

# Determinants of institutional delivery in Kenya. Evidence from population and Demographic health survey,2014

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## Research Article

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# Abstract

**Background:** Maternal mortality in Kenya remains high. Analysis of the factors associated with institutional delivery is crucial to inform reproductive health policies and programs in public health.

**Objective:** To identify the factors associated with institutional delivery among women of reproductive age in Kenya.

**Methods:** Data sets for this study were extracted from the 2014 Kenya Demographic health surveys (KDHS, 2014); participants were 20,661 women between the age of 15-49-year. Data sets were analyzed using Chi-square tests, univariate and multivariable binary logistic regression. Factor analysis was used to explore potential subpopulation profiles related to institutional delivery.

**Results:** On national average 62.10% of participant women utilized institutional delivery. Although all sociodemographic variables in this analysis were associated with institutional delivery, multivariable analysis show that women from urban place were 1.37 time (95%CI:1.14-1.65) more likely to delivery in health facility compared to women from rural place. Women with higher education level tended to deliver in health facility compared with no education (Secondary and above: OR:4.03; 95%CI:2.91-5.59; primary level: OR:2.03;95%CI:1.53-2.68). Household wealth status was positively associated, richest 11.12 times (95%CI:7.18-17.22), richer 3.88 times (95% CI:2.96-5.07), middle 2.33 times (95%CI:1.87-2.90), and poorer 1.82 times (95% CI:1.40-2.23) more to use institutional delivery than the poorest. The odds of having institutional delivery was 2.58 times (95%CI:2.07-3.23) and 1.44 times (95%CI:1.20-1.71) higher among the first and second to fourth birth orders than five or above respectively. Three common factors with high loading socioeconomic on (Wealth quintile, TV watching, Mother's education, Radio listening, and Place of residence), family support on (Wanted last child, Mother's occupation, and Husband education), and women status on (Mother age group, Birth order, and Marital status) were found significantly ( $p < 0.001$ ) associated with institutional delivery. Women with high scores of these factors were tended to received more institutional deliveries

**Conclusion:** Institutional delivery is low in Kenya. Maternal health programs focused on subpopulation profiles should be designed to encourage institutional delivery. Further efforts are needed to improve the accessibility and optimal up-take of institutional delivery.

## Background

Maternal death remains a major public health issue in developing countries particularly in Africa. About 295,000 women died during pregnancy and childbirth in 2017, of whom 94% (277,300) were from low income countries and around two-third (196,000) were from Sub-Saharan Africa region (1). In 2017 sub-Saharan Africa recoded the highest maternal mortality with an estimated 542 death per 100000 live births and a life time risk of 1 in 37 maternal death, compare with a 1 in 7800 in Australia and New Zealand (1). Africa has many physical, economic, social limitations, especially in its rural areas with

scattered settlements, poor health infrastructure, shortage of qualified health-care personnel, transportations and low health awareness, and low level of income and education (2, 3).

Reducing maternal mortality through providing effective intrapartum care based on strategies of having deliveries in primary-level institutions with access to referral-levels facilities is a high priority for the international community. The millennium development goal (MDG) number 5 adopted in 2000–2015 was dedicated to reduce maternal mortality by 75% (4). The World Health Organization (WHO) has been working on standard frameworks to achieve the MDG precursors to the current Sustainable development goal (SDG) 2015–2030 (reducing maternal mortality rate to < 70 deaths/ 100000 live births) and registered a significant reduction globally (5). However maternal mortality remains significantly high in low- and middle-income countries (6–8), and is receiving greater attention. Some studies emphasize most maternal mortalities were avoidable for they reflect disparities between rich and poor women, and between developed and developing countries (7–9).

Majority of maternal death that arise due to complications at the time of birth remains difficult to predict during antenatal periods. Hemorrhage is the leading cause of maternal death in developing countries (3, 6). Moreover, poverty, limited access to healthcare, unhygienic conditions during delivery, unskilled childbirth and maternal sociodemographic characteristics are among the indirect causes of maternal mortality (2, 3, 10). Therefore, institutional delivery attended by skilled health professionals is crucial for the well-being of the mother and newborns through timely management and treatment of attributable factors (8). Despite the importance of institutional delivery, a significant number of deliveries in Ethiopia (69%), Tanzania (59%), Indonesia (57.3%), Kenya-2008/2009 (57%), Kenya-2012 coastal region study (26%), and other sub-Saharan Africa countries are still taking place at home in the absence of specialized service to deal with any potential complications that can happen during delivery (3, 11–15). Therefore, factors associated with institutional deliveries should be identified and interventions on scaling up of maternal and child health service utilizations should be strengthened.

Kenya, the third-largest economy in sub-Saharan Africa after Nigeria and South Africa is the first East African Community member state to achieve the middle-income status. However, the poverty rate in Kenya had been on a downward trend over the past 15 years, and placed it as the third poorest lower-middle-income country globally.

In Kenya, the trends of maternal mortality declined from 687 to 510/ 100000 live births between 1990 and 2015(16). A 2019 WHO report revealed that, the life time risk of women to die from maternal causes was estimated 1 in 76 in Kenya (1). Most maternal deaths (34%) in Kenya happened within the first 24 hours after admission (17), and can be prevented through early intervention. Therefore, institutional delivery under skilled birth attendant (SBA) is crucial for effective management to save both women and neonates during childbirth (7).

The load of non-institutional deliveries in some African countries is unacceptably high (12, 18, 19). Previous studies have reported that the factors associated are culture, low socioeconomic status, low maternal or paternal education, rural place of residence, old maternal age, high birth orders and limited

availability of services have been observed to be associated with non-institutional deliveries (3, 12, 14, 18–23).

A key requirement for advancing safe and skilled delivery is to understand the causes associated with institutional delivery for effective policy and health program decisions. Therefore, we conducted a secondary data analysis using the recent standard populations and Demographic Health Survey conducted in Kenya, KDHS 2014 to examine the factors associated with institutional delivery.

## Methods

### Study design

We used data from the Kenya Demographic and health survey (KDHS 2014). The DHS survey used a nationally representative cross-sectional study using a stratified two-stage cluster sampling design.

### Study Setting

This study was carried out on nationwide population and demographic health survey including urban and rural regions. The population under surveillance included 20,964 households.

### Participants

The DHS is a five-year periodic survey used to collect information from women aged 15–49 years and ever-married men 15–54 years about demographic and health status. Information including women demographic characteristics and their reproductive history are the main focus of this study. Details of the DHS are published elsewhere (24, 25) [[http:// www.dhsprogram.com/data/data-collection.cfm](http://www.dhsprogram.com/data/data-collection.cfm)].

Permission to use the data was granted from the <https://dhsprogram.com/Data/terms-of use.cfm>.

Women who have one or more births five years before the survey were included as study participants. A total of 20,661 women met the criterion on place of delivery and were included in this analysis and 303 delivery places not know were excluded.

### Outcome Variables

The primary outcome of our study was venue of the last delivery (dichotomized as health facility delivery or home delivery). Facility based delivery is defined as giving birth at a health facility such as a public or private hospital, community health centers or private clinic under a skilled health care professional (accredited health professional) who can manage normal (uncomplicated) pregnancies and childbirth. Home delivery includes either attendant's home or others home. This category on women's delivery location was made based on the previous DHS analysis(26).

### Explanatory Variables

A set of socio-demographic variable related to the utilization of institutional delivery were identified from the survey data sets. Maternal age in years, women education, husband education, women occupation,

women religion, place of residence, antenatal care visits, birth order (parity), household wealth index, frequency of listening radio/ watching TV, desire for the last pregnancy, and region were used as predictors of institutional delivery. Women with unknown response for the explanatory variables were excluded from the analysis.

Data was collected through household interview using a structured questionnaire. It is conducted every five years in low and middle-income countries with a well-defined method of data collection. The women were interviewed about the place of giving birth. There is a module conducted on women's reproductive health for those aged 15–49 years including a review on each birth history. All forms were checked by field supervisors and data clerks before entering into data bases. This demographic information was taken from the latest household survey of the country (25).

Multiple responses for place of delivery were addressed by limiting to the study looking the service given to a woman by qualified health care professionals during their recent pregnancy.

### **Data analysis**

Data analysis was performed using a STATA software version 14.0. Numerical values like age, Antenatal care (ANC) visits and years of education attended were grouped in to categories. Analysis was conducted using weight, clustering and stratification variables provided by DHS, using the svyset command, to account for the study design. Descriptive analysis was performed to summarize the background characteristics using percent in table. Household wealth index was constructed using a principal component analysis method from items related to possession of durable assets, access to utilities and infrastructure, and housing characteristics to assess the economic status of the mothers. Each woman was ranked in to five categories (poorest, poorer, middle, richer and richest) based on a household asset score. The wealth quantiles were created based on the methods used by the Demographic health surveys (27). Chi-square tests were used to analyze the potential factors associated with institutional delivery. Logistic regression was used to investigate the association between independent variables and the outcomes. The final multivariable model included all variables that were statistically significant in a bivariate analysis. Women age, marital status, husband education, and antenatal care visit were excluded from the multivariable analysis due to collinearity effect with a variance inflation factor value (VIF > 4) on collinearity diagnosis test inline to previous work (28). There are correlations between explanatory variables, so we further use factor analysis to extract the main sub-population profiles associated with institutional delivery (29). A two-tailed P-value < 0.05 was considered statistically significant.

### **Ethics approval:**

This study was exempt from review by the ethics committee as publicly available data sets were used and no identifying participant information was obtained. The authorization for using the data in the current analysis was granted from the DHS program: DHS, ICF international, Rockville, Maryland, USA office upon presenting the research protocol and research plan aims.

# Results

## Baseline characteristics of the study population

Results showed that the mean age of the study participants was  $28.72 \pm 0.46$  (95%CI: 28.63–28.81) years old, and among all women who had given birth at least once within the last 5 years preceding the survey, only 5% were between 15–19 years of age. More than 62% of women were from rural place of residence. More than two-third (70.90) of the women were from Protestant/Other Christian religion. Table-1 also shows that majority (83.80) of the women were married at the time of the study. More than half (56%) of women have at least a primary level of education. More than one-fifth (23.80%) of the studied women live in the poorest households. Almost two-third of the women reported listening to radio at least once a week, while 21.8% reported never using any. Rate of TV watching was less common as 31.7% at least once a week, 11.6% less than once a week, and 56.7% did not watch TV at all. Table-1 also shows that more than one-third (38.8%) of the study participants have received four or more antenatal cares during their last pregnancy.

Table 1  
Distribution of study participants by sociodemographic factors

<b>Variables</b>	<b>N (20,661)</b>	<b>unweighted %</b>	<b>weighted %</b>
<b>Age (Mean/SD)</b>			
<b>Age group</b>			
15–19	1041	5.04	5.11
20–24	4909	23.76	24.70
25–29	6315	30.56	30.50
30–34	4120	19.94	20.20
35–39	2742	13.27	12.70
40–44	1206	5.84	5.32
45–49	328	1.59	1.38
<b>Place of delivery</b>			
Home delivery	9411	45.55	37.90
Institutional delivery	11250	54.55	62.10
<b>Marital status</b>			
Currently married	17516	84.78	83.80
Formerly married	1861	9.01	9.13
Never married	1284	6.21	7.07
<b>Place of residence</b>			
Urban	6739	32.62	36.00
Rural	13922	67.38	64.00
<b>Religion</b>			
Roman Catholic	3792	18.39	18.00
Protestant/Other Christian	12767	61.9	70.90
Muslim	3471	16.83	8.51
No religion	533	2.58	2.57
<b>Mother's education</b>			
No education	4529	21.92	11.80
Primary	10879	52.65	56.00

<b>Variables</b>	<b>N (20,661)</b>	<b>unweighted %</b>	<b>weighted %</b>
Secondary & higher	5253	25.42	32.20
<b>Husband education</b>			
no Education	1716	8.33	4.13
Primary	4480	21.76	22.59
Secondary & higher	3050	14.81	17.47
Missing	11346	55.10	55.81
<b>Mother's occupation</b>			
Not working	3637	17.60	14.74
Working	6284	30.41	32.96
Missing	10740	51.98	52.29
<b>Wealth quintile</b>			
Poorest	7081	34.27	23.80
Poorer	4268	20.6	20.31
Middle	3437	16.64	18.00
Richer	3098	14.99	17.72
Richest	2777	13.44	20.22
<b>Radio</b>			
Not at all	5970	28.90	21.80
Less than once a week	2576	12.47	12.40
At least once a week	12108	58.62	65.80
<b>TV</b>			
Not at all	13464	65.21	56.70
Less than once a week	2394	11.59	11.60
At least once a week	4789	23.19	31.70
<b>Birth order</b>			
First	4758	23.03	26.30
Second - fourth	10373	50.21	50.70
Fifth & above	5530	26.77	23.00

<b>Variables</b>	<b>N (20,661)</b>	<b>unweighted %</b>	<b>weighted %</b>
<b>ANC visits</b>			
No ANC visits	907	4.40	2.89
1–3 ANC visits	5811	28.19	28.24
4 + ANC visits	7992	38.77	42.71
Missing	5,904	28.64	26.16
<b>Wanted last child</b>			
wanted then	6117	29.61	27.86
wanted later	2647	12.81	13.97
wanted no more	1196	5.79	6.09
Missing	10701	51.79	52.08
<b>Region</b>			
Coast	2615	12.66	10.37
North Eastern	1572	7.61	3.30
Eastern	2968	14.37	11.80
Central	1404	6.80	9.21
Rift Valley	6773	32.78	29.16
Western	1943	9.40	11.50
Nyanza	2861	13.85	14.16
Nairobi	525	2.54	10.50

### **Situation Of Institutional Delivery**

Overall proportion of institutional delivery was 62.10% (Table 1).

Figure 1 describes the percentage distribution of institutional delivery across place of residence, household socioeconomic status, and women educational level. It shows that, the utilization of institutional delivery was higher among urban residents of all levels of wealth quantiles than their rural counterparts, but the increase was much higher with increase in socioeconomic status. Similarly, in both urban and rural women utilization of institutional delivery increased with increase in educational level.

### **Factors Associated With Institutional Delivery**

Table 2 describes the percentage distribution of institutional delivery and associated variables

Table 2  
Associations of sociodemographic factors on institutional delivery

<b>Variables</b>	<b>Home delivery</b>	<b>Institutional delivery</b>	<b>x<sup>2</sup>- value</b>	<b>P-value</b>
<b>Age (Mean/SD)</b>				
<b>Age group</b>				
15–19	389(37.37)	652(62.63)	187.37	< 0.001
20–24	2040(41.56)	2869(58.44)		
25–29	2790(44.18)	3525(55.82)		
30–34	1926(46.75)	2194(53.25)		
35–39	1395(50.88)	1347(49.12)		
40–44	658(54.56)	548(45.44)		
45–49	213(64.94)	115(35.06)		
<b>Marital status</b>				
Never married	393(30.61)	891(69.39)	123	< 0.001
Currently married	8146(46.51)	9370(53.49)		
Formerly married	872(46.86)	989(53.14)		
<b>Place of residence</b>				
Urban	1604(23.80)	5135(76.20)	1907.17	< 0.001
Rural	7807(56.08)	6115(43.92)		
<b>Religion</b>				
Roman Catholic	1698(44.78)	2094(55.22)	612.79	< 0.001
Protestant/Other Christian	5167(40.47)	7600(59.53)		
Muslim	2100(60.50)	1371(39.50)		
No religion	391(73.36)	142(26.64)		
<b>Mother's education</b>				
No education	3520(77.72)	1009(22.28)	3700	< 0.001
Primary	5015(46.10)	5864(53.90)		
Secondary & higher	876(16.68)	4377(83.32)		
<b>Father's education</b>				

<b>Variables</b>	<b>Home delivery</b>	<b>Institutional delivery</b>	<b>x<sup>2</sup>- value</b>	<b>P-value</b>
no Education	1390(81.0)	326(19.0)	1400	< 0.001
Primary	2167(48.37)	2313(51.63)		
Secondary & higher	760(24.92)	2290(75.08)		
<b>Mother's occupation</b>				
Not working	1948(53.56)	1689(46.44)	139.25	< 0.001
Working	2596(41.31)	3688(58.69)		
<b>Wealth quintile</b>				
Poorest	5268(74.40)	1813(25.6)	4900	< 0.001
Poorer	2066(48.41)	2202(51.59)		
Middle	1231(35.81)	2206(64.18)		
Richer	616(19.88)	2482(80.12)		
Richest	230(8.28)	2547(91.72)		
<b>Radio listening</b>				
Not at all	3959(66.31)	2011(33.69)	1500	< 0.001
Less than once a week	1128(43.79)	1448(56.21)		
At least once a week	4323(35.70)	7785(64.30)		
<b>TV watching</b>				
Not at all	7762(57.65)	5702(42.35)	2500	< 0.001
Less than once a week	872(36.42)	1522(63.58)		
At least once a week	772(16.12)	4017(83.88)		
<b>Birth order</b>				
First	1271(26.71)	3487(73.29)	1500	< 0.001
Second - fourth	4575(44.10)	5798(55.90)		
Fifth & above	3565(64.47)	1965(35.53)		
<b>ANC visits</b>				
No ANC visits	807(88.97)	100(11.03)	1300	< 0.001
1-3 ANC visits	2738(47.12)	3073(52.88)		
4 + ANC visits	2452(30.68)	5540(69.32)		

Variables	Home delivery	Institutional delivery	x <sup>2</sup> - value	P-value
<b>Wanted last child</b>				
wanted then	2751(44.97)	3366(55.03)	38.99	< 0.001
wanted later	1156(43.67)	1491(56.33)		
wanted no more	646(54.01)	550(45.99)		
<b>Region</b>				
Coast	1300(49.71)	1315(50.29)	1600	< 0.001
North Eastern	1019(64.82)	553(35.18)		
Eastern	1342(45.22)	1626(54.78)		
Central	145(10.33)	1259(89.67)		
Rift Valley	3665(54.11)	3108(45.89)		
Western	951(48.94)	992(51.06)		
Nyanza	938(32.79)	1923(67.21)		
Nairobi	51(9.71)	474(90.29)		

All sociodemographic variables in this study appeared to be associated with place of delivery. Age, marital status, urban place of residence, Catholic/ protestant Christian religion, secondary and above women and husbands' educational level, household wealth, access to Radio and TV information, first birth order, 4 + ANC visits, wantedness of last pregnancy and region were significantly associated with institutional deliveries. More than three-fourth of women from urban place of residence, secondary & higher educational level of women and husband's, richer family, who have access to television information for at least once a week, and from Central and Nairobi regions chose health facility for their most recent deliveries. Other sociodemographic variables highly associated with institutional delivery were marital status, middle income socioeconomic status and first birth orders, in which more than two-third of these women gave birth in health facility. Old age, poor family with no access to radio information, no religion, no antenatal care visits and women from North Eastern region had the lowest percent of institutional delivery.

Results of univariate analysis (Table 3) show that maternal age has a significant association with institutional delivery. Women aged 15–19 years were more than twice to delivery in health facility than 45 years and older. As women age increases institutional delivery declined, and the difference was statistically significant ( $p < 0.005$ ) in all groups (Table 3). Women from urban place were almost five times more likely to delivery in health facility than from rural place of residence. Women and husband

with secondary/ higher educational levels were more than 17 and 15 times more likely to delivery in health facility than with no schooling respectively.

Table 3

Univariate and multivariable analysis of sociodemographic factors on institutional delivery

Variables	OR	95% CI	p-value	AOR	95% CI	p-value
<b>Age group</b>						
15–19	2.66	1.89–3.75	< 0.001	–	–	–
20–24	2.45	1.81–3.33	< 0.001	–	–	–
25–29	2.37	1.75–3.20	< 0.001	–	–	–
30–34	1.99	1.47–2.68	< 0.001	–	–	–
35–39	1.58	1.16–2.14	0.004	–	–	–
40–44	1.43	1.01–2.01	0.042	–	–	–
45–49	1.00			–		
<b>Marital status</b>						
Never married	1.82	1.48–2.23	< 0.001	–	–	–
Currently married	1.04	0.90–1.20	0.635	–	–	–
Formerly married	1.00			–		
<b>Place of residence</b>						
Urban	4.84	4.19–5.60	< 0.001	1.37	1.14–1.65	< 0.001
Rural	1.00			1.00		
<b>Religion</b>						
Roman Catholic	4.08	2.76–6.02	< 0.001	1.34	0.87–2.06	0.179
Protestant/Other Christian	3.67	2.52–5.35	< 0.001	1.26	0.83–1.90	0.277
Muslim	1.85	1.22–2.81	0.004	1.49	0.89–2.50	0.131
No religion	1.00			1.00		
<b>Mother's education</b>						
No education	1.00			1.00		
Primary	3.83	3.19–4.59	< 0.001	2.03	1.53–2.68	0.009
Secondary & higher	17.42	14.16–21.43	< 0.001	4.03	2.91–5.59	< 0.001
<b>Husband education</b>						
no Education	1.00			–		
AOR: adjusted odd's ratio, -: variables not included in the multivariable analysis						

<b>Variables</b>	<b>OR</b>	<b>95% CI</b>	<b>p-value</b>	<b>AOR</b>	<b>95% CI</b>	<b>p-value</b>
Primary	4.97	3.91–6.33	< 0.001	-	-	-
Secondary & higher	15.91	12.24–20.67	< 0.001	-	-	-
<b>Mother's occupation</b>						
Not working	1.00			1.00		
Working	1.23	1.06–1.43	0.008	0.99	0.82–1.96	0.90
<b>Wealth quintile</b>						
Poorest	1.00			1.00		
Poorer	2.27	1.96–2.63	< 0.001	1.82	1.40–2.23	< 0.001
Middle	3.91	3.32–4.62	< 0.001	2.33	1.87–2.90	< 0.001
Richer	9.52	7.85–11.54	< 0.001	3.88	2.96–5.07	< 0.001
Richest	33.84	26.20–43.71	< 0.001	11.12	7.18–17.22	< 0.001
<b>Radio listening</b>						
Not at all	1.00			1.00		
Less than once a week	1.99	1.68–2.35	< 0.001	1.33	1.00–1.76	0.05
At least once a week	2.80	2.48–3.16	< 0.001	0.98	0.81–1.76	0.87
<b>TV watching</b>						
Not at all	1.00			1.00		
Less than once a week	1.97	1.71–2.27	< 0.001	1.02	0.80–1.30	0.87
At least once a week	7.57	6.57–8.74	< 0.001	1.40	1.10–1.78	0.06
<b>Birth order</b>						
First	5.99	5.23–6.87	< 0.001	2.58	2.07–3.23	< 0.001
Second – fourth	2.76	2.45–3.11	< 0.001	1.44	1.20–1.71	< 0.001
Fifth & above	1.00			1.00		
<b>ANC visits</b>						
No ANC visits	1.00			-		
1–3 ANC visits	6.20	4.55–8.44	< 0.001	-	-	-
4 + ANC visits	14.13	10.45–19.11	< 0.001	-	-	-

AOR: adjusted odd's ratio, -: variables not included in the multivariable analysis

Variables	OR	95% CI	p-value	AOR	95% CI	p-value
<b>Wanted last child</b>						
wanted then	2.00	1.66–2.40	< 0.001	1.38	1.10–1.74	0.01
wanted later	1.83	1.50–2.24	< 0.001	1.25	0.98–1.59	0.07
wanted no more	1.00			1.00		
<b>Region</b>						
North Eastern	1.00			1.00		
Coast	3.30	2.32–4.69	< 0.001	1.52	0.92–2.51	0.10
Eastern	4.17	2.97–5.85	< 0.001	1.69	0.99–2.88	0.05
Central	24.53	17.0-35.38	< 0.001	4.66	2.45–8.85	< 0.001
Rift Valley	2.42	1.76–3.31	< 0.001	0.90	0.53–1.54	0.71
Western	2.15	1.55-3.00	< 0.001	0.85	0.48–1.52	0.59
Nyanza	4.60	3.28–6.44	< 0.001	1.84	1.04–3.23	0.04
Nairobi	20.59	11.85–35.77	< 0.001	0.89	0.43–1.82	0.74
AOR: adjusted odd's ratio, -: variables not included in the multivariable analysis						

From Table 3, it is also clear that those who have access to radio listening and TV watching at least once a week were nearly three- times (OR: 2.80, 95% CI: 2.48–3.16) and more than seven times (OR: 7.57, 95% CI: 6.57–8.74) more likely to deliver in health facility than those who have not access at all. Compared to the lowest wealth quantile, women from richest socioeconomic status were 33 time more likely to delivery in health facility.

### Multivariable analysis

Table 3 also summarizes findings of regression analysis on the strength of association of selected sociodemographic predictors related to institutional delivery after adjustment.

Results of multivariable analysis show that urban place of residence, higher educational level, wealth status, birth order, then wanted pregnancy, and regions of Eastern, Central and Nyanza were significant associated with higher odds of institutional delivery. Women from urban area were 37% (AOR = 1.37, 95%CI: 1.14–1.65,  $p < 0.001$ ) more to deliver in health facility than those from rural area. Comparing those who had not education, those who had primary, secondary and higher educational levels were 2.0 times (AOR = 2.03, 95%CI: 1.53–2.68,  $p = 0.009$ ) and 4.0 times (AOR = 4.03, 95%CI: 2.91–5.59,  $p < 0.001$ ) more likely to deliver in health facility. The odds of institutional delivery among religious groups of

Roman Catholic, Protestant and Muslim were 34%, 26% and 49% more than those who have not religion, but their difference was not significant.

The odds of institutional delivery were also 11.1, 3.9, 2.3, and 1.82 times higher among women from the richest, richer, middle and poor households compared to the poorest households respectively. We evaluated maternal institutional delivery was associated with wanted ness of the last pregnancy and birth order. Women of first and second to fourth birth order were 2.58 and 1.44 times more likely to delivery in health facility compared to fifth and above birth orders. This is shown in Table 3.

### **Factor Analysis**

Results of factor analysis (Table 4) show that the first three factors with eigenvalue  $> 1$  are enough to explain 91.3% of the total variability of institutional delivery. Factor 1 explains (38%), factor 2 explains (34.1%) and factor 3 explains (19.3%).

Table 4  
Factor loadings for determinants of institutional delivery with total variance explained (three factors selected)

Dimensions and item statements	Factor Loading		
	Factor1	Factor2	Factor3
<b>Factor 1: Socio-economic (5 items)</b>			
Wealth quintile	0.890		
TV watching	0.802		
Mother's education	0.751		
Radio listening	0.617		
Place of residence	0.577		
<b>Factor 2: Family support (3 items)</b>			
Wanted last child		0.953	
Mother's occupation		0.945	
Husband education		0.936	
<b>Factor 3: Women status (3 items)</b>			
Age group			0.806
Birth order			0.800
Marital status			0.407
<b>Rotation sum of square loadings</b>			
Eigenvalues	3.44	2.51	1.33
Proportion of variance (%)	38.00	34.00	19.30
Cumulative variance explained (%)	38.00	72.00	91.30
Variables with absolute factor loadings < 0.30 are not shown.			

### Extraction of commonalities and its association with place of delivery

From the factor analysis (Table 5), Wealth quintile, TV watching, Mother's education, Radio listening, and Place of residence have higher loading on factor 1 (socioeconomic factor), Wantedness of last child, Mother's occupation, and Husband education have higher loading on factor 2 (Family support), and Mother age group, Birth order, and Marital status (women status) have positive loading on factor3. The rotated component matrix also showed a similar grouping of the factors.

Association of tertiles extracted communalities with institutional delivery shows all communality factors (socio-economic, family support and women status) were significantly associated with institutional delivery. Above all, women socioeconomic status related factors were the most main determinants of institutional delivery in this study settings.

Women in the first tertile (high socioeconomic factor) had 11 times higher uptake of institutional delivery (AOR:11.04; 95%CI: 9.379–12.988), than women of the same category in the third tertile (low socioeconomic factor). Significant differences were also found among women from second tertile (middle socioeconomic factor) had more than 3 times higher odds of institutional delivery (AOR:3.11; 95%CI: 2.675–3.604) than women from the third tertile (low socioeconomic factor). In addition, women in the first tertile (high family support) were more than twice (AOR:2.54; 95%CI: 2.242–2.888) more encouraged to use institutional delivery than those of in the third tertile (low family support). Similarly, higher women’s status was also positively associated with institutional delivery.

Table 5  
Logistic regression analysis of extracted communalities

Factors	Home Delivery	Institutional Delivery	$\chi^2$	Univariate	Multivariate
	n (%)	n (%)	P-value	OR (95%CI)	AOR (95%CI)
<b>Factor-1: Socioeconomic</b>					
Low	5000(73.42)	1810(26.58)	***	1.0[Ref]	1.0[Ref]
Middle	3070(45.09)	3738(54.91)		3.36(3.130–3.614) ***	3.11(2.675–3.604) ***
High	1237(18.17)	5571(81.83)		12.44(11.464–13.50) ***	11.04(9.379–12.988) ***
<b>Factor-2: Family support</b>					
Low	4160(61.10)	2648(38.90)	***	1.0[Ref]	1.0[Ref]
Middle	2403(35.29)	4406(64.71)		2.33(2.173–2.493) ***	1.95(1.735–2.192) ***
High	2744(40.30)	4065(59.70)		2.88 (2.687–3.088) ***	2.54(2.242–2.888) ***
<b>Factor-3: Women status</b>					
Low	3341(49.07)	3468(50.93)	***	1.0[Ref]	1.0[Ref]
Middle	2941(43.19)	3868(56.81)		1.27(1.184–1.356) ***	1.23(1.106–1.378) ***
High	3025(44.43)	3783(55.57)		1.2(1.126–1.289) ***	1.31(1.161–1.476) ***

\*\*\*: *P-value* < 0.001

## Discussion

Although access to skilled birth attendance via childbirth in health facility is a key intervention to reduce maternal mortality, our study shows that the national weighted average of institutional delivery in Kenya was low (62.10%). However, this proportion on institutional delivery was higher than the corresponding economic category in Indonesia which showed 42.3% (15), Nepal 35% (20) and from Ethiopia 55% (19).

In this study, institutional delivery has a significant association with women place of residence, educational level, wealth status, birth order, desire for the last pregnancy, and some regions after controlling for potential confounding factors.

The odds of institutional delivery were higher among women whose age range from 15–19 years. This finding is in line to other reports from Ethiopia, Indonesia, Nepal, and five other East African countries (12, 15, 20, 23). For obvious reasons, young women are more educated and have a better knowledge on the direct and indirect causes of maternal mortality as well as the benefits of institutional delivery. On the contrary, older women who have more experiences with home deliveries may be consider it as less risky. Moreover, women who have access to visit the health facility for antenatal checkups were more to utilize institutional delivery than those who did not take any uptake of antenatal care. This significant difference was concurrent to other studies (15, 22).

Perceived distance to health facility is negatively associated with institutional delivery. Long distances are usually having problems with waking distance, lack of transport, cost, and poor road infrastructure which might be making for rural women to decide on non-institutional delivery (2, 3). Former studies from rural coastal Kenya and others reported that, distance to health facility was a fundamental barrier for institutional delivery and an independent factor for home delivery (3, 12, 14, 15, 22, 23) which is in line to our study.

Compared to more than three-fourth of women and partners with secondary & higher education delivering in health facility, only less than one-fifth of those with no education at all delivered in health facility. Therefore, higher educational attainment of both mother and partners were associated with institutional deliveries (Table 2), similar to other studies (14, 15, 18, 23). This highlights knowledge related limitations on institutional delivery utilization is still highly existing among the study population and should be addressed.

Like many other studies in developing and middle-income countries (15, 19, 20, 23, 26), our study revealed that household wealth status is the most important determinant of health facility utilization for delivery. After controlling all sociodemographic factors, household socioeconomic status remained significant predictor, in which women from richest, richer, middle, and poorer families were 11.1 times, 3.9 times, 2.3 times, and 82% more to use institution compared to the poorest category. There is a presumption for lower double or triple burdens on affluent people, better educated, have a better income,

better access to media information towards health promotion on the benefits of institutional delivery, live in urban areas proxy to the healthcare service, and accessible transportation service, which makes favorable for optimum institutional utilization for delivery (Figure-1).

Other factors such as wantedness of the last pregnancy and ecological zone were also associated with institutional delivery inline to previously published studies from Nepal, Ethiopia, and five other East African countries (19, 20, 23). The highest percentage of institutional delivery was among mothers from Central and Nairobi regions, which covers more than nine-tenth of mother's delivery in a health facility. In this regard, women from Central region were 4 times more likely to use institutional delivery compared to the North Eastern after adjustment. Therefore, regional variability factors should continuous be assessed.

Regardless of the number of times a woman gave birth, all women are encouraged to delivery in a health facility where they can receive adequate care and support during and after delivery. However, multivariable logistic regression showed that first birth order women were greater than two-folds more to use health facility than those fourth and above birth orders. This finding is comparable to other studies in Tanzania and other sub-Saharan Africa countries (30, 31).

Even though, many studies on global recommendations have reported that access to information through media has significant implication on institutional delivery promotions (15), no significant association with frequency of listening to radio or watching TV was detected in our study after adjusting other variable.

Our results highlighted that three communality factors (socioeconomic, family support, and women status) were identified as having the major variance on place of delivery (Table 4). The result suggested that women from high (first tertile) of socioeconomic factor tended to receive more institutional delivery than those in the lowest third tertile of socioeconomic group. Moreover, high family support factor was associated with higher odds of institutional delivery. Our findings also emphasized that high women status factor was significant associated with women's uptake of institutional delivery. Further studies are needed to explore the detail associations in this study settings.

Strength of the study: compared with the similar study, just focus on the association between each explanatory variable with institutional delivery, ignore the correlations between explanatory variables, we use the factor analysis to extract the subpopulation profiles associated with institutional delivery. Our results help government to more accurately locate vulnerable groups that need attention.

Limitation of the study: The low level of institutional delivery among the urban, educated and wealth families may suggest that the quality of service may be an issue, and was not included in this study. Additionally, from this cross-sectional survey, it cannot affirm causal relationships and direction of the association.

## Conclusion

1. Institutional delivery in Kenya is very low, still a gap to meet the SDG-5.

2. Subpopulation profiles with low socio-economics, low family support and low maternal status are vulnerable group and need to receive special attention.
3. Finally, national and local government, health care professionals, and the community have an unlimited responsibility to enhance behavioral change for institutional delivery in the county. Policy regarding an optimal way of institutional delivery under skilled health care professional should be introduced.

## Abbreviations

DHS: Demographic and health survey

KDHS: Kenya demographic and health survey

MDG: Millennium development goal

SDG: Sustainable development goal

WHO: World Health Organization

ANC: Antenatal care

## Declarations

**Ethics approval and consent to participate:** This study was exempt from review by the ethics committee as publicly available data sets were used and no identifying participant information was obtained. The authorization for using the data in the current analysis was granted from the DHS program: DHS, ICF international, Rockville, Maryland, USA office upon presenting the research protocol and research plan aims.

**Consent for publication:** Not applicable

**Availability of data and materials:** Data sets used in the analysis are publicly available and can be accessed online (<https://www.dhsprogram.com/data/model-datasets.cfm>) through application to MEASURE DHS . Analysis syntaxes and outputs generated for the study can be made available upon request to the corresponding author.

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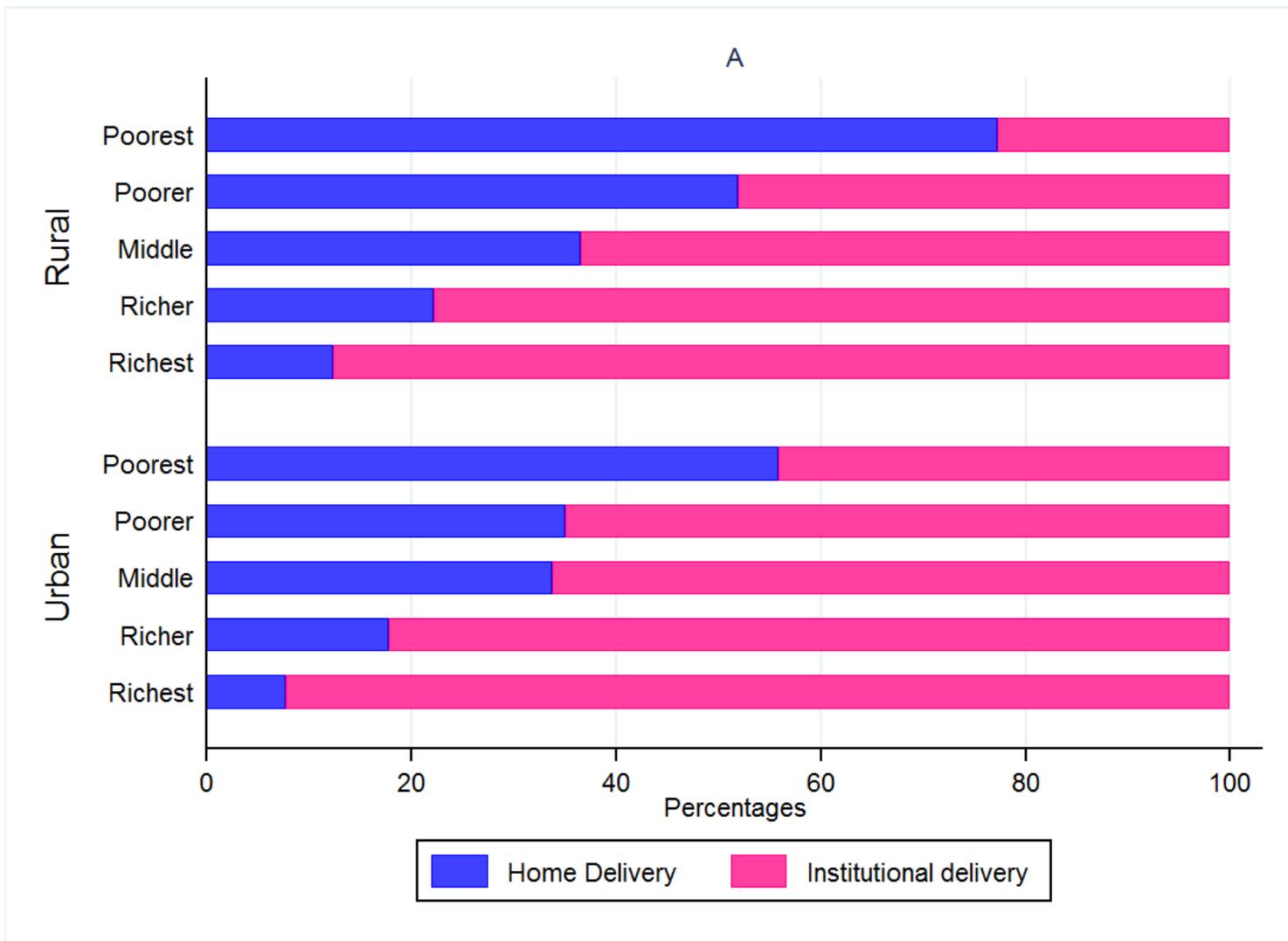
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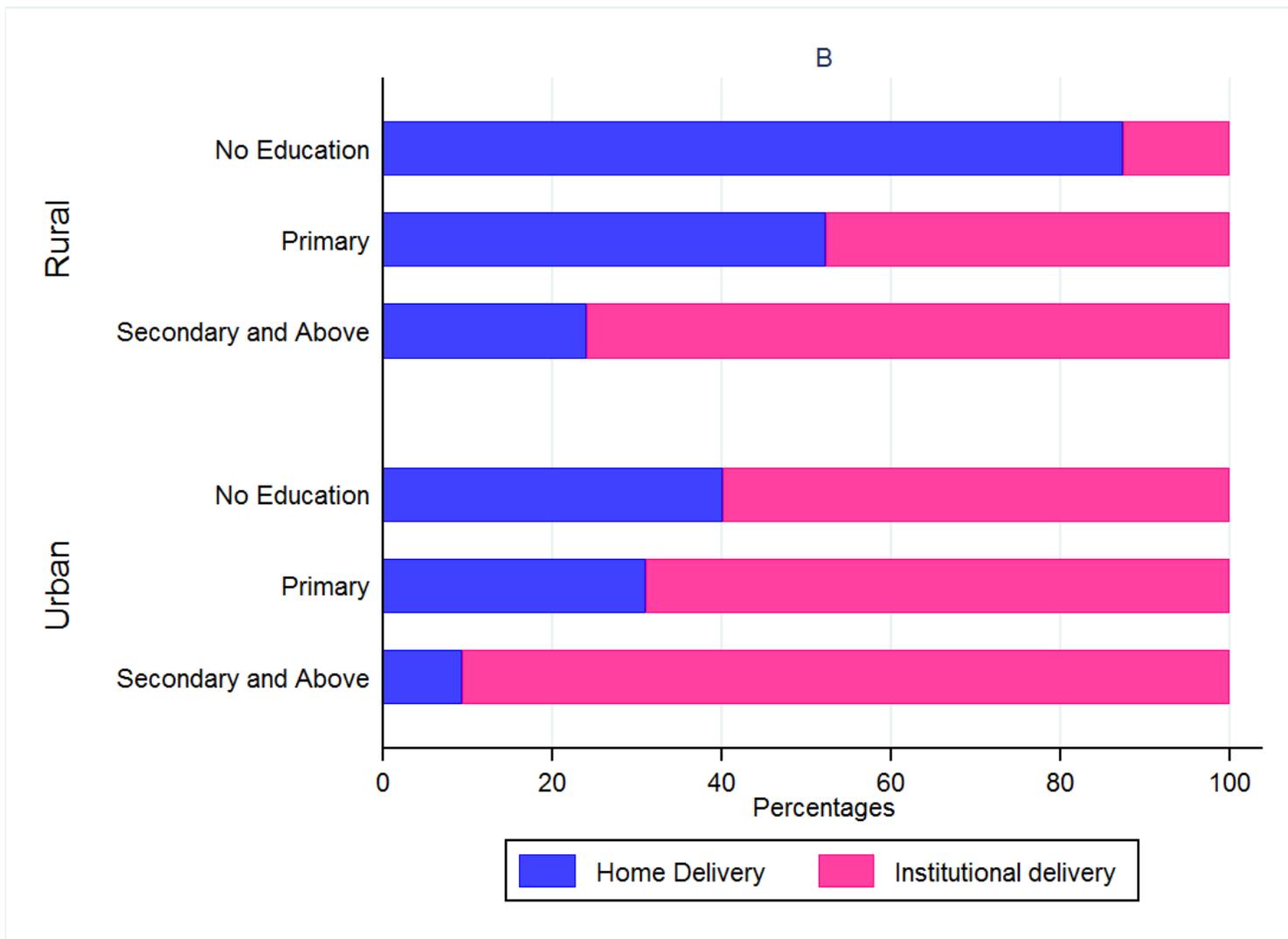
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## Figures



**Figure 1**

Stacked horizontal bar chart showing percentage place of delivery by wealth quintile and place of residence



**Figure 2**

Stacked horizontal bar chart showing percentage place of delivery by educational level and place of residence