Factors influencing desired number of children among Ethiopian women: Application of count regression models

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ABSTRACT

The number of children wanted in one's lifetime is one of the major factors influencing population dynamics. Knowing the factors influencing the desired family size is crucial in regulating the population growth of a nation. This study assesses the desired number of children and its determinants among Ethiopian women. The study used the 2016 Ethiopian Demographic and Health Survey (EDHS) data where samples were selected using two stage stratified random sampling. A total of 13,941 women with complete information on the study variables were considered in the study. Generalized linear model was used to identify determinant factors for the desired number of children among women in Ethiopia. The average number of children desired per women was 4.9. The random intercept negative binomial regression model was found to best fit the data. The model identified that women's age, household head, contraception, wealth index, women's education, religion, marital status, husband's work, family size and age at first marriage were significantly associated with women's desire for children ($p < 0.05$). Women who had attained a higher level of education preferred a smaller family size compared to women with no formal education. Desire for more children was high among mothers from rural areas, women in the poorest economic level and women having no work. Educating women and engaging them in income generating activities should be among the priority policy agendas.

Keywords: Desired number of children; Generalized linear model; Multilevel analysis; Ethiopia
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INTRODUCTION

The continuing growth of the world population has become a global concern. More than half of the projected increase in the global population up to 2050 will be concentrated in just nine countries, five of which, including Ethiopia, are in Africa. With a projected addition of over one billion people, countries of sub-Saharan Africa could account for more than half of the growth of the world's population between 2019 and 2050. This continued and unplanned population growth remains a

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challenge for sustainable development by putting more pressure on already strained resources. This challenge will be more pronounced in economically developed countries (United Nations and Social Affairs, 2019). Several factors contribute to the rapid growth in population size. These factors include demographic factors such as fertility, mortality and migration trends, population composition in terms, for instance, of age, sex, races etc. and socio-economic factors such as education level, family income, employment opportunities, etc. (Alvarez-Dias *et al.*, 2018). The desire to have children is one major contributor for the world's growing population size.

Desired or preferred family size is defined by Thomson (Thomson, 2015) as the number of children wanted in one's lifetime. It is a biological urge and women in every part of the globe need to bear children. Variables reflecting desired family size are strong predictors of the numbers of children born to women (Bhargava, 2007). Identifying factors for the desired number of children will help to monitor and take relevant policy measures to slow down the growth of world population. Several studies have been conducted to identify factors that influence the desire for children. These factors include women's age, educational level, knowledge of contraceptive methods, household income, and religion (Pebley *et al*., 1979; Arnold *et al*., 1998; Clark, 2000; Jensen, 2003; Bhargava, 2007; James and Isiugo-Abanihe, 2010; Bongaarts, 2011). The desire for a balanced number of daughters and sons or at least one child of each sex is also one major contributor for the number of children a family wants to have. This may force couples to continue giving birth until they achieve a desired number of sons and daughters (Cleland *et al*., 1983; Arnold, 1997; Bongaarts, 2001). However, in some countries, especially in developing countries in Asia and Africa, sons are more needed than daughters to provide family labor on the farm and support their parents of old age. Ethiopia has predominantly a rural society whose livelihood depends on individual level subsistence farming. In this kind of set up children are expected to help their parents in their efforts to feed their families. This kind of gender preference for children affects desired family size and the fertility and reproductive behavior of the women (Mason, 1992; Dharmalingam, 1996; Campbell and Campbell, 1997; Arnold *et al*. 1998; Clark, 2000; Jensen, 2003; Rai *et al*., 2014).

Fertility intentions are also influenced by couples' experiences with child mortality and their expectation about child survival conditions (Pebley *et al*., 1979; Yohannes Dibaba, 2009; Uddin *et al*., 2011). The high level of child mortality in Ethiopia, where 1 in 17 children die before reaching age 5, and 7 in 10 of the deaths occur during infancy, also plays an important role to determine the desired family size (Addisalem Tebeje *et al.*, 2010). Even though women's desired family size has declined in the last ten years, from 5.3 children in 2000 to 4.9 children in 2016, a large proportion of Ethiopians, regardless of their number of living children, still want to have four or more children (CSA and ICF, 2016). Some studies investigated determinants of desired family size using some set of variables and statistical

methods such as multivariable logistic regression models (Yohannes Dibaba, 2009; Cernigliaro *et al*., 2018). Multiple linear regression model has also been used to model desired family size (Bekele Dibaba and Mitike, 2016). When the response variable is a count which can take on non-negative integer values (0, 1, 2 ...), it is appropriate to use non-linear models based on non-normal distribution to describe the relationship between the dependent variable and a set of predictor variables (Karazsia and Van Dulmen, 2008). For count data, the standard framework for explaining the relationship between the outcome variable and a set of explanatory variables includes the Poisson and negative binomial regression models (Gardner *et al*., 1995). This study was aimed at identifying factors associated with the desired number of children among Ethiopian women of reproductive age using count regression models.

METHODS

Data for the study

The data for this study was taken from the 2016 Ethiopian Demographic and Health Survey (EDHS), a nationally representative survey that was conducted under the authority of the Ethiopian Central Statistical Agency in collaboration with the Federal Ministry of Health (FMoH) and the Ethiopian Public Health Institute (EPHI), with technical assistance from International Consultancy Fund (ICF). The survey was conducted from January 18, 2016, to June 27, 2016, based on a nationally representative sample that provides estimates at the national and regional levels and for urban and rural areas. The study used two stage stratified random sampling technique to select samples. To get unbiased estimates for population parameters in complex study settings like the 2016 EDHS sample which uses a two-stage stratified cluster sampling technique to select the samples, sampling weights based on sampling probabilities separately for each sampling stage and each cluster were used.

The survey target groups were women aged 15-49 and men aged 15-59 in randomly selected households across Ethiopia. A total of 18,008 households were selected using two-stage stratified cluster sampling method of which 17,067 were occupied. Of the occupied households, 16,650 were successfully interviewed, yielding a response rate of 98%. After excluding women who gave non-numerical answers such as “It depends on God”, “As many as I can”, and the like, 13,941 women who gave numeric response for desired number of children were considered in this study. These women were asked questions on the background characteristics such as region, age, education level, household headship, living children, use of contraceptives, place of residence, wealth index, employment status, religion, marital status, family size, age at first marriage, husband’s education level and work.

Data analysis

Poisson distribution is the most common probability model for discrete data with observations assumed to have a constant rate of occurrence amongst individual units with the property of equal mean and variance (Dobson and Barnett, 2008). If the discrete random variable Y has Poisson distribution with intensity or rate parameter $\mu, \mu > 0$ and y_i is the exposure defined as the number of times the event occurs, then Y has the density

$$\Pr(Y = y_i/\mu_i) = \frac{e^{-\mu_i}\mu^{y_i}}{y_i!}, \qquad \mu_i \geq 0$$

where $y_i = 0,1,2 \ldots\ldots$ are discrete counts and μ_i is the mean of the Poisson distribution.

Let $Y_1, \ldots, Y_N$ be independent random variables with Y_i denoting the number of events observed from exposure n_i for the ith covariate pattern. The mean and variance of Poisson distribution are equal and is given as

$$E(Y_i) = \text{var}(Y_i) = \mu_i = n_i\theta_i$$

The dependence of θ_i on the explanatory variables is modeled by

$$\theta_i = e^{x_i^T\beta} = n_i\theta_i$$

Therefore, the generalized linear model is $E(Y_i) = \mu_i = n_i\theta_i = n_i e^{x_i^T\beta}$ (Dobson and Barnett, 2018).

However, mean and variance may not be equal in practice. An extension of the Poisson distribution which allows for unequal mean and variance is the negative binomial distribution (Hilbe, 2011). Both the Poisson and negative binomial models are a family of generalized linear models (GLM). The binomial negative distribution is given as:

$$P(Y_i, \mu_i, \alpha) = \frac{\Gamma\left(y_i + \frac{1}{\alpha}\right)}{y_i!\,\Gamma\frac{1}{\alpha}}(1+\alpha\mu_i)^{-\frac{1}{\alpha}}\left(1+\frac{1}{\alpha\mu_i}\right)^{-y_i}, \text{ where } y_i = 0 \text{ and } \alpha > 0$$

The mean and variance of this distribution are given by

$$E(Y_i) = \mu_i = \exp(X_i'\beta) \quad \text{and} \quad \text{var}(Y_i) = \mu_i(1+\alpha\mu_i)$$

where α shows the level of over-dispersion and it is constant and $\Gamma(.)$ is the gamma function.

Researchers often encounter grouped or multilevel data like individuals nested within families, and families nested within neighborhoods. For instance, women aged 15-49 are nested within regions. Most multivariate models assume that observations are independent, while grouped data clearly violate this assumption. Data sets with a nesting structure that include unexplained variability at each level of nesting are usually not adequately represented by single level regression (Hox *et al*., 2010).

Multilevel negative binomial regression model is given by;

$$p(Y_{ij} = y_{ij}) = \frac{\Gamma(y_{ij} + v)}{y_{ij}!\ \Gamma(v)} \frac{v^v \mu_{ij}{}^{*y_{ij}}}{(v + \mu_{ij}{}^*)^{v + y_{ij}}} y_{ij} = 0,1,2, \ldots.$$

with mean and variance given, respectively, as follows:

$$E(Y_{ij}) = \lambda_{ij}^* = \log(\eta_{ij}), \text{and } var(Y_{ij}) = \lambda_{ij}^* + \alpha(\lambda_{ij}^*)^2$$

where $\eta_{ij} = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \cdots + \beta_{kj}X_{kij}$

The best approach to the analysis of multilevel data is an approach based on variance components model where the total variation of the desired number of children among individual women is decomposed into variation between women in different regions (between-groups) and variation between women in the same region (within-group) within a single analysis, where group refers to the units at the higher levels of the nesting hierarchy (Hox *et al*., 2010). In this study since individual women are nested in regions, two-level count regression model where women are considered level-1 and the regions are level-2 was used. The two-level random intercept model is given by

$$E(Y_{ij}) = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \cdots + \beta_{kj}X_{kij} + u_{0j} + e_{0ij}$$

$$var(e_{0ij}) = \sigma_{e0}^2, \qquad var(u_{0j}) = \sigma_{u0}^2$$

$$var(Y_{ij}/\beta_{0j}, \beta_{kj}, X_{kij}) = var(u_{0j}, e_{0ij}) = \sigma_{e0}^2 + \sigma_{u0}^2$$

The covariance between two women represented by i_1 and i_2 in the same region is given by $cov(u_{0j} + e_{0i_1 j}, u_{0j} + e_{0i_2 j}) = cov(u_{0j}, u_{0j}) = \sigma_{u0}^2$

since the level 1 residuals are assumed to be independent. The correlation between two such women is therefore

$$\rho = \frac{\sigma_{u0}^2}{\sigma_{e0}^2 + \sigma_{u0}^2}$$

which is referred to as the 'intra-level-2-unit correlation or the intra-region correlation. This correlation measures the proportion of the total variance which is between-regions. If this proportion is statistically significant, it indicates that the desired number of children per mother differs from region to region.

Sampling weights have also been considered when fitting models to this survey data.

The design weights are used either when we want the survey statistics to be representative of the underlying population or when we want to compensate for over or under-sampling of specific cases or for disproportionate stratification. For computing design weights, we must know the sampling fraction, which is usually the over-sampling or the under-sampling amount for a given group or area. Thus, for instance, the unweighted samples in a survey over or under-represent people of certain areas or size of households, such as those in larger households. The design weight corrects for differences in selection probabilities, thereby making the sample more representative of a true sample of individuals in a country. The design weights were computed as normalized inverse of the inclusion probabilities (Johnson, 2008). Due to the non-proportional allocation of the samples to the different regions and their urban and rural areas and the possible differences in response rates, sampling weights must be used in all analyses using the 2016 EDHS data to ensure that the survey results at both the national and domain levels were representative. Since the 2016 EDHS sample is a two-stage stratified cluster sample, sampling weights were based on sampling probabilities separately for each sampling stage and each cluster.

RESULTS AND DISCUSSION

A total of 13,941 women were included in the study. Of all women studied, 76% live in rural areas and more than three fourth of the households were headed by males. One third of the women were not employed and nearly half (45%) have no education. The mean desired number of children per women was 4.9 and the corresponding standard deviation was 2.7 children (variance 7.29) per women in Ethiopia showing that the distribution of desired family size was over-dispersed, i.e., the variance is greater than the mean (see Table 1).

Figure 1 shows that the distribution of the desired number of children per women in the reproductive age group is positively skewed and does not have normal distribution suggesting the use of non-normal error models. As the response variable is a count, a family of count regression models such as Poisson and negative binomial models are better alternatives for the data (Cameron and Trivedi, 2013).

In an effort to identify which distribution may better be used to model the data, summary statistics were computed and displayed in Tables 2, 3 and 4. Table 2 shows that the ratio of the Deviance (20712.96) and Pearson Chi-square (16592.95) statistics to their corresponding degrees of freedom were greater than one, indicating over dispersion in the data. Therefore, negative binomial regression model was superior over the Poisson regression model (Yaacob *et al*., 2010).

Table 1. Mean and standard deviation of desired number of children among women aged 15-49 in Ethiopia (EDHS 2016).

Variable	Category	Mean	Std. Dev.	Obs.
Total desired children		4.45	2.76	13941
Women's age	15-19	3.58	2.34	3247
	20-24	3.91	2.24	2676
	25-29	4.39	2.51	2537
	30-34	4.78	2.72	1950
	35-39	5.30	3.09	1655
	40-44	5.67	3.30	1070
	45-49	5.66	3.46	806
Household head	Male	4.51	2.75	9651
	Female	4.28	2.80	4290
Living children	No living child	3.56	2.19	5166
	Living child	4.93	2.91	8775
Contraception using	Not using	4.50	2.95	10883
	Using	4.30	2.11	3058
Region	Tigray	4.78	2.04	1436
	Afar	6.06	4.59	888
	Amhara	4.05	2.09	1511
	Oromia	4.07	2.92	1684
	Somali	10.42	4.52	1093
	Benishangul Gumuz	5.09	2.50	1012
	SNNPE	4.91	2.19	1712
	Gambela	4.92	2.40	974
	Harari	4.16	2.55	816
	Addis Ababa	3.57	1.87	1786
	Dire Dawa	5.39	3.10	1029
Place of residence	Urban	3.84	2.18	5012
	Rural	4.64	2.89	8929
Wealth index	Poorest	5.50	3.68	3189
	Poorer	4.60	2.77	1787
	Middle	4.47	2.63	1790
	Richer	4.28	2.51	1825
	Richest	3.89	2.18	5350
Women's working	Not working	4.54	2.85	8813
	Working	4.28	2.57	5128
Women's education	No education	5.21	3.21	5827
	Primary	3.95	2.30	4801
	Secondary	3.57	1.73	2151
	Higher	3.63	1.73	1162
Religion	Orthodox	3.99	2.10	5855
	Catholic	3.59	2.33	86
	Protestant	4.50	2.35	2631
	Muslim	5.06	3.60	5229
	Traditional	5.11	4.28	75

	Other	6.29	3.62	65
Marital status	Single	3.47	2.16	4015
	Married	4.94	2.89	8321
	Separated	4.10	2.63	1605
Husband's education	No education	5.30	3.22	3659
	Primary	4.85	2.62	2702
	Secondary	4.22	2.33	1127
	Higher	4.13	2.26	965
	Don't know	4.09	3.29	75
Husband's work	Not working	5.77	3.56	837
	Working	4.86	2.81	7569
	Don't know	4.73	3.07	122
	Total	4.90	3.33	13941

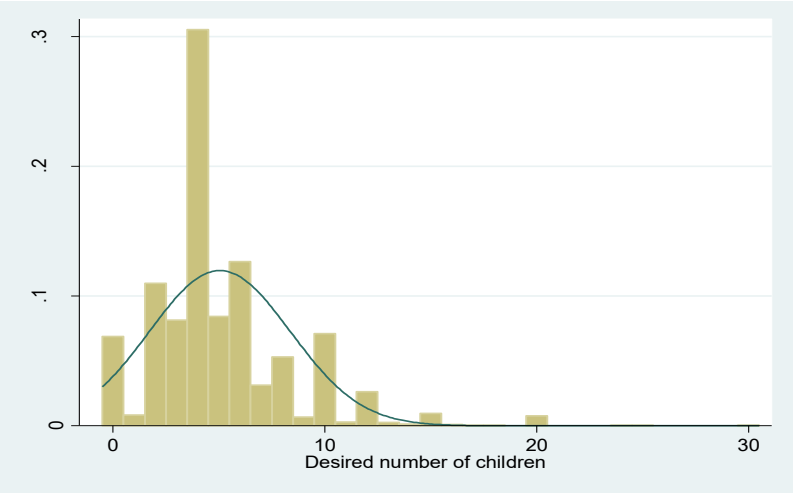

Figure 1. Histogram for desired number of children by women weighted data.

The likelihood ratio test (p-value<0.001) also indicates some heterogeneous random effects existed. Hence, in view of our observation that desired number of children may have variations across regions multilevel negative binomial regression model could provide a good fit to the data (e.g., Likelihood ratio test value for multilevel negative binomial regression model with LRT selection criteria resulted in a Negative binomial regression model of 116.7).

Table 2. The results of over-dispersion test after fitting a Poisson regression.

Statistics	**Value**	**Degrees of freedom**	**Value/Deg. Freedom**	***P*-value**
Deviance test statistics	20712.96	13925	1.4874	0.0000
Pearson Chi-square statistic	16592.95	13925	1.1915	0.0000

Table 3 shows a comparison of families of negative binomial models where values of log likelihood, AIC and BIC were smaller for the random intercept model suggesting that the random intercept negative binomial model better fits the given data.

Table 3. Comparison of multilevel negative binomial regression models.

Selection criteria	Multilevel Negative Binomial Regression Model		
	Random Intercept only model	Random intercept model	Random intercept & coefficients model
Log likelihood	-33352.45	-32246.06	-32333.4
AIC	66710.90	64566.11	64750.8
BIC	66733.53	64845.19	65067.6

The results from the random intercept negative binomial model given in Table 4, showed that the level-two (region level) variance of the random intercept $\delta^2_{u_0}$ = 0.0083395, the proportion of the total variance which is among the different regions, was found to be significant (p-value <0.0001) indicating that the number of desired children per mother differs from region to region. The results of multilevel negative binomial regression of random intercepts model showed that women's age, household head, contraception, wealth index, women's education, religion, marital status, family size and age at first marriage were statistically significant predictors of the desired number of children. On the other hand, husband's education, husband's work, place of residence, women's employment status and number of living children were not statistically significant predictors for the outcome variable.

The model parameters as in the table may be interpreted in terms of expected log count of the number of children needed by a family. This means that, taking the variable "Age at first marriage", for each one-year increase in age at first marriage of a women the expected log count of the number of children wanted by a family decreases by 0.007. From Table 4, we can see that the categorical variable "Women's education level" was negatively associated with the desired number of children. The indicator variable Secondary (for example) is the expected difference in log of the desired number of children between a woman who has attained secondary education and a woman having no formal education (Reference category). The expected log count of the number of children wanted by woman who has attained secondary education is 0.024 lower than those women in with no formal education. Other categories may be interpreted in the same way. The estimated coefficients for all age groups are positive showing that the desired number of children increases with age of the women. The expected log of the desired number of children by women aged 45-49 was 0.265 higher than the expected log of the number of children wanted by a women aged 15-19 controlling all other variables in the model and random effect at level two. The coefficient for the contraception use is negative and statistically significant, showing that the expected log count of the

desired number of children for contraceptive user women was 0.085 lower than the expected log count of the number of children wanted by non-user women. Poor mothers tend to have more desire for children compared to relatively wealthy mothers. Women following Protestant, Muslim, Traditional and Other religions had higher desired number of children as compared to women following Orthodox Christian religion (0.108, 0.149, 0.06 and 0.273, respectively, more expected log of number of children wanted than women following Orthodox Christian). Other variables may be interpreted similarly. As may be expected desired family size decreases with age at first marriage. Women getting married at later ages had less desire for more children than those married at younger ages.

Table 4. Results of random intercept negative binomial model for desired number of children.

						[95% CI for IRR]	
Parameter	**Coef.**	**Std. Err.**	**Z**	**p > |z|**	**IRR**	**Lower**	**Upper**
Women's Age (Ref. 15-19)							
20-24	0.013	0.018461	0.72	0.472	1.013	0.9773521	1.050701
25-29	0.067	0.020445	3.26	0.001	1.069	1.027015	1.112705
30-34	0.095	0.022405	4.22	<0.001	1.099	1.051901	1.148462
35-39	0.194	0.023118	8.39	<0.001	1.214	1.160205	1.270256
40-44	0.253	0.025111	10.1	<0.001	1.288	1.226525	1.353397
45-49	0.265	0.026814	9.89	<0.001	1.304	1.237042	1.374144
Household head (Ref. Male)							
Female	0.077	0.013697	5.60	<0.001	1.080	1.051085	1.109059
Living children (Ref. No)							
Yes	0.023	0.020359	1.14	0.256	1.023	0.983362	1.065055
Contraception using (Ref. No)							
Yes	-0.085	0.012204	-6.93	<0.001	0.919	0.897169	0.941132
Place of residence (Ref. urban)							
Rural	0.008	0.020228	0.39	0.695	1.008	0.968793	1.048736
Wealth index (Ref. poorest)							
Poorer	-0.141	0.016257	-8.66	<0.001	0.869	0.841500	0.896869
Middle	-0.155	0.016215	-9.56	<0.001	0.856	0.829566	0.884005
Richer	-0.169	0.016538	-10.2	<0.001	0.845	0.817730	0.872496
Richest	-0.153	0.021619	-7.1	<0.001	0.858	0.822471	0.895209
Women employment (Ref. Not employed)							
Working	-0.011	0.010924	-1.00	0.318	0.989	0.968203	1.010561
Women's education (Ref. No Edu.)							
Higher	-0.065	0.028464	-2.26	0.024	0.938	0.886694	0.991358
Secondary	-0.084	0.020842	-4.05	<0.001	0.919	0.882256	0.957362
Primary	-0.091	0.013258	-6.93	<0.001	0.912	0.888774	0.936183
Religion (Ref. Orthodox)							
Catholic	-0.099	0.060173	-1.49	0.136	0.914	0.812564	1.028717
Protestant	0.108	0.012775	8.45	0.000	1.114	1.086507	1.142301
Muslim	0.149	0.012119	12.3	<0.001	1.161	1.133249	1.188381
Traditional	0.059	0.056414	1.05	0.293	1.061	.9500486	1.185183
Other	0.273	0.058904	4.63	<0.001	1.313	1.170207	1.474150

Marital status (Ref. Single)							
Married	0.183	0.057837	3.16	0.002	1.200	1.071795	1.344538
Separated	0.109	0.035938	3.04	0.002	1.116	1.039641	1.196916
Husband's education (No Edu)							
Primary	0.007	0.013723	0.50	0.614	1.0071	0.980229	1.034401
Secondary	-0.024	0.023377	-1.03	0.301	0.976	0.932409	1.021887
Higher	-0.024	0.028428	-0.85	0.393	0.976	0.923132	1.031952
Don't know	-0.174	0.077850	-2.23	0.026	0.840	0.721476	0.978933
Husband's employment (Not employed)							
Working	-0.066	0.0215762	-3.08	0.002	0.936	0.8970159	0.976184
Don't know	-0.095	0.0620669	-1.52	0.128	0.910	0.8055432	1.027429
Family size	0.020	0.0022731	8.78	<0.001	1.020	1.015612	1.024702
Age at first marriage	-0.007	0.0014893	-4.66	<0.001	0.993	0.990188	0.995986
_cons	1.437	0.0603361	23.82	<0.001	4.210	3.740352	4.738369
/lnalpha	-2.355	0.0424003	-55.6	<0.001	-2.356	-2.43856	-2.27235
Region							
var(_cons) $\delta^2_{u_0}$	0.00834	0.00758			0.00834	0.00140	0.04957

The present study was based on data from the 2016 Ethiopian Demographic and Health Survey (EDHS). A total of 13,941 women of age between 15 and 49 from the 2016 EDHS data were included in the study. The study explores the determinants of desired number of children an Ethiopian woman of reproductive age (15-49) would like to have in her lifetime using count regression models. The mean desired number of children by Ethiopian women in her reproductive age was 4.9 showing a slight decrease from the 2005 EDHS report which was 5.1 (CSA and ICF, 2016). This study showed that the desired family size changes in positive direction with the change in age of respondents, meaning that the older the respondent, the more children that they desired. In fact, the average number of children wanted in a family increases linearly with the increase in the age of respondent women. Women aged 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49 responded that the average number of children wanted is 3.58, 3.91, 4.39, 4.78, 5.30, 5.67, and 5.66 respectively. This is in line with other studies in Bangladesh and in Ethiopia (Uddin *et al*., 2011; Bekele Dibaba and Mitike, 2016). The results of some other studies indicated that younger women have higher likelihood of having high desire for children through her life time than older woman (Greene, 2000; Dudgeon and Inhorn, 2004; Nattabi *et al*., 2009). Desired number of children shows a decline with the increase in age at marriage of the mother.

Education is an important variable in influencing the desired number of children. A negative association was observed between the levels of education and desired family size. More educated woman tended to have lower desired number of children as compared to less educated women. This finding is in line with many previous

literature in different settings (Bhargava, 2007; Yohannes Dibaba, 2009; Uddin *et al*. 2011; Puurbalanta and Aselisewine, 2016). This result is logical in the Ethiopian context in the sense that less educated women were mostly not employed and spend most of their time looking after their children as housewives which again makes them comfortable to still have more children. It may also be that most of the women included in this study reside in rural areas where children are considered as assets. Another study in Guatemala however reported that education was positively associated with the desire for another child (Pebley *et al*., 1979).

The findings of this study showed that the expected desired number of children was high among large family size households than households with small family size. This result was consistent with other studies (e.g., Adhikari, 2010; Puurbalanta and Aselisewine, 2016), in which it was reported that women with large family size were more likely to desire for additional children than those who had small family size. This result is still expected in view of the education level and place of residence of the women discussed above. Unexpectedly, husband's education is not important predictor for the desire of children in this study. Similar result has also been observed in a study in Bangladesh (Uddin *et al*., 2011). It however seems illogical as husbands have significant role in making decisions on the number of children in their family, particularly in the Ethiopian context where husbands are dominant. However, it may be that since three-fourth of the women studied were from rural areas and that in rural areas both husbands and wives more or less have similar education level and social setups which make them share same views on the number of their children.

Consistent with our findings a study in Bangladesh revealed that negative relation was also observed between wealth index and the desired family size; the higher the wealth index, the lower the desired family size (Uddin *et al*., 2011).

CONCLUSION

This study was based on a nationwide large sample demographic and health survey conducted by the Ethiopian Statistical Agency. The study had empirically investigated and identified the determinants of the desired number of children by Ethiopian women. The negative binomial regression model analysis identified that a large degree of heterogeneity in the desired number of children per mother was observed among the different regions of Ethiopia. The random intercept model identified that variables such as women's age, household head, religion, marital status and family size were positively associated with the desired number of children by women during their reproductive age while age at first marriage, contraception, wealth index and women's education were negatively associated with the desired number of children by women at reproductive age. Education and wealth index play a key role in deciding on the number of children a family wants to have. Women with no formal education or who have attained only elementary education and women earning less income tend to have more desire for children. The desire to limit

the number of children increases with age at first marriage. To halt the continuing rapid population growth in a resource poor country like Ethiopia, educating women and engaging them in income generating activities should be among the priority policy agendas.

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Consent to publication: This manuscript has not been published elsewhere and is not under consideration in any other journal.

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