

Regional Variations and the Risk Factors Among Teenager Childbearing in Ethiopia an Evidences From Ethiopian Demographic and Health Survey, 2016

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Abstract

Background: Childbearing is a teenage girl usually within the ages of 13-19, becoming fertile. Teenage childbearing and the consequences associated with it remain a major concern worldwide. In Sub-Saharan African countries like Ethiopia, teenage childbearing rates have high compared to the rest of the world. The study assessed risk-factors and regional-variations among teenage childbearing in Ethiopia.

Method: The data were obtained from the 2016 Ethiopian Demographic and Health Survey. A two-stage cluster sampling design was applied to select the sample. Multilevel logistic regression models were used to assess' the risk-factors and regional-variation among teenage childbearing in Ethiopia.

Results: In this study, 3498 teenagers from nine regional states and two administrative cities in Ethiopia were included. Over 10% of teenagers have been born children at the time of data collection. Shortage of education, poor-wealth index, knowing ovulatory cycle, non-usage of contraceptive-method, and non-exposure to media found to be determinants of teenager childbearing in Ethiopia.

Conclusions: The incidence of teenage childbearing is high in Ethiopia then the concerned bodies provide awareness to the society on the risk of early pregnancy, encourage education, expand mass media and give special attention to poor and middle-income teenagers.

Background

Teenage childbearing is defined as a teenage girl, usually within the ages of 13–19, becoming fertile (18). Teenage childbearing and the consequences associated with it remain a major concern worldwide (5). WHO defines the age group 13–19 years of age as teenagers (21). A total of 1.2 billion adolescents aged 10–19 around the world make up 16% of the world's population. A total of 21 million pregnancies between 15–19 years in developing countries in 2016; approximately half (49%) were unintended, in which 43% in Asia, 45% in Africa, and 74% in Latin America and the Caribbean (22). Worldwide, adolescents injured from an inconsistent share of early marriage, unwanted pregnancies, and risky abortions, sexually transmitted infections (STIs) including HIV/AIDS, female genital cutting, underfeeding and anemia, sterility, sexual and gender-based violence, and other serious reproductive health problems (1, 11).

Half of the world's populations are under 25 years, 1.8 billion are aged 10–25, history's largest generation of adolescents, and about 85% live in the developing world. Most people become sexually active before their 20th year birthday. From the girls, in the least developed countries, 49% of girls marry before they turn 18 years (18). In each year an estimated 14 million adolescents between the ages of 15 and 19 give birth globally, in which more than 90% occur in developing countries (12, 19). Sub-Saharan African countries have high teenage and total fertility rates compared to the rest of the world (14). The regional average rate of births per 1000 females 15–19 years of age is 143, fluctuating from 45 in Mauritius to 229 in Guinea. This is very high compared to the world average of 65 (16). Accordingly, in Ethiopia almost constant fertility rate (115 per 1000 adolescents) was recorded from 1960 to 1967, the highest and almost constant fertility rate (120 or 121 per 1000 adolescents) was recorded from 1975 to 1985, and the smallest fertility rate (65 per 1000 adolescents) was recorded in 2016 (2). Teenage fertility rates in developing countries are declining, but the rates remain extremely high relative to those in the developed countries (20).

A study was done by Narring, F et al (10) on demographic and behavioral factors associated with adolescent pregnancy in Switzerland revealed that the use of less-effective methods of contraceptive or nonuse had an association with pregnancy and childbearing: Ever-users of rhythm or withdrawal were more likely to have experienced pregnancy and childbearing than those who had never used these methods (10).

A study conducted by Kosunen, E. et al on the trends and regional variation in teenage pregnancy, abortion and fertility rates found that there were remarkable regional differences in teenage fertility rates in Finland (9). It also showed highest fertility rates were in remote areas of the country and from the 1970s to 1990s regional differences remained the same and significant decreases in the incidence of teenage pregnancies were recorded. The highest rates in remote areas are attributed to the less effective use of contraceptives and the reduction of sex education in schools (9).

According to a study employed by Sayem, A. and Abu Taher using logistic regression technique to assess factors associated with teenage marital pregnancy among Bangladeshi women revealed that participants aged 20–24 years had a higher likelihood (OR: 1.971), whereas participants aged 25–29 years had lower likelihood (OR: 0.054) of experiencing teenage marital pregnancy compared with participants aged 15–19 years. Also, participants desired for greater than 2 children had higher odds (OR: 3.573) and participants born in urban area had lower odds (OR 0.458) for teenage marital pregnancy (15). Similarly, a study done by Chiavegatto and Kawachi using longitudinal multilevel analysis on Income inequality is associated with adolescent fertility in Brazil revealed that there is a positive association between income inequality and adolescent fertility (6).

A study employed by Alemayehu et al on the determinants of adolescent fertility in Ethiopia using a logistic regression model found that 13.6% and 3.1% of fertility rates were pregnant for the first time during the study period (17). Delayed marriage or non-marriage and postpartum sterility were also the determinants of childbearing both in urban and rural residents in the country while the use of contraceptives was a determinant factor in the urban area. The study also revealed that age at first marriage, education status, place of residence, and age were significant predictors (17).

According to a CSA, the report revealed that Teenagers in rural areas are three times more likely to have begun childbearing than their urban peers: 15% of rural teenagers have had a live birth or are pregnant, as compared with 5% of urban teenagers. By region, teenage childbearing is highest in Affar (23%) and Somali (19%) and lowest in Addis Ababa (3%) followed by Amhara (8%) (7). Similarly, a study conducted by Beyene et al in Assossa General Hospital showed that Teenage pregnancy is estimated as 20.4%. A high proportion of teenagers (46.8%) had engaged in premarital sex. It also revealed that among sexually active teenage females, 46.7% of them were experienced their first sexual by pressure. Being young (AOR = 0.21), single (AOR = 0.06), housemaid (AOR = 3.93), and use of family planning (AOR = 2.39) had a statistically significant association with teenage pregnancy (4).

A study employed by Eyasu, using logistic regression models on determinants of adolescent fertility among rural women of Ethiopia using EDHS 2011 data found that low knowledge of ovulatory cycle, low contraceptive used and low knowledge of family planning, shortage of education and communication with the health professionals, improve mass media message follow up was the main determinants in Ethiopia (3).

Many studies have been done, but most of the studies are specific to some area and centered on the general populations of reproductive age, and done based on the binary logistic regression model. However, the binary logistic model fails to handle random effects, regional variation, and subject-specific variation in teenage fertility. Hence, this study was focused on applying multilevel logistic regression models to overcome these problems. Thus, this study aimed to assess teenager fertility variation among regional states of Ethiopia.

Methods

Data Source and sampling procedure

A 2016 Ethiopia Demographic and Health Survey (2016-EDHS) data was used for this study. EDHS 2016 data is the fourth survey and conducted by the Central Statistical Agency (CSA). The data was collected from January 18, 2016, to June 27, 2016. The total frame is 84,915 enumeration areas (EAs) that cover an average of 181 households.

The data was stratified and selected in two stages. Before that, each region was stratified into urban and rural areas and then samples of EAs were selected independently.

In the first stage, a total of 645 EAs (202 EAs in urban and 443 EAs in rural areas) were selected with probability proportional to the EA size and with independent selection in each sampling stratum. And then a household listing operation was carried out in all the selected EAs for one year (7). The resulting lists of households helped as a sampling frame for the selection of households in the second stage. In this stage of selection, a fixed number of 28 households per cluster were selected with an equal probability systematic selection from the newly created household listing.

From the selected EAs a total of 18,008 households were selected for the sample, of which 17,067 were occupied. Out of the full households, 16,650 were successfully interviewed. Out of the interviewed households, 16,583 women were eligible for individual interviews; at the end, interviews were accomplished with 15,683 women yielding a response rate of 95 percent. 14,795 eligible men were identified in the sampled households and 12,688 were interviewed well. Generally, the response rates were higher in rural than urban areas, especially for men.

Outcome Variable

The response variable for this study is the status of fertility and it was dichotomized with being fertile by the time of the interview and not being fertile.

Predictor Variables

Is a variable that is supposed to affect or determine an outcome variable. Since based on the reviewed literature, some of the common predictors that are expected to influence determinants of teenage fertility in Ethiopia were residence, region, Religion, knowledge of ovulatory cycle, Exposure to mass media, working status, economic status, and usage of contraceptive method.

Inclusion and exclusion criteria

All the participants of the study ranging from 15 to 49 years in age were considered and otherwise excluded.

Method of data analysis

In this study binary and multilevel logistic regression models were conducted to examine the factors and variations of teenage fertility in Ethiopia across regions using the help of SPSS and STATA software packages respectively.

Results

Results of descriptive statistics

In this study, 3498 teenagers from nine regional states and two administrative cities in Ethiopia were included. Among these, 359 (10.263%) teenagers have been born child at the time of data collection.

Table-1 showed that among the total teenagers 8.27%, 20.68%, 7.04%, 13.73%, 15.36%, 10.55%, 6.91%, 15.57%, 14.21%, 1.85% and 7.17% of childbearing rates were live in Tigray, Affar, Amhara, Oromia, Somali, Benshangul, SNNPR, Gambella, Harari, Addis Ababa, and Dire-Dawa regions respectively. Similarly, out of the total 4.25% of urban teenagers were fertile and 13.59% of rural teenagers were fertile at the time of data collection. And, 5.25% of teenagers followed Orthodox, 14.84% of teenagers followed Muslim, and 11.01% of teenagers followed other religions were fertile at data collection time. The result showed that; 22.46%, 9.47%, 4.64%, and 1.94% of teenagers had no education, primary education; secondary education and higher education respectively were fertile.

According to table-1, 17.61% of poor, 12.13% of middle, and 4.93% of rich wealth index teenagers were fertile. Similarly, 10.20%, 18.14%, 8.64%, 10.23%, 9.94%, and 6.41% of teenagers knew during her period, after the period ended, middle of the cycle, before a period begins, at any time and don't know anything was fertile respectively. It also shows, 8.28% of teenagers' used contraceptive methods; 9.94% of them have not used any method, 6.41% of them were used traditional and modern methods. Furthermore; 10.71% of non-employed and 8.91% of employed teenagers were fertile at the time of data collection. Likewise, 14.88% of teenagers were non-exposed and 6.58% of teenagers who were exposed to any mass media were fertile.

Table 1
The rate of teenagers' fertility for each indicator

Variables		Fertility Status					Chi-square test		
		Not Fertile	Fertile	Total	Rate	Proportion	Value	df	P-value
Region	Tigray	388	35	423	8.27%	9.02%	101.88	10	0.000
	Afar	211	55	266	20.68%	26.07%			
	Amhara	330	25	355	7.04%	7.58%			
	Oromia	358	57	415	13.73%	15.92%			
	Somali	270	49	319	15.36%	18.15%			
	Benishangul	212	25	237	10.55%	11.79%			
	SNNPR	364	27	391	6.91%	7.42%			
	Gambela	179	33	212	15.57%	18.44%			
	Harari	157	26	183	14.21%	16.56%			
	Addis Adaba	424	8	432	1.85%	1.89%			
Dire Dawa	246	19	265	7.17%	7.72%				
Residence	Urban	1193	53	1246	4.25%	4.44%	75.89	1	0.000
	Rural	1946	306	2252	13.59%	15.72%			
Religion	Orthodox	1335	74	1409	5.25%	5.54%	71.499	2	0.000
	Muslim	1222	213	1435	14.84%	17.43%			
	Others	582	72	654	11.01%	12.37%			
Educational Level	No education	442	128	570	22.46%	28.96%	128.57	3	0.000
	Primary	1835	192	2027	9.47%	10.46%			
	Secondary	761	37	798	4.64%	4.86%			
	Higher	101	2	103	1.94%	1.98%			
Wealth Index	Poor	992	212	1204	17.61%	21.37%	128.54	2	0.000
	Middle	413	57	470	12.13%	13.80%			
	Rich	1734	90	1824	4.93%	5.19%			
Knowledge of Ovulatory Cycle	During her period	132	15	147	10.20%	11.36%			
	After period ended	537	119	656	18.14%	22.16%			

	Middle of the cycle	592	56	648	8.64%	9.46%	62.20	5	0.000
	Before period begins	237	27	264	10.23%	11.39%			
	At any time	707	78	785	9.94%	11.03%			
	Don't know	934	64	998	6.41%	6.85%			
Contraceptive Method used	No method	3015	272	3287	8.28%	9.02%			
	Traditional method	2	2	4	50.00%	100.00%	234.18	2	0.000
	Modern method	122	85	207	41.06%	69.67%			
Working Status	No	2342	281	2623	10.71%	12.00%	2.30	1	0.129
	Yes	797	78	875	8.91%	9.79%			
Household head Sex	Male	2123	250	2373	10.54%	11.78%	0.594	1	0.441
	Female	1016	109	1125	9.69%	10.73%			
Exposure to Mass Media	No	1321	231	1552	14.88%	17.49%	64.684	1	0.008
	Yes	1818	128	1946	6.58%	7.04%			

Table-1 also showed that the Chi-square Test of association between teenagers' childbearing and explanatory variables. Therefore, regions, residence, religion, teenagers' educational level, household wealth index, knowledge of ovulatory cycle, contraceptive method usage status, and exposure to mass media have a significant association with teenagers' fertility at a 5% level of significance.

Results of logistic regression analysis

Hosmer and Lemeshow Test of Goodness of fit

Table-2 showed that the Hosmer and Lemeshow test statistic. Since the Hosmer and Lemeshow goodness-of-fit test statistic is not significant at 5% of levels of significance, indicating that the fitted model is good to fit the data.

Table 2
Hosmer and Lemeshow Test

Hosmer and Lemeshow Test			
Step	Chi-square	Df	Sig.
1	7.825	8	0.451

Results of Multilevel Logistic Regression Analysis

Test of Heterogeneity between Regions

Table-3 showed that Pearson Chi-square = 101.880 with P-value = 0.000, which is highly significant and it indicates that there is heterogeneity among teenagers' fertility across regional states of Ethiopia. Therefore, applying multilevel logistic analysis is better to fit the data set.

Table 3
Tests of Heterogeneity

Chi-Square Tests			
Statistics	Value	Df	p-value
Pearson Chi-Square	101.880 ^a	10	0.000

Results of Random Slope Multilevel Logistic Regression Model

Table 4 showed that the p-value for all variables were less than 0.05, it suggested the variations of all variables from region to region were significant at a 5% level of significance and the variables educational level and contraceptive methods have high regional variations, indicating that they are the most varying variables through the region and are permitted to analyze random slope method.

Table 4
Comparison between different models with their random slopes

Models	Source of Random Slope	Loglik	AIC	BIC	Chi2	P-Value	Regional Variation
Model1	Religion	-916.3357	1865.748	1976.627	11.05	0.00114	0.0374
Model2	Education-Level	-914.48	1864.96	1975.84	11.84	0.0079	0.0844
Model3	Wealth Index	-916.33	1868.659	1979.538	8.14	0.0432	0.0002
Model4	KnoOvuCycle	-915.2054	1866.411	1977.29	10.39	0.0155	0.009
Model5	Cont.Method	-906.9147	1849.829	1960.709	26.97	0.000	1.467
Model6	Media Exposure.	-915.878	1867.755	1978.634	9.05	0.0287	0.00224
Model7	Logistic	-903.1437	1856	2010.286	-	-	-
Model8	Cont.Method and Edu.Level	-901.3247	1844.649	1974.008	38.15	0.000	-
Model9	Cont.Method and Religion	Hessian is not negative semi-definite (ltr = 6, loglik= -903.69056)					
Mode10	Religion&Education level	-913.2903	1868.58	1997.94	14.22	0.0273	-

According to the result, model-8 was better than the other multilevel logistic regression models because it has the smallest AIC and the largest log-likelihood.

Table 5 is the final model for the data and it revealed that within a region, the odds of teenagers who followed other religion were 2.276 times more likely to childbearing than Orthodox religion followers, and odds of teenagers' who followed Muslim religion were 2.83 times more likely to childbearing than that of teenagers in Orthodox religion followers holding the other variables constant. Similarly, the odds of teenagers who have primary education were 0.426 times less likely to fertile than that of teenagers with no education and the odds of teenagers with higher education is 0.103 times less likely to fertile than that of teenagers with no education holding the other variables constant.

The model also showed that within a region the Odds of teenagers with poor wealth index were 2.883 times more likely to childbearing than teenagers with rich wealth index and odds of teenagers with middle wealth Index were 2.335 times more likely to fertile than that of teenagers with their wealth index rich.

The finding also showed that within a region, the Odds of teenagers knowing the Ovulatory cycle during her period were 2.61 times more likely to fertile than that of teenagers who don't have any knowledge. The odds of teenagers knowing the Ovulatory cycle after their period ended were 4.564 times more likely to fertile than that of teenagers' who don't have any knowledge. Similarly, the odds of teenagers' knowing the Ovulatory cycle at the middle of their cycle were 2.9 times more likely to fertile than that of the reference group, the odds of teenagers' knowing the Ovulatory cycle before their period begins were 2.986 times more likely to fertile than that of the reference group and the odds of teenagers knowing Ovulatory cycle at any time were 2.071 times more likely to fertile than that of teenagers' who don't have any knowledge about Ovulatory cycle.

The model also showed that within the region the odds of teenagers' who don't use modern contraceptive methods were 18.46 times more likely to fertile than that of teenagers' who used a modern contraceptive method. Furthermore, the result showed that within the region the odds of teenagers' who were exposed to media were 0.758 times less likely to fertile than that of teenagers who don't expose to media.

Table 5: Results of random slope multilevel logistic regression analysis

Log likelihood = -901.32466		Prob > chi2 = 0.0000				
Fertility Status	Coef(β)	Odds ratio	Std. Err.	z	P> z	[95% Conf. Interval]
Religion						
Others	.8224863	2.276152	.2466771	3.33	0.001	[.3390081 1.305965]
Muslim	1.040384	2.830303	.1984133	5.24	0.000	[.6515008 1.429267]
Edu_Level						
Primary	-.8529002	.4261771	.2067004	-4.13	0.000	[-1.258026 -.4477748]
Secondary	-1.364583	.2554872	.3763602	-3.63	0.000	[-2.102235 -.6269306]
Higher	-2.27489	.1028082	.8928239	-2.55	0.011	[-4.024793 -.5249874]
Wealth Index						
Poor	1.058784	2.882862	.1793554	5.90	0.000	[.7072535 1.410314]
Middle	.8481119	2.335234	.2103075	4.03	0.000	[.4359168 1.260307]
KnowIOvuCycle						
During her period	.9589383	2.608925	.3467006	2.77	0.006	[.2794176 1.638459]
After period ended	1.518106	4.563572	.1846378	8.22	0.000	[1.156222 1.879989]
Middle of the cycle	1.064731	2.900057	.2190734	4.86	0.000	[.6353546 1.494106]
Before period begins	1.093862	2.985783	.2831784	3.86	0.000	[.5388424 1.648881]
At any time	.7278221	2.070566	.1928218	3.77	0.000	[.3498983 1.105746]
Cont_Method						
Not used Modern Method	2.915632	18.46047	.5033395	5.79	0.000	[1.929105 3.902159]
Media						
yes	-.2769216	.7581139	.1506539	-1.84	0.049	[.5721979 .6183547]
_cons	-3.782807	.0227587	.2855193	-13.25	0.000	[-4.342415 -3.2232]
Random-effects Parameters Estimate Std. Err. [95% Conf. Interval]						
Region: Unstructured						
var(Cont_M~d)	2.046371	1.270492				[.6060591 6.909615]
var(Edu_Le~l)	.194058	.1339266				[.0501748 .750546]
var(_cons)	.0214262	.0375757				[.0006889 .6663766]
cov(Cont_M~d,Edu_Le~l)	-.5556981	.3540378				[-1.249599 .1382032]
cov(Cont_M~d,_cons)	.1995797	.1977573				[-.1880174 .5871769]
cov(Edu_Le~l,_cons)	-.0449959	.0710352				[-.1842223 .0942304]
LR test vs. logistic regression: chi2(6) = 38.15 Prob > chi2 = 0.0000						
Akaike's information criterion and Bayesian information criterion						
Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	3498	.	-901.3247	21	1844.649	1974.008

Discussions

The main aim of this study was to assess socioeconomic, demographic, other determinants associated with teenagers' fertility outcome in Ethiopia. Accordingly, descriptive analysis, chi-square test, binary logistic regression, and multilevel logistic regression models were employed. Accordingly, the results from this study were slightly consistent with most previous studies in terms of the risk factors of teenager's fertility and discussed as follow:

The descriptive analysis revealed that teenagers' fertility in Ethiopia was about 10.26%, meaning that there are about 103 fertile teenagers' for every 1000 teenagers. This finding is in correspondence with a study employed by Alemayehu et al (17) revealed that the teenage fertility rate was 13.6%. Teenagers who live in Affar, Gambela, Somali, Harari, and Oromia regions were more fertile rates than teenagers living in Benshangul, Tigray, Dire Dawa, Amhara, SNNPR, and Addis Ababa regions respectively.

The finding revealed that education level was significantly associated with the fertility of Teenagers'. It dealt that within in a region, the odds of teenagers who have primary education were 0.426 times less likely to fertile than that of teenagers with no education, and the odds of teenagers with higher education were 0.103 times less likely to fertile than that of teenagers with no education holding the other variables constant. This result is correspondence with a study conducted by Alemayehu et al (1); Eyasu (3) and Govindasamy et al (8) revealed that low education has one of a significant predictor on teenager's fertility.

The study also showed that usage of the Contraceptive method has a significant role on teenager's fertility. The odds of teenagers' who don't use modern contraceptive methods were 18.46 times more likely to fertile than that of teenagers' who used a modern contraceptive method. This finding is consistent with a study done by Eyasu (3), CSA (7), and Govindasamy et al (8) revealed that low knowledge of usage of Contraceptive method or never a user of Contraceptive method has one of a significant factor on teenager's fertility. Similarly, the result also correspondence with a study employed by Narring et al (10) revealed that the use of less-effective methods of contraceptive or nonuse had an association with pregnancy and childbearing.

The finding revealed that the wealth index was significantly associated with the fertility of Teenagers'. The odds of teenager's fertility indicating that within a region the Odds of teenagers with poor wealth index were 2.883 times more likely to fertile than that of teenagers with their wealth index rich and Odds of teenagers with middle wealth Index were 2.335 times more likely to fertile than that of teenagers with rich wealth index. This finding is consistent with a study conducted by Chiavegatto and Kawachi (6) showed that income inequality is associated with adolescent fertility. Similarly, the result also showed that knowledge of the Ovulatory cycle has a significant positive relationship with the odds of a teenager's fertility. The finding dealt that Odds of teenagers knowing the Ovulatory cycle were more likely to fertile than that of teenagers who don't have any knowledge. This finding is opposed to the study done by Eyasu(3) revealed that low knowledge of the ovulatory cycle is one predictor of teenagers' fertility.

Moreover, the study showed that Exposure to any mass media was significantly associated with the fertility of teenagers. The odds of teenagers exposed to media were 0.758 times less likely to fertile than that of teenagers exposed to media. This finding is in correspondence with a study employed by Govindasamy et al (8) and Yebo et al (23) showed that that exposure to media has a significant association with teenager's fertility.

Conclusions

In this study, 3498 teenagers from nine regional states and two administrative cities in Ethiopia were included. Over 10% of teenagers have been born children at the time of data collection. According to the result; Shortage of education, poor wealth index, knowing ovulatory cycle, non-usage of contraceptive method, non-exposure to media, and Muslim and other religious followers were found to be determinants of teenagers fertility in Ethiopia. Based on this; the concerned bodies provide awareness to the society on the risk of early pregnancy,

support Teenage to complete at least secondary education, expand mass media, and give special attention to teenagers with poor and middle income.

Abbreviations

ALR: Alternating Logistic Regression, ANC: Antenatal Care, AOR: Adjusted Odds Ratio, CSA: Central Statistical Agency, EAs: Enumeration Area, EDHS: Ethiopian Demographic and Health Survey, GLMM: Generalized Linear Mixed Model, JU: Jimma University, OR: Odds Ratio, GEE: Population Average, SPSS: Statistical Package for Social Science and WHO: World Health Organization

Declarations

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Authors' contributions

AE wrote the proposal and collected data from CSA. AE, AD, YN, BA, and YH performed the analysis. Although, AD wrote the manuscript principally together with all authors and all authors read and approved the final manuscript for submission.

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Ethics approval and consent to participate

Ethics approval and participant consent were not necessary for this study due to the use of previously-published data by the CSA of Ethiopia.

Availability of data and materials

The dataset was accessed from the CSA website after formal online registration and submission of the detailed project description. The data can be accessed through <http://www.statsethiopia.gov.et/>.

Consent for publication

Not applicable.

Competing Interests

The authors declare that there is no conflict of interest associated with the material presented in this study.

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