Individual and community level factors associated with unmet need for contraception among married reproductive age women in Ethiopia. A multilevel analysis using 2016 Ethiopian Demographic and Health Survey

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Abstract

Background: There is limited evidence on unmet need to contraceptive among married reproductive age women especially in developing countries like Ethiopia. Thus, this study aimed to assess individual and community level factors associated with unmet need for contraception among married women of reproductive age in Ethiopia, EDHS 2016 dataset, 2019. Method: A secondary analysis was done on Ethiopian Demographic and Health Survey (2016) dataset by using cross sectional study design. A total of 9125 women who were married, fecund and/or sexually active were included in the analysis. Multilevel mixed-effect logistic regression analysis was done by STATA version 14.0 to identify individual and community level factors. Adjusted odds ratio with 95% confidence interval was used to show the strength and direction of association and statistical significance was declared at P value less than 0.05. Result: Factors significantly associated with unmet need were; ages between 15-19 years [AOR=2.25, 95% CI: (1.34, 3.79)], greater than or equal to three living children [AOR=1.87, 95 % CI: (1.40, 2.49)], belong to richer household [AOR=0.73, 95% CI: (0.54, 0.97)], Muslim followers [AOR=1.37, 95% CI: (1.02, 1.83)], married more than once [AOR=1.31, 95 % CI: (1.06, 1.62)]. From community level variables, belong to Somali region [AOR=0.34, 95% CI: (0.19, 0.61)] were significantly associated with unmet need. Conclusion: Both individual and community-level factors were significant determinants of unmet need. From individual level factors; ages of women, number of living children, religion, married more than once and wealth of house hold and from community level variables; region was significantly associated with unmet need for contraception. The findings suggested that health care providers should mainly focus on women nearly on menopauses, who live in the poorest household and who had many number of living children and married more than once to decrease unmet need to contraceptive.

Introduction

Unmet need for family planning (FP) is the number or percentage of married women who want to postpone their next birth for two or more years or stop child bearing but are not using a contraceptive method. Pregnant or amenorrheic women are also considered to have unmet need if their pregnancy was mistimed or [1, 2]. Total unmet need is the sum of unmet need for spacing and unmet need for limiting [3].

Even though FP was greatly emphasized in different strategies of maternal health, its utilization is still below what is expected and many women had unmet need to it. Globally, about 222 million couples want to stop or delay childbearing, but they are not using family planning [4]. It would range up to 84 million in Asia [5] and 200 million in developing countries [6, 7]. According to Ethiopian and Demographic Heath Survey (EDHS) result, it was 25.3% and 22 % in 2011 and 2016 respectively [8, 9].

World Health Organization (WHO) estimated that maternal death could be reduced to one third if the unmet need of FP was satisfied [10]. FP service reduces unsafe abortion and the number of women who need medical care as a result of unsafe abortion from 5.2 million to 1.2 million and from 2.2 million to 500,000 respectively [4, 11]. Ethiopian estimate from 2005 to 2015 also showed that 24 million

pregnancies were unintended. By meeting this unmet need in Ethiopia, there would be almost 6 million fewer unintended pregnancies, which lead to 2 million fewer abortions. In addition to that more than 1 million under five mortality could be averted and nearly 13, 000 maternal deaths would be decreased over ten years period [11]. Evidence from study also showed that there was elevated risk of under-five death for children born from mothers who had unmet need [12].

Unmet need for contraception were determined by socio-demographic characteristics of mothers [13-16], husband factors [17-19], Household factor [20] and community factor [21-23]. Unmet need for family planning is an important concept that is largely used for reproductive health advocacy, designing family planning policies and the monitoring/evaluation of implemented programs especially Sustainable Developmental Goals (SDGs) and Growth and Transformation Plan two (GTPII).

Even though unmet need for FP was addressed in previous studies, most of them were taking on individual level analysis by omitting cluster effect. In individual level analysis the independent assumption among clustered individuals may not work and the association at the individual level may not work at cluster level and vice versa. So, all of this articles are subject to atomistic or Ecological fallacy. It is clear that the factors associated with unmet need to FP are area specific which requires different approach of analysis at different level. So, this study took in account those different levels of analysis and aimed to assess individual and community level factors associated with unmet need for contraception among married women of reproductive age in Ethiopia, EDHS 2016 dataset, 2019.

Methods

Study area and data source

The study was conducted in Ethiopia, which is located in the North Eastern part of Africa, also known as the horn of Africa, lies between 3^0 and 15^0 North latitude and 33^0 and 48^0 East longitudes. This study used the EDHS 2016 dataset which were conducted by Central Statistical Agency (CSA) in collaboration with the Federal Ministry of Health (FMoH) and the Ethiopian Public Health Institute (EPHI). Data were accessed from their URL: www.dhsprogram.com by contacting them through personal account after justifying the reason for requesting it. Then reviewing the account permission was given via the email. A cross-sectional study design using secondary data from 2016 EDHS was conducted. All reproductive age women who were married, fecund and or sexually active were included in the study and those women who were sexually active 30 days prior to the survey were excluded.

Sample size determination and sampling procedure

A total of 9,125 weighted reproductive age women who were married, fecund and/or sexually active were included (Figure1).

The 2016 EDHS sample was stratified and selected in two stages. In the first stage, stratification was conducted by region and then in each region stratified as urban and rural, yielding 21 sampling strata. A

total of 645 EAs (Enumeration Areas) (202 in urban areas and 443 in rural areas) were selected with probability proportional to EA size in each sampling stratum. In the second stage, a fixed number of 28 households per cluster were selected with an equal probability systematic selection from the newly created household listing.

Variable measurement

The outcome variable for this study is dichotomized as unmet need (yes/no) which was generated from a constructed EDHS variable. It is the sum of unmet need for spacing and limiting and reproductive age women who were married, fecund and/or sexually active have unmet need if they don't want any more children or want to delay their next birth for at least two years but not using contraception. Pregnant or amenorrheic women with unwanted or mistimed pregnancies or births were also considered to have unmet if they were not using contraception at the time they conceived [15, 17, 24].

Data processing and analysis

Data cleaning was conducted to check for consistency and missing value. Recoding, labeling and exploratory analysis was performed by using Stata/SE version 14.0. Descriptive statistics was used to present frequencies, with percentages in tables, graphs and using texts. Sample weight was used in order to compensate for the unequal probability of selection between the strata that were geographically defined, as well as for non-responses.

Multilevel analysis was conducted after checking that the data was eligible for multilevel analysis that means Intra-cluster Correlation Coefficient (ICC) greater than 10% (ICC=12.74%). Since DHS data are hierarchical, i.e. individuals (level 1) were nested with in communities (level 2), two-level mixed-effects logistic regression model was fitted to estimate both independent (fixed) effects of the explanatory variables and community-level random effects on unmet need for family planning. The log of the probability of unmet need for family planning was modeled using two-level multilevel model as follows:

$$Log\,[= \beta_0 + \beta_1 X_{ij} + B_2 Z_{ij} + \mu_j + e_{ij}$$

Where, i and j are the level 1 (individual) and level 2 (community) units, respectively; X and Z refer to individual and community-level variables, respectively; πij is the probability of unmet need for family planning for the i^{th} women in the j^{th} community; the β's indicates the fixed coefficients. Whereas, β0 is the intercept-the effect on the probability of unmet need for family planning in the absence of influence of predictors; and uj showed the random effect (effect of the community on unmet need for family planning for the j^{th} community and eij showed random errors at the individual levels. By assuming each community had different intercept (β0) and fixed coefficient (β), the clustered data nature and the within and between community variations will be taken in to account.

During analysis first bivariable multilevel logistic regression was fitted and variables with p-value less than 0.2 were selected to build the 3 models (model1-3).Then the analysis was performed in four steps:

Model 0 (empty model or null model/ without explanatory variable); Model 1 (only individual-level factors) Model 2 (only community factors); and Model 3 (both individual and community-level factors). The measures of association (fixed-effects) estimates the associations between likelihood of women to have unmet need for family planning and various explanatory variables were expressed as Adjusted Odds Ratio (AOR) with their 95 % Confidence level. A variable in which its p-value <0.05 was used to declare statistical significance. The measures of variation (random-effects) were reported using ICC, Median Odds Ratio (MOR) and proportional change in variance (PCV) to measure the variation between clusters.

The ICC shows the variation in unmet need for family planning for married reproductive women due to community characteristics. The higher the ICC, the more relevant was the community characteristics for understanding individual variation in unmet need for contraceptive for married reproductive women. The ICC was calculated as follows: [ICC=], where is the estimated variance of clusters. MOR is defined as the median value of the odds ratio between the area at highest risk and the area at lowest risk when randomly picking out two areas and it was calculated using the formula [MOR=exp( )]. In this study MOR shows the extent to which the individual probability of having unmet need for family planning for married reproductive women is determined by residential area. PCV measures the total variation attributed by individual level factors and area level factors in the multilevel model.

The presence of multicollinearity was checked among independent variables using standard error at cut off point of $\pm$2 and there was no multicollinearity. Log likelihood test were used to estimate the goodness of fit of the adjusted final model in comparison to the preceding models (individual and community level model adjustments).

Result

Socio-demographic characteristics of respondents

The total numbers of married and/or sexually active fecund women included for the analysis were 8710 when it is weighted 9125. Out of which, 4684 (51.33%) women were age less than 30 years. Five thousand three hundred sixty four 5364(58.80) women were not educated at all. Coming to place of residence, 7614(83.43) women were rural dwellers and 3,782(41.44) women were Orthodox followers (Table1).

Individual and community level factors associated with unmet need for contraception (Fixed Effects)

After adjusting for individual and community level factors (model 3) age of women, number of living children, wealth of house hold, religion, married more than once and region were found to have a statistically significant association with unmet need for contraception.

Those women whose ages between 45-49 years were 2.3 times more likely to have unmet need for contraception than those ages between 15-19 years [AOR=2.25, 95% CI: (1.34, 3.79)]. The odds of unmet need for women who had greater than or equal to three living children were, almost 1.9 times higher than

those who had less than three children [AOR=1.87, 95 % CI: (1.40, 2.49)]. Those women who belong to richer household were 27% less likely to have unmet need for contraceptive as compared to poorest [AOR=0.73, 95% CI: (0.54, 0.97)]. The odds of unmet need for contraceptive for women who follow Muslim were 1.4 times more likely then compare to Orthodox followers [AOR=1.37, 95% CI: (1.02, 1.83)]. Those women who married more than once were 1.3 times more likely to have unmet need for contraceptive than married once [AOR=1.31, 95 % CI: (1.06, 1.62)]. Lastly, those women who belong to Somali region were 66% less likely to have unmet need for contraceptive than Addis Ababa [AOR=0.34, 95% CI: (0.19, 0.61)] (Table2).

Random effect (measure of variation)

The results of multilevel logistic regression for random effects showed that, there was a significant variation in the utilization of PNC across the clusters (Table3). The Intra-cluster correlation coefficients showed that 12.74% of the variation in unmet need for contraceptive was related to community-level factors. The full model also showed that, there is statistically significant variation in unmet need to contraceptive across communities or clusters. About 33.33% of unmet need to contraceptive in clusters was explained in the full model. In addition, the MOR confirmed that unmet need to contraceptive was attributed to community level factors. The MOR for unmet need for contraceptive 1.79 in the empty model: These indicates that there was variation between communities (clustering) since MOR was 1.79 times higher than the reference (MOR = 1). The unexplained community variation in unmet need for contraceptive decreased to MOR of 1.46 when all factors were added to the model. This shows that when all factors are considered, the effects of clustering are still statistically significant in the full models.

Discussion

As described in model 3 ages of women, number of living children, wealth of house hold, religion, married more than once and region were statistically significant with unmet need (Table2). In this study age between 45-49 years was positively associated with unmet need for contraceptive. The finding of this study is in line with previous studies conducted in Enemay district and Southern nations, nationality and peoples Region, Ethiopia [14, 24, 25]. It is also consistent with a study conducted in Kenya, Nigeria and Saudi Arabia [15, 26, 27]. The possible reason for this association may be due to that women near to menopause may perceive as low risk to pregnancy.

But, unmet need for contraception was negatively associated with living number of children. This finding is similar with previous studies conducted Oromia and Southern nations, nationality and peoples Region, Ethiopia [14, 23]. It is also similar with different studies conducted in African countries [15, 28-30]. Again it is in line with a study conducted in India [17, 21]. The possible reason for this may be due to that, as the number of living children increase their interest to have further children decrease.

Similarly wealth also has negative relationship with unmet need for contraception. The finding is in line with a study conducted in Ethiopia [24]. This is consistent with Nigeria, Kenya [20, 31, 32] Bengal, Iran and Indonesia [13, 33, 34].This may be due to wealth may increase their health seeking behavior and may

increase exposure too. Women who were Muslim are more likely to have unmet need to contraceptive than orthodox followers. But, the finding of this study is contrary to the finding of a study conducted in Nigeria which says Muslims had less likely to have unmet need [27]. This difference might be due to that the context of Ethiopia and Nigeria is totally different.

The other findings tell us as they undergone marriage more than once; they would have high probability of unmet need to contraceptive. The finding is in line with a study conducted in Burkina Faso [29]. This might be due to that if they are married more than once, their husband may not understand them and the women may not have decision to control fertility. The only significant community level variable is region. This is also similar with previous studies conducted in Ghana and Nigeria [27, 31, 35, 36]. Since this study takes secondary data, small numbers of community level variables were included in the analysis that could be potential determinant factors for unmet need for contraception.

Conclusion

Individual and community level factors explained nearly thirty three percent of the variation of unmet need across the communities. Both individual and community-level factors were significant determinants of unmet need PNC utilization. From individual level factors; ages of women, number of living children, wealth of house hold, religion and married more than once and from community level variables; region were significantly associated with unmet need for contraception. The findings suggested that health care providers should mainly focus on women nearly on menopauses, who live in the poorest household and who had many number of living children. Not only this, great emphasis should be given to women married more than once to decrease unmet need to contraceptive.

List Of Abbreviations

CSA-Central Statistical Agency, EA- Enumeration area, EDHS-Ethiopian Demographic and Health Survey, FP-Family Planning, ICC-Intra-cluster Correlation Coefficient, MMR-Maternal Mortality Rate, MOR-Median Odds Ratio, PCV-Proportional Change in Variance and WHO-World Health Organization.

Declarations

Ethical approval and consent to participate

Ethical approval was obtained from the Ethical Review Committee of Wollo University, College of Medicine and Health Sciences with approval and supporting letter. Authorization letter of permission for downloading 2016 EDHS dataset was obtained from CSA of Ethiopia, by requesting with the website www.measuredhs.com. The data was used only for purpose of this study. It was not passed to other researchers without consent of DHS. All data was treated as confidential and no need to identify any household or individual respondent interviewed in the survey.

Consent for publication: Not applicable.

Availability of data and material: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

Founding: Not applicable.

Authors' contribution: MY: Initiated the idea, analyze the data, **BA**: Write the result and draft the manuscript, **BK**: Edit and revise the manuscript, **YD**: Edit and revise the manuscript.

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Tables

Table 1: Socio-demographic characteristics of reproductive age women who were married in Ethiopia, EDHS 2016 dataset, 2019.

Variable	Category	Unweight n (%)	Weighted n (%)
Age of women in years	15-19	690(7.92)	627(6.86)
	20-24	1806(20.73)	1711(18.75)
	25-29	2198(25.24)	2346(25.71)
	30-34	1735(19.92)	1910(20.93)
	35-39	1338(15.36)	1418(15.54)
	40-44	677(7.77)	770(8.44)
	45-49	266(3.05)	343(3.75)
Age of marriage in years	<18	5137(59.73)	5606(61.98)
	≥18	3464(40.27)	3439(38.02)
Education of women	No education	4793(55.03)	5364(58.80)
	Primary	2516(28.89)	2698(29.50)
	Secondary	856(9.83)	648(7.10)
	Higher	545(6.26)	416(4.60)
Education of husband	No education	3675(43.13)	40045(44.80)
	Primary	2754(32.32)	3,427(38.20)
	Secondary	1109(13.01)	882(9.80)
	Higher	906(10.63)	645(7.20)
Occupation of women	Not working	4706(54.03)	4683(51.32)
	Working	4004(45.97)	4,442(48.68)
Occupation of husband	Not working	778(9.13)	633(7.07)
	Government employee	5330(62.55)	6,357(70.94)
	Merchant	782(9.18)	690(7.70)
	Labourer	1125(13.20)	908(10.14)
	Others*	506(5.94)	371(4.15)
Place of residence	Urban	2278(26.15)	1511(16.57)
	Rural	6432(73.85)	7614(83.43)
Region	Tigray	881(10.11)	600(6.58)
	Afar	743(8.53)	81(0.89)

	Amhara	1040(11.94)	2206(24.17)
	Oromia	1168(13.41)	3539(38.78)
	Somali	814(9.35)	270(2.96)
	Benishangul Gumz	689(7.91)	96(1.06)
	SNNP	1071(12.30)	1,907(20.90)
	Gambela	630(7.23)	26(0.28)
	Harari	509(5.84)	21(0.23)
	Dire Dewa	524(6.02)	45(0.49)
	Addis Ababa	641(7.36)	333(3.65)
Religion	Orthodox	3259(37.42)	3,782(41.44)
	Protestant	1567(17.99)	1,990(21.81)
	Muslim	3718(42.69)	3,122(34.21)
	Others**	166(1.91)	231(2.54)
Wealth	Poorest	2518(28.91)	1,745(19.12)
	Poorer	1324(15.20)	1,856(20.34)
	Middle	1202(13.80)	1,835(20.10)
	Richer	1151(13.21)	1,750(19.17)
	Richest	2515(28.87)	1,939(21.25)

Others*= who didn’t know and it was also recorded as others in EDHS dataset, Others**= Catholic and traditional.

Table 2: Multi level mixed effect logistic regression on unmet need for contraception among married reproductive age women in Ethiopia, EDHS 2016 dataset, 2019.

idual level ıbles	COR (95% CI)	Model 0 n=8633, ICC=10.3%	Model 1 AOR (95% CI) n=8444	Model 2 AOR(95% CI) n=8595	Model 3 AOR (95% CI) n=8407
of women					
)	1		1		1
4	0.89(0.63, 1.26)		0.91(0.64, 1.30)		0.91(0.63, 1.29)
)	1.15(0.84, 1.59)		0.98(0.67, 1.42)		0.97(0.66, 1.42)
4	1.49(1.04, 2.15)		1.09(0.70, 1.69)		1.07(0.68, 1.66)
)	1.87(1.29, 2.73)		1.27(0.80, 1.99)		1.25(0.79, 1.98)
4	2.34(1.58, 3.46)		1.54(0.93, 2.54)		1.51(0.91, 2.51)
)	3.53(2.28, 5.46)		2.28(1.37, 3.80)		2.25(1.34, 3.79)*
of marriage					
years	1		1		1
years	0.79(0.66, 0.95)		0.91(0.75, 1.11)		0.90(0.74, 1.10)
and occupation					
working	1		1		1
t employee	0.89(0.65, 1.23)		0.92(0.66, 1.29)		0.90(0.64, 1.27)
chant	0.51(0.33, 0.79)		0.67(0.42, 1.07)		0.68(0.43, 1.10)
urer	0.61(0.42,		0.76(0.51,		0.79(0.53,

	0.89)	1.13)	1.18)
rs*	1.05(0.65, 1.71)	1.39(0.83, 2.34)	1.44(0.85, 2.44)
ation status of mother			
educated	1	1	1
ary	0.76(0.64, 0.90)	1.23(0.98, 1.55)	1.23(0.97, 1.53)
ndary	0.52(0.36, 0.74)	1.11(0.71, 1.76)	1.15(0.72, 1.84)
ge and e	0.36(0.24, 0.55)	0.88(0.55, 1.42)	0.94(0.58, 1.53)
ation status of husband			
educated	1	1	1
ary	0.72(0.59, 0.86)	0.92(0.76, 1.12)	0.88(0.72, 1.08)
ndary	0.49(0.37, 0.65)	0.86(0.61, 1.22)	0.84(0.59, 1.19)
er and e	0.54(0.37, 0.79)	1.09(0.69, 1.72)	1.09(0.69, 1.74)
ber of living children			
	1	1	1
	2.28(1.89, 2.73)	1.88(1.42, 2.49)	1.87(1.40, 2.49)*
th			
est	1	1	1
er	0.91(0.73, 1.14)	0.99(0.78, 1.26)	0.92(0.72, 1.17)
le	0.78(0.60, 1.01)	0.86(0.65, 1.13)	0.79(0.60, 1.04)

er	0.68(0.52, 0.89)	0.78(0.59, 1.03)	0.73(0.54, 0.97)*
est	0.47(0.36, 0.63)	0.67(0.46, 0.99)	0.68(0.44, 1.05)
health facility in the last 12 months			
	1	1	1
	0.77(0.65, 0.92)	0.87(0.73, 1.02)	0.86(0.72, 1.02)
ance to health facility			
problem	1	1	1
big problem	0.77(0.63, 0.93)	0.88(0.72, 1.08)	0.96(0.77, 1.18)
gion			
odox	1	1	1
estant	0.97(0.75, 1.27)	0.92(0.69, 1.23)	0.74(0.53, 1.03)
im	1.54(1.24, 1.93)	1.43(1.12, 1.82)	1.37(1.02, 1.83)*
rs**	1.93(1.15, 3.24)	1.94(1.12, 3.38)	1.50(0.84, 2.69)
ried more than once			
	1	1	1
	1.39(1.13, 1.72)	1.27(1.02, 1.56)	1.31(1.06, 1.62)*
a exposure			
	1	1	1
	0.70(0.57, 0.86)	0.90(0.71, 1.14)	0.89(0.71, 1.13)
munity level variables			

e of residence			
n	1	1	1
l	2.24(1.82, 2.75)	1.59(1.06, 2.38)	1.35(0.84, 2.16)
on			
s Ababa	1	1	1
ay	1.74(1.28, 2.36)	0.87(0.59, 1.27)	0.88(0.5, 1.37)
	1.70(1.22, 2.38)	0.79(0.52, 1.22)	0.61(0.35, 1.05)
ara	1.55(1.15, 2.08)	0.72(0.49, 1.06)	0.67(0.42, 1.05)
nia	3.21(2.40, 4.28)	1.50(1.02, 2.20)	1.43(0.89, 2.27)
ali	1.17(0.82, 1.67)	0.52(0.33, 0.81)	0.34(0.19, 0.61)*
shangul ze	2.37(1.72, 3.26)	1.12(0.75, 1.66)	1.02(0.64, 1.62)
P	2.18(1.60, 2.95)	0.98(0.66, 1.47)	1.19(0.75, 1.91)
bela	2.50(1.75, 3.58)	1.46(0.94, 2.27)	1.64(0.99, 2.70)
ri	2.23(1.57, 3.16)	1.37(0.95, 1.96)	1.27(0.81, 2.00)
Dewa	2.07(1.40, 3.07)	1.34(0.90, 1.98)	1.12(0.69, 1.82)
inuous ables	**Coefficient (95% CI)**	**Coefficient (95% CI)**	**Coefficient (95% CI)**
munity level	-0.006(-0.011,	0.99(0.99, 1.00)	0.99(0.99,

media sure	-0.002)		1.00)
munity level ducation	-0.014(-0.018, -0.010)	0.99(0.98, 1.00)	1.00(0.99, 1.01)

=significant at 5%, SNNP= Southern nation, nationalities and peoples, Others= who didn't know and it was also recorded as others in EDHS dataset and Others**= Catholic and traditional

Table 3: Measure of variation on individual and community level factors among reproductive women who were married in Ethiopia, EDHS 2016 dataset.

easure of variation	**Model 0 (Null model)**	**Model 1**	**Model 2**	**Model 3 (Full model)**
riance	0.48	0.42	0.33	0.32
plained variance (PCV %)	Reference	12.50	31.25	33.33
edian odds ratio (MOR)	1.79	1.67	1.48	1.46
ra-cluster correlation coefficient C) in %	12.74	11.33	9.12	8.87
odel fitness				
g likelihood	-4940.50	-4633.80	-4887.24	-4595.49

Figures

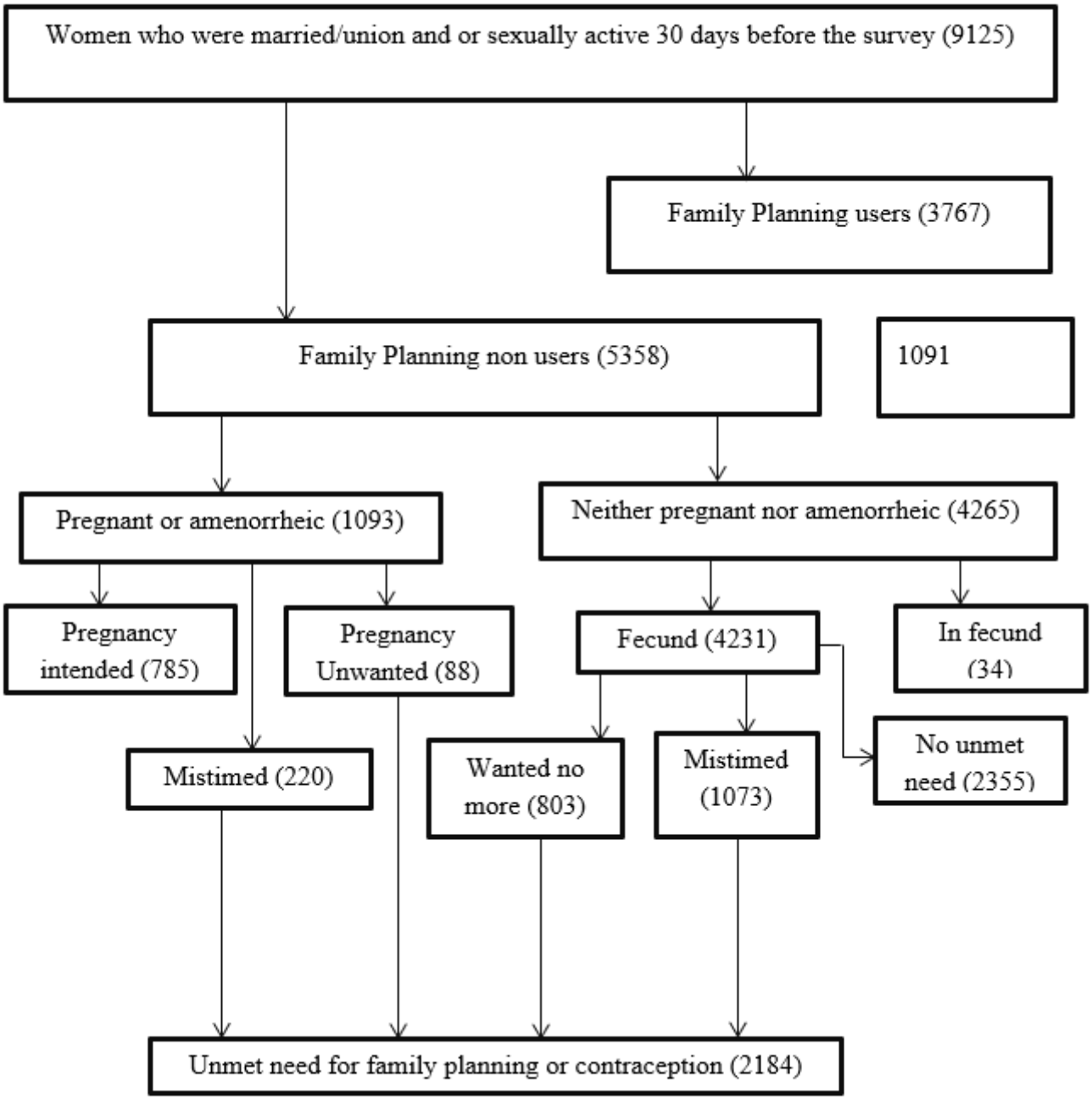

Figure 1

Total number of reproductive age women who were married, fecund and/or sexually active (sample size) included for analysis in 2016 EDHS, 2019.