic of Ethiopia, Fed Democ Repub Ethiop Minist Heal (2011) 1–69. Oct. 2011. 2011.
- [14] Federal Democratic Republic of Ethiopia M of H, ANNUAL HEALTH SECTOR PERFORMANCE, 2018.
- [15] [Ethiopia] Ethiopian Public Health Institute (EPHI), I. Ethiopia Mini Demographic and Health Survey, Key Indicators [Internet], EPHI and ICF, Maryland, USA, 2019. Available from: [www.DHSprogram.com](http://www.DHSprogram.com).
- [16] L.A. Sech Jr., Daniel R. Mishell, Contraception and its global public health impact, *Women Health* 11 (2015) 727–728.
- [17] U.N.F.P.A. Unfinished, Business: the pursuit of rights and choices FOR ALL, *State World Popul* (2019) 1–176, 2019.
- [18] FMOH. Health, Sector Transformation Plan, Addis Ababa: The Federal Democratic Republic of Ethiopia Ministry of Health, 2015.
- [19] J.B. Asimwe, P. Ndugga, J. Mushomi, J.P. Menyenye Ntozi, Factors associated with modern contraceptive use among young and older women in Uganda; a comparative analysis, *BMC Publ. Health* 8 (14) (2014) 926.
- [20] ICRW (International Center for Research on Women), Why invest in international family planning? a look at the evidence [Internet]. Washington, DC, Available from: [www.icrw.org](http://www.icrw.org), 2018.
- [21] GUTTMACHER INSTITUTE, Investing in Contraception and Maternal and Newborn Health for Adolescents in Ethiopia, 2018, 2018 Dec;(December). Available from: [www.guttmacher.org](http://www.guttmacher.org).
- [22] Family Planning 2020. Family Planning's Return on Investment, 2018 [cited 2019 Jul 1];1(202). Available from: [www.familyplanning2020.org](http://www.familyplanning2020.org).
- [23] A.G. Worku, G.A. Tessema, A.A. Zeleke, Trends of Modern Contraceptive Use Among Young Married Women Based on the 2000 , 2005 , and 2011 Ethiopian Demographic and Health Surveys : A Multivariate Decomposition Analysis, 2015, pp. 1–14.
- [24] T. Jane, , School of public health and tropical medicine, tulane university, Evasius K. Bauni, in: Department of Geography, Kenyatta University, Kenya), RON J., (Faculteit van de Economische, Sociale en Politieke Wetenschappen, Vrije Universiteit Brussel, B (. Factors Affecting Contraceptive Use in Sub-Saharan Africa, National Academy of Sciences, Washington, D.C., 1993. Available from: <http://www.nap.edu/catalog/2209.html>.
- [25] S. Bellizzi, H.L. Sobel, H. Obara, M. Temmerman, Underuse of modern methods of contraception : underlying causes and consequent undesired pregnancies in 35 low- and middle-income countries, *Human Reproduct.* 30 (4) (2015) 973–986.
- [26] R. Ochako, M. Mbondo, S. Aloo, S. Kaimenyi, R. Thompson, M. Temmerman, et al., Barriers to modern contraceptive methods uptake among young women in Kenya : a qualitative study, *BMC Publ. Health* 15 (118) (2015) 1–9.
- [27] D.S. Getahun, H.F. Wolde, K.F. Muchie, H.Y. Yeshita, Utilization and determinants of long term and permanent contraceptive methods among married reproductive age women at Janamora district, northwest Ethiopia, *BMC Res. Notes* 11 (1) (2018) 1–6, <https://doi.org/10.1186/s13104-018-3942-0>. Available from: .
- [28] F.A. Mekonnen, W.N. Mekonnen, S.H. Beshah, Predictors of long acting and permanent contraceptive methods utilization among Women in Rural North Shoa, *Ethiopia, Contracept Reprod Med* 2 (1) (2017) 1–6.
- [29] Justin Geno Obwoya, K. Joseph, A.K. Wulifan, Factors influencing contraceptives use among women in the Juba city of South Sudan, Available from: <https://www.hindawi.com>, 2018, 7.
- [30] Sennon Hounton, Aluisio J.D. Barros, Amouzou Agbessi, Shiferaw Solomon, Maiga Abdoulaye, Akanni Akinyemi, et al., Patterns and trends of contraceptive use among sexually active adolescents in Burkina Faso, Ethiopia, and Nigeria: evidence from cross-sectional studies [Internet], *Glob. Health Action* 1 (October) (2015) 1–11. Available from: <http://www.globalhealthaction.net/index.php/gha/article/view/29737>.
- [31] Syed Khurram Azmat, Moazzam Ali, Muhammad Ishaque, Ghulam Mustafa, O.F. K. Waqas Hameed, et al., Assessing predictors of contraceptive use and demand for family planning services in underserved areas of Punjab province in Pakistan : results of a cross-sectional baseline survey, *Biomed Cent* 12 (25) (2015) 1–10.
- [32] A.M. Moore, Y. Gebrehiwot, T. Fetters, Y.D. Wado, A. Bankole, S. Singh, et al., The estimated incidence of induced abortion in Ethiopia, 2014: changes in the provision of services since 2008, *Int. Perspect. Sex. Reprod. Health.* 42 (3) (2016) 111–120.
- [33] J. Stover, Æ.J. Ross, How Increased Contraceptive Use Has Reduced Maternal Mortality, 2014, p. 10995.
- [34] S. Ahmed, Maternal Deaths Averted by Contraceptive Use: Results from a Global Analysis of 172 Countries Saifuddin, vol. 410, 2010.
- [35] J. Chintsanya, Trends and Correlates of Contraceptive Use Among Married Women in Malawi: Evidence from 2000-2010 Malawi Demographic and Health Surveys [WP87], DHS Working Papers, 2013.
- [36] Wenjuan Wang, Alva Soumya, Rebecca Winter, CB. Contextual influences of modern Contraceptive use among rural women in Rwanda and nepal, *DHS Analytical Studies* 41 (2013).
- [37] J.G. Balew, Y. Cho, C.T. Kim, W. Ko, Structural Determinants in Family Planning Service Utilization in Ethiopia : EDHS 2011 Analysis, 2015, 2015.
- [38] A. Musa, N. Assefa, F. Weldegebreal, H. Mitiku, Z. Teklemariam, Factor associated with experience of modern contraceptive use before pregnancy among women who gave birth in Kersa HDSS, Ethiopia, *BMC Public Health* [Internet] 16 (1) (2016) 1–6, <https://doi.org/10.1186/s12889-016-3292-6>. Available from: .
- [39] F.N. Tiruneh, K.Y. Chuang, P.A.M. Ntenda, Y.C. Chuang, Factors associated with contraceptive use and intention to use contraceptives among married women in Ethiopia, *Women Health* 56 (1) (2016) 1–22.
- [40] S.H. Nyarko, Prevalence and correlates of contraceptive use among female adolescents in Ghana, *BMC Wom. Health* (2015) 4–9.
- [41] S. Eliason, J.K. Awoonor-Williams, C. Eliason, J. Novignon, M. Aikins, Determinants of modern family planning use among women of reproductive age in the Nkwanta district of Ghana: a case-control study, *Reprod. Health* 11 (1) (2014) 1–10.
- [42] F.A. Mekonnen, W.N. Mekonnen, S.H. Beshah, Predictors of long acting and permanent contraceptive methods utilization among Women in Rural North Shoa, *Ethiopia, Contracept Reprod Med* 2 (1) (2017) 1–6.
- [43] Do NK. Mai, Women's Empowerment and Choice of Family Planning Methods [Internet], 2010 (WP-10-115). Available from: <http://www.cpc.unc.edu/measure>.
- [44] A. Kes, N. John, L. Murithi, M. Steinhaus, S. Petroni, Economic Impacts of Child Marriage: Global Synthesis Report [Internet]. Washington, DC, 2017. Available from: <http://documents.worldbank.org/curated/en/530891498511398503/pdf/116829-WP-P151842-PUBLIC-EICM-Global-Conference-Edition-June-27.pdf>.
- [45] A. Gebeyehu, Trends and Determinants of Contraceptive Use Among Young Married Women (Age 15-24), 2014. August.
- [46] [Ethiopia] Central Statistical Agency, Population Projections for Ethiopia, Addis Ababa, 2013.
- [47] UN Department of Economics and Social Affairs, World Population Prospects - Population Division - United Nations [Internet], vol. 9, The International Journal of Logistics Management, 2015, pp. 1–13. Available from: <https://esa.un.org/unpd/wpp/>.
- [48] Central Statistical Authority [Ethiopia] and ORC Macro. Ethiopia Demographic and Health Survey, Addis Ababa, Maryland, 2000.
- [49] Central Statistical Agency [Ethiopia] and ORC Macro, Ethiopia Demographic and Health Survey [Internet]. Addis Ababa, Maryland, Addis Ababa, Ethiopia, Central Statistical Agency and ORC Macro, 2005. Available from: <http://www.measuredhs.com>.
- [50] Central Statistical Agency and ICF International, Ethiopia Demographic and Health Survey [Internet]. Addis Ababa, Ethiopia and Maryland, USA, 2011. Available from: <http://www.measuredhs.com>.
- [51] I. Kenya National Bureau of Statistics, Kenya Demographic and Health Survey, 2014. Nairobi, Kenya, and Rockville MD, USA.
- [52] National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH), [Rwanda] and II. 2014-15 RDHS Key Findings, 2014. Rockville, Maryland, USA, Rwanda.
- [53] P.A. Avisah, S. Dery, B.K. Atsu, A. Yawson, R.M. Aloitaibi, H.R. Rezk, et al., Modern Contraceptive Use Among Women of Reproductive Age in Ghana : Analysis of the 2003 – 2014 Ghana Demographic and Health Surveys, *BMC Womens Health* [Internet], 2018, pp. 1–10, <https://doi.org/10.1186/s12905-018-0634-9>. Available from: .
- [54] M. Jabeen, F. Gul, F. Wazir, N. Javed, P. Welfare, L.M. Hospital, Knowledge , attitude and practices of contraception in women of, *Gomal J. Med. Sci.* 9 (2) (2011) 5–7.
- [55] Ana Paula Verona, Laura Wong, Claudio Santiago Dias Jr., VDL. Age at first marriage, use of contraception, and gender in Afghanistan, *Semanticscholar* 1–7 (2014).