

**MODELLING UTILISATION OF MATERNAL HEALTH
CARE SERVICES IN KENYA**

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Declaration

I, hereby declare that this Project is my original work and has not been presented for a degree in any other University.

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Dedication

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Abstract

Objectives: To better understand the individual and community factors and perceptions that influence women's health care-seeking behaviors during pregnancy in order to increase women's utilization of maternal health services.

Methods: This study investigates the demographic and sociocultural barriers that influence women's utilization of selected maternal health services in Kenya using the KDHS 2008/9 Data.

Results: Results reveal that the level of utilization of maternal health care services in Kenya is still low though strategies to improve the health care systems have improved. Adequate ANC use is at 49 per cent while Delivery care is at 44 per cent. Utilization of ANC services is influenced by a woman's age, geographical region, type of residence, religion, her ethnic background and her education attainment.. For delivery care place of residence, region in the country, maternal education coupled with the partner's educational attainment and total children ever born greatly influences utilisation of this particular maternal health care service.

Conclusions: Evidence suggests that in order to improve maternal health utilization in Kenya there is need to provide focused and sustained health education that is geared towards promoting use of these selected maternal health care services; ANC, DC and postnatal care in the country.

Abbreviations

ANC	Ante-Natal Clinic
CI	Confidence Interval
DC	Delivery care
GHI	Global Health Initiative
GLMM	Generalised linear Mixed Models
ICDDR, B	International Centre for Diarrheal Disease Research (Dhaka, Bangladesh)
ICPD	International conference Population Development
KDHS	Kenya Health Demographic Survey
LR	Likelihood Ratio
MDG	Millenium Development Goals
MHCU	Maternal Health Care utilisation
ML	Maximmum likeihood
OR	Odds Ratio
PNC	Post natal care
WHO	World Health Organization

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1. CHAPTER ONE

1.1 Introduction

1.2 Overview of the study

The United Nations estimate that 536 000 women die each year from complications related to pregnancy or child birth each year worldwide, 96% are in Africa and Asia alone (WHO/UNICEF/UNFPA, 2007). A high proportion of those deaths occur in Sub-Saharan Africa, within countries like Kenya. In Sub-Saharan Africa where the burden is highest, the lifetime risk of dying from maternal causes is approximately 1 in 22 which contrasts sharply with a risk of 1 in 7,300 for women from the developed regions (WHO/UNICEF/UNFPA, 2007). In Kenya the maternal health indicators have not improved significantly over the years. The 1998, 2003 and 2008/9 Kenya Demographic and Health Surveys (KNBS and ICT Macro, 1999, 2004 and 2010) recorded a national maternal mortality ratio of 590, 414 and 448 deaths per 100,000 live births respectively. Women play a crucial role in management of family affairs, rearing of children and entire society. Thus maternal mortality and morbidity of women during their most productive years means a loss of resources for the family, community and the nation at large. (Ross, 2009)

Studies on maternal mortality and morbidity in developing countries, and research identifying causes of maternal deaths, have repeatedly emphasized the need for wide spread accessibility and utilization of maternal health care services during pregnancy (antenatal care-ANC). A study by global health initiative in Bangladesh found out that the levels of mortality and morbidity due to causes related to childbearing and other preventable conditions is still high at 320 per 100 000 live births ((GHI, 2010). A study by WHO during the International Conference on Population and Development (ICPD) in Cairo recommended that expanding the provision of maternal health services in the context of primary health care will help reduce maternal deaths by 2015. (WHO, 2004). A study conducted by futures group; MEASURES Evaluation project on maternal and neonatal programs in developing countries indicated that access to safe motherhood services in rural areas is more limited than in urban areas. Overall, Kenya received a rating of 47 with an average of 35 for rural access and 59 for urban access (A.Ross, 2000)

Researchers have also consistently emphasized the need for trained medical personnel to attend women during labor and delivery (Fauveau V, 1988). Since a large proportion of maternal deaths occur within the first few days after delivery, safe motherhood programs have recently increased their emphasis on the importance of postnatal care (Fortney, 1988). Scaling up and improving the quality of a package of effective maternal health interventions to reduce maternal mortality and morbidity is paramount. These include timely ANC, increasing delivery by skilled attendants, obstetric care, active management of third stage labor and community management of post partum bleeding (GHI, 2010).

In September 2000, the Government of Kenya embarked on a campaign to achieve the UN Millennium Development Goals (MDGs) by 2015. Top on its agenda was the achievement of MDG No. 5, reducing maternal mortality by three quarters by the year 2015 (UNESCO, 2005). There are clear indications that this goal may not be achieved as envisioned; a recent study that

analyzed trends in mortality reduction between 1990 and 2008 shows that Kenya is one of the eight countries in Africa that have made no progress in reducing maternal deaths or where maternal mortality seem to be increasing (Bulatao, 2000). An estimated 7900 women die each year from preventable and treatable causes during pregnancy and childbirth in Kenya, while many suffer disabling injuries such as obstetric (WHO/UNICEF/UNFPA, 2010)

Maternal health care utilization is essential for further development and improvement of maternal health. In Kenya, little is known about the current magnitude of use and factors influencing the use of these services. This study seeks to fill the gap using the 2008/09 Kenya Demographic and Health survey (KDHS). By studying the relationship between use of selected maternity care services and by elucidating the various factors influencing the use of these services; it is hoped that the results of the study will improve policymakers' understanding of determinants of maternal mortality and morbidity in the country. This will serve as a tool for any possible intervention aimed at scaling up the low utilization of maternity care services in the country.

1.3 Problem Statement

The study is of interest because maternal health fosters strong families, communities and countries (Véronique Filippi, 2008). The Global Health initiative; 2009-2014 seeks to save approximately 360 000 women's lives by reducing maternal mortality by 30 percent across assisted countries. The strategies include integrate and take to scale MCH programs, strengthen health systems functions to ensure quality and reach of health services, working with governments use of community based and private sector participation approaches (GHI, 2010). Although many strategies have been attempted to improve maternal health outcomes, women's utilization of maternal health services are often influenced by perceived societal and cultural aspects, economic and health system factors. These factors are operating at the community, household and individual level as well as within the larger social and political environments.

Despite the fact that maternal health care utilization is essential for further improvement of maternal health little is known about the current use and factors influencing use of this services in Kenya. This study therefore aims to fill this gap using data from the 2008/2009 Kenya Demographic and health Survey.

A suitable model which relates maternal health utilization to the factors influencing it and the ordered responses on utilization will be is utilized in predicting this sub-set of determinants likely to influence and subsequent uptake of the maternal healthcare services.

1.4 Objectives of the Study

1.4.1 Main Objective

To determine the current status of utilization of maternal health care service in Kenya on the basis of the KDHS (2008/2009) and to identify associated determinants that specifically influence MHC in Kenya.

1.4.2 Specific objectives

- Determine the current magnitude of utilization of maternal health services and factors influencing the use of these services in Kenya.
- To identify the key individual, household, community and state level factors that influence the use of maternal health care services in Kenya.
- To investigate the differentials in maternal health care utilization among the study population according to different socio-economic and demographic characteristics

1.5 Significance of the study

The study will be significant to planners and health providers giving answers to questions on the extent of utilization of maternal health care services in the country. It will show variations by social demographic characteristics that exist thereby describing the role these variable play in utilization patterns. This information is the expected to lead to better service delivery and care.

The study is useful in Kenya because the factors that influence maternal health care service use are established and appropriate strategies can be devised to enhance use of these services; prolonging the life of women in the country. Maternal deaths and morbidity are felt by the women's families and communities. Loss of women during their most productive age 15-49 years means a loss of resources for the entire society; children who lose their mothers are at risk of death or other problems such as malnutrition, social evils. The safe motherhood programs recognizes and supports the rights of women and girls to lead healthy lives in which they have control over the resources and decisions that impact on their health and safety. It requires up scaling awareness of complications associated with pregnancy delivery, providing access to high quality health services (antenatal, delivery, postpartum, family planning, etc.), and eliminating harmful practices.

An important proximate determinant of maternal health is access to and use of quality health care services (Bhatia, 1993, McCarthy, 1992). This study will contribute to maternal health by investigating one of the determinants of maternal deaths: the utilization of maternal health care service. While availability of healthcare facilities does not guarantee utilization, utilization is an important indicator of health status, health seeking behavior and cost and quality of services.

Family health greatly depends on the health of the women throughout their life. The economic contribution of women to the family and societal development in general is often derailed due to pregnancy related problems and hence need for this study.

1.6 Scope and Limitations of the study

The scope of the study covers 8,444 women aged 15 to 49 years selected from 400 clusters throughout the country interviewed in the 2008/2009 Kenya Demographic Health survey (KDHS). This is a population that is at its active reproductive ages and thus at most risk of maternal deaths. These are women whom antenatal, delivery and postnatal services are relevant. The data will be analyzed to establish levels and differentials in health care service utilization and

their association with social economic, demographic and exposure characteristics of the study population.

1.6.1 Limitation

The Kenya Demographic Health survey (KDHS) has the following limitations:

1. It covers broad topics and thus does not include detailed information on this particular topic. The area of maternal health is given little coverage compared to infant mortality and control contraceptive use. Thus it is only limited to only available aspects of the data.
2. It is difficult to control quality of secondary data survey as it may have had sampling and non sampling errors. No modification will be made for this study as the data is fairly representative of the study area.

2. CHAPTER TWO

2.1 Literature Review

Utilization of maternal health care services has been seen as an important determinant of maternal health in developing countries. (Caldwel, 1990) found out that use of modern maternal health care services can be influenced by the socio-economic and demographic characteristics of women.

(Mekonnen, 2002) used logistic regression to study utilization of health care services in Ethiopia and found out that a number of socio cultural and demographic characteristics of women greatly influence use of maternal health care services. A number of factors that have important influence in utilization of health care services in Ethiopia were identified. These include place of residence, women's education, marital status, religion, parity, and number of children under five. Place of residence and women's education are common predictors for antenatal care, delivery care and postnatal services. Religion and marital status are significant only for utilization in antenatal care. On the other hand, parity is a most significant factor for the utilization of delivery care for the entire country.

(T.Elo, 1992) used both cross sectional and fixed effects logit models to study utilization of health care services and the role of women's education. He followed the conceptual framework of health-seeking behavior developed by Kroeger and identified education as only one of many factors influencing decisions concerning the utilization of health-care services. The study intimated that formal education of women influences the woman's propensity to seek the services of modern maternal health care. The mother's childhood place of residence, household socio-economic status also determines access to health care services. To a large extent, maternal education was found to be of great importance on the utilization of both prenatal care (ANC) and delivery assistance in Peru. The study by Irma found out that the level of maternal schooling explained the differences in health care use although there were significant differences in the four educational categories. In the same study region of residence was also important in determining maternal health care use. There were a higher percentage of uneducated women in Lima a Metropolitan area who used both prenatal and delivery assistance (62.0 and 72.0 per cent) than women with the highest level of education in the rural sierra (57.7 and 41.1 per cent). From the study, the household's socio economic status and the woman's previous reproductive experience weaken the fixed effects model though maternal education retains a significant effect.

(Navaneetham, 2000) used logistic regression models to estimate the covariates on the utilization of maternal health care services in south India i.e. (antenatal care, tetanus toxoid vaccine, place of delivery and assistance during delivery). The determinants of maternal health care services are not same across states and for different maternal health care indicators. Although illiterate women are less likely to use maternal health care services, there was no difference among the educated. The differential in access to health care facilities between rural-urban areas is an important factor for lower utilization of maternal health care services, particularly for institutional delivery and delivery assistance by health personnel in the rural areas of the three states. Also, the health workers in the rural areas are playing a pivotal role in providing antenatal care in south India. It

was also found the level of utilization of maternal health care services was highest in Tamil Nadu, followed by Andhra Pradesh and Karnataka. Part of the interstate differences in utilization could be due to differences in availability and accessibility of health care facilities and program factors, For instance the illiterate women in Tamil Nadu and Kerala had greater utilization of all maternal health care services than illiterate women in Andhra Pradesh.

In this study, (Navaneetham, 2000) used logistic regression and confirmed the effects of various socio, economic, cultural and programmatic factors such as order of birth, parity, type of residence working status of women, religion, education and exposure to media had an influence on the pattern of utilization maternal health care services in south India.

(Woldemcael, 2007) used logistic regression models to investigate the effect of women's autonomy on maternal health care seeking behaviour in Ethiopia and Eritrea. In the analysis it was found out that where women's autonomy is low, health care seeking behaviors are more strongly affected by socio economic factors like education, residence and employment. In these countries, maternity hospitals are quite far thus financial constraints and lack of awareness on health care utilization are barriers to uptake of the services. On the other hand, even if a woman has adequate financial resources and/or education, her low level of autonomy due to lack of authority and restriction by her husband can lead to low uptake of maternal health services. In this case, as a result of the compromised decision-making autonomy, maternal care seeking behavior could be negatively affected.

(Nguyen, 2005) used multinomial logistic regression model to study factors that influence utilization of maternal health care services in northern Vietnam. The socio-economic characteristics that influence utilization of maternal health care services include residence, education and ethnicity. For antenatal care and delivery care, educational attainment was the strongest predictor followed by residence. There were differentials of ANC and delivery care use between majority and minority groups. With respect to delivery, ethnicity plays an important role when women chose to deliver and whom they choose to be assistants. Thus it seems that the choice of delivery may be a result of custom. Since it may be difficult to change some habits, education into safer delivery practices should be emphasized to develop appropriate delivery habitual practices.

(Christan, 2008) carried a cross sectional study in Anambra State, Nigeria; to assess the use of maternal services by parturient mothers. He found out that the women in the study population utilize maternal health services very well. It is clear that problem of maternal mortality in the country may not necessarily lie with the mothers' failure to utilize maternal care but that the health care system probably needs to be repositioned to meet up with the challenges of modern obstetric care.

(Sagir, 2009) used a cross sectional study to investigate maternal and child health utilization in coastal Karnataka. The results suggest that women are aware of the available health services and have utilized them but their awareness on proper and timely vaccinations of children should be increased. Further, accessibility to health care equipped with modern maternity facilities will have a significant influence upon the health seeking behavior of the women. On the whole the study

population is doing well when compared to the national indicators and this good work needs to be continued with focus on specific areas such as couple protection rate and child immunization. Hence there is a need for improving community awareness on maternal and child health and for motivating women to utilize MCH services.

(Anuja Jayaraman, 2008) used multinomial logistic regression in their study to examine factors affecting maternal health care seeking behavior in Rwanda using three rounds of Rwanda Demographic and Health Survey (RDHS) data (1992, 2000, and 2005). The results found out that a woman who goes for antenatal care is more likely to deliver in a health facility or deliver at home with professional help than a woman who does not go for antenatal check-ups. At the same time, the likelihood of delivering at a health facility is lower in 2000 and 2005 compared to 1992. In Rwanda, a number of socio economic factors influence the utilization of health care such as house hold head, parity, education, access, and costs of seeking health care, effect of work status on delivery at health all contribute to factors affecting.

(Iqbal Anwar A. T.M, 2004) used logistic regression model to study the inequalities in utilization of maternal health care services from Matlab in Bangladesh. The findings were: women from poorer households used ICDDR, B delivery facilities significantly less than their better-off counterparts: the ratio between the best-off and worst-off 20% of the population was nearly 3:1. While overall facility utilization increased during the study period, the economic disparities in use persisted. Factors other than economic status associated with use of maternity care were; area of residence, number of antenatal visits, birth order, maternal education and age, and year of delivery.

2.2 Key issues emanating from the study

The significant variables from the studies are: residence, women's education, marital status, religion, parity, and number of children under five, employment and exposure to media.

Many studies used logistic regression as a statistical method, cross sectional and fixed logit models strongly advocates for women's education as the most key factor in utilization of maternal health care. Multinomial logistic regression method and cross sectional studies are other statistical methods used in the reviews above.

Theory: Thus it seems that the choice of delivery may be a result of custom. Since it may be difficult to change some habits, education into safer delivery practices should be emphasized to develop appropriate delivery habitual practices. Awareness on available maternal health services would thus motivate women to use MCH services.

2.3 Importance of taking the design into consideration: GLMM

In the case of the DHS 2008/9, the selection of households within cluster will lead to consideration of a logistic regression with a random effect and hence generalized linear mixed models- GLMM.

The logistic regression model considers the relationship between a binary dependent variable and a set of independent variables (maternal age at birth, parity, number of children under five, educational status of women, marital status, work status, religion, residence, and year of birth of the child). The set of factors have been derived from the literature review and are deemed significant in most of the studies above.

Generalized linear mixed models (GLMMs) provide a more flexible approach for analyzing non normal data when random effects are present.

For our study maternal health care utilisation; GLMM is used because of the non continuous responses i.e. binary data and is clustered in some way since women are nested in the households and or region/community.

The DHS 2008/9 data has a random effect, whose purpose is to quantify the variation among individuals. This is because count data with many zero values cannot be made normal by transformation thus glmm is used to estimate variability and extrapolate statistical results beyond the study sample.

Thus generalized linear mixed models (GLMMs) combines the properties of two statistical frameworks, linear mixed models (which incorporate random effects) and generalized linear models (which handle non normal data by using link functions and exponential family [e.g. normal, Poisson or binomial] distributions). This is because GLMMs are the best tool for analyzing non normal data that involve random effect.

3. CHAPTER THREE

3.1 Methodology

The data for this study is from the Kenya Demographic and Health Survey (KDHS) 2008-09 and is a national representative sample survey of 8,444 women aged 15 to 49 from 400 clusters. The survey utilized a two stage sample based on the 1999 population and housing census NASSEP IV and was designed to produce separate estimates for a key indicator maternal health care utilization for each of the eight provinces. Data collection took place over a three-month period, from 13 November 2008 to late February 2009.

Data set for this project were selected from Kenya. The sample used for this project consists of women aged between 15-49 years who had at least one live birth in the five years period preceding this survey (2003-2009). Therefore, only information associated with utilization of antenatal care, delivery care and postnatal care during the most recent live birth shall be considered. The women's questionnaire was used to collect information from all women aged 15-49 years old and covered maternal health i.e. antenatal and delivery care, maternal mortality among others. In this study we mainly focus on the utilization of three maternal health care services during pregnancy and birth of the reference child.

3.2 GLMM3.2.1 Introduction

Generalized linear mixed models (GLMM) are among a class of generalized linear models. It provides a means of modeling deviations from the usual linear mixed models which mostly assumes linear responses, constant variance and normality.

In this study the design is clustered taking responses from women within households selected from the 400 clusters sampled. For each woman, antenatal care outcome is 1 or 0; where 1= adequate when a woman aged 15-49 years seeks maternal health care four times or more times; and 0= inadequate/none when having received no antenatal check up and one to three time antenatal visits. The responses observed are nested within larger units i.e. households, communities, regions and so on. For analysis of such multilevel data, a random effect is added into the regression model to account for the correlation of the data. The resulting model is a mixed model including usual effects for the regressors plus random effects.

GLMM the mixed effects logistic regression model is given by:

$$g(\mu_{ij}) = \text{logit}(\mu_{ij}) = \log\left[\frac{\mu_{ij}}{1-\mu_{ij}}\right] = x_i\beta + v_i = \eta_{ij}.$$

Equation 1

It consists of three parts namely:

A linear predictor: $\pi = x_{ij}^T \beta + v_i$

Equation 2

That models the relationship between the fixed and random effects; where v_i is the random effect which represents the influence of subject i on her repeated observations that is not captured by the observed covariates. These are treated as random effects because the sample is assumed to be distributed as $N(0, \delta_v^2)$.

The parameter δ_v^2 indicates the variance in the population distribution and therefore the degree of heterogeneity of subjects. The variance function; $v(\mu_{ij}, \phi)$ is used to model residual variability; { residual variability is often greater than expected due to sampling and needs to be accounted for with an over dispersion parameter}.

The expected value of the outcome variable $\{g(\mu_{ij})\}$, which is related to the linear predictor via the link function is given as

$$\mu_i = E[Y_{ij} | v_i, x_{ij}]$$

Equation 3

Thus the Inverse link functions;

$$\mu_{ij} = h(\eta_i)$$

Equation 4

models the relationship between linear predictor and the conditional mean of the observed response.

3.2.2 Estimation

Estimating the parameters of a GLMM is key in my analysis; these parameters are the fixed-effects parameters (effects of covariates, differences among treatments and interactions) and random- effect parameters (the standard deviation of the random effects).

Parameter estimation in GLMMs typically involves maximum likelihood (ML) or variants of ML.

For the GLMM: $\log\left(\frac{\mu_{ij}}{1-\mu_{ij}}\right) = x_i \beta + v_i$ indicates the probability of level-1 response y_{ij} conditional on the random effects v_i . Let Y_i denote the vector of responses from subject i then the probability

of any response pattern Y_i (of size n_i), conditional on ν_i is equal to the product of the probabilities of level-1 responses.

$$l(Y_i | \nu_i) = \prod_{j=1}^{n_i} p(Y_{ij} | \nu_i)$$

Equation 5

The marginal density of Y_i in the population is expressed as an integral of the likelihood $l(\bullet)$

$$h(Y_i) = \int_{\nu_i} l(Y_i | \nu_i) f(\nu_i) d\nu_i$$

Equation 6

Where $f(\nu_i)$ represents the distribution of the random effects often assumed to be a multivariate normal density. Equation 5 represents the conditional probability and 6 indicates the unconditional probability for response vector of subject i . The marginal log-likelihood from the sample of N subjects is the obtained as

$$\log L = \sum_i^N \log h(Y_i)$$

Equation 7

When the response variables are normal, all treatments have equal sample sizes (i.e. the design is balanced) and all random effects are nested effects, classical ANOVA methods based on computing differences of sums of squares give the same answers as ML approaches for simple analyses. However, this equivalence breaks down for more complex GLMMs: to find ML estimates, one must integrate likelihoods over all possible values of the random effects. For GLMMs this calculation is at best slow, and at worst (e.g. for large numbers of random effects) computationally infeasible (Benjamin M. Bolker, 2009)

Thus Maximum likelihood (ML) will find the parameters of a model that maximises the probability of the observed data (likelihood). It underestimates random-effect standard deviations except in large data sets but is more useful for comparing models with different fixed effects (Benjamin M. Bolker, 2009)

3.2.3 Inference

After estimating parameter values for GLMMs, the next step is drawing statistical conclusion from the data by examining the estimates and their confidence intervals, testing hypotheses, selecting the best model(s) and evaluating differences in goodness of fit.

3.2.3 a).Hypothesis testing

Wald Z, χ^2 , t and F tests for GLMMs test a null hypothesis of no effect by scaling parameter estimates by their estimate standard errors and comparing the resulting test statistic to 0. (Agresti, A, 2002). The Wald Z, χ^2 tests are only appropriate for GLMMs without over dispersion.

The Likelihood ratio (LR) test determines the contribution of a single factor by comparing the fit (measured deviance i.e. -2 times the log likelihood ratio) for models with and without the factor namely nested models. The LR is only adequate for testing fixed effects when both ratio of the total sample size to the number of fixed effects levels and the number of the random effects blocks are large (Agresti, 2002). The LR tests are preferred for inference on random effects because generally Wald tests make stronger assumptions (Vaida, 2005)

3.2.3 b) Model selection

A statistical model describes how we partition the data into systematic structure and random variation. The null model represents one extreme where the data is represented entirely as random variation, while the saturated or full model represents the data as being entirely systematic. There are various methods of selecting models; pair wise comparison using LR tests and Bayesian approaches for nested models and large sample sizes.

The full model does give us a measure of how well any model could possibly fit and so we might consider the difference between the log-likelihood for the full model, and that for the model under consideration, expressed as a likelihood ratio statistic (LR).

Procedures of creating a full model

First, specify fixed and random effects, include only important interactions. Restrict the model to feasible level of complexity and adequate sample sizes. Secondly, choose an error distribution and link function for this study it is a logit link function. Thirdly graphical checking for variances, are responses linear with predictors, any outliers and if the distributions within match the assumed distribution. Fourthly, fit fixed effect the GLMs both to the full data set and within each level of the random factors; assumption is that estimated parameters should be approximately normally distributed cross groups. Next fit the full GLMM model and last check assumptions for the final model by graphical checking and check the parameter estimates and confidence intervals are reasonable.

After constructing a full model and random effects are a focus of study, I have chosen to retain them all, selecting some by backward stepwise regression using the LR test to test random effects and Wald χ^2 tests.

4. CHAPTER FOUR

4.1 Choice of Variables

The dependent variables are classified into different categories as shown in Table (4.1) below.

4.1.1 Dependent variable (Outcome)

Table 4-1: Dependent Variable classification

Category	Descriptions/ categories
Antenatal care (ANC)	Adequate -four times or more times; 1=adequate None -having received no antenatal check up and one to three time antenatal visits; 0= none.
Delivery Care (DC)	Adequate- Delivery at a health facility under a supervision or assistance of a trained health professional; 1=adequate None having received no assistance during birth and Delivery at home under supervision or assistance of a trained health worker or TBA's; 0= none
Postnatal Care(PNC)	Adequate: Postnatal care received with assistance of a health professional or a TBA within forty two days after a non institutional birth; 1=adequate None: For all non institutional births and no postnatal check-up are done at all and if postnatal check-up is within 3-41 days from a health professional or a TBA; 0= none.

4.1.2 Independent variables (Predictors)

Independent variables are classified into various categories as shown in Table (4.2).

Table 4-2: Independent Variable classification

Independent variables	Descriptions/ Categories
Demographic characteristics	Maternal age at birth: the women are categorized by 5 year cohort such as 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49 Marital Status: the variable is categorized as never married, currently married, and formerly married. Total children ever born: This is divided into one child, 2-4 children and more than five children.
Socio-economic characteristics	Education status of women: The variable is categorized into four levels, no education, and incomplete primary, complete primary, incomplete secondary, complete secondary and higher education. Residence: is divided into two categories rural and urban. Working status: the variable measures the employment status of the respondent (Yes/or No). Religion: the variable is categorized into Roman Catholic, Protestant, Muslim, no religion. Ethnicity: The variable is categorized into; Kalenjii, Kamba, Kikuyu, Kisii, Luhya, Luo, Maasai, Meru, Mijikenda, Somali and others).

Region: the categories are Nairobi, Central, Coast, Eastern, Nyanza, Rift valley western and North Eastern.

Partners' education attainment: The variable is categorized into four levels; no education, incomplete primary, completes primary, incomplete secondary, complete secondary and higher education.

4.2 Descriptive Aspects

The selection of explanatory variables given below was based on the univariate analysis for the use of maternal health care services in Kenya.

Table 4.3 below presents the univariate analysis antenatal health care services in the country. Maternal age, region coupled with the place of residence of a woman, education of the mother and the partners' really influenced the use of antenatal care in the study period 2008-2009. Religion, ethnicity and current marital status of a mother are also other factors that are significant in ANC use. Births in the last five years were used as a control variable. Parity and working status are not strongly related to antenatal care use.

Table 4-3: Association between ANC & Determinants for 2008/9

Variable	χ^2	df	P value
Maternal Age	32.176	6	<0.0001
Region	96.327	7	<0.0001
Residence	73.666	1	<0.0001
Religion	54.666	4	<0.0001
Ethnicity	65.946	12	<0.0001
Education	167.241	5	<0.0001
Total children ever born	26.773	12	0.008
Births in the last 5 years	16.609	4	0.002
Respondent's work status	6.659	1	0.01
Partner's Education	137.275	5	<0.0001
Marital status	19.313	5	0.002

Table 4.4 below presents the univariate analysis of delivery care; part of maternal health care for the period 2008-2009 in Kenya. It is generally believed that care during delivery would be higher for the first order births and is expected to decline as order of births increases (Elo, 1992). Thus total number of children ever born, residence of the woman whether rural or urban, region of residence, education attainment of the woman, the partner's education attainment, ethnic background and religious affiliation of the woman and her age are significantly related to delivery health care utilization.

Table 4-4: Association between Delivery care and Determinants of Maternal Health Care Utilisation 2008/9

Variable	χ^2	df	p- value
Age	50.679	6	<0.0001
Region	539.624	7	<0.0001
Residence	416.943	1	<0.0001
Religion	135.749	4	<0.0001
Ethnicity	566.688	13	<0.0001
Education	773.542	5	<0.0001
Total children ever born	419.175	14	<0.0001
Births in the last 5 years	213.601	3	<0.0001
Work status	15.883	1	<0.0001
Partner's Education	635.524	6	<0.0001
Marital status	45.175	5	<0.0001

Table 4.5 below presents the explanatory variables that explain postnatal health care utilization in Kenya in the 2003. The only variable that is significant is total children ever born.

Table 4-5: Association between Post Natal Care and determinants of MHCU 2008/9

Variable	χ^2	df	p- value
Age	9.428	6	0.151
Region	9.589	7	0.213
Residence	0.825	1	0.364
Religion	2.592	3	0.459
Ethnicity	9.196	12	0.686
Education	4.142	5	0.529
Total children ever born	38.404	13	<0.0001
Births in the last 5 years	2.787	3	0.426
Work status	1.709	1	0.191
Partner's Education	8.308	6	0.216
Marital status	1.365	5	0.928

4.3 Level of utilization for the specific MHCU services

ADEQUATE ANTENATAL CARE (ANC)

Table 4-6: Per centage of women who had a live birth in the last five years preceeding the survey who received ANC by background characteristics

	Category	N	% who rece'd adequate ANC	% of Total who rec'd adequate ANC		Category	N	% who rece'd adequate ANC	% of Total who rec'd adequate ANC
Age 5-year groups	15-19	147	34%	2%	Educational attainment	No education	423	33%	7%
	20-24	573	44%	12%		Incomplete primary	600	40%	11%
	25-29	530	48%	12%		Complete primary	506	45%	11%
	30-34	414	57%	11%		Incomplete secondary	185	54%	5%
	35-39	276	48%	6%		Complete secondary	229	66%	7%
	40-44	112	39%	2%		Higher	148	84%	6%
	45-49	39	38%	1%		TC	one child	1227	50%
Region	Nairobi	161	81%	6%	two children		702	50%	10%
	Central	162	52%	4%	three children		151	50%	8%
	Coast	292	50%	7%	four children		10	49%	6%
	Eastern	228	42%	5%	five children		1	43%	4%
	Nyanza	451	44%	9%	over six children		413	38%	8%
	Rift Valley	329	41%	7%	Births in last five years		1	1227	50%
	Western	294	44%	6%		2	702	43%	14%
North Eastern	174	35%	3%	3		151	38%	3%	
Type of place of residence	Urban	579	62%	17%		4	10	40%	0%
	Rural	1512	41%	30%		5	1	100%	0%
Religion	Roman Catholic	365	46%	8%	Current marital status	Never married	194	37%	3%
	Protestant/ other Christian	1269	51%	31%		Married	1596	48%	37%

	Muslim	360	32%	6%		Living together	101	34%	2%	
	No religion	79	42%	2%		Widowed	58	47%	1%	
	Other	15	93%	1%		Divorced	29	41%	1%	
Ethnicity	Embu	15	80%	1%	Respondent working	Not living together	113	55%	3%	
	Kalenjin	191	41%	4%		No	884	44%	19%	
	Kamba	110	56%	3%	Yes	1199	49%	28%		
	Kikuyu	274	60%	8%	Partner's educational attainment	No education	300	28%	4%	
	Kisii	166	42%	3%		Incomplete primary	376	40%	8%	
	Luhya	347	45%	8%		Complete primary	521	46%	13%	
	Luo	300	47%	7%		Incomplete secondary	144	48%	4%	
	Masai	25	56%	1%		Complete secondary	374	61%	12%	
	Meru	87	56%	2%		Higher	180	75%	7%	
	Mijikenda/ Swahili	200	44%	4%						
	Somali	190	34%	3%						
	Taita/ Taveta	32	72%	1%						
	Other	153	38%	3%						
	Average ANC = 48.5%									

Table 4.6 above presents the pattern of maternal health care utilization in Kenya. It is clear that less than half (49 percent) of pregnant women receive adequate antenatal care. Over sixty percent of urban women make four or more antenatal care visits, compared with less than half of rural women (44 percent).

It is worth noting that the women from urban areas' level of utilization is over 60 percent much higher than the rural women at 41 per cent. Using region as a variable to explain adequate ANC use; women from Nairobi province are leading with 81 percent utilization of ANC and the least usage being among women from North Eastern province at 35 percent. Region and ethnicity correspond as women of Somali origin (who mainly stem from the north eastern region) utilise about 34% of ANC while Kikuyu and are at 60 percent. Ethnicity also can be used to explain utilization of antenatal care since regions and ethnic groups are found in specific areas hence the result. Religion in these regions are important with protestant Christian churches leading with a level of 51 percent compared to the Roman catholic and the Muslims who stand at (46%) and (32%)

The magnitude of ANC utilization among different age categories shows that women aged between 30-34 years are the highest in adequately using ANC services at 57 percent. There is an upward trend in ANC utilisation from age 15-19 steady decline as the women grow older from 35 years. In regard to education attainment; more than half of the women who have attained at least secondary level and above are more likely to utilize adequate ANC services at 54, 66 and 84 percent unlike the ones with no education. Also more than two thirds of women whose partners have attained complete secondary and above are more likely to access ANC services than the ones with lower education; no education being less a third.

ADEQUATE DELIVERY CARE

Institutional delivery coupled with assistance by a health professional is an important factor in reducing the health risk to both the mother and the infant. Proper medical attention and hygienic conditions during delivery can help reduce infections and complications that can cause mortality to either the baby or mother. Table 4.7 below shows that overall, 48 percent of births in Kenya are delivered under the supervision of a trained health professional, usually a nurse or doctor and in a health facility.

Births to older women and births of higher order are determinant to accessing adequate delivery care for women in Kenya. Such categories are less likely to utilise adequate DC and births could be at home or with no supervision of a trained medical assistant. There is a consistent decline in utilization of delivery care as the women grow older; 35 years and above it declines upto 31 percent. More than three quarters of women who reside in urban areas received adequate delivery care while 36% of women residing in rural areas received adequate delivery care and this is expected; other factors such as distance to the health facility come into play. Though the regions of residence were also significant to explain delivery care, Nairobi and Central were highest with 93 and 75 percent respectively while women from the North Eastern province were trailing with 32 percent utilisation of adequate delivery care.

Education of women was paramount in the access of adequate DC; more two thirds of women with atleast secondary education utilized adequate delivery care services and much higher for women with higher education at 95 percent. This is consistent with the influence of the partner's level of education. If it is higher say at secondary complete then more than half of women with such spouses' utilized DC compared with ones whose partner's had no education at 12 percent. There is higher utilisation of adequate delivery care for births in urban areas to mothers' with more education and lower in rural areas with mothers with less education attainment.

In regard to religion, wmen who do not confess any religion are less likely to utilise adequate DC; at 25% compared to women who 53 percent of the women who profess to be protestant Christians.

Table 4-7: Percentage of women who had a live birth in the last five years preceding the survey who received DC by background characteristics

Delivery Care									
Variable	Category	N	% of adequate	% of total women	Variable	Category	N	% of adequate	% of total women
Age 5-year groups	15-19	146	51%	4%	Educational attainment	No education	424	19%	4%
	20-24	575	46%	13%		Incomplete primary	597	32%	9%
	25-29	530	51%	13%		Complete primary	506	54%	13%
	30-34	417	52%	10%		Incomplete secondary	188	63%	6%
	35-39	278	43%	6%		Complete secondary	233	83%	9%
	40-44	111	39%	2%		Higher	151	95%	7%
	45-49	42	31%	1%		TC	one child	459	68%
Region	Nairobi	164	93%	7%	two children		431	56%	11%
	Central	165	75%	6%	three children		352	45%	8%
	Coast	293	50%	7%	four children		256	41%	5%
	Eastern	229	50%	5%	five children		193	37%	3%
	Nyanza	449	48%	10%	over six children		408	27%	5%
	Rift Valley	326	34%	5%	Births in last five years		1	1242	56%
	Western	295	32%	5%		2	695	37%	12%
	North Eastern	178	24%	2%		3	151	30%	2%
Type of place of residence	Urban	588	78%	22%		4	10	40%	0%
	Rural	1511	36%	26%		5	1	0%	0%
Religion					Current marital status	Never married	193	53%	5%
	Roman Catholic	368	49%	9%		Married	1598	47%	36%
	Protestant/ Christian other	1273	53%	32%		Living together	104	46%	2%
	Muslim	364	30%	5%		Widowed	57	35%	1%

	No religion	76	25%	1%		Divorced	29	34%	0%
Ethnicity	Other	15	87%	1%	Respondent working	Not living together	118	50%	3%
	Embu	14	79%	1%		No	886	44%	19%
	Kalenjin	190	42%	4%	Yes	1204	50%	29%	
	Kamba	112	57%	3%	Partner's educational attainment	No education	301	12%	2%
	Kikuyu	281	79%	11%		Incomplete primary	372	33%	7%
	Kisii	168	52%	4%		Complete primary	521	44%	12%
	Luhya	348	35%	6%		Incomplete secondary	146	51%	4%
	Luo	297	48%	7%		Complete secondary	381	71%	14%
	Masai	26	42%	1%		Higher	183	87%	8%
	Meru	86	71%	3%					
	Mijikenda/ Swahili	199	38%	4%					
	Somali	194	26%	2%					
	Taita/ Taveta	32	84%	1%					
	Other	151	28%	2%					
	Average adequate Delivery care= 48%								

4.4 Multivariate Analysis

4.4.1 Antenatal Care

Table 4-8: GLMM for ANC

		Estimate =Par Est.β	Std. Error= β	Relative Risk= Exp β	z value	Pr(> z)
	(Intercept)	0.29	1.01	2.75	0.288	0.77347
Age group	20-24	-0.25	0.28	0.32	-0.901	0.36782
	25-29	-0.29	0.30	1.35	-0.968	0.33297
	30-34	-0.65	0.33	1.39	-2.006	0.04482 *
	35-39	-0.37	0.36	1.43	-1.036	0.30036
	40-44	-0.23	0.42	1.52	-0.543	0.58739
	45-49	-0.40	0.50	1.65	-0.79	0.42947
Region	Coast	-0.27	0.41	1.50	-0.669	0.50336
	Eastern	0.17	0.38	1.47	0.451	0.65217
	Nairobi	-1.07	0.39	1.48	-2.742	<0.001
	Northeastern	-0.78	0.62	1.86	-1.256	0.20928
	Nyanza	-0.25	0.40	1.49	-0.641	0.52173
	Rift Valley	-0.26	0.35	1.42	-0.734	0.4629
	Western	-0.40	0.38	1.47	-1.045	0.29589
Residence	Urban	-0.35	0.16	1.18	-2.164	0.03043 *
Religion	Other	-0.71	0.33	1.38	-2.168	0.03017 *
	Protestant	-0.79	0.26	1.30	-2.98	<0.001
	Roman Catholic	-0.60	0.28	1.33	-2.115	0.03441 *
Ethnicity	Kalenjin	1.67	0.77	2.17	2.162	0.03059 *
	Kamba	1.16	0.74	2.10	1.569	0.11659
	Kikuyu	1.14	0.74	2.10	1.532	0.12547
	Kisii	2.04	0.79	2.19	2.591	<0.001
	Luhya	1.80	0.76	2.13	2.38	0.01731 *
	Luo	1.67	0.77	2.16	2.158	0.03089 *
	Masai	1.01	0.88	2.40	1.153	0.24884
	Meru	0.66	0.75	2.12	0.88	0.37892
	Mijikenda/ Swahili	1.04	0.80	2.22	1.303	0.19271
	Other	1.37	0.76	2.15	1.796	0.07255. **
	Somali	1.20	0.93	2.53	1.292	0.19637
	Taita/ Taveta	1.02	0.88	2.41	1.162	0.24505
Total no of children	4	-0.26	0.22	1.24	-1.197	0.23135
	1	-0.22	0.28	1.32	-0.775	0.43861

ever born	over 6	-0.11	0.21	1.23	-0.516	0.60559
	3	-0.34	0.21	1.24	-1.617	0.10599
	2	-0.17	0.23	1.26	-0.739	0.46007
	5	0.06	0.09	1.10	0.661	0.50834
Woman's Education	Compl.secondary	-0.56	0.20	1.23	-2.76	<0.001
	Higher	-1.49	0.34	1.40	-4.394	<0.001
	Incomp. primary	0.07	0.15	1.16	0.448	0.65412
	Incomp secondary	-0.35	0.20	1.22	-1.735	0.08282
	No education	0.20	0.22	1.25	0.894	0.3713
Marital status	Living together	0.49	0.47	1.60	1.041	0.2977
	Married	-0.06	0.41	1.51	-0.143	0.88617
	Not living together	-0.18	0.46	1.59	-0.395	0.69279
	Widowed	-0.19	0.50	1.65	-0.388	0.69789
Working	Yes	-0.07	0.12	1.12	-0.638	0.52322
Partner's Education	Complete.secondary	-0.30	0.16	1.17	-1.876	0.06069
	Higher	-0.17	0.25	1.28	-0.664	0.50688
	Incomplete. primary	0.11	0.15	1.16	0.749	0.45384
	Incomplete. Sec	-0.04	0.20	1.23	-0.199	0.84235
	No education	0.46	0.22	1.24	2.109	0.03495 *

Results of the multivariate analysis of utilisation of maternal health care services in Kenya; reinforces that age of the woman, place of residence, and region in Kenya, religion, ethnicity and education attainment of the mother has significant effect on ANC utilization ($p < 0.05$).

In reference to women aged 15-19 years, women aged between 30-34 years are 65 percent more likely to utilize adequate ANC by the odds ratio. The geographical region coupled with where a mother stays has influences utilisation of ANC services among women of reproductive age. More than half of the women in Nairobi that is 53 percent of them are more likely than women from Central Kenya and other regions to adequately utilise ANC services. And there is significant evidence that women residing in urban areas are 83% more likely than women in rural areas to utilise adequate ANC services.

Religion seems distinctive and is clearly significant: women of Roman Catholic and Protestants are 70 and 67 percent respectively more likely than Muslims and others to utilise ANC services adequately. Regarding four antenatal visits to a health facility; ethnicity has great influence on women of Kalenjin, Kisii, Luhya and Luo origin. They are 2.1, 2.2, 2.1, and 2.2 times more likely to utilise ANC services than women of Embu ethnicity respectively. The respondent's education attainment has same effects on adequacy of ANC; and women who have completed secondary

and have higher education are 77 and 60 percent more likely than women with complete primary school education to adequately utilise ANC services in Kenya.

Thus ANC utilisation in Kenya is determined by age of the women, the region, residence whether urban or rural, religion one is professing and the woman's education attainment as ascertained above.

4.4.2 Delivery Care

Table 4-9: GLMM for DC

Variable	Category	Estimate	Std. Error= β	Relative Risk= $\text{Exp } \beta$	z value	Pr(> z)
		Par Est. β				
	(Intercept)	0.27	1.24	3.44	0.218	0.82764
Age group	20-24	0.35	0.32	1.38	1.09	0.27551
	25-29	-0.07	0.35	1.43	-0.209	0.83418
	30-34	-0.33	0.39	1.47	-0.852	0.394021
	35-39	-0.21	0.43	1.54	-0.481	0.630658
	40-44	-0.43	0.50	1.65	-0.846	0.397362
	45-49	-0.53	0.62	1.85	-0.863	0.388337
Region	Coast	0.37	0.57	1.78	0.641	0.521464
	Eastern	0.02	0.55	1.73	0.036	0.970933
	Nairobi	-0.14	0.62	1.85	-0.232	0.816256
	Northeastern	1.14	0.86	2.36	1.335	0.181734
	Nyanza	0.64	0.56	1.76	1.136	0.255887
	Rift Valley	1.34	0.51	1.66	2.654	<0.001
Western	0.55	1.84	6.28	1.00404	0.06612	
Residence	Urban	-1.37	0.23	1.26	-5.946	<0.001
Religion	Other	0.22	0.44	1.55	0.513	0.60764
	Protestant	0.07	0.33	1.39	0.227	0.820795
	Roman Catholic	0.06	0.35	1.42	0.175	0.861265
Ethnicity	Kalenjin	-0.03	0.95	2.59	-0.033	0.973981
	Kamba	1.49	0.88	2.42	1.69	0.091027
	Kikuyu	-0.16	0.90	2.45	-0.177	0.859324
	Kisii	0.82	0.96	2.60	0.861	0.389001
	Luhya	1.23	0.91	2.49	1.345	0.178685
	Luo	0.99	0.93	2.54	1.066	0.286248
	Masai	-0.29	1.05	2.87	-0.273	0.784534
	Meru	-0.19	0.91	2.50	-0.209	0.834315
	Mijikenda/ Swahili	1.09	0.96	2.61	1.14	0.254482
Other	1.24	0.94	2.55	1.324	0.185652	

	Somali	0.04	1.14	3.12	0.034	0.972941
	Taita/ Taveta	0.08	1.09	2.99	0.069	0.944993
Total no of children ever born	1	-1.41	0.35	1.42	-4.03	<0.001
	2	-0.73	0.28	1.33	-2.589	<0.001
	3	-0.30	0.26	1.29	-1.142	0.253459
	4	-0.05	0.26	1.30	-0.176	0.860187
	5	-0.11	0.11	1.12	-0.995	0.319641
	over 6	0.05	0.25	1.29	0.207	0.835865
Woman's Education	Compl.sec	-0.94	0.26	1.30	-3.563	<0.001
	Higher	-1.95	0.56	1.74	-3.509	<0.001
	Incomp. primary	0.53	0.17	1.19	3.098	<0.001
	Incomp sec	-0.29	0.23	1.26	-1.25	0.211324
	No education	1.01	0.28	1.32	3.636	<0.001
Marital status	Living together	-0.63	0.54	1.72	-1.168	0.242683
	Married	-0.77	0.47	1.61	-1.619	0.105535
	Not living together	-0.22	0.54	1.71	-0.401	0.688692
	Widowed	-0.87	0.58	1.79	-1.497	0.1343
Working	Yes	0.08	0.15	1.16	0.525	0.599897
Partner's Education	Comp.secondary	-0.52	0.19	1.21	-2.776	<0.001
	Higher	-0.72	0.32	1.38	-2.211	0.027018 *
	Incomp. primary	0.06	0.18	1.20	0.318	0.750636
	Incomp. Sec	0.01	0.24	1.27	0.054	0.956581
	No education	1.16	0.29	1.34	3.937	<0.001

The results of the multivariate analysis in Table 4.9 above of delivery care reinforces that fact that a woman's residence and region, parity, her education attainment coupled with the spouse's education attainment have a significant effect on utilisation of adequate delivery care in Kenya.

Women living in urban areas are 73 percent more likely to utilise adequate delivery care services in Kenya. In terms of region of residence 25 percent of the women living in the rift valley deliver in a health facility and are attended by trained medical personnel using the log-odds.

A woman's parity determines access of DC services where by a woman with one child and/or two children utilise adequate delivery care at 84 and 73 percent respectively using the log-odds.

The woman's education attainment influence utilisation of maternal services in Kenya; the probability that a woman who has attained higher education, and complete secondary is 90 and 77 percent while less than half of women who have attained incomplete primary education adequately utilise delivery care services in Kenya. Women who have no education have 68

percent chance to utilise adequate DC and this can be attributed to the health education programs and other intervention to mitigate maternal deaths in Kenya. The partner's education level greatly influences the utilisation of health care services in the country. We see that partners' with higher education and have completed secondary school level influence utilisation of adequate DC by 87 and 69 percent respectively.

5. CHAPTER FIVE

5.1 Discussions

This report is based on the Kenya Demographic health Survey conducted at the national level in Kenya in 2008/9. The data used for this analysis are consistent in terms of content, geographical coverage and timeliness with the other previous studies on KDHS in the country.

The study shows that the coverage of adequate antenatal care health care in Kenya at 49 percent is low compared to the 92 percent of all the Kenyan women who received from ANC. Adequate delivery care for all pregnant women in Kenya was at 48 percent which is more of the same as with the utilization level of women who gave birth within the last five years (44.4%) in Kenya. Three quarters of all maternal deaths occur during delivery and the immediate post-partum period. One of the most critical interventions for safe motherhood is to ensure skilled care provided by skilled professionals during pregnancy and childbirth. The results of Demographic and health survey conducted in other African countries show coverage of adequate antenatal care ranging from as low as 17.6 per cent in Burkina Faso to 90 per cent in Uganda. Delivery care utilization ranges from a low of 39 per cent in Burkina Faso to 48 per cent in Uganda. (DHS measures, 2007)

The major objective of this report was to determine a parsimonious model which explains the maternal health care utilization in Kenya and determine factors that influence use of these services. Most of the factors investigated are related to the socio cultural and demographic characteristics of women aged between 15 to 49 years old. Then using glmm has identified a set of factors that have important influence on adequate utilization of maternal health care services in Kenya. Adequate ANC depends on a woman's age, geographical region, type of residence, religion, her ethnic background and her education attainment. While adequate delivery care place of residence, region in the country, maternal education coupled with the partner's educational attainment and total children ever born greatly influences utilisation of this particular maternal health care service.

Women who are educated and are mostly staying in urban areas would tend to utilize the ANC and delivery care more than the other groups. Overall education as a variable explains adequate ANC and DC use in maternal health. There is a strong linkage between use of antenatal care and place of delivery – women who make four or more antenatal care visits are more likely to deliver in a proper health facility than women who make less than four antenatal visits.

We determined bivariate associations between each of the independent variables and the dependent variables of interest. We used separate multivariable models to assess the relation between the independent variables and the dependent variables of interest (antenatal care, utilization of health professional during delivery and postnatal care). Model fit was assessed using a combination of stepwise regression.

5.2 Recommendations

Policy and Program Recommendations

The need to provide focused and sustained health education geared towards promoting use of antenatal and obstetric services. This is critical in ensuring that more women appreciate the importance of starting antenatal care visits in their first trimester, making at least four antenatal care visits, and delivering in a proper health facility with skilled care, equipment and life-saving drugs. Also for non institutional births women to be aware when and the necessity of seeking health care within 42 days of giving birth.

The second Kenya National Health Sector Strategic Plan (NHSSP-II) for the period 2005–2010 identifies equitable access to care and improved quality of services as key policy objectives. This study recognizes that the public sector alone will not be able to provide the necessary services to all population groups; it values partnerships with the private sector and communities as a vehicle to achieving the NHSSP goals. In light of these commitments and principles, Kenya's two ministries of health should design and implement a two-pronged strategy of partnership with the private sector and the communities aimed at bringing quality health services closer to all populations. For instance, the continuous training opportunities offered to medical personnel working in the public sector should be extended to staff in the private facilities in the districts. The ministries of health could also extend its emergency backup referral services to private health facilities operating in the districts to ensure quick transfers in emergency cases considering that many women die due to delays in accessing specialized care following complications. The maternal health challenge in poor rural communities in Kenya needs to be prioritized in national planning because failing to reach this rapidly growing sub-population with health services may result in lack of progress towards the health Millennium Development Goals.

Overall, 44 percent of births in Kenya are delivered under the supervision of a skilled birth attendant, usually a nurse or midwife (DHS 2008/9 report). Institutional delivery coupled with assistance by a health professional reduces the risk of maternal mortality. As regards to delivery care, 48 per cent of the deliveries were adequate.

About three quarters of women in urban areas accessed adequate delivery care in comparison to the rural folk. This calls for programme interventions that will encourage more women in rural areas to seek institutional and be attended to a trained medical personnel during delivery.

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