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Corresponding author: Irene T. Obago, Department of Public Health, Great Lakes University of Kisumu, Kisumu, Kenya; Email: ireneobago@yahoo.com

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ABSTRACT

Improving maternal health remains a priority in Kenya. It is essential in all countries that women have access to high-quality medical care before pregnancy, during pregnancy and childbirth, and afterwards. Timely care could avert many maternal deaths. Despite interventions to promote maternal care, few women use skilled delivery care in Kenya, and maternal mortality rates remain high. While nearly all women have at least one ANC visit, fewer than 50% have the four or more visits recommended by the World Health Organization (WHO). Thus they miss out on key services and tests and do not receive medical advice on possible pregnancy complications. Lack of sufficient antenatal care interrupts the continuum of maternal care.

This study examines the role of antenatal care in predicting use of health facilities for delivery among women in Kenya. Data from the 2008-09 Kenya Demographic and Health Survey (KDHS) were analyzed using Stata 11.0 software. Logistic regression was used to run univariable and multivariable analyses. The final multivariable models adjust for maternal age at last birth, education, urban-rural residence, province, level of exposure to mass media, religion, wealth index, and birth order.

The study found that both the number of ANC visits and the quality of these visits (based on number of services received) are positive predictors of health facility delivery. Women who received a higher quality of antenatal care (based on an index derived from the number of ANC services received) were from two to four times more likely to deliver in a health facility compared with women who received only one service. Similarly, women with four or more ANC visits were two and a half times more likely than women with no ANC visits to deliver in a health facility.

Interventions should target both the supply and demand sides by ensuring that pregnant women know about ANC services to ask for and that health facilities are sufficiently equipped to provide these services.

Keywords: Antenatal care, quality of care, health facility delivery, Demographic and Health Survey (DHS), Kenya.

INTRODUCTION AND LITERATURE REVIEW

High-quality antenatal care (ANC) has been shown to promote maternal and fetal well-being (Chen et al. 2007, Ochako et al. 2011, Rani et al. 2008, WHO and UNICEF 2003). ANC is central to the continuum of medical care that is necessary before and during pregnancy, at childbirth, and postpartum. ANC is important in reducing maternal mortality, low birth weight, and perinatal morbidity and mortality (Rani et al. 2008). It is also an opportunity for mothers to access skilled care at delivery, usually at a health facility. In many developing countries, however, maternal mortality rates continue to be high, with many deaths the result of complications related to pregnancy and childbirth (Ronsmans and Graham 2006). Further, many women are prone to injuries associated with pregnancy and delivery, which may result in adverse consequences for both themselves and their families (Abouzar and Wardlaw 2001, Fotso et al. 2008).

In 2008 an estimated 356,000 maternal deaths occurred worldwide. Although this represented a 34% decline from the levels in 1990, developing countries continued to account for 99% of all maternal deaths, with 87% in sub-Saharan Africa and South Asia (Wang et al. 2011). In these two regions a woman faces a 1 in 31 adult lifetime risk of maternal death compared with only 1 in 4,300 in developed regions (WHO et al. 2004). Sub-Saharan Africa accounted for the highest maternal mortality ratio (MMR) of any region in 2008 (640 maternal deaths per 100,000 live births). With a MMR of 530 maternal deaths per 100,000 live births in 2008 (Fotso et al. 2008), Kenya was among 11 countries that accounted for 65% of maternal deaths that year (Chou et al. 2010).

In order to encourage interventions aimed at reducing maternal death rates, Millennium Development Goal (MDG) 5 focused on improving maternal health (United Nations 2000). While the aim was to reduce the maternal death rate by 75% by 2015, many countries have made very limited or no progress toward that goal (United Nations 2000, Wang et al. 2011). The global decline in maternal mortality between 1990 and 2008 of 2.3% annually is far below the 2015 target of a 5.5% annual decline. The decline in sub-Saharan Africa so far has been only 0.1%, a level that needs to increase substantially in order to achieve MDG 5 (DFID 2007). The proportion of women receiving skilled care during delivery is used as a progress indicator for

reducing maternal mortality, since direct measurement of maternal mortality is difficult (Campbell 1999, de Bernis et al. 2003, Nikiema et al. 2010).

The majority of maternal deaths occur during labor, delivery, and the immediate postpartum period (Wanjira et al. 2011). Because most maternal deaths occur due to preventable obstetric complications, most could be prevented if women had access to high-quality maternal health care, including antenatal care, skilled assistance at delivery, and postnatal care (Chou et al. 2010, Pembe et al. 2010).

Skilled Birth Attendance

For the majority of women in labor, access to a skilled birth attendant along with equipment, drugs and supplies is now advocated as the single most important factor in preventing maternal deaths (WHO et al. 2004). Nonetheless, in Africa only 46% of patients receive such care (Wang et al. 2011). This regional situation is comparable to that in Kenya, where the 2008-09 KDHS found that only 43% of women delivered at a health facility with skilled care (KNBS and ICF Macro 2010). Where maternal mortality rates are high, the General Assembly of the World Health Organization (WHO) in 2001 recommended that countries should ensure that skilled birth attendants assist at 60% of deliveries (WHO 2001).

Skilled delivery care has a strong positive influence on the health of mothers and children (Graham et al. 2001, Wanjira et al. 2011, WHO et al. 2004). WHO defines a skilled attendant as "an accredited health professional who has been educated and trained to proficiency in the skills needed to manage uncomplicated pregnacies, child birth and the immediate post natal period" (WHO 1999). Skilled care at birth is a measure for assessing progress toward MDG 5 (Fotso et al. 2008, Wang et al. 2011). A comparative study using DHS data from six countries found that the proportion of deliveries by health professionals increased between 1990 and 2000 (Bell et al. 2003). Although globally there is a growing trend for women to give birth in health facilities (Wang et al. 2011), the situation in sub-Saharan Africa is mixed, with rates ranging from below 20% to 70%. In most countries skilled birth attendance for women follows a pattern similar to the use of health facilities, mainly because these facilities are where skilled personnel are found.

In sub-Saharan Africa the proportion of women receiving professional care at delivery has remained low, or has increased very slightly (United Nations 2006).

Use of health facilities for delivery varies by women's socioeconomic status. Institutional births are negatively correlated with maternal age and birth order, a correlation that is most evident in sub-Saharan Africa, suggesting that the use of health facilities for delivery in this region is a recent trend (Wang et al. 2011). Compared with women living in rural areas, women in urban areas are more likely to deliver in health facilities (Wang et al. 2011). Not only are levels of maternal education and wealth higher in urban areas than rural areas, but urban areas also have a higher density of health facilities.

In Kenya assisted deliveries and institutional deliveries have ranged between 40% and 45% since the 1990s (KNBS and ICF Macro 2010, Ochako et al. 2011, Wanjira et al. 2011). Studies in some districts of the country have showed that about 12% to 20% of women deliver without skilled care (Eijk 2006, Mwaniki et al. 2002), despite interventions put in place after the launch of the Safe Motherhood Initiative in Nairobi in 1987 (Nikiema et al. 2010). One such intervention is free antenatal care and delivery (Ochako et al. 2011). In several regions of the country, traditional birth attendants (TBAs) attend over 70% of deliveries (MOH and UNFPA 2004), while in other areas the figure is as low as 2% (Wanjira et al. 2011). In 2008 the national average of deliveries by TBAs was 28%. TBAs have been found to be more popular in rural communities than in urban areas (Izugbara et al. 2009). TBAs are considered to be unskilled, and unskilled birth attendance is more likely than skilled attendance to be unhygienic, putting the mother and child at risk (MOH and UNFPA 2004). Skilled care is particularly essential when complications of pregnancy or delivery occur.

Antenatal Care

The process of skilled assistance at childbirth should begin with skilled antenatal care (Nikiema et al. 2010). Antenatal care provides a unique opportunity to improve the health of women and their children (Chen et al. 2007, Tann et al. 2007), hence reducing the risk of morbidity and mortality (Ochako et al. 2010, WHO and UNICEF 2003). It creates an opportunity to deliver interventions for improving maternal nutrition, providing health education especially

with the understanding of the need for women to prepare mentally, physically and logistically for childbirth (MOH and UNFPA 2004). Tetanus injection, prevention and treatment of malaria during pregnancy, treatment of sexually transmitted diseases, and management of anemia during pregnancy can lead to remarkable improvement in the health of the mother as well as the newborn (Fotso et al. 2008, Nikiema et al. 2010). Antenatal care also provides an avenue for encouraging skilled attendance at birth (Wang et al. 2011), early detection and management of potential complications (Mpembeni et al. 2007), and provision of health education on good nutrition, family planning, and breastfeeding (Fotso et al. 2008, WHO 1999).

One study on the levels and trends in antenatal care conducted in the early 2000s based on household data from 49 African and Asian countries showed that the use of antenatal care increased by 20% between 1990 and 2000 (AbouZar and Wardlaw 2003). While the developing world has achieved great success in antenatal care coverage, with over 80% of women in many of the countries having at least one antenatal care visit, many sub-Saharan African and Asian countries still have unsatisfactory levels of the WHO-recommended four or more antenatal care visits (Wang et al. 2011). In most cases, women in sub-Saharan Africa wait until the second or third trimester in pregnancy to make the initial antenatal care visit, reducing their chances of their making at least four visits (Chen et al. 2007, Mpembeni et al. 2007, Ochako et al. 2011).

Estimates from Kenya show that more than 90% of women make at least one antenatal care visit but fewer than 50% make four or more visits. Thus they miss out on key services such as urine and blood tests, and medical advice on possible pregnancy complications. Lack of sufficient antenatal care interrupts the continuum of maternal care (KNBS and ICF Macro 2010). It is encouraging, however, that levels of having at least four antenatal care visits show improvement since 1990.

Use of skilled health providers in antenatal care also has been increasing in most developing countries since the 1990s (Wang et al. 2011). While doctors are the main providers in Latin America and the Caribbean, in sub-Saharan Africa women rely pimarily on nurses or midwives for antenatal care. Rarely are TBAs and health care providers other than nurses, midwives, or doctors reported as providers of antenatal care. There appears to be a strong association between a woman receiving antenatal care from a skilled health care provider and residence in an urban area rather than a rural area, having a higher education level, and coming

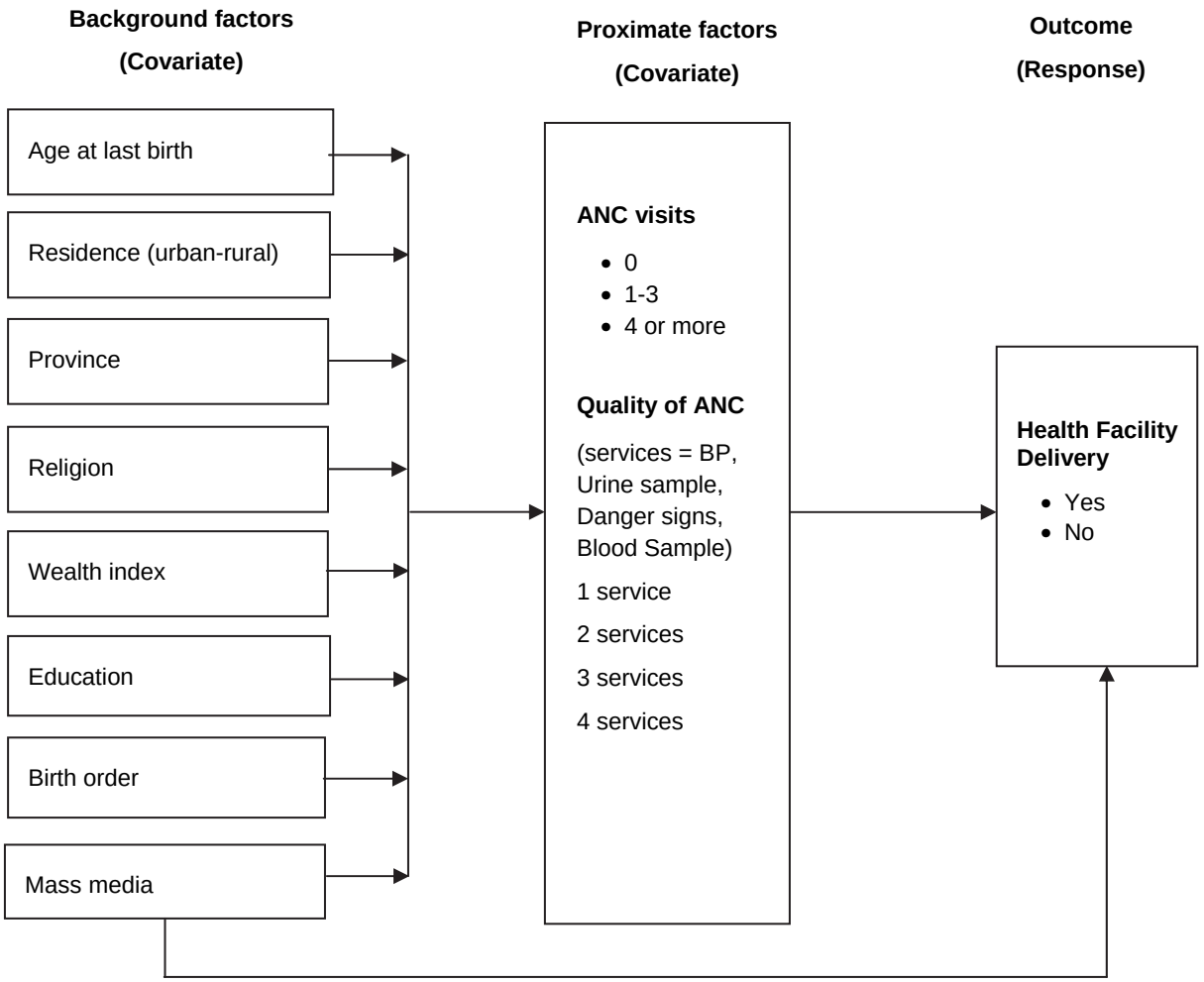
from a wealthier household (Ochako et al. 2011, Wanjira et al. 2011, Wang et al. 2011). The differentials are smaller in coutries with overall high levels of antenatal care (Wang et al. 2011).

While the number of women with access to at least one antenatal care visit is easily and regularly monitored, little has been done to monitor and measure the content and quality of this care (Rani et al. 2008,). Studies suggest that full access to antenatal care often may not be enough, because many women who seek ANC do not deliver in a health facility (Bloom et al. 1999, McDonagh 1996). Because the quality of ANC might have a significant role to play, there have been recommendations that it should be considered when assessing the relationship between use of ANC and maternal health (Bloom et al. 1999, McDonagh 1996, Rani et al. 2008). Quality of antenatal care can be examined from various aspects such as structure, process and outcome. It can also be assessed by looking at clinical quality or interpersonnal quality (Rani et al. 2008). Tests and services by a skilled health care provider such as measuring weight and height, taking blood pressure, testing urine and blood, abdomen examination, providing iron and folic acid supplementation, and conducting tetanus toxoid examinations all constitute measurement of clinical quality. In addition, information on nutrition, danger signs of pregnancy, delivery care, newborn care, and family planning helps to measure quality of care (Chou et al. 2010, Rani et al. 2008, WHO 2001).

It has been reported that ANC alone could reduce maternal death rate by more than 20%, provided it is of good quality and regularly used by pregnant women (Nikiema et al. 2010). However, information is scarce about the quality of care provided during ANC in Kenya and about the role of quality of care in predicting delivery in a health facility. This study examines the quality of care received during antenatal care, and how this care predicts use of health facilities for delivery. In this study, quality of antenatal care is based on clinical quality and limited to four services: measurement of blood pressure; urine testing; blood testing; and provision of information on danger signs associated with pregnancy. An index based on these four services was developed and is used in the analysis.

Conceptual Framework

The theoretical basis of this study stems from concepts identified from review of the literature. The outcome variable of interest is health facility delivery. The different levels of grouping of the independent variables represent the proximity of the factors to the dependent variable being measured. The background modifying factors may influence the dependent variable indirectly, while the proximate factors may have a direct effect. The background factors may also modify the association between proximate and outcome factors in some way. The main explanatory factors for use of health facilities for delivery are number of antenatal care visits and the quality of antenatal care. The study examines the associations between the dependent and independent variables.



Research Questions

- Does antenatal care predict use of health facilities for delivery among pregnant women in Kenya?
- Does number of ANC visits matter?

  For this question associations between the number of ANC visits and delivery at a health facility are examined.

- Does quality of ANC matter?

  For this question the relationships between quality of ANC visit and delivery at a health facility are examined.

METHODS

This research paper analyzed data from the 2008-09 Kenya Demographic Health Survey (KDHS). A DHS survey has been conducted in Kenya every five years since the 1980s, and the data are available to the public. The design used for the surveys is cross-sectional and employs a systematic two-stage cluster sampling technique to select the households to be included in the sample. The sample is nationally representative. In the 2008-09 KDHS, a total of 8,444 women age 15-49 were interviewed. The population of interest in this study is women age 15-49 who had a birth in the last five years preceding the survey, and the analysis covers 3,973 women. The study used information on most recent birth because it is for this birth that antenatal care information is available in the KDHS. Because this research was based on secondary analysis of publicly available data, no ethical considerations were needed before undertaking it.

Sample Design

The sampling strategy in the 2008-09 KDHS, as with all other DHS surveys, was a two-stage cluster sample: a selection of clusters from a national master sample and sampling of households from a list of all households from the sampled clusters. The sample drawn allowed for separate estimates of key indicators for each of the country's eight provinces and for urban and rural separately.

Definition of Key Variables

These concepts in the conceptual framework, which are also the study variables, are described as follows:

	Variable	Measure	Description
Dependent variable			
1.	Health facility delivery	0 no institutional delivery; 1 Includes all deliveries at an institution.	Health facility delivery is the main outcome variable of interest
Independent covariates			
2.	No. of ANC visits	1 0 visit; 2 1-3 visits; 3 4 or more visits	Categorizes number of ANC visits into three groups
3.	Quality of ANC (ANCQL)	0 service; 1 service; 2 services; 3 services; 4 services	An index is developed for quality of ANC based on the four services outlined below that are provided during the visits. – Blood sample taken – Urine sample taken – Blood pressure measured – Informed about pregnancy complications • ANCQL 0 – no service provided • ANCQL 1 – 1 of 4 service provided (Ref) • ANCQL 2 – 2 of 4 services provided • ANCQL 3 – 3 of 4 services provided • ANCQL 4 – 4 of 4 services provided
4.	Mother's age at last birth	1 15-24; 2 24-34; 3 34+	
5.	Type of residence	0 Rural; 1 Urban	
6.	Province	1 Nairobi; 2 Central; 3 Coast; 4 Eastern; 5 Nyanza; 6 R. Valley; 7 Western; 8. North Eastern	
7.	Religion	0 No religion; 1 Catholic; 2 Protestant; 3 Muslim	
8.	Education level	1 No education; 2 Primary; 3 Secondary +	
9.	Birth order	1 1-3; 2 4-5; 3 6+	
10.	Wealth index	1 Poorest; 2 Poorer; 3 Middle; 4 Richer; 5 Richest	
11.	Mass media	MMedia 0; MMedia 1; MMedia 2; MMedia 3;	An index developed for level of exposure to mass media (Listening to radio, watching television and reading newspapers) MMedia 0 – exposure to any three less than once a week MMedia 1 – exposure to any one at least once a week MMedia 2 – exposure to any two at least once a week MMedia 3 – exposure to any three at least once a week

Methods

Data was analyzed using Stata 11.0 statistical software. All numbers are weighted to accomodate non-response, over-sampling and under-sampling. The sample was described using frequencies in percentages. Results are reported based on 95% confidence intervals. Three models are reported: Model 1 describes the unadjusted odds ratios, Model 2 adjusts for number of ANC visits and quality of ANC as applicable for both objectives, Model 3 adjusts for mother's age at birth, education, exposure to media, wealth index, birth order, religion, province, and urban-rural residence, in addition to those adjusted for in Model 2.

RESULTS

Sample Description

Table 1 shows the characteristics of the 3,973 women age 15-49 at the birth of their most recent child. The great majority were under age 35, and 79% lived in rural areas. The sample was nearly equally distributed within the five wealth quintiles. Slightly more than half (53%) of the women had their child in a health facility. Only 7% had no antenatal care visits, while and about half (49%) made four or more ANC visits. About one-third (31%) received all four services, while one-third (33%) received three services during ANC.

Table 1. Sample characteristics of women age 15–49 who had a live birth in the five years preceding the survey, for the most recent birth, 2008-09 KDHS

Response	N (weighted)	%	Other characteristics	N (weighted)	%
HEALTH FACILITY DELIVERY			***Level of exposure to media***		
No	2,115	53.2	MMedia 0	850	21.4
Yes	1,858	46.8	MMedia 1	1,902	47.9
MAIN COVARIATES			MMedia 2	782	19.7
Number of ANC visits			MMedia 3	439	11.1
0	290	7.3	***Residence type***		
1-3	1,730	43.5	Urban	823	20.7
4+	1,953	49.2	Rural	3,150	79.3
Quality of ANC			***Religion***		
ANCQL 0	542	13.6	No religion	137	3.5
ANCQL 1	373	9.4	Catholic	820	20.6
ANCQL 2	543	13.7	Protestant	2,698	67.9
ANCQL 3	1,297	32.7	Muslim	318	8.0
ANCQL 4	1,218	30.7	Province		
OTHER COVARIATES			Nairobi	269	6.8
MOTHER'S CHARACTERISTICS			Central	371	9.3
Age at last birth			Coast	330	8.3
15-24	1,795	45.2	Eastern	630	15.9
25-34	1,652	41.6	Nyanza	733	18.4
35+	526	13.2	Rift valley	1,103	27.8
Maternal education			Western	442	11.1
No education	441	11.0	North Eastern	97	2.4
Primary	2,487	62.6	***Wealth index***		
Secondary and above	1,045	26.3	Poorest	843	21.2
Birth order			Poorer	764	19.2
1-3	2,378	59.9	Middle	742	18.7
4-5	829	20.9	Richer	765	19.3
6+	766	19.3	Richest	859	21.6

Characteristics of Women Delivering in a Health Facility

Table 2 describes the characteristics of women delivering in a health facility. Only 11% of women with no ANC delivered in a facility compared with 60% of women who had at least four ANC visits. Only 37% of women age 35 or older delivered in a facility. Of women who received all four services during ANC, 68% delivered in a health facility. By place of residence, 90% of all women who delivered in a health facility resided in Nairobi.

Table 2. Percent distribution of women age 15-49 who had a live birth in the five years preceding the survey, by health facility delivery for the most recent birth, according to background characteristics, 2008-09 KDHS

	Health facility delivery %		Health facility delivery %
MAIN COVARIATES		***Level of exposure to mass media***	
Number of ANC visits		MMedia 0	26.73
0	10.72	MMedia 1	39.29
1-3	38.21	MMedia 2	65.56
4+	59.66	MMedia 3	84.32
Quality of ANC		***Residence type***	
ANCQL 0	13.69	Urban	75.76
ANCQL 1	19.27	Rural	39.18
ANCQL 2	34.86	***Religion***	
ANCQL 3	53.56	No religion	22.63
ANCQL 4	67.92	Catholic	48.54
		Protestant	48.30
OTHER COVARIATES		Muslim	39.46
Mother's characteristics		***Province***	
Age at last birth		Nairobi	90.28
15-24	49.28	Central	74.34
25-34	47.09	Coast	49.20
35+	37.09	Eastern	49.63
Maternal education		Nyanza	47.29
No education	17.17	Rift valley	33.71
Primary	40.74	Western	29.11
Secondary and above	73.55	North Eastern	18.45
Birth order		***Wealth index***	
1-3	56.68	Poorest	18.84
4-5	37.08	Poorer	32.25
6+	26.43	Middle	45.22
		Richer	55.08
		Richest	80.92
Total	3,973		

Association between Health Facility Delivery and Dependent Variables

Table 3 for Model 1 shows the unadjusted odds ratios for a number of covariates. Women with four or more ANC visits were 12 times more likely to deliver at a health facility (95% CI 6.6-23.10) compared with women with no ANC visits. Similarly, use of facilities for deliveries increased with an increase in the quality of antenatal care. Women who received four services during their ANC visits were about nine times more likely to deliver at a facility compared with women who received only one service (95% CI 6.3-12.5).

Table 3. Unadjusted Odds ratio (UOR) of various covariates on health facility delivery (no health facility delivery versus health facility delivery) for women age 15-49 who had a live birth in the five years preceding the survey, for the most recent birth, 2008-09 KDHS

	UOR* (95% CI)		UOR* (95% CI)
PROXIMATE COVARIATES		***Level of exposure to media (ref = 0)***	
Number of ANC visits (ref = 0)		MMedia 1	1.77(1.30 – 2.43)**
1-3	5.15(2.75 – 9.63)**	Mmeda 2	5.22(3.74 – 7.27)**
4+	12.31(6.56 – 23.10)**	MMedia 3	14.74(9.43 – 23.02)**
Quality of ANC (ref = 1)		***Residence type (ref = Rural)***	
ANCQL 0	0.7(0.42-1.04)	Urban	4.85(3.34 – 7.05)**
ANCQL 2	2.2(1.61-3.11)**	***Religion (ref = No religion)***	
ANCQL 3	4.8(3.40-6.86)**	Catholic	3.23(1.59 – 6.55)**
ANCQL 4	8.9(6.32-12.45)**	Protestant	3.19(1.56 – 6.53)**
		Muslim	2.23(0.99 – 5.03)
OTHER COVARIATES		***Province (ref = Nairobi)***	
Mother's characteristics		Central	0.31(0.15 – 0.65)**
Age at last birth (ref = 15-24)		Coast	0.10(0.05– 0.21)**
25-34	0.92(0.74-1.14)	Eastern	0.11(0.05 – 0.22)**
35+	0.61(0.47-0.79)**	Nyanza	0.10(0.05– 0.19)**
Maternal education (ref = No education)		Rift valley	0.06(0.03– 0.11)**
Primary	3.32(2.11– 5.21)**	Western	0.04(0.02 – 0.06)**
Secondary and above	13.42(8.04 – 22.40)**	North Eastern	0.02(0.01 – 0.06)**
Birth order (ref = 6+)		***Wealth index (ref = Poorest)***	
4-5	1.6(1.2– 2.26)**	Poorer	2.05(1.45 – 2. 91)**
1-3	3.6(2.77– 4.79)**	Middle	3.56(2.58 – 4.91)**
		Richer	5.28(6.60– 7.74)**
		Richest	18.26(11.48- 29.06)**

Do Quality of Care and Number of ANC Visits Influence Health Facility Delivery?

Table 4 for Models 2 and 3 shows adjusted associations between health facility delivery and number of ANC visits and quality of ANC. Model 2 in the second panel adjusts for number of ANC visits and quality of ANC. In addition to these, Model 3 adjusts for other important covariates such as mother's age at child's birth, education level, birth order, level of exposure to media, urban-rural residence, religion, province, and wealth index. The percentage of women delivering in a health facility has a significant association with four or more ANC visits (AOR 2.5, 1.1-5.9) in the multivariable analysis, after controlling for quality of care and other potential confounders. Similarly, the quality of ANC significantly predicts health facility delivery. Women who received two (AOR 2.3, 95%CI;1.61-3.18), three (AOR 3.2 95% CI 2.16-4.79) or four (AOR 4.1 95%CI 2.8-6.0) services during ANC were significantly more likely than women who received only one service to deliver at a health facility.

Other covariates found to be significantly associated with health facility delivery were higher education level, lower birth order, higher level of exposure to media, and urban versus rural residence. Women in Coast, Rift Valley and Western Provinces were less likely to deliver at a health facility compared with those in Nairobi. Also, the likelihood of delivering in a facility increased with an increase in wealth.

Table 4. Adjusted odds ratio of various covariates on health facility delivery (no health facility delivery versus health facility delivery) for women age 15-49 who had a live birth in the five years preceding the survey, for the most recent birth, 2008-09 KDHS

	MODEL 2: AOR (95%CI)	MODEL 3: AOR (95%CI)
PROXIMATE COVARIATES		
Number of ANC visits (ref = 0)		
1-4	1.4(0.59-3.11)	1.7(0.77-3.86)
4+	2.5(1.06-6.04*)	2.53(1.1-5.86)*
Quality of ANC (ref = 1)		
ANCQL 0	0.9(0.51-1.50)	0.8(0.45-1.47)
ANCQL 2	2.2(1.59-3.06) *	2.3(1.61-3.18)*
ANCQL 3	4.4(3.07-6.31) *	3.2(2.16-4.79)*
ANCQL 4	7.6(5.46-10.72) *	4.1(2.8-6.0)*
OTHER COVARIATES		
Mother's characteristics		
Age at last birth (ref = 15-24)		
25-34		1.0(0.72-1.41)
35+		1.0(0.61-1.74)
Maternal education (ref = No education)		
Primary		1.69(1.03-2.79)*
Secondary and above		3.35(1.83-6.14)*
Birth order (ref = 1-3)		
4-5		0.6(0.45-0.79)*
6+		0.7(0.42-1.05)
Level of exposure to media (ref = 0)		
MMedia 1		
MMeda 2		1.63(1.13-2.34)*
MMedia 3		2.43(1.42-4.15)*
Residence type (ref = Rural)		
Urban		0.89(0.52-1.51)
Religion (ref = Protestant)		
Catholic		0.6(0.24-1.41)
Protestant		0.9(0.73-1.16)
Muslim		1.2(0.64-2.24)
Province (ref = Nairobi)		
Central		0.9(0.4-2.1)
Coast		0.43(0.20-0.90)*
Eastern		0.6(0.24-1.3)
Nyanza		0.5(0.22-1.09)
Rift valley		0.23(0.1-0.55)*
Western		0.19(0.09-0.44)*
North Eastern		0.4(0.15-1.05)
Wealth index (ref = Poorest)		
Poorer		1.4(0.95-2.03)
Middle		1.88(1.31-3.70)*
Richer		2.0(1.31-3.04)*
Richest		4.38(2.6-7.38)*

DISCUSSION

The need for high-quality antenatal care has been highlighted as an important way to improve maternal health and to reduce maternal mortality rates. ANC provides a crucial link in the continuum of care necessary during pregnancy, childbirth, and the postpartum period. The literature also has noted that pregnant women should have the recommended four or more antenatal care visits receive key services such as monitoring blood pressure and counselling on possible complications of pregnancy. Also, ANC offers an opportunity for providers to encourage pregnant women to make use of skilled care at health facilities during delivery.

In Kenya, while nearly all women with a birth in the five years preceding the 2008-09 KDHS had at least one ANC visit, fewer than 50% had the recommended four visits. In addition, not all women received the recommended services during these visits. Furthermore, only 47% had their last birth under skilled care in a health facility.

This study examined the role that antenatal care plays in predicting use of health facilities for delivery. Specifically, the study assessed the extent to which the number of ANC visits and the quality of care during these visits influences health facility delivery among women in Kenya. In interpreting the findings, several limitations should be considered. Since the DHS is cross-sectional, it cannot establish causality, but only association between the variables. Also, while a wide range of services are provided during ANC, this study was limited to only four clinical services and by no means captures the wide range of care.

The study results demonstrate a significant association both between the number of antenatal care visits a woman makes and between the quality of the care she receives during these visits and subsequent delivery in a health facility. Consistent with other studies (Chou et al. 2010, Ochako et al. 2011, Wanjira et al. 2011), findings from this study show that the number of ANC visits matters in predicting health facility use for delivery. Women with more antenatal care visits are more likely to deliver at a health facility. The effect of antenatal care on use of a health facility for delivery illustrates the role that ANC can play in informing women of the importance of delivering at a health facility. It follows therefore that women who obtain skilled care during pregnancy are also more likely to seek skilled care for delivery.

Quality of antenatal care has been recognized as a determinant in the use of health services (Nikiema et al. 2010). This study has demonstrated a positive and significant association between receiving more services during antenatal care visits and delivering under skilled attendance at a health facility. It follows that not only ANC visits but also the quality of care provided during the visits completes the continuum of care necessary to ensure maternal health and hence to reduce the level of maternal mortality in Kenya. Other important covariates for facility delivery that the study identified include women's level of education, exposure to media, and wealth status. These are also characteristics of women who make more visits for antenatal care.

The findings suggest that interventions should not only encourage women to make more ANC visits but also ensure that during these visits women receive all the services required for good maternal health. Interventions should target both the supply and demand sides by ensuring that pregnant women know about the ANC services to ask for and that health facilities are sufficiently available and equipped to provide these services. The fact that the rate of skilled delivery use in Kenya is less than 50% indicates that the country still has a need to step up information and services for better maternal health care.

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