ORIGINAL ARITICLE

Multivariate Analysis of the Predictors of Women's Delivery at a Health Facility: Evidence from 2016 Ethiopian Demography and Health Survey

Kassahun Tegegne[1]

Abstract

The prevalence of women's health institutional delivery in developing countries, particularly in Ethiopia is very low. The empirical data show that migration and socio-demographic factors are responsible for low institutional deliveries in developing countries. Therefore, the overall objective of the study was to establish whether there were differences in women's access to delivery facilities across the different migration status and socio-demographic factors. To achieve this objective, a cross-sectional analysis of data from 2016 Ethiopian Demographic and Health Survey (EDHS) was conducted. The 2016 EDHS interviewed a total of 15, 683 women, aged 15 to 49 years both in rural and urban areas. Out of the 15,683 interviewed women, only 7590 women who had live birth(s) in the last five years preceding the survey were taken as a study participant. The bivariate and multivariate analysis results show that urban to urban migrants and urban to rural migrants were more likely to deliver at a health facility than those from other migration status. In relation to socio-demographic factors, women who live in rural areas, women with no education, non-working women, older women, women with high birth order and women in the poorest wealth index were less likely to deliver at a health institution. Therefore, maternal health remains a public health concern due to lack of sufficient access to delivery facilities. Attention should be given on migration and socio-demographic factors that are responsible to inhibit women's institutional delivery. The government should target the most vulnerable groups such as rural women, non-working women, women in the poorest wealth category and women with high birth order to further reduce maternal mortality in the country.

***Keywords**: Migration types, place of delivery, socio-demographic, and Demographic and Health Survey*

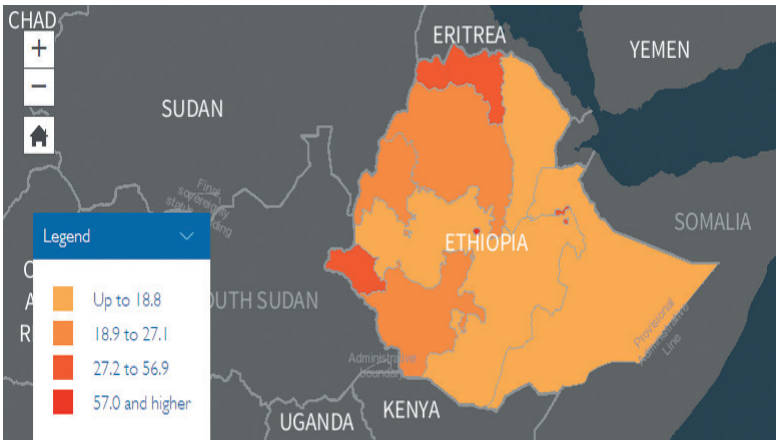
Introduction

The prevalence of women's delivery at a health institution is very low in developing countries, particularly in Ethiopia. Many factors contribute to the low prevalence of women's delivery in the Ethiopian health facilities. Some of the factors are low education, poverty, social and cultural factors, poor health care systems, low awareness and limited knowledge about delivery at a health facilities, limited supply of health care services and low empowerment of women (Chimankar and Sahoo, 2011; Chkraborty et al, 2003; Titaley et al, 2010; Singh et al, 2012; Subaiya, 2007; Yakong et al, 2010). There are many evidences that show the low prevalence of women's delivery at health facilities that are linked to a range of problems, including distance to a health facility, migration status, residence, and religious factors (Rahman et al, 2011; Singh et al, 2012; Ochako et al, 2011; Kusuma et al, 2013; Gabrysch and Campbell, 2009; Feng et al 2005; Dias et al, 2008; Chu, 2005).

Empirical evidences in Ethiopia show that there are inequalities in maternal health care service utilization, particularly, women's delivery at a health facility across migration status and socio-demographic variables. At national level, only, 31% of women delivered at health facilities as indicated in the survey (CSA, 2017). The existing delivery institutions at national level do not adequately respond to the delivery needs of regional levels. For

1 University of Gondar, Ethiopia

instance, the 2016 Ethiopian Demographic and Health Survey (EDHS) showed that more than 50% of women in Addis Ababa, Harari, Tigray, Dire Dawa and Gambella regions had delivered in health facilities compared to other regions of the country (see figure 1). Apart from regional variations, socio-demographic factors such as migration status, wealth status, religion, place of residence, birth order, education, age, years lived in the place of residence when the survey was conducted; work status and participation in household decision are also responsible for the variations in institutional deliveries in Ethiopia.



Source: 2016 Ethiopian Demographic and Health Survey

Figure 1: Map of Ethiopia showing the prevalence of Institutional Delivery across the Regions of the country

Ethiopia is one of the developing countries which poorly performs in terms of maternal health care service provision. According to the Ethiopian Demographic and Health Survey (CSA, 2017), the maternal mortality rate is estimated as 673 per 100, 000 live births, which is the highest in the world. Data from the World Health Organization (WHO) estimates about 88% maternal deaths in Ethiopia are attributed to unsafe abortion, lack of obstetric emergency services, limited health care services and skilled delivery services (WHO, 2012). Data from EDHS indicated that maternal health care service provision is poor with only 32 % of women received 4 and above antenatal checkups during pregnancy from a skilled professional such as doctors and nurses/midwives, health officers and health extension workers, while 28% delivered with the help of skilled birth attendants, and 26 % delivered in a health facility (CSA, 2017; CSA, 2008). Moreover, only 17% of mothers had a postnatal check-up within 2 days of delivery. The provision of maternal health care services has been very poor over time. A recent report revealed that Ethiopia ranks the lowest in overall maternal health care service utilization among the Sub-Saharan African countries (CSA, 2012; United Nations, 2012). However, antenatal care increased from 10% in 2000 to 32% in 2016; and delivery in a health facility increased from 5 in 2000 to 26% in 2016 (CSA, 2017; CSA, 2002). According to the 2016 EDHS reports, access to and utilization of maternal health care services were higher in urban areas than in rural areas.

Various studies have been conducted on the effect of migration types and socio-demographic factors on women's delivery at a health facility. A brief review of the literature on the effect of migration types on maternal delivery at health facility indicates that there are three main theories which explain the relationship between migration and women's

delivery at health facility (Lindstrom and Saucedo, 2007). These theories are migration selection, disruption, and adaptation. Migration selection indicates that migrants are not randomly selected from among the population at their place of origin; rather, they are selected based on their socio-economic and demographic backgrounds (Dias et al, 2008). Migration disruption, on the other hand, refers to migrant women's separation from their social and/or economic support, parents, and relatives immediately after migrating (Minnis, 2010). Migration adaptation refers to changes in the migrant's reproductive behavior and attitudes in line with the new socioeconomic, cultural, and reproductive behavior of the host community at the place of destination (Lindstrom and Munoz-Franco, 2006). All these migration theories affect women's maternal health seeking behaviors. Various studies in relation to migration and maternal delivery at a health facility produced different results and, thus, remained inconclusive. This is due to the fact that some of the studies were conducted in very specific areas using limited sample sizes. For instance, studies have shown that rural to urban migrant women and women who live in urban areas, are more likely to deliver at a health facility while other studies have failed showing any significant difference (Shiferaw et al, 2013; Yesufi et al, 2014; Abebe et al, 2012; Worku et al, 2013). The lack of conclusive patterns from previous studies is mainly attributable to the fact that most of these studies have focused on specific settings, involving small samples with limited statistical power to detect significant associations. However, this study uses a national survey which comprises a large sample size that involves a comprehensive analysis of data. Thus, it provides an overall picture for the factors that affect women's delivery at a health facility in the country.

The Study Objectives

The overall objective of the study was to establish whether there were differences in women's delivery at a health facility across the different migration categories and socio-demographic factors in Ethiopia.

The specific Objectives of the Study

1. To identify the demographic factors that affect women's delivery at a health facility.
2. To assess the economic factors that affect women's delivery at a health facility.
3. To determine which migration type has a positive effect on women's delivery at a health facility.

Methods

All the data sources and methods used to address the objectives of the study are discussed in this section.

The Data Source

The data for the secondary analysis came from the 2016 Ethiopian Demographic and Health Survey (EDHS). The Demographic and Health Surveys are large scale studies that are conducted on a regular basis in many countries and are probably the most important source of demographic and health data in developing countries. The 2016 EDHS was conducted by the Central Statistical Agency (CSA) under the auspices of the Ministry of Health. This is the fourth Demographic and Health Survey conducted in Ethiopia, under the worldwide MEASRE DHS project, a USAID – funded project. Technical support for the survey was provided by Macro International Inc (CSA, 2017). The DHS is a population-based, national representative survey that links individual reproductive health care services utilization with the full set of socio-economic and demographic factors. The sur-

vey is designed to produce representative estimates for the country as a whole, for the urban and the rural areas separately, and for each of the eleven regions.

The EDHS contained three types of questionnaires: the household questionnaire, the woman's questionnaire, and the man's questionnaire (CSA, 2017). The household information includes: household composition, basic demographic characteristics of the household members, and socio-economic characteristics of the households. The individual woman's questions focus on demographic and reproductive health characteristics such as family planning, contraceptive use, maternal health care service, birth histories, births within the last five years preceding the survey, antenatal care, place of delivery, delivery assistance and postnatal care. As part of the International survey, EDHS's questions have been adapted from model survey questionnaires developed by the MEASURE DHS project and have been tested over different developing countries for more than 100 surveys and thus the increment of its validity and quality of the data is maximized (CSA, 2017).

A total of 16,650 households were interviewed and yielded a response rate of 99%. Similarly, out of 15,683 interviewed women, 96% of them completed the interview and out of 12,688 interviewed men, 89% of them responded to the survey. The household response rate was higher than the response rate of women and men (CSA, 2017).

Data Cleaning and Recoding of Variables

Prior to embarking on data analysis, it is important to check the dataset for errors. Even though the data are a secondary data that were screened and cleaned by the Central statistical Agency (CSA, 2017), still there were issues that need to be assessed in order to identify outliers and missing cases. The examination of outliers and missing cases is important to determine the variable that will be part of the analysis. If there are more missing cases, the variable may not be included in the analysis. After assessing the missing values of the outcome and predictor variables, the distributions of cases in categorical variables were also assessed by running frequencies. Based on the frequency results, variables which have very few cases were merged into categories to facilitate the multivariate analysis.

Method of Data Analyses

The data analyses were started with the univariate presentation of the socio-demographic characteristics of women while bivariate statistics was carried out to explore the association of migration status and socio-demographic variables with women's delivery at a health facility. Binary logistic regression was used as outcome variables were dichotomous. For binary logistic regression analyses, statistical inferences were made on the basis of estimates of the odds ratio (OR) with 95% confidence level. A number of models were fitted until the significant variables were determined for the final model. All models were carried out using SPSS version 20. Those variables identified as having a significant effect on women's delivery at a health facility in the bivariate statistics with statistically significant at (0.05) were selected for further multivariate analyses. Variables which were not statistically significant at 0.05 levels were removed from the final model. The final model of the logistic regression was assessed for its robustness using two methods: checking of outliers and multicollinearity. To check outliers, the regression model residuals were used to identify potential outlines (observations not well fit by the model). For example, a predictor with a residual of +/-2.0 or larger indicates an outlier. Using this criterion, the residuals were assessed and there were no variables which had a residual of +/-2 or larger.

The second way of checking robustness of the model was assessing the multicollinearity. Multicollinearity refers to the association between the explanatory variables. The study assessed multicollinearity using two methods: Correlation matrices and variance of inflation factors (VIF). The correlation matrix is simply a table produced as one of the logistic regression results that indicates the correlation between two explanatory variables. If the value of the correlation is closer to 1 or -1 that indicates the existence of collinearity. The results of the analysis indicated that there was no correlation between two explanatory variables whose correlation value is more than 0.8.

The second method used to detect multicollinearity was variance inflation factor (VIF). The variance inflation factors were checked in the same way as it is done for the linear regression. Since logistic regression model has no facility to examine the multi-collinearity, a linear regression analysis was carried out using the same predictors and dependent variables. The value of variance inflation factors of each variable was assessed to detect whether there is multicollinearity or not. If the value of VIF is more than 10, there is multicollinearity among predictors, but the results of this study indicated that there was no multicollinearity because the value of VIF for all variables were less than 10.

Operational Definition of Dependent and Independent variables

Table1 Operational Definition of Dependent and Independent variables

Variables	**Description**	**Measurement scale: definition**
Dependent variable		
Place of delivery	This was defined as whether a woman delivered her last live birth in a health facility (both at public and private facilities) or at home	Dichotomous 0= delivered at home and 1=delivered at health facilities
Independent variables		
Migration status	This is constructed from the information about migration relating to the number of years spent at the respondents' current place of residence (coded as single years, and always) and the type of previous and current place of residence (rural and urban)	Migration status: Nominal 1=urban non-migrants 2=urban to urban migrants 3=urban to rural migrants 4=rural non-migrants 5=rura to urban migrants 6= rural to urban migrants
Years lived in the current place of residence	This variable is constructed from the information about migration relating to the number of years migrants spent at the current place of residence (coded as single years and always)	Years lived in the current place of residence: Ordinal 1=non-migrants, 2=0-5 years 3=6-9 years, 4=10 years and above
Residence	Respondent's current place of residence	Nominal: 1=urban and 2 =rural

Age	Self reported age of respondent at the time of the survey	Continuous, but recoded as Ordinal 1= 15-24 yrs, 2=25-34 yrs 3=35-49 yrs
Religion	Religious affiliation of respondent	Nominal: 1=Orthodox, 2=Muslim, 3=protestant and 4=others
Region	Place/region	Nominal: 1=Tigray, 2=Afar, 3=Amhara, 4=Oromia, 5=Somali, 6=Benishangul, 7=SNNPR, 8=Gambela, 9=Harari, 10= Addis Adaba and 11=Dire Dawa
Education	Respondent's educational level	Ordinal: 0=no education, 1 primary education, and 2 =secondary and above
Wealth status	This variable is constructed from a household's durable assets using a principal component analysis	Ordinal: 1=poorest, 2=poorer, 3=middle, 4=richer, 5=richer, and 6=richest
Working status	respondent's working status at the time of the survey	Ordinal: 0=not working, and 1=working
Number of antenatal care	Number of antenatal cares a woman received at her last pregnance	Continuous (count data), recoded into: 0= no antenatal care received 1=1-3 antenatal care received 4 and above antenatal care received
Decision on health care	Person who decides respondents' health care(coded as respondent alone, respondent and husband/partner, respondent and other person, husband and partner alone, someone else, and other)	Nominal: 0=husband/partner/other alone 1=Jointly(husband, respondent and other)
Birth order		Ordinal: 1=1 2=2-3 birth order 3=4 and above birth order

Results

In this section, the results of the study are presented and examined in detail. The section begins with a description of the 2016 EDHS sample population by migration status, and socio-demographic characteristics, followed by the results of bivariate and multivariate analyses.

Table 2 summarizes the background characteristics of the study population. Of the 7590 ever married women who had a live birth(s) in five years preceding the survey were interviewed in the 2016 EDHS, and the majority of them were rural non-migrants (60.0%), rural to rural migrants (24.0%) and urban non-migrants (5.5%). The survey results also indicate that among migrants, 16.5%, 12.0%, and 6.3% lived 10 years, 0-5 years, and 6-9 years in the current place of residents, respectively. In relation to place of residence, 87.2% of respondents and 12.8% of respondents lived in rural and urban areas, respectively. In terms of age, 5 to 24 comprise 23.8%, those of 25 to 34 years were 47% and those 35 to 49 years were 25.8% of the total respondents. The distribution of the study population across regions shows that 41.2%, 21.5% and 21.1% of women were from regions of Oromia, Amhara and SNNPR, respectively.

As one can see from Table 2, majority of the respondents (38.0%) were followers of Orthodox Christian followed by Muslim (37.2%). According to the survey results, the educational levels of the study population were very low. Only 8.6% and 28.3% of women had secondary/higher and primary education respectively. In relation to wealth status, the majority of women were from the poorest (21.8%) and poorer (21.8) households. The distribution of respondents by their working status indicated that close to 54% of women were not working during the survey. The distribution of women by the number of antenatal care indicates that 56.8% of women did not receive any antenatal care during their last pregnancy.

Table.2: The Percentage Distribution of Women who had Live Births in the Last Five Years Preceding the Survey by Migration Status and Selected Socio-demographic Characteristics, EDHS 2016 (N=7590)

Characteristics	**Respondents characteristics**	
	Number (Weighted)	**Percent**
Migration Status		
Urban non-migrants	414	5.5
Urban to urban migrants	257	3.4
Urban to rural migrants	246	3.2
Rural non-migrants	4553	60.0
Rural to urban migrants	297	3.9
Rural to rural migrants	1822	24.0
Years lived in the current place		
Non-migrants	4950	65.2
0_5 yrs	912	12.0
6_9 yrs	477	6.3
10 yrs and above	1251	16.5
Place of residence		
Urban	969	12.8
Rural	664	87.2
Age of women		
15-24 yrs	1804	23.8
25-34 yrs	3826	50.4
35- 49 yrs	1959	25.8

Characteristics	Respondents characteristics	
	Number (Weighted)	**Percent**
Birth order		
1	1434	18.9
2-3	2282	30.1
4 and above	3874	51.0
Religion		
Orthodox Christian	2882	38.0
Muslim	2824	37.2
Protestant	1651	21.8
Others	231	3.1
Administrative regions		
Tigray	537	7.1
Afar	71	0.9
Amhara	1632	21.5
Oromia	3129	41.2
Somali	269	3.5
Benishangul	81	1.1
SNNPR	1601	21.1
Gambela	21	0.3
Harari	17	0.2
Addis Adaba	198	2.6
Dire Dawa	33	0.4
Women's education		
No education	4791	63.1
Primary education	2150	28.3
Secondary education and more	649	8.6
Respondent current working status		
No	4078	53.7
Yes	3512	46.3
Wealth status		
Poorest	1651	21.8
Poorer	1654	21.8
Middle	1588	20.9
Richer	1427	18.8
Richest	1269	16.7
NO of ANC received		
No ANC received	4314	56.8
1-3 ANC received	1612	21.2
4 ANC and above	1663	21.9
Person who decides about respondent's health care		
Jointly	5,668	74.7
Husband/partner/others	1, 921	25.3

Source: 2016 Ethiopian Demographic and Health Survey

In the following section, the paper presented the association of migration status and socio-demographic variables with women's delivery at health facility. As one can see from Table 3 migration status, number of years migrants lived in the current place of residence, age, birth order, religion, region of residence, level of education, working status, wealth status, number of antenatal care women received, and women's participation in decision making were statistically associated with women's delivery at a health facility. The results show that significant proportion of urban to urban migrants (93.1%) and rural to urban migrant women (80.6%) delivered in a health facility as compared to other migration status. The likelihood of giving birth at a health facility decreased with increasing migrant women's number of years lived in the current place of residence. For instance, 52.0%, 28.5%, and 24.9% of migrant women who lived 0-5 years, 6-9 years and 10 years and above in the current place of residence delivered at a health facility, respectively($p<0.001$). A higher proportion of urban women (79.3%) than rural women (19.7%) delivered in a health facility ($p<0.001$). The likelihood of women's delivery at health facility decreased with increasing women's age, from 15 to 24 years (34.3 %%), 25 to 34 year (25.5%) to 35-49 years (20.6%).

Similarly, delivery at a health facility decreased with increasing birth order. A lower proportion of women who had four or more birth orders (16.4%) have delivered at a health facility compared to women who had 1 live birth order (48.3%) ($p<0.001$). The reported health facility delivery was higher among Orthodox women (36.6%), followed by protestant women (24.2%), and Muslim women (20.1%). There were also regional disparities in the health facility delivery in the country. The results show that, except women in Addis Ababa, Dire Dawa, Harari and Tigray region, women's delivery at a health facility was below 50% in other regions of the country ($p<0.001$).As shown in Table 3, delivery at a health facility increases with increasing women's educational levels. Women with no education (15.9%), women with primary education (36.8%), and women with secondary education/higher (82.2%) had delivered at the health facility. Again, working women were more likely to deliver at a health facility (34.2%) compared to non-working women (23.7%).

The wealth index was highly associated with women's delivery at a health facility ($P<0.001$). The proportion of women who gave birth at health facility increased as the level of wealth increased, from poorest (10.6%) to richest (68.6%). Other variable such as women's antenatal care has a significant association with women's delivery at health facility ($p<0.001$). Women who received antenatal care had a positive effect on women's delivery at a health facility. Also, women who participated in household decision making were more likely to deliver at a health facility compared to women who did not participate in household decision making.

Table 3: Bivariate Analysis of Women's Delivery at a Health Facility by Migration Status and Socio-demographic Factors

Characteristics	Place of Delivery			
	Home N(%)	Health facility N(%)	Total N(%)	P-value
Migration Status				
Urban non-migrants	160(29.8)	377(70.2)	537(100)	
Urban to urban migrants	22(6.9)	296(93.1)	318(100)	
Urban to rural migrants	70(19.4)	291(41.7)	361(100)	P<0.001
Rural non-migrants	5594(81.4)	1275(18.6)	6869(100	
Rural to urban migrants	187(58.3)	134(80.6)	321(100)	
Rural to rural migrants	2098(80.1)	520(19.9)	2618(100	
Years lived in the current place				
Non-migrants	5742(77.7)	1644(22.3)	7386(100)	
0_5 yrs	557(48.9)	604(52.0)	1161(100)	P<001
6_9 yrs	556(71.5)	222(28.5)	778(100)	
10 yrs and above	1276(75.1)	422(24.9)	1698(100)	
Place of residence				
Urban	252(20.7)	963(79.3)	1215(100)	P<001
Rural	7878(80.3)	1929(19.7)	9807(100)	
Age of women				
15-24 yrs	1608(65.7)	838(34.3)	2446(100)	
25-34 yrs	4352(74.5)	1490(25.5)	5842(100)	P<001
35- 49 yrs	2171(79.4)	563(20.6)	2734(100)	
Birth order				
1	1064(51.7)	995(48.3)	2059(100)	
2-3	2384(71.0)	975(29.0)	3359(100)	P<001
4 and above	4683(63.6)	922(16.4)	5605(100)	
Religion				
Orthodox Christian	2393(63.4)	1379(36.6)	3772(100)	
Muslim	3646(79.9)	915(20.1)	4561(100)	P<001
Protestant	1765(75.8)	564(24.2)	2329(100)	
Others	327(90.6)	34(9.4)	361(100)	
Administrative regions				
Tigray	308(43.0)	408(57.0)	716(100)	
Afar	97(85.1)	17(14.9)	114(100)	
Amhara	1510(72.9)	562(27.1)	2072(100)	
Oromia	3941(81.2)	910(18.8)	4851(100)	
Somali	417(82.1)	9(17.9)	508(100)	P<001
Benishangul	90(74.4)	31(25.6)	121(100)	
SNNPR	1710(74.5)	586(25.5)	2296(100)	
Gambela	15(55.6)	12(44.4)	27(100)	
Harari	13(50.0)	13(50.0)	26(100)	
Addis Adaba	8(3.3)	236(96.7)	244(100)	
Dire Dawa	21(44.7)	26(55.3)	47(100)	

Characteristics	Place of Delivery			
	Home N(%)	Health facility N(%)	Total N(%)	P-value
Women's education No education Primary education Secondary education and more	6125(84.1) 1866(63.2) 14017.0)	1159(15.9) 1085(36.8) 648(82.2)	7284(100) 2951(100) 788(100)	P<0.001
Respondent currently working No Yes	6165(76.7) 1965(65.8)	1869(23.3) 1023(34.2)	8034(100) 988(100)	*P<0.001*
Wealth status Poorest Poorer Middle Richer Richest	2357(89.4) 2050(81.3) 1773(77.8) 1453(72.7) 498(31.4)	279(10.6) 470(18.7) 507(22.2) 546(27.3) 1090(68.6)	2636(100) 2520(100) 2280(100) 1999(100) 1588(100)	P<001
NO of ANC received No ANC received 1-3 ANC received 4 ANC and above	5537(88.4) 1539(65.7) 1055(43.7)	729(11.6) 803(34.3) 1360(56.3)	6266(100) 2342(100) 3415(100)	*P<001*
Person who decide about respondent's health care Jointly Husband/partner/others	5961(73.3) 2170(26.7)	*2271(78.5)* *621(21.5)*	*8232(74.7)* *2791(25.3)*	*P<0.001*

Source: 2016 Ethiopian Demographic and Health Survey

The multivariate analysis of the determinants of women's delivery at a health facility is presented in the following section. The analysis was done for women who had at least one live birth five years before the demographic health survey (N=7, 590)

Table 4 presents the determinants of odds for delivering at a health facility by migration status and selected background characteristics. The results show that women's delivery at a health facility was significantly associated with women's migration status both in the unadjusted and adjusted models. The odds of urban to urban migrants and urban to rural migrants' delivery at a health facility has declined slightly following adjustment from 5.61 unadjusted odds ratios (95%CI, 3.53 to 8.95) to 2.96 adjusted odds ratios (95%CI, 1.74 to 5.03) and from 1.78 unadjusted odds ratios (95%CI, 1.29 to 2.44) to 1.53 adjusted odds ratios (95%CI, 1.04 to 2.26) compared to urban non-migrants, respectively.

The probability of health facility delivery was significantly associated among migrant women who lived in the current place of residence from 0-5 years (UOR, 3.79, 95%CI, 3.34 to 4.31), 6 to 9 years (UOR, 1.39, 95%CI, 1.18 to 1.64), and 10 years or more (UOR, 1.16, 95%CI, 1.02 to 1.31) compared to non-migrant women. However, after adjustment, only migrant women who lived 0-5 years were more likely to deliver at a health facility than non-migrant women (AOR.1.85, 95%CI1.52 to 2.18). Women who lived in rural areas were less likely to deliver at a health facility (AOR, 0.04, 95%CI, 0.03 to 0.05) compared to

women who lived in urban areas. The adjusted odds ratios show that the odds of women's delivery in a health facility decreased with increasing women's age. For instance, women aged 35 to 49 were more likely to deliver at a health facility (AOR, 1.28, 95%CI, 1.03 to 1.59) compared to women aged 15 to 24. Similarly, there was an inverse association between birth order and the odds of delivery at a health facility. The probability of health facility delivery was lowest for women with 4 and above birth orders (AOR, 0.32, 95%CI, 0.27 to 0.39), women with 2 to 3 birth orders (AOR, 0.47, 95%CI, 0.40 to 0.55) compared to women with first birth order. Health facility delivery was less likely among protestant (AOR, 0.65, 95%CI, 0.53 to 0.79), followed by other religious followers (AOR, 0.37, 95%CI, 0.24 to 0.58) compared to Orthodox women. There were also regional disparities in the health facility delivery. The results show that women who lived in Afar, Amhara, Oromia, Somali, Beishangul and SNNPR were less likely to deliver at a health facility compared to women who lived in Tigray region. Furthermore, women's level of education had a significant effect on women's delivery at a health facility. For example, the odds of delivering at a health facility for women with secondary education or higher were 3.47 (95%CI, 2.70 to 4.46) than women with no education.

Table 3: Logistic Regression Analysis of the Determinants of Women's Delivery at a Health Facility –Unadjusted and Adjusted Odds Ratios

Characteristics	Health Facility Delivery	
	Unadjusted OR(95%CI)	Adjusted OR(95%CI)
Migration Status		
Urban non-migrants	1.00	1.(Ref)
Urban to urban migrants	5.61(3.53_8.95)***	2.96(1.74_5.03)***
Urban to rural migrants	1.78(1.29_2.44)***	1.53(1.04_2.26)***
Rural non-migrants	0.10(0.08_0.12)***	0.32(0.24_0.42)***
Rural to urban migrants	0.31(0.23_0.41)***	0.55(0.38_0.80)***
Rural to rural migrants	0.11(0.09_0.13)***	0.28(0.21_0.38)***
Years lived in the current place		
Non-migrants	1.00	1.00
0_5 yrs	3.79(3.34_4.31)***	1.05(1.57_2.18)***
6_9 yrs	1.39(1.18_1.64)**	0.99(0.79_1.22)
10 yrs and above	1.16(1.22_1.41)**	1.23(1.01_1.18)**
Place of residence		
Urban	1.00	1.00
Rural	0.06(0.06_0.07)***	0.04(0.0.3_0.05)***
Age of women		
15-24 yrs	1.00(Ref)	*1.00(Ref)*
25-34 yrs	0.66(0.59_0.73)***	*1.04(0.88_1.22)*
35- 49 yrs	0.50(0.44_0.56)***	*0.28(0.43_0.68)***
Birth order		
1	1.00(Ref)	1.00(Ref)
2-3	0.44(0.39_0.49)***	0.47(0.0.40_0.55)***
4 and above	0.21(0.19_0.24)***	0.32(0.27_0.39)***

Characteristics	Health Facility Delivery	
	Unadjusted OR(95%CI)	Adjusted OR(95%CI)
Religion		
Orthodox Christian	1.00(Ref)	1.00(Ref)
Muslim	0.44(0.40_0.48)**	0.90(0.77_1.06)
Protestant	0.55(0.49_0.62)***	0.65(0.53_0.79)***
Others	0.18(0.13_0.26)***	0.37(0.24_0.58)***
Administrative regions		
Tigray	1.00(Ref)	1.00(Ref)
Afar	0.13(0.08_0.22)**	0.17(0.08_0.36)***
Amhara	0.28(0.24_0.34)***	0.26(0.21_0.32)***
Oromia	0.18(0.15_0.21)***	0.28(0.22_0.35)***
Somali	0.17(0.13_0.22)**	0.39(0.27_0.57)***
Benishangul	0.26(0.17_0.40)***	0.36(0.21_0.61)***
SNNPR	0.26(0.22_0.31)***	0.37(0.28_0.47)***
Gambela	0.62(0.29_1.34)	0.44(0.15_0.29)
Harari	0.76(0.35_1.68)	0.61(0.21_1.77)
Addis Adaba	21.6(10.62_43.93)***	1.13(0.53_2.42)
Dire Dawa	0.97(0.54_1.76)	0.59(0.26_1.37)
Women's education		
No education	1.00(Ref)	1.00(Ref)
Primary education	3.10(2.79_3.39)	1.55(1.36_1.75)***
Secondary education and more	24.57(20.25_29.81)***	3.47(2.70_4.46)***
Respondent currently working		
No	1.00(Ref)	1.00(Ref)
Yes	1.72(1.57_1.88)***	1.14(1.01_1.29)**
Wealth status		
Poorest	1.00(Ref)	1.00(Ref)
Poorer	1.93(1.65_2.27)***	1.86(1.55_2.23)***
Middle	2.42(2.06_2.83)***	2.19(1.82_2.62)***
Richer	3.17(2.71_3.71)***	2.31(1.92_2.79)***
Richest	18.47(15.69_21.74)***	3.64(2.89_4.59)***
NO of ANC received		
No ANC received	1.00(Ref)	1.00(Ref)
1-3 ANC received	3.97(3.54_4.45)***	3.52(3.09_4.01)***
4 ANC and above	9.79(8.76_10.95)***	6.67(5.86_7.59)***
Person who decide about respondents health care		
Jointly	1.00(Ref)	1.00(Ref)
Non-jointly	0.63(0.56_0.71)***	0.42(0.32_0.93)**

Source:2016 Ethiopian Demographic and Health Survey

The adjusted odds ratio shows that working women were more likely to deliver at a health facility (AOR, 1.14, 95%CI, 1.01 to 1.29) compared to non-working women. In relation to wealth status, women in the richest (AOR, 3.64, 95% CI, 2.89 -4.59), richer (OR, 2.31, 95% CI, 1.92 - 2.79), middle (OR, 2.19, 95% CI, 1.82 - 2.62), and the poorer (AOR, 1.86, 95% CI, 1.55 -2.23) wealth quintiles were more likely to deliver in a health facility compared to women in the poorest wealth quintile. The results also reveal that women who received 4 and more ANC (AOR, 6.67, 95% CI 5.86–7.59), and women who received 1-3 ANC (AOR, 3.52, 95%CI, 3.09 to 4.01) were more likely to deliver at a health facility than women who did not receive any antenatal care during their recent pregnancy. In relation to participation in decision making, women who did not participate in decision making were less likely to deliver at health facility (AOR, 0.42, 95% CI, 0.32 -0.93) than women who participated in decision making.

Discussion

This section presents the discussion of the major findings which sought to achieve the following research objectives: The overall objective of the study was to establish whether there were differences in women's delivery at a health facility across different migration status and socio-demographic factors, specifically attempting to identify the demographic factors that affect women's delivery at a health facility, assess the socio-economic factors that affect women's delivery at a health facility, and determine which migration status has a positive effect on women's delivery at a health facility

The discussion also links the findings of this study with previous findings to check for differences across various studies in relation to factors that affect women's delivery at a health facility in Ethiopia. The result shows that there were differences in women's delivery at a health facility across the various migration status and socio-demographic factors. The differences across the different migration statuses are largely attributed to migration selection, adaptation and disruption. Such factors are also documented in many studies as indicated by Chiang et al, 2012; Chen and Xie. 2010; Bazant and Koenig, 2009.

Migration can affect women's place of delivery through selectivity, adaptation (either by adopting destination reproductive norms or by responding to destination opportunity costs), or disruption. Out of the factors of migration, the study results show strong evidence for migration selectivity and adaptation because migrants were more likely to use reproductive health care services at the time of migration and post migration. The positive effect of migration selection persists even after adjusting for known risk factors in the models including socio-demographic variables. The role of migration selection and adaptation in affecting women's delivery at a health facility is reported in other studies (Almeida et al, 2013; Adanu and Jonson, 2009; Minnis, 2010). The results from this study do not, however, confirm the disruption effect of migration on women's reproductive health care service utilization.

The multivariate analysis results also showed that older women and women with higher birth orders were less likely to deliver at a health facility (Babalol and Fatusi, 2009). This may be due to the fact that older women had long experiences in home deliveries so that they may not be interested to go to health facilities. Another reason can be that older women may not have a positive attitude towards modern maternal health care services because they are more likely influenced by traditional culture and religious factors that discourage them off using maternal health facilities than younger women. On the contrary, younger women are generally less experienced about pregnancy and childbirth. They feel insecure about the status of their pregnancy and they are also at a higher risk of adverse effects during pregnancy and at childbirth than older women. As a result, younger women need to visit a health institution for antenatal care services and they are more likely to deliver

in a health facility with the assistance of trained health professionals than older women (Agha and Carton, 2011). In relation to birth order, women with first birth order had no experience of childbirth and they fear the risks associated with childbirth so that they seek maternal health care services than higher-order births. Moreover, low utilization of maternal health care services among higher parity women could be due to time and resource constraints faced by those with large families and the greater experience of higher parity women with pregnancy and child birth.

The number of years migrant women lived at a given place of residence was an important factor to influence women's reproductive behavior. As the number of years women lived in the current place of residence increases, the probability of women's delivery at a health facility also increases. Studies in many developing countries were also found that women who lived longer in the current place of residence were more likely to know and use of maternal health care services than women who lived for a short period of time (Rahman, Islam, and Islam, 2010; Minnis, 2010; Lindstrom and Munoz-Franco, 2006; Babalol and Fatusi, 2009). Moreover, women who lived longer in the current place of residence may receive more information regarding the importance of delivery at a health facility. In contrast, women who lived for a short period of time in the current place of residence may not know where to get the maternal health care services information or they may not be interested in knowing about delivery at health facility because they may not have the experience about the importance of delivering at a health facility.

Religious background has been identified as one of the factors that affect women's reproductive behavior because religion determines the social and personal behavior of the women within the communities. A number of studies have shown that the influence of religious background on women's reproductive health knowledge and use are the functions of religious faiths as well as cultural values (Babalol and Fatusi, 2009). It is believed that the Ethiopian religious values and cultural norms discourage the use of maternal health care services. Especially the Orthodox Christian and Muslim religions discourage the use of maternal health care services. As a result, the majority of the religious community is highly resistant to deliver at a health facility

Education is not only transforming women's knowledge, but also empowers women and improves their self-esteem. It is expected that educated women are more likely to become aware of their health status and seek health knowledge. Furthermore, educated women may have a greater decision-making power on health-related matters. Therefore, education not only increases women's knowledge, but also their confidence and capability to make decisions regarding the use of maternal health care services. It enables women to make informed choices and decision about delivery at a health facility. It is also a means to avoid cultural and religious barriers that resist in using maternal health care services. Similar findings were reported elsewhere (Lindstrom, and Hernandez, 2006 Chen and Xie, 2010). In addition to this, the reproductive health care service utilization variation could be also attributed to factors such as culture, public health quality, inequality, and infrastructure among others.

In addition, it was reported that working women's likelihood of seeking maternal health care services was higher than that of non-working women. The possible reason for why working women delivered at health facility is that they may have enough income to cover the service fees. Besides, working women were more likely educated to have awareness and knowledge about the value of delivering at a health facility. It is generally accepted that female labor force participation increased women's knowledge and use of reproductive health care services.

The empowerment of women in the household decision-making has a significant effect on women's maternal health care service utilization. The study found that women who involved in the household decision were more likely to deliver at a health facility, respectively than women who did not involve in any of the household decisions. The effect of women's empowerment on maternal health care utilization has been documented in other studies (Chkraborty et al, 2003). The decision to seek health care services in Ethiopia is largely dependent on the good will of women's husbands. Women in Ethiopia have low social status and autonomy than men, and this, in turn, affects women's utilization of maternal health care services. Moreover, women's access to maternal health care services in Ethiopia is constrained by financial problems, long waiting times, and poor quality of the health care systems. Improving women's status and financial capacity have been seen as pathway to increase women's access and use of maternal health care services (Abebe, Berhane, and Girma, 2012).

Women who did four or more antenatal visits were more likely to deliver at a health facility. This could be due to the reason that women received educational advice during their antenatal visits from health professional about the importance of health facility delivery as well as about the potential risks that might be associated with home delivery. Frequent contacts between health professional and pregnant women usually help to develop a positive attitude towards maternal health care service utilization. In general, the findings of the study have shown that following adjustment for known demographic and socio-economic factors migration status plays a major role in determining women's knowledge and use of reproductive health care services.

Ethical Considerations

The Ethiopian Demographic and Health Survey was reviewed and approved by the Macro International Internal review board, Ethiopian Statistical Agency and the National Ethics Committee of Ethiopia. The researcher got permission from Macro International, Inc. to use the data for this analysis. This researcher used the data without violating any of the intention and interests of the primary data owners.

Conclusion

The study confirms that urban to urban migrants and urban to rural migrants were more likely to deliver at a health facility than urban non-migrants. The variations in delivery at a health facility were accountable to migration types and socio-demographic differences of the study participants. Moreover, migrant women's delivery at a health facility depends on the relative number of years migrant lived in the current place of residence after migration. The study found that as the duration of residence in current place of residence increases, the likelihood of women's delivery at a health facility also increases. As a result, long term migrants were more likely to deliver at a health facility than recent migrants. For instance, migrant women who lived 10 years or more in the current place of residence were more likely to deliver at a health facility compared to the short-term migrants. Therefore, based on the findings, the study can conclude that as duration of residence in the current place increases migrant women's delivery at a health facility. The study also confirmed that there are differences in delivery at a health facility among women in the various socio-economic and demographic factors. Among the various socio-economic and demographic factors, the study identified the following socio-economic and demographic factors as the determinants of women's delivery at a health facility: educational levels of the women, women's working status, women's empowerment (measured by women's involvement in household decision-making) and household wealth status, age, place of residence, region and birth orders.

Bibliography

Abebe, F., Berhane, Y and Girma, B. (2012). Factors Associated with Home Delivery in Bahir Dar, Ethiopia: A Case Control Study. *BMC Research Notes*, 5(653).

Adanu, R.M.K., & Jonson, T.R.B. (2009). Migration and Women's Health. *International Journal of Gynecology and Obstetrics,* 106 (2), pp. 179-181.

Adjasi, C.K., & Abor, J. (2011). The Socio-economic Determinants of Maternal Health Care Utilization in Ghana. *International Journal of Social Economics*, 38 (7), pp. 628-648.

Agha, S., & Carton, T.W. (2011). Determinants of Institutional Delivery in Rural Jhang, Pakistan. *International Journal for Equity in Health*, 10 (31), pp. 1-12.

Almeida, L.M., Caldas, J., Ayres-de-Campos, D., Salcedo-Barrientos, D., & Dias, S. (2013). Maternal Health Care in Migrants: A Systematic Review. *Maternal and Child Health Journal,* 17 (8), pp. 1346-1354.

Babalol, S, & Fatusi, A. (2009). Determinants of Use of Maternal Health Services in Nigeria-looking Beyond Individual and Household Factors. *BMC Pregnancy and Childbirth*, 9 (43), pp. 1-13.

Bazant, E.S., & Koenig, M.A. (2009). Women's Satisfaction with Delivery Care in Nairobi Informal Settlements. *International Journal for Quality in Health Care,* 21 (2), pp. 79-86.

Central Statistical Agency (CSA), Ethiopia, (2001). *Ethiopia Demographic and Health Survey 2000*. Addis Ababa, Ethiopia

Central Statistical Agency (CSA), Ethiopia. (2006). *Ethiopia Demographic and Health Survey 2005*. Addis Ababa, Ethiopia.

Central Statistical Agency (CSA), Ethiopia. (2012). *Ethiopia Demographic and Health Survey 2005*. Addis Ababa, Ethiopia.

Central Statistical Agency (CSA), Ethiopia. (2017). *Ethiopia Demographic and Health Survey 2005*. Addis Ababa, Ethiopia.

Central Statistical Agency (CSA), Ethiopia. (2008). *The 2007 Population and Housing Census of Ethiopia*. Addis Ababa, Ethiopia.

Chen, L., & Xie. (2010). Effects of Rural to Urban Return Migration on Women's Family Planning and Reproductive Health Attitudes and Behaviour in Rural China. *Studies in Family Planning*, 41 (1), pp.31-44.

Chiang, C., Elshair, IH., Kawaguchi, L., Fouad, NA., Abdou, NM., Higuchi, M., Aoyama, A. (2012). Improvement in the Status of Women and Increased Use of Maternal Health Services in Rural Egypt. *Nagoya Journal of Medical Science*, 74 (3-4), pp. 233-240.

Chimankar, D.A., & Sahoo, H. (2011). Factors Influencing the Utilization of Maternal Health Care Services in Uttarakhand. *Ethno Med.*, 5 (3), pp. 209-216.

Chkraborty, N., Islam, M.A., Chowdhury, R.I., Bari, W., & Akhter, H.H. (2003). Determinants of the Use of Maternal Health Services in Rural Bangladesh. *Health Promotion International,* 18 (4), pp. 327-337.

Chu, C.M. (2005). Postnatal Experience and Health Need of Chinese Migrant Women in Brisbane, Austria. *Ethnicity and Health*, 10 (1), pp. 33-56.

Dias, S.F., Severo, M., & Barros, H. (2008). Determinants of Health Care Utilization by Immigrants in Portugal. *BMC Health Services Research*, 8 (207), pp. 1-18.

Feng, W., Ren, P., Shaokang, Z., & Anan, S. (2005). Reproductive Health Status, Knowledge and Access to Health Care among Female Migrants in Shanghai, China. *Journal of Biosocial Science,* 37, pp. 603-622.

Gabrysch, S., & Campbell, O.M. (2009). Still Too Far to Walk: Literature Review of the Determinants of Delivery Services Use. *BMC Pregnancy and Childbirth*, 9 (34), pp. 1-18.

Gage, A.J. (2007). Barriers to Utilization of Maternal Health Care in Rural Mali. *Social Science and Medicine,* 65 (8), pp. 1666-1682.

Kusuma, Yadlapalli S and Kaushal, Sonia(2013), Migration and access to maternal healthcare: determinants of adequate antenatal care and institutional delivery among socio-economically disadvantaged migrants in Delhi, India, *Tropical Medicine and International Health,* 18(10), pp 1202–1210

Lindstrom, D.P., & Munoz-Franco, E. (2006). Migration and Maternal Health Services Utilization in Rural Guatemala. *Social Science and Medicine*, 63 (3), pp. 706-721.

Malmusi, D, Borrell, C., & Benach, J. (2010). Migration Related Health Inequalities: Showing the Complex Interactions between Gender, Social Class and Place of Origin. *Social Science and Medicine*, 71 (9), pp. 1610-1619

Minnis, A.M. (2010). U.S. Migration and Reproductive Health among Mexican Women: Assessing the Evidence for Health Selectivity. *Field Actions Science Reports, Special issue 2*.

Ochako, R., Fotso, J-C., & Khasakhala, A. (2011). Utilization of Maternal Health Services among Young Women in Kenya: Insights from the Kenya Demographic and Health Survey, 2003. *BMC Pregnancy and Childbirth*, 11 (1), pp. 1-9.

Rahman, M., Islam, A.Z., & Islam, R. (2010). Rural-Urban Differentials of Knowledge and Practice of maternal health care service utilization in Bangladesh. *Journal of Population and Social Studies*, 18 (2), pp. 87-110

Rahman, M., Haque, S.E., M.G., Mostofa., Tarivonda., L., & Shuaib, M. (2011). Wealth Inequality and Utilization of Reproductive Health Services in the Republic of Vanuatu, Insights from the Multiple Indicators Cluster Survey. *International Journal of Equity in Health*, 10 (59), pp. 1-10.

Singh, P., Rai, P., & Singh, L. (2012). Examining the Effect of Households Wealth and Mi gration Status on Safe Delivery Care in Urban India 1992-2006. *PLOS ONE*, 7 (9). pp. 1-12

Singh, PK, Raj, RK, Alagarajan, M., & Singh, L. (2012). Determinants of Maternity Care Services Utilization among Married Adolescents in Rural India. *PLOS ONE*, 7 (2).

Shiferaw, S., Spigt, M., Godefrooij, M., Melkamu, Y. and Tekie, M. (2013). Why Do Women Prefer Home Births in Ethiopia? *BMC Pregnancy and Childbirth*, 13(5)

Singh, P., Rai, P., & Singh, L. (2012). Examining the Effect of Households Wealth and Migration Status on Safe Delivery Care in Urban India 1992-2006. *PLOS ONE*, 7 (9). pp. 1-12

Subaiya, L. (2007). Internal Migration and Use of Reproductive and Child Health Services in Peru. *Population Studies*, 60 (2). pp.189-205.

Titaley, C.R., Dibley, M.J., & Roberts, C.L. (2010). Utilization of Village Midwives and Other Trained Delivery Attendants for Home Deliveries in Indonesia: Results of Indonesia Demographic and Health Survey 2002/2003 and 2007. *Maternal and Child Health Journal*, 15 (8), pp. 1400-1415.

The United Nations. (2012). *The Millennium Development Goals Report*. New York

WHO. (2012). *Trends in Maternal Mortality*:1990 to 2010.

Worku, A. G., Yalew, A. W. and Afework, M. F (2013). Factors Affecting Utilization of Skilled Maternal Care in Northwest Ethiopia: A Multilevel Analysis. *BMC International Health and Human Rights*. 13(20).

Yesuf, E., . Kerie, M. W and Calderon-Margalit, R (2014). Birth in a Health Facility –In equalities among the Ethiopian Women: Results from Repeated National Surveys. *PLoS ONE*, 9(4).