

# Does the Quality of Antenatal Care Predict Health Facility Delivery Among Women in Kenya? Further Analysis of KDHS Data 2008/09

Irene T. Obago<sup>1,\*</sup>, James O. Ouma<sup>2</sup> and Joyce A. Owino<sup>3</sup>

<sup>1</sup>Lecturer/Public Health Researcher, Center of Health Systems Research Excellence, Tropical Institute of Community Health & Development, Great Lakes University of Kisumu, P.O Box 2224-40100, Kisumu, Kenya

<sup>2</sup>Lecturer Department of Nursing, Great Lakes University of Kisumu, P.O Box 2224-40100, Kisumu, Kenya

<sup>3</sup>Dean of Faculty of Health Science, Lecturer Department of Nursing, Great Lakes University of Kisumu, P.O Box 2224-40100, Kisumu, Kenya

**Abstract:** Improving maternal health remains a priority in Kenya and beyond. It is essential that women get good medical care before, during and after pregnancy to reduce maternal mortality. Skilled delivery care remains low in Kenya and maternal mortality rate high regardless of numerous ongoing interventions. Antenatal care is known to promote maternal and fetal well-being. However less than 50% of women make the recommended four or more antenatal care visits, missing out on key services such as urine and blood tests, and advice on possible pregnancy complications, that determine the quality of ANC. This study examines how the number of ANC visits and the quality of those visits predict health facility use at delivery.

Maternal health data from DHS of 2008/2008 in Kenya was analyzed using Stata 11.0 software. Logistic regression was used to evaluate relationships between facility delivery and predictor variables in univariate and multivariate models. Estimates were based on 95% confidence interval. The models were examined at 95% CI and 80% power and adjusted for maternal age at last birth, education, place and type of residence, level of exposure to media, mother's religion, wealth index and birth order.

The quality of ANC was an index developed based on the number of services received during ANC visits. The quality of ANC visits progressively increased the likelihood of health facility delivery. Supply and demand should be intervention targets to ensure that women know and understand the services to demand. Health facilities should also be sufficiently prepared and ready with the services.

**Keywords:** Kenya, antenatal care quality, health facility delivery.

## INTRODUCTION AND LITERATURE REVIEW

Antenatal care is the medical care a woman receives during pregnancy. This care provides a key entry point for a range of preventive and promotive health services which help to ensure healthy outcomes for the mother and the newborn. For antenatal care to be effective it has to be of high quality where all essential services are provided. Antenatal care is central to the continuum of medical care that is necessary before and during pregnancy as well as at childbirth and postpartum. It is important in reducing maternal mortality, low birth weight and perinatal morbidity and mortality [1]. It is also an opportunity for mothers to access skilled care at delivery, usually at a health facility. Despite an overall increase in the number of women receiving antenatal care [2] few women make use of health facilities during delivery. As a result high maternal mortality rates continue to be registered each year, many of which result from complications related to pregnancy and child birth [3].

Further, it has been shown that many more women are prone to injuries associated with pregnancy and delivery, which may result in significant risk [7, 8]. High quality ANC has been shown to promote maternal and fetal well-being [1, 4-6].

An estimated 356,000 pregnancy related maternal deaths occurred in 2008 [9]. This was a 34% decline from the 1990 levels of 546,000 deaths. However, developing countries accounted for 99% of these deaths, with 87% being in Sub Saharan Africa and South Asia. In Sub Saharan Africa every woman faces a 1 in 31 adult lifetime risk of maternal death compared with only 1 in 4300 in developed regions [10]. In order to encourage interventions aimed at reducing maternal mortality, Millennium Development Goal 5 was focused on improving maternal health [12]. The aim was to reduce maternal mortality by 75% by 2015. Between 1990 and 2008 there was only an average of 2.3 % annual decline in maternal mortality globally, way below the projected target of 5.5% annual decline by 2015. The decline in Sub Saharan Africa was 0.1% and needs to increase precipitously in order to realize the target [11]. Indeed many SSA countries have made little progress [9, 12]. The proportion of women delivering under skilled care is used as a progress

\*Address correspondence to this author at the Lecturer/Public Health Researcher, Center of Health Systems Research Excellence, Tropical Institute of Community Health & Development, Great Lakes University of Kisumu, P.O Box 2224-40100, Kisumu, Kenya; Tel: +254 721 395 480; E-mail: ireneobago@yahoo.com

indicator for reducing maternal mortality as direct measurement of maternal mortality is difficult [2, 13].

Most maternal deaths occur during labor, delivery and the immediate postpartum period [10] due to preventable obstetric complications [14-16]. Access to a skilled birth attendant along with equipment, drugs and other medical supplies is currently promoted for preventing maternal deaths [10]. However, only 46% of patients receive such care in Africa [9]. In Kenya 43% of women delivered at a health facility with skilled care [17]. This is far below the WHO recommendation of 60% [6]. Skilled care improves delivery outcome [18, 10]; and is used as a measure for assessing progress towards MDG 5 [9, 7]. Skilled delivery rates have improved over time [19, 9] but in Sub Saharan Africa the proportion of women receiving professional care at delivery has remained very low or increased very slightly [20]. Use of health facilities for delivery varies by socioeconomic status and place of residence [9]. Institutional births is negatively correlated with maternal age and birth order and this is more evident in Sub Saharan Africa, giving an indication that the use of health facilities for delivery in this region is a recent trend. Women living in urban areas are more likely to deliver in health facilities compared to those living in rural areas. The rate is also related with maternal education and wealth, as well as distance to health facilities.

In Kenya assisted delivery, along with institutional deliveries has ranged between 40% and 45% since the 1990s [4, 17, 18]. But this is not uniform nationwide; Mwaniki *et al.* (2002) and Eijk (2006) found rates between 12% to 20% in some districts [21, 22]. Numerous interventions including waiver of antenatal care fees, safe motherhood campaigns have turned out little gains [4]. The situation is complicated by the lay traditional birth attendants (TBA) previously promoted and placed in rural areas by the government and other partners [23]. The national average of deliveries by TBAs in 2008 was 28% but in many regions of the country, TBAs attend to over 70% of deliveries [18, 23]. TBAs are more popular in rural communities [24] and may be linked to the low skilled care rate.

Skilled delivery attendance is modeled as a sequelae to antenatal care attendance [4, 5, 10, 25]. 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 [10] and risks of unattended delivery thereby encouraging skilled attendance at birth [18].

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 in the developing world had increased by 20% between 1990-2000 [8]. 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 [18]. It is however encouraging that the data on trends in having at least four antenatal care visits show improvements since 1990 in most countries.

Most women in Sub Saharan Africa delay the initial ANC visit to the second or third trimester and fail to make the recommended minimum of four visits [4, 5, 24]. In Kenya over 90% of women make at least one antenatal care visit but only less than 50% reach the minimum of four thus missing out on key linked services including urine and blood tests, and monitoring of possible complications [17]. This may interrupt the quality continuum of care.

Use of skilled health providers in providing antenatal care has been increasing in most developing countries since the 1990s [9]. While doctors are the main providers in Latin America and the Caribbean, in Sub Saharan Africa women rely primarily on nurses and/or midwives for such care. Rarely are traditional attendants and health care providers other than nurses, and midwives 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 richer household [4, 9, 18]. The socioeconomic gap in antenatal care is considerably larger in countries where overall use of skilled health providers is low.

While the number of women with access to at least one antenatal care visit is easily and regularly monitored and has improved in many countries, much has not been done in monitoring and measuring the content and quality of this care [1, 26]. Full access to antenatal care may not suffice, as many women who attend ANC do not always deliver at a health facility [26, 27]. It is necessary to evaluate if quality of ANC could predict skilled delivery care at a health facility [1, 26, 28]. The inquiry should include the salient quality attributes that may predict the care. The investigation

into the quality may be set from myriad perspectives, including the structure, process and outcome. It can also be assessed by looking at the clinical quality or interpersonal quality [1]. Tests and services by a skilled health care provider such as measurement of weight, height, blood pressure, urine and blood testing, abdomen examination, provision of iron and folic acid supplementation and tetanus toxoid examination all constitute measurement of clinical quality, in addition to provision of information on nutrition, information on nutrition, danger signs of pregnancy, delivery care, newborn care and family planning [1, 10, 15].

So far most studies have focused on the number of antenatal care and health facility delivery. This study goes further to examine the quality of such ANC in terms of the services provided, and how that quality related with health facility delivery.

It has been reported that ANC alone could reduce maternal death rate by more than 20% provided it is of good quality and regularly attended by pregnant women [18]. However, there is scarce information about the quality of care provided during ANC in Kenya and in several other countries as well, and its role in predicting health facility delivery. This study examines the quality of care provided during antenatal care, and how this predicts use of health facilities for delivery. In this study, quality of antenatal care is based on clinical quality and only limited to measurement of blood pressure, urine and blood testing and provision of information on danger signs associated with

pregnancy. An index based on these four services is developed and is used in the analysis.

The outcome variable of interest is health facility delivery. Different levels of grouping of the independent variables represent the proximity of the factors to the dependent variable being measured. 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. Possible associations between the dependent and independent variables are examined in this study.

**RESEARCH QUESTIONS**

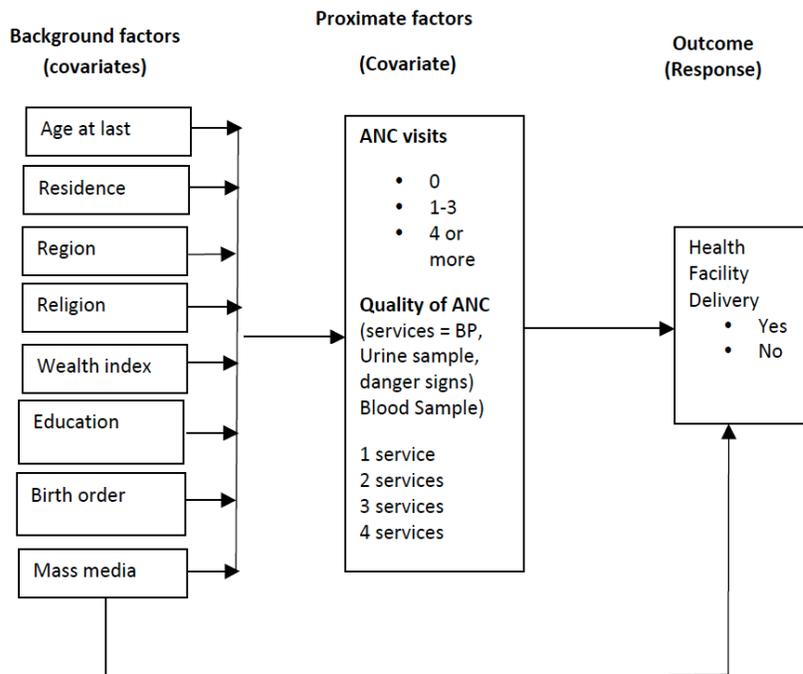
Does antenatal care predict use of health facilities for delivery among pregnant women in Kenya?

1. Does number of ANC visits matter?

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

2. Does quality of ANC matter?

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



## Defination of Key Variables

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

	Variable	Measure	Description		Variable	Measure	Description
<b>Response</b>				<b>Response</b>			
1.	Health facility delivery	0 Other, HF delivery	1 Includes all deliveries at an institution. This is the main outcome variable of interest	4.	Mother's age at last birth	1 15-24, 2 24-34, 3 34+	
Independent covariates				5.	Type pf residence	0 Rural, 1 Urban	
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	6.	Province	1 Nairobi, 2 Central, 3 Coast, 4 Eastern, 5 Nyanza, 6 R. Valley, 7 Western, 8. North Eastern	
3.	Quality of ANC	0 service	An index is developed for quality of ANC based on the four services outlined below that are provided during the visits. ANCQL0 – no service provided	7.	Religion	0 No religion, 1 Catholic, 2 Protestant, 3 Muslim	
		ANCQL1	1 service – 1 of 4 service provided (Ref)	8.	Education level	1 No education, 2 Primary, 3 Secondary +	
		ANCQL2	• 2 services – 2 of 4 services provided	9.	Birth order	1 1-3, 2 4-5, 3 6+	
		ANCQL3	• 3 services – 3 of 4 services provided	10	Wealth index	1 Poorest, 2 Poorer, 3 Middle, 4 Richer, 5 Richest	
		ANCQL4	• 4 services - 4 of 4 services provided	11	Mass media	MMedia 0	An index developed for level of exposure to mass media (Listening to radio, watching television and reading newspapers)
						MMedia 1	MMedia 0 – exposure to any three less than once a week
						MMedia 2	MMedia 1 – exposure to any one at least once a week
						MMedia 3	MMedia 2 – exposure to any two at least once a week
							MMedia 3 – exposure to any three at least once a week

## METHODS

Data from the demographic health survey conducted in Kenya during 2008/2009 was analyzed for this research paper. Kenya Demographic Health Survey (KDHS) is conducted in Kenya every five years since the 80's and the data is available to the public. The most recent survey was conducted at the end of 2008 and the start of 2009. 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 always nationally representative. In the last DHS, a total of 8, 444 women aged 15-49 were interviewed. The population of interest in this study are women aged 15-49 who had a birth in the last five years preceding the survey. Data on births that occurred during the five years preceding the survey was used, and the analysis

is restricted to the last birth to 3973 women. Information on most recent birth was used as it is for this birth that antenatal care information was available. Because this research was based on secondary analysis of publicly available data, no ethical considerations were needed before the undertaking.

### Sample Design

The sampling strategy in the 2008/09 survey as with all other 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 8 provinces and for urban and rural separately [17].

### Analysis Methods

Data was analyzed using Stata 11.0 statistical software. All numbers are weighted to accommodate non-response, over and under sampling. The sample was described using frequencies in percentages. Both univariable and multivariable logistic regression analyses were employed. 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

**Table 1: Sample Characteristics of Women Aged 15-49 Years who had a Live Birth During the Five Years Preceding the 2008/2009 KDHS, Restricted to the Most Recent Birth**

RESPONSE	n(weighted)	%	Other characteristics	n(weighted)	%
<b>HF delivery</b>			<b>Level of exposure to media</b>		
No	2115	53.24	MMedia 0	850	21.38
Yes	1858	46.76	MMedia 1	1902	47.88
<b>MAIN COVARIATES</b>			MMedia 2	782	19.68
Number of ANC visits			MMedia 3	439	11.06
0	290	7.29	Residence type		
1-3	1730	43.54	Urban	823	20.71
4+	1953	49.17	Rural	3150	79.29
Quality of ANC			Religion		
ANCQL 0	542	13.64	No religion	137	3.45
ANCQL 1	373	9.38	Catholic	820	20.64
ANCQL 2	543	13.67	Protestant	2698	67.9
ANCQL 3	1297	32.65	Muslim	318	8.01
ANCQL 4	1218	30.67	Province		
<b>OTHER COVARIATES</b>			Nairobi	269	6.76
Mother's characteristics			Central	371	9.33
Age at last birth			Coast	330	8.3
15-24	1795	45.17	Eastern	630	15.85
25-34	1652	41.59	Nyanza	733	18.44
35+	526	13.24	Rift valley	1103	27.77
Maternal education			Western	442	11.12
No education	441	11.01	North Eastern	97	2.43
Primary	2487	62.58	Wealth index		
Secondary and above	1045	26.31	Poorest	843	21.21
Birth order			Poorer	764	19.22
1-3	2378	59.85	Middle	742	18.67
4-5	829	20.87	Richer	765	19.26
6+	766	19.28	Richest	859	21.63

3 adjusts for mother's age at birth, education, exposure to media, wealth index, birth order, religion, region and residences in addition to those adjusted for in model 2.

## RESULTS

### Sample Description

Table 1 shows the characteristics of the 3973 women aged 15-49 at the birth of their most recent child. The majority were aged 34 and below. Slightly

more than 50% had their child in a health facility. As expected only 7% had no antenatal care visit and about 50 percent made four or more ANC visits. About 30% received all four services during ANC. The sample was nearly equally distributed within the five wealth quintiles, and about 70% resided in rural areas.

### Characteristics of Women Delivering in a Health Facility

Table 2 describes the characteristics of women who delivered in a health facility. As expected only 11% of

**Table 2: Percent Distribution of Women Aged 15-49 who had a Live Birth in the 5 Years Preceding the Survey by Health Facility Delivery for the Most Recent Birth, According to Background Characteristics, Kenya 2008/09**

MAIN COVARIATES	HF delivery % *	Total**	Residence type	HF delivery % *	Total**
Number of ANC visits			Urban	823	75.76
0	290	10.72	Rural	3150	39.18
1-3	1730	38.21	Religion		
4+	1953	59.66	No religion	137	22.63
Quality of ANC			Catholic	820	48.54
ANCQL 0	542	13.69	Protestant	2698	48.3
ANCQL 1	373	19.27	Muslim	318	39.46
ANCQL 2	543	34.86	Province		
ANCQL 3	1297	53.56	Nairobi	269	90.28
ANCQL 4	1218	67.92	Central	271	74.34
OTHER COVARIATES			Coast	330	49.2
Mother's characteristics			Eastern	630	49.63
Age at last birth			Nyanza	733	47.29
15-24	1795	49.28	Rift valley	1103	33.71
25-34	1652	47.09	Western	442	29.11
35+	526	37.09	North Eastern	97	18.45
Maternal education			Wealth index		
No education	441	17.17	Poorest	843	18.84
Primary	2487	40.74	Poorer	764	32.25
Secondary and above	1045	73.55	Middle	742	45.22
Birth order			Richer	765	55.08
1-3	2378	56.68	Richest	859	80.92
4-5	829	37.08	Total		3973
6+	766	26.43			
Level of exposure to mass media					
MMedia 0	850	26.73			
MMedia 1	1902	39.29			
MMedia 2	782	65.56			
MMedia 3	439	84.32			

\*Includes percent deliveries at a government hospital, health center, other public hospital, mission hospital/clinic, private hospital/clinic, nursing maternity home or other private medical facility. \*\*Weighted numbers.

those with no ANC delivered in a facility compared to 60% of those who had at least four visits. Only 37% of those aged 35 and above delivered in a facility. Of those who received all four services during ANC, over 65% had their children in a health facility as did 90% of those who reside in Nairobi.

### Association between Health Facility Delivery and Dependent Variables

Table 3 shows the unadjusted odds ratios for a number of covariates. Women with four ANC visits or more were 12 times more likely to deliver at a facility (95% CI 6.6-23.10), compared to those with none. Similarly, use of facilities for deliveries increased with an increase in the quality of care. Those who received four services were about 9 times more likely to deliver at a facility compared to their counterparts with only counterparts with only one service (95% CI 6.3-12.5).

### Examining Weather Quality and Number of ANC Visits Influence Health Facility Delivery

Table 4 shows adjusted associations between health facility delivery versus number of ANC visits and quality of ANC. As indicated, 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 age at birth, education level, birth order, level of exposure to media, type of residence, place of residence, religion, province and wealth index. The percentage of women delivering at 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 the 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

**Table 3: Unadjusted Odds Ratio (UOR) of Various Covariates on Health Facility Delivery (No hf Delivery vs Health Facility Delivery) for Women Age 15-49 who had a Live Birth in the 5 Years Preceding the Survey, for the Most Recent Birth, Kenya 2008/09**

Proximate covariates			
Number of ANC visits (ref = 0)	UOR* (95% CI)	Residence type (ref rural)	UOR* (95% CI)
1-3	5.15(2.75 – 9.63)**	Urban	4.85(3.34 – 7.05)**
4+	12.31(6.56 – 23.10)**	Religion (ref no religion)	
Quality of ANC (ref = 1)		Catholic	3.23(1.59 – 6.55)**
ANCQL 0	0.7(0.42-1.04)	Protestant	3.19(1.56 – 6.53)**
ANCQL 2	2.2(1.61-3.11)**	Muslim	2.23(0.99 – 5.03)
ANCQL 3	4.8(3.40-6.86)**	Province (ref Nairobi)	
ANCQL 4	8.9(6.32-12.45)**	Central	0.31(0.15 – 0.65)**
Other covariates		Coast	0.10(0.05– 0.21)**
Mother's characteristics		Eastern	0.11(0.05 – 0.22)**
Age at last birth (ref = 15-24)		Nyanza	0.10(0.05– 0.19)**
25-34	0.92(0.74-1.14)	Rift valley	0.06(0.03– 0.11)**
35+	0.61(0.47-0.79)**	Western	0.04(0.02 – 0.06)**
Maternal education (ref No education)		North Eastern	0.02(0.01 – 0.06)**
Primary	3.32(2.11– 5.21)**	Wealth index (ref poorest)	
Secondary and above	13.42(8.04 – 22.40)**	Poorer	2.05(1.45 – 2.91)**
Birth order (6+)		Middle	3.56(2.58 – 4.91)**
4-5	1.6(1.2– 2.26)**	Richer	5.28(6.60– 7.74)**
1-3	3.6(2.77– 4.79)**	Richest	18.26(11.48- 29.06)**
Level of exposure to media (ref =0)			
MMedia 1	1.77(1.30 – 2.43)**		
Mmeda 2	5.22(3.74 – 7.27)**		
MMedia 3	14.74(9.43 – 23.02)**		

**Table 4: Adjusted Odds Ratio of Various Covariates on Health Facility Delivery (No hf Delivery vs Health Facility Delivery) for Women Age 15-49 who had a Live Birth in the 5 Years Preceding the Survey, for the Most Recent Birth, Kenya 2008/09**

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

4.1 95% CI 2.8-6.0) services during ANC were significantly more likely than their counterparts with 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 place of residence. Women who resided in Coast, rift valley and western provinces were less likely to deliver at a health facility compared to those in Nairobi. Also the likelihood of delivering at a facility increased with an increase in wealth.

## DISCUSSION

In the introduction, the need for quality antenatal care was highlighted as a way to improve maternal well being [1, 4, 5, 10] and in turn lead to reduction in maternal mortality [1]. It provides a crucial link in the continuum of care necessary during pregnancy, childbirth and postpartum. It was also noted that pregnant women should have the recommended four or more antenatal care visits so they do not miss out on the key services such as monitoring of blood pressure, counselling on complications that might arise during

pregnancy [10, 29], and that ANC provides an opportunity for women to be encouraged to make use of skilled care at health facilities during delivery [18]. In Kenya, while nearly all women who had a birth in the five years preceding the 2008/2009 demographic health survey had at least one ANC visit, less than fifty percent had the recommended four. In addition, not all women receive the recommended services during these visits. Furthermore, findings from this study show that only 47% had their last birth under skilled care at a health facility. This study examined the role antenatal care plays in predicting health facility use for delivery. Specifically, number of ANC visits and quality of these visits in influencing health facility delivery among women in Kenya was assessed.

In interpreting the findings a few limitations should be considered: since the DHS is cross-sectional, causality cannot be established. Also while there is a wide range of services provided during ANC, this study was limited to only four clinical services and by no means captures the wide range of care. The rate of skilled delivery has been shown to be less than 50% in Kenya and indicates that the country still has to step up interventions for reducing maternal mortality. The results demonstrate the association between number of antenatal care and quality of this care and health facility delivery. Consistent with studies by others [4, 15, 18], findings from this study show that number of ANC visits mattered in predicting health facility use for delivery. Women with more antenatal care visits were more likely to deliver at a health facility. The effect of antenatal care illustrates the roles that care during pregnancy has in informing women of the importance of delivering at a health facility. It follows therefore that women who utilize pregnancy care are also more likely to seek skilled care for delivery [29]. It is likely that these women have similar characteristics that cause them to have similar health seeking behaviour, such as higher education and higher exposure to media.

Quality of antenatal care has been recognized as a determinant in the use of health services [5]. This study has demonstrated a positive and significant association between women who receive more services during antenatal care and delivering under skilled attendance at a health facility. It follows that not only ANC visits but the care provided during the visits completes the continuum of care necessary to ensure maternal health and hence reduce maternal mortality.

The main conclusions from this study are that the number of antenatal care visits together with the quality

of these visits play a significant role in predicting health facility use for delivery, among women in Kenya. Women with more ANC visits as well as those receiving more services are more likely to deliver at a health facility than those with fewer visits and those receiving less services respectively. Other important covariates for facility delivery that were identified include level of education, exposure to media, and wealth. Interventions therefore, should not only be targeted at encouraging more number of ANC visits, but at ensuring that the required number of services is provided during these visits as well. Women should be educated on what services to expect when they attend ANC, so that they are able to demand these services.

## ACKNOWLEDGEMENT

ICF International fellowship for junior faculty 2012.

## REFERENCES

- [1] Rani M, Bonu S, Harvey S. Differentials in the quality of antenatal care in India. *Int J Qual Health Care* 2007; 20(1): 62-71.  
<http://dx.doi.org/10.1093/intqhc/mzm052>
- [2] De Bernis L, Sherratt D, Abouzahr C, Van Lerberghe W. Skilled attendants for pregnancy, childbirth and postnatal care. *Br Med Bull* 2003; 67: 39-57.  
<http://dx.doi.org/10.1093/bmb/ldg017>
- [3] Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. *Lancet* 2006; 368(9452): 1189-200.  
[http://dx.doi.org/10.1016/S0140-6736\(06\)69380-X](http://dx.doi.org/10.1016/S0140-6736(06)69380-X)
- [4] Ochako R, Fotso J, Ikamari L, Khasakhala A. Utilization of maternal health services among young women in Kenya: Insights from Kenya Demographic Health Survey, 2003. *BMC Pregnancy and Childbirth* 2011; 11: 1.
- [5] Chen XK, Wen SW, Yang Q, Walker MC. Adequacy of prenatal care and neonatal mortality in infants born to mothers with and without antenatal high-risk conditions. *Aust NZ J Obstet Gynaecol* 2007; 47(2): 122-7.
- [6] WHO/UNICEF. (2003). Antenatal Care in Developing Countries: promises, achievements and missed opportunities: an analysis of trends, levels and differentials, 1990-2001; 2003.
- [7] Fotso JC, Ezech A, Oronje R. Provision and use of maternal health services among urban poor women in Kenya: what do we know and what can we do. *J Urban health* 2008; 85: 3.  
<http://dx.doi.org/10.1007/s11524-008-9263-1>
- [8] Abouzahr C, Wardlaw T. Maternal mortality at the end of the decade: signs of progress? *Bull World Health Organ* 2001; 79: 561-68.
- [9] Wang W, Alva S, Wang S, Fort A. Levels and trends in the use of maternal health services in developing countries. Calverton, Maryland USA: ICF Macro 2011.
- [10] WHO, ICM, and FIGO. Making pregnancy safer: the critical role of the skilled attendant. A joint statement by WHO, ICM and FIGO. Geneva: World Health Organization 2004.
- [11] Department for International Development: DFID'S Maternal Health Strategy Reducing maternal deaths: evidence and action. DFID Second Progress Report 2007.
- [12] United Nations. General Assembly. Resolution adopted by the General Assembly. United Nations Millennium Declaration, 55th session, 18<sup>th</sup> September, 2000. New York,

- NY: United Nations, 2000. 9 p. (<http://www.un.org/millennium/declaration/ares552e.pdf>, Accessed on 11 December, 2011).
- [13] Campbell O. Measuring progress in safe motherhood programs: uses and limitations of health outcome indicators. *In: Berer M, Ravindran TKS, editors. Safe motherhood initiatives: critical issues.* Oxford: Blackwell Science 1999; pp. 31-42.
- [14] Ministry of Health [Kenya], National Council for Population and Development [Kenya], and ORC Macro. Kenya Service Provision Assessment Survey 1999. Calverton, Maryland: Ministry of Health, National Council for Population and Development, and ORC Macro 2000.
- [15] Chou D, Inoue M, Mathers C, Oestergaard M, Say L, Mills S. *et al.* Trends in Maternal mortality estimates 1990-2008. WHO, UNICEF, UNFPA and the World Bank Geneva 2010.
- [16] Pembe A, Varlstedt A, Urassa D, Lindmark G, Nystrom L, Darj E. Quality of antenatal care in Rural Tanzania: counseling on pregnancy danger signs. *BMC Pregnancy Childbirth* 2010; 10(35).
- [17] Central Bureau of Statistics (CBS) [Kenya], Ministry of Health (MOH) [Kenya], ORC Macro: Kenya Demographic and Health Survey 2008/2009. CBS, MOH, ORC Macro 2009
- [18] Wanjira C, Mwangi M, Mathenge E, Mbugua G, Ng'ang'a Z. Delivery Practices and Associated Factors among Mothers Seeking Child Welfare Services in Selected Health Facilities in Nyandarua South District, Kenya. *BMC Public Health* 2011; 11: 360. <http://dx.doi.org/10.1186/1471-2458-11-360>
- [19] Bell J, Curtis S, Alayón S. Trends in delivery care in six countries. In DHS analytical studies N0.7. Calverton, Maryland USA: ICF Macro and International Research Partnership for Skilled Attendance for Everyone (SAFE) 2003.
- [20] United Nations 2006. The Millennium Development Goals Report 2006. New York 2006.
- [21] Mwaniki P, Kabiru E, Mbugua G. Utilization of antenatal and maternity services by mothers seeking child welfare services in Mbeere District, Eastern Province, Kenya. *East Afr Med J* 2002; 79: 184-87. <http://dx.doi.org/10.4314/eamj.v79i4.8875>
- [22] Eijk A, Bles H, Odhiambo F, Ayisi J, Blokland I, Rosen D, *et al.* Use of antenatal services and delivery care among women in rural Western Kenya: a community based survey. *J Reprod Health* 2006; 3(2): 1-9.
- [23] MOH/UNFPA: Needs assessment of obstetric fistula in Kenya. Final report by division of reproductive health; 2004 [[http://www.endfistula.org/docs/na\\_kenya.pdf](http://www.endfistula.org/docs/na_kenya.pdf)].
- [24] Izugbara C, Ezech A, Fotso JC. The persistence and challenges of homebirths: perspectives of traditional birth attendants in urban Kenya. *Health Policy and Planning* 2009; 24: 36-45. <http://dx.doi.org/10.1093/heapol/czn042>
- [25] Tann C, Kizza M, Morison L, Mabey D, Muwanga M, Grosskurth M, *et al.* Use of antenatal services and delivery care in Entebbe Uganda: a community survey. *BMC Pregnancy and Childbirth* 2007; 7(23).
- [26] Bloom S, Lippeveld T, Wypiz D. Does antenatal care make a difference to safe delivery? A study in urban Uttar Pradesh, India. *Health Policy Plan* 1999; 14: 38-48. <http://dx.doi.org/10.1093/heapol/14.1.38>
- [27] Mcdonagh M. Is antenatal care effective in reducing maternal morbidity and mortality? *Health Policy Plan* 1999; 11: 1-15. <http://dx.doi.org/10.1093/heapol/11.1.1>
- [28] Magadi MA, Zulu EM, Brockerhoff M. The inequality of maternal health care in urban Sub-Saharan Africa in the 1990s. *Popul Stud* 2003; 57(3): 347-66. <http://dx.doi.org/10.1080/0032472032000137853>
- [29] Stephenson R, Baschieri A, Clements S, Hennink M, Madise N. Contextual influences in the use of health facilities for childbirth in Africa. *Am J Public Health* 2006; 96(1). <http://dx.doi.org/10.2105/AJPH.2004.057422>