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Master Project in Social Statistics

# Modelling determinants of Contraception use in women in rural households in Kenya

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**Modelling determinants of Contraception use in  
women in rural households in Kenya**  
**Research Report in Social Statistics, Number XX, 2021**

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Master Thesis

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## Abstract

In recent times, there has been an exponential growth of the human population currently standing at 7.6 billion. There has been an increase in contraception which entails pregnancy prevention by inhibiting the normal process of ovulation, fertilization, and implantation (Lasong et al., 2019). However, contraception is not embraced and adopted by all women of childbearing age, which contributes to uncontrolled population growth due to an increase in unintended pregnancies. Contraceptive use in rural areas is low compared to urban areas in Kenya. Low contraceptives use in the rural setting translates to high population growth, which leads to poverty as the inhabitants' strain to acquire the basic necessities, including water, food, and decent clothing. There is a need to enhance increased awareness about contraceptives in rural areas to address the negative outcomes associated with early and unwanted pregnancies. The intervention is bound to help the women in the rural setting overcome challenges in meeting health and socio-economics needs while accelerating development, as witnessed in most urban settings in Kenya.

The project aims to study the determinants of contraception use in women in rural households in Kenya. The study has utilized secondary data from the 2014 Kenya demographic Health Survey (KDHS). The binary logistic model is used for the analysis of data in the study. The study has also focused on comparing contraceptive use among teenage girls and adults. The backward selection method allowed for dropping of non-significant variables and retaining of significant variables in the model. The findings show the variables that were associated with the outcome variable were; age in 10-year brackets, age at first birth, highest education level, age at first sex, religion, household size, literacy level, wealth index, number of children ever born, gender of head of the household and marital status. Results reveal that women who were young adults (25-34) years were less likely to use contraceptives compared to the Adolescent Girls and Young Women (15-24) years.

The study findings inform the policy interventions geared towards creating awareness to boost contraceptives use among women in the rural setting of Kenya. The study recommends the efforts to empower women to be more self-reliant, which will ensure they can access contraceptives without challenges.



## Declaration and Approval

I the undersigned declare that this dissertation is my original work and to the best of my knowledge, it has not been submitted in support of an award of a degree in any other university or institution of learning.



20/11/2021

\_\_\_\_\_  
Signature\_\_\_\_\_  
Date**DANIEL MAKALE**

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In my capacity as a supervisor of the candidate's dissertation, I certify that this dissertation has my approval for submission.



23rd November 2021

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## Dedication

This project has been dedicated to my family members for their encouragement and support.

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Again to you all, thank you.

Daniel Makale

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Nairobi, 2021.



# 1 Chapter 1: Introduction

The aim of this thesis is to investigate the determinants of contraceptive use in women in rural households in Kenya.

## 1.1 Background of the Study

As of 2019, the world population was 7.674 billion people. In comparison with the population in 1960 that was 3.031 billion, the population is about to triple (World Bank Open Data, 2019b). Even though the world's population growth has decreased over time, the latter triple figure will be reached in a couple of years since the population growth rate as at 2019 was 1.075% (World Bank Open Data, 2019a). The continued increase in population has many adverse effects, including straining of the limited available resources, decreased welfare especially for the those already poor, compounding the climate change effects, increased dependency ratio, etc. The exponential growth of human population and arithmetic progression in resources until their eventual depletion has been echoed by many scholars – one of the notable works is that of Malthus 1798 Essay that was later proffered by Glass, 1976, which stressed:

The faster population increases, the more help will be got to draw off the water, and consequently an increasing quantity will be taken every year. But the sooner, undoubtedly, will the reservoir be exhausted, and the streams only remain. When acre has been added to acre, till all the fertile land is occupied, the yearly increase of food will depend upon the amelioration of the land already in possession; and even this moderate stream will be gradually diminishing (p. 34).

To counter these adverse effects, the use of contraceptives among women of childbearing age cannot be overlooked. Lasong et al., 2020 define contraception as pregnancy prevention by inhibiting the normal process of ovulation, fertilization, and implantations. Use of modern contraceptive methods allows individuals to plan and have their ideal family size, reduces maternal deaths and child mortality by minimizing unsafe abortion, teenage pregnancies, and pregnancy complications (Lasong et al., 2020). Interestingly, uncontrolled population growth will hinder the attainment of sustainable development goals 03 and 05, and their related targets 3.7 and 5.6, respectively (Sustainable Development Solutions Network, n.d.). Worldwide, contraceptive prevalence has increased overtime. This notwithstanding, contraceptives are yet to be embraced and adopted by all women of childbearing age.

According to Cleland et al., 2011, the fertility and future projected population growth in Sub-Saharan Africa will be higher than any other region despite the declining birth rates. These assertions tally with Sharan et al., 2011 findings on Sub-Saharan Africa fertility rate which as at 2009 was 5.1. Compared to other regions, Sub-Saharan fertility rate was very high, the succeeding region, South Asia had an average fertility rate of 2.8, while Latin America and Caribbean had a mean fertility rate of 2.2. Apparently, at the time, Sub-Saharan Africa had the lowest contraceptive prevalence (22%) as opposed to other regions, South Asia (53%) and East Asia (77%) (Sharan et al., 2011). Nonetheless, evidence suggests that there is an upward trajectory in the usage of contraceptives in Sub-Saharan Africa and the other regional blocks of the world.

In particular, as of 2014, a significant number of women in Kenya used contraceptives – 58% of those married and 65% of sexually active unmarried women used them (KDHS, 2014). Around sixty-one percent (61.8%) of women in urban areas used contraceptives compared to 55.5% of women residing in rural areas. Despite the high percentages of contraceptives usage, teenage pregnancy still remains a significant concern in the country. Eighteen percent (18%) of women aged 15-19 years became expectant at such a tender age when one should ideally have been in school. It is worth noting that the percentage of women who have begun childbearing increases rapidly with age. The difference in teenage pregnancy disaggregated by the residential area was very small with a variation of 1.2%, i.e., rural – 18.5% and urban – 17.3% (KDHS, 2014).

In addition to the place of residence and marital status of a woman, the other key determinants of contraceptive use according to KDHS (2014) included education status, wealth levels, access, knowledge, health concerns (side effects), cost, religious/cultural values, and infrequency of sex. Globally, contraceptives dropping rate within the first year of usage was 38% (Ontiri et al., 2020). Kenya is not immune to this and as of 2014, 31% of contraceptives users dropped them within 12 months of starting using (KDHS, 2014). This shows that some of those who have unmet family planning needs were prior contraceptives users. While a significant investment in contraceptives awareness and use in Kenya has been made, still variations in the usage in rural and urban area exist. In this regard, this study will explore the determinants of contraceptives use in women in Kenya's rural areas and proffer recommendations on what can be done to enhance the usage for accelerated growth and development of the nation.

## 1.2 Problem Statement

Contraceptive use in rural areas is low compared to urban areas in Kenya. According to the KNBS 2019 Census data, Kenya's population is concentrated in the rural areas – they account to more than two-thirds of the total population, i.e., 32,732,596 of the total 47,564,296 people. The low uptake of contraceptives translates to high total fertility rate. It is worth noting that most of the rural inhabitants' strain to get the basic necessities,



more so, decent clothing and food. Besides, they do not have sufficient financial resources to cater for their children education, and generally their health. In other words, they struggle to meet their daily, socio-economic, and health needs.

Unintended pregnancies and poor maternal health outcomes compound the already worse-off situation. The continuous population growth results to poverty as the population keeps growing but with fewer resources to cater for their needs. Limited knowledge is a major setback to the populace in rural settings that explains the low usage of contraceptives that in turn lead to early and unwanted pregnancies which results to overpopulation that breeds poverty in the rural settings. The development of a country cannot be attained not unless there is a homogeneous growth of all parts regardless of whether urban or rural. On the same note, rural settings cannot grow with their current average family sizes, which put more pressure on the available resources. Thus, this study will explore the factors that determine contraception use in rural parts of Kenya and proffer recommendations on what can be done to increase their adoption and usage with the eventual end goal being accelerated growth and development of these settings.

## **1.3 Objectives**

### **1.3.1 General Objective**

To study the determinants of contraception use in women in rural households in Kenya.

### **1.3.2 Specific Objectives**

1. To identify factors determining contraceptive usage.
2. To compare contraceptive use among Adolescent and Young Women (15-24) years to Young adults (25-34) years.
3. To model contraceptive use among different wealth quintiles in Kenya.

## **1.4 Significance of the Study**

This investigation will help the policymakers to formulate policies geared towards improving contraceptive prevalence rate in the rural areas of Kenya. The Ministry of Health and the county departments of health, especially those with rural settings, will use the findings of this study to understand their populace better and to design interventions aimed at increasing contraception use that will in turn improve women health. Further to this, the research will show how various factors interrelate with each other to either improve or discourage women from using contraceptives and the awareness measures, or incentives that can be utilized to address each accordingly.

## 2 Chapter 2: Literature Review

Family planning is a significant public health intervention. Evidence from studies done on contraception shows that access to family planning services in nations with high fertility rates can substantially reduce poverty, eliminate food insecurity, and prevent maternal and childhood deaths (Abdi et al., 2020; Okigbo et al., 2015). As of 2013, maternal deaths in developing countries reduced by 40 per cent due to increased access to contraceptive services (Tumlinson et al., 2013). This notwithstanding, 214 million women of childbearing age globally have unmet family planning needs. Okigbo et al., 2015 study stressed that an estimated a quarter of women in less developed countries wanted to avoid pregnancy but did not use an effective contraceptive. Further, 84% of unintended pregnancies in developing countries are because of the unmet need for modern contraception methods (Abdi et al., 2020).

The low use of modern contraceptives in the region is worrying in the light of its high fertility. In comparison with some countries in Sub-Saharan Africa (SSA), Kenya was way ahead in the use of modern contraceptives as opposed to Senegal and Nigeria – according to the three countries' Demographics and Health Surveys (KDHS 2014; SDHS 2010/11; NDHS 2013), the percentage of women in union using modern contraceptives stood at 53, 12, and 10 per cent for Kenya, Senegal, and Nigeria, respectively (Okigbo et al., 2015). Surprisingly, Okigbo et al., 2015 study further unearthed that only 18, 30, and 16 per cent of women in Kenya, Senegal, and Nigeria, respectively, attest to their unmet family planning need; implying that high fertility/large family desires persist in SSA.

Key to note is that awareness campaigns on the use of modern contraceptives have been done repeatedly. However, still many women and girls have not fully adopted them as a way of family planning. Studies reveal that women in SSA face many socio-cultural barriers that affect their adoption of contraceptives. The other obstacles to the usage of contraceptives include but are not limited to the perception that people hold about the contraceptive methods, the influence of household heads – who in most cases are males, religion, and experiences of contraceptives among others. Kenya is not immune to these barriers, and despite the publicisation of modern contraceptives being high, still many women are yet to accept and approve the use of modern contraceptives.

### 2.1 Religion

The relationship between religion and the use of contraceptives is a complex phenomenon. Most of the religions in Kenya do not fully support the use of contraceptives. For instance,

the Roman Catholic Church and the Conservative Protestants proffers the primary purpose of a sexual relationship to be procreation. In contrast, some Protestant Churches do not forbid any form of the family planning method, including modern contraceptives, provided the marriage has children (Bakibinga et al., 2016). Further to note is that Bakibinga et al., 2016 study used an ordered logit to establish the factors that influenced family planning among women and girls. On the other hand, in a qualitative study exploring the perceptions of Muslims towards family planning, Abdi et al., 2020 unearthed divergent views about family planning. Some believed family planning was in line with Muslim teachings, while an overwhelming majority held the opinion that contraceptive use was a violation of God's intentions and laws (Kiura, 2014).

## 2.2 Perceptions, Attitudes, and Misinformation about Contraceptives Use

Perceptions play an integral role in determining the overall interaction with a given phenomenon. In this regard, contraceptive use is highly influenced by the standpoints that women and girls hold. In a study conducted on the constrained agency on family planning adoption and usage by Somali women refugees in Kakuma Refugee Camp, Kenya, misinformation was identified as a significant barrier to contraceptives use (Kiura, 2014). The women opined that contraceptives could destroy fertility, and in lieu, they cited natural methods as having higher efficacy and with no adverse side effects.

In a cross-sectional study on abortion and contraceptive use among secondary school students in Western Kenya, teenagers' perceptions and attitudes (13-21years) held on contraceptives accurately predicted the likely use (Rehnström Loi et al., 2019). The study employed various statistical methods to analyse the findings, including descriptive statistics to determine the stigma scores, Pearson's X2 test to test the differences in the opinions between sexes and age groups, binary logistic regression was employed to assess the relationship of the independent factors with dependent variables. Some of the perceptions linked with contraceptives that are likely to hamper the usage of contraceptives include regarding girls using contraceptives as promiscuous, being likely to influence other girls to be promiscuous, inability for a girl to decide on the use of a contraceptive method, entitlement of contraceptives to only married women, and an attitude that a girl who uses contraceptives will have problems when giving birth ((Rehnström Loi et al., 2019; Makenzius et al., 2019). Moreover, there was a clear indication of power dynamics between the male and female students – the male had a higher average score on contraceptives stigma.

Additionally, communal perceptions hamper the use of contraceptives among women and girls. For example, the number of sons that the community and a woman perceive as an ideal can hinder or encourage contraceptive use. Dynes et al., 2012 research showed that women who perceived themselves as having lesser sons than what society perceived

as an ideal number were less likely to use contraceptives. Thus, a woman with an ideal number of sons is expected to use contraceptives, and the converse is true.

### 2.3 Male Position on Contraceptives

In the Kenyan setting, mostly men are the key decision-makers — their influence cuts across all the family matters, including the health and wellbeing of the family members. Women health needs and decisions are not exempt from male influence. Notably, Dynes et al., 2012 study unearthed a positive correlation between the perception of other's approval to using contraceptives in Kenya – a higher score on the perception of other's approval index for family planning was substantially associated with contraceptives use. Kiura, 2014 study also found out that males were against contraceptive use and sometimes could turn violent upon discovering the usage of contraceptives by their spouse. Similarly, a qualitative survey of the men's role in family planning found out that men in the former Nyanza Province had a substantial influence on contraceptives use by their female counterparts (Withers, Dworkin, Onono, et al., 2015). Surprisingly, according to Jalang'o et al., 2017 study on determinants of contraceptives use among women in rural settings, women using postpartum family planning were highly likely to be married and of young age compared to the nonusers. This shows that age and marital status were integral factors determining the use of modern contraceptives.

### 2.4 Negative Experiences with Contraceptives

Bad contraceptives' experiences shared from a user to a potential user, or from a user to another, or personal negative experience is detrimental to the future usage. According to Kiura, 2014 study, some of the negative experiences spurring from the use of contraceptives include excessive bleeding, the disappearance of the menstrual cycle, infertility, weight gain, palpitations, and high blood pressure (Jalang'o et al., 2017). These findings were consistent with those of research done by Håkansson et al., 2020, whereby the discussants confirmed that contraceptives could negatively affect a woman's health. These factors are likely to hamper the use of contraceptives by women and girls.

### 2.5 Education and Knowledge

Education is an essential enlightenment tool. In the context of contraceptives use, education is a significant determinant. Dynes et al., 2012 study on the influence of perceptions of community norms on family planning adoption found out that educational attainment directly increased the odds ratio of contraceptive use among men and women. Likewise, Håkansson et al., 2020 highlighted the lack of sexuality education as a barrier to mainstreaming contraceptives. According to their study, sexuality was considered taboo, and any topic covering such was unwelcome both at home and in school settings. In other

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words, the teachers and parents rarely discussed sexuality topics. To this end, education and knowledge cannot be underestimated in studying the factors determining the adoption and use of contraceptives by women and girls.

## 2.6 Employment and Income

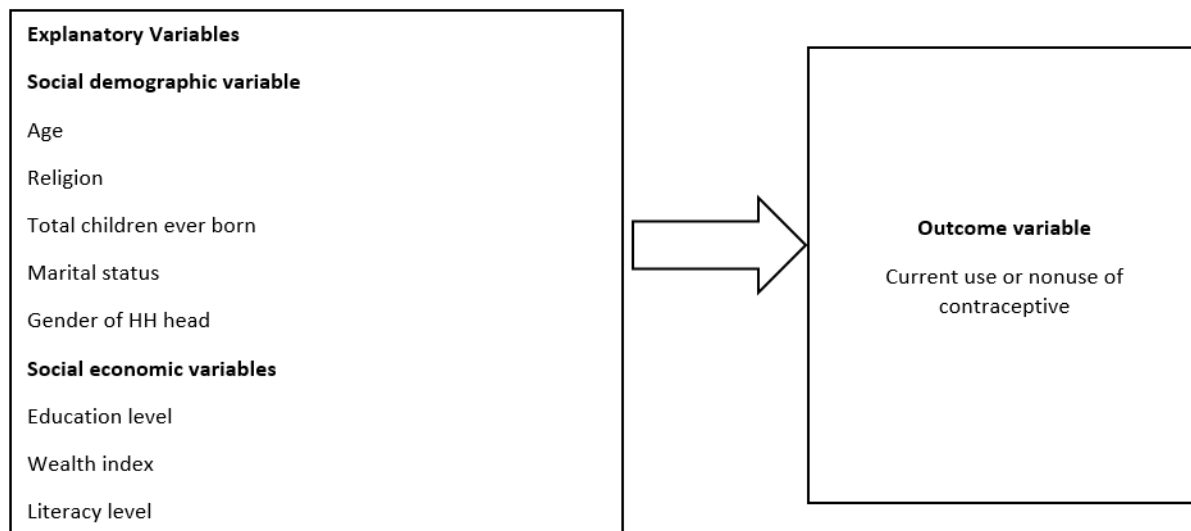
The employment status of women is a factor determining the use of contraceptives. According to Jalang'o et al., 2017 research, women's employment status was crucial in predicting their postpartum family planning uptake. The investigation further found out that women in employment were more likely to use contraceptives than those who were not. In a study to explore the differences in the adoption of modern family planning methods by the urban rich and poor, Fotso et al., 2013 found that the gap was meagre for the period spanning 1993 to 2008/09. In other words, the gap between the urban rich and poor was very small. Key to note is that Fotso et al., 2013 investigation used multivariate logistic regression models to unearth this difference. Thus, a woman's employment (an income source) to a better extent determines whether she will or will not use family planning. However, the wealth status is not a substantial aspect determining women's adoption and usage of contraceptives.

## 2.7 Provider Barrier to Contraceptives Access

Surprisingly, health care providers (HCPs) can also impose restrictions on contraceptives access. Tumlinson et al., 2013 research are among the notable studies that explored the associated provider hindrances to accessing particular family planning methods by women and girls in Kenya's urban areas (Nairobi, Mombasa, Kisumu, Machakos, and Kakamega). The research found that the HCPs had set an eligibility criterion guiding them on the specific contraceptives to offer to women and girls who fully met the specified requirements. In other words, their preferences were not considered. Critically, such conditions are the precursor to low usage of modern contraceptives by women and girls.

In summary, founded on the existing studies about the subject, the main determinants of contraceptive use are age, marital status, perception and attitude towards family planning, employment status, HCPs restrictions, education and knowledge, and information shared from one user to another or potential user. Thus, this study will further explore the determinants of contraceptive use by women in rural parts of Kenya to enrich the existing literature about the subject, compare the usage across various age bands, and, more specifically, between teenage girls and adults, and model contraceptives use in Kenya.

## 2.8 Conceptual Framework



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## 3 Chapter 3: Methodology

### 3.1 Introduction

This chapter entails the following; Data source and study design, the technique of analysis, outcome variable, Explanatory variable and the control variables, the description of the model, fitting the model.

### 3.2 Data source and study design

The study utilized secondary data acquired from Kenya demographic Health Survey (KDHS), 2014. Request to access and analyze the data was made online by stating the objective and methodology to be used in the study. The response rate was 99%. The total number of women who were eligible for the survey was 83591. The 2014 KDHS sample was obtained from the fifth National Sample Survey and Evaluation Program (NASSEP V), a master sampling frame, which KNBS uses to conduct its survey in Kenya. The structure consists of 5360 clusters, which are divided into four equal sub samples. The clusters were obtained through stratified probability proportional to the sampling methodology's size. There were 96251 enumeration areas (EAs). Two sub-samples from NASSEP V were used in KDHS. Kenya has 47 counties. Each county is stratified as either urban strata or rural strata; since Mombasa and Nairobi Counties are purely urban areas, thereby having 92 sampling strata.

There are 40300 households design to be in the sample from 1612 clusters across the country, with 617 clusters in the urban areas and 995 clusters in the rural areas. Models are selected independently in each sampling stratum using a two-stage sample design. During the first stage, 1612 EAs were chosen with equal probability from the NASSEP V frame. The sampling frame was the households from listing operations. In each cluster, 25 families were selected. The interviewers only visited pre-selected homes, and there was no replacement for pre-selected homes. As a result of Non proportional assignment to sampling strata and fixed sample size per cluster, the survey was not self-weighting. The data was weighted to be representative at county, regional and national level.

### 3.3 Response variable

The outcome variable was current use of contraceptives which had four categories; No method, Folkloric method, Traditional method and Modern method. Using the categories, the outcome of interest was recoded to contraceptive use (1), if a respondent used

any of the three stated methods and contraceptive non-use (0), if they stated they did not use any contraceptive method.

### **3.4 Explanatory variable**

The explanatory variables comprised of Socio-economic and Socio-demographic variables in the data that were used to predict contraceptive use or non-use. The variables that were used were; age, religion, age at first sex, level of education, gender of head of the household, literacy level, number of children ever born, marital status and occupation of the respondent.

### **3.5 Study population**

Population refers to the entire pool of elements from which a sample is drawn. To avoid bias in collection, it requires the researcher to use proper sampling techniques in order to avoid bias. The sampling technique to use is mainly dependent on the type of research design to be used. For this study, the population was women of child bearing age 15 – 49 residing in both urban and rural areas in Kenya, obtained from the 2014 KDHS data set. The working sample size was 10349 women.

### **3.6 Study design**

The study adopted secondary data that was from a cross-sectional survey conducted in the year 2013/2014 using a sample drawn from the population.

### **3.7 Selection criteria**

A woman was eligible to be a part of the study if she was of reproductive age ,15 – 49 years, and resided in the rural settings in Kenya.

### **3.8 Analysis Technique**

The study employed both descriptive and inferential analysis techniques.

### **3.9 Descriptive analysis**

The descriptive analyses applied were frequency tables to understand the distribution of some categorical variables as well as use of histograms to understand the distribution of continuous variables.



### 3.10 Inferential analysis

Inferential analysis technique used was binary logistic regression model.

### 3.11 Odds ratio

#### Calculation of Odds ratio

**Odds:** Are a ratio of the probability that an event will occur versus the probability that the event will not occur.

$$\text{Odds} = \frac{\text{Probability of Event Occurring}}{\text{Probability of Event not Occurring}} = \frac{p}{1-p} \quad (3.1)$$

**Odds ratio:** A measure of the odds of an event happening in one group compared to the odds of the same event happening in another group. With respect to an event of interest occurring; for two groups, say A and B, the odds ratio is given by;

$$\text{O.R} = \frac{\text{Odds of Event for Group A}}{\text{Odds of Event for Group B}} \quad (3.2)$$

or

$$\text{O.R} = \frac{\text{Odds of Event for Group B}}{\text{Odds of Event for Group A}} \quad (3.3)$$

The values of an odds ratio range from zero to infinity.

#### Odds ratio interpretation

When interpreting the O.R, we can have three possible classification categories:

- i OR=1
- ii OR<1
- iii OR>1

An odds ratio equal to one means that both groups had the same odds of the event of interest occurring

An odds ratio of less than one means that the event of interest is less likely to occur for the group in the numerator compared to the group in the denominator

An odds ratio of greater than one means that the event of interest is more likely to occur for the group in the numerator compared to the group in the denominator

### Calculating 95% CI

The OR can be expressed in a contingency table as shown;

**Table 3.11.1. Contingency table for odds ratio**

	Outcome (+)	Outcome (-)
Exposure (+)	a	b
Exposure (-)	c	d

Where;

a =Number of cases exposed

b =Number of non-cases exposed

c =Number of unexposed cases

d =Number of unexposed non cases

Hence OR is given by;

$$OR = (a/c)/(b/d) \quad (3.4)$$

$$OR = ad/bc \quad (3.5)$$

The 95% CI is calculated by;

$$\text{Upper 95\% CI} = e[\ln(OR + 1.96.E * \ln(OR))] \quad (3.6)$$

$$\text{Lower 95\% CI} = e[\ln(OR - 1.96.E * \ln(OR))] \quad (3.7)$$

Where,

$$S.E * \ln(OR) = \sqrt{(1/a + 1/b + 1/c + 1/d)} \quad (3.8)$$

### 3.11.1 Binary logistic regression

Binary logistic regression models the relationship between a binary response/outcome and one or more predictor/explanatory variables. Let  $Y_i$  be the binary response variable. The variable takes two possible forms, that is;

$Y_i = 1$ , if the category of interest

$Y_i = 0$ , otherwise

For explanatory variables, Let  $X = (X_1, X_2, X_3, \dots, X_k)$  be a set of predictor variables, where  $X_i$  is the observed value of the predictor at observation  $i$ .

The model is of the form;

$$p = Pr(Y_i = 1/X_i = x_i) \quad (3.9)$$

$$\text{logit}(p) = \log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \dots + \beta_k X_k \quad (3.10)$$

$$\frac{1-p}{p} = \frac{1}{\exp(\beta_0 + \beta_1 X_1 + \dots + \beta_k X_k)} \quad (3.11)$$

$$\frac{1}{p} = 1 + \frac{1}{\exp(\beta_0 + \beta_1 X_1 + \dots + \beta_k X_k)} \quad (3.12)$$

$$\frac{1}{p} = \frac{\exp(\beta_0 + \beta_1 X_1 + \dots + \beta_k X_k) + 1}{\exp(\beta_0 + \beta_1 X_1 + \dots + \beta_k X_k)} \quad (3.13)$$

$$p = \frac{\exp(\beta_0 + \beta_1 X_1 + \dots + \beta_k X_k)}{1 + \exp(\beta_0 + \beta_1 X_1 + \dots + \beta_k X_k)} \quad (3.14)$$

$$\text{logit}(p) = \beta_0 + \beta_1 X_1 + \dots + \beta_k X_k \quad (3.15)$$

### Parameter Estimation

Maximum Likelihood Estimation (MLE) is adopted for estimation of the parameters for the binary logistic regression. The likelihood for the binary logistic regression model is:

$$p(y_1, \dots, y_n, \beta_0, \beta_1) = \prod_{i=1}^n \pi(x_i)^{y_i} (1 - \pi(x_i))^{1-y_i} \quad (3.16)$$

$$p(y_1, \dots, y_n, \beta_0, \beta_1) = L(\beta_0, \beta_1) = \prod_{i=1}^n \left[ e^{\beta_0 + \beta_1 x_i} \right]^{y_i} \frac{1}{1 + e^{\beta_0 + \beta_1 x_i}} \quad (3.17)$$

$$\ln(\beta_0, \beta_1) = \ln(L(\beta_0, \beta_1)) = \sum_{i=1}^n y_i (\beta_0 + \beta_1 x_i) - \sum_{i=1}^n \ln(1 + e^{\beta_0 + \beta_1 x_i}) \quad (3.18)$$

Derivative of log-likelihood:

$$\frac{\partial(\beta_0, \beta_1)}{\partial \beta_0} = \sum_{i=1}^n (y_i - \pi(x_i)) = 0 \quad (3.19)$$

$$\frac{\partial(\beta_0, \beta_1)}{\partial \beta_1} = \sum_{i=1}^n (y_i x_i - x_i \pi(x_i)) = \sum_{i=1}^n (y_i - \pi(x_i)) x_i = 0 \quad (3.20)$$

To obtain values of  $\beta_0$  and  $\beta_1$ , Newton-Raphson numerical iteration method is used.

### Assumptions of binary logistic regression

- i The dependent/outcome variable should be binary
- ii There should be one or more independent variables, that are either continuous (i.e., an interval or ratio variable) or categorical (nominal variable)
- iii The observations are required to be independent of each other. i.e., the observations should not come from repeated measurements or matched data.
- iv There should be little or no multicollinearity among the independent variables. That is, the independent variables should not be too highly correlated with each other
- v Logistic regression assumes linearity of independent variables and log odds, it requires that the independent variables are linearly related to the log odds

#### 3.11.2 Multicollinearity

To check for multicollinearity between the predictor variables, the Variance Inflation Factor (VIF) was used. The VIF for the  $i$ th predictor is given by;

$$VIF_i = 1/(1 - R_i^2) \quad (3.21)$$

Where;

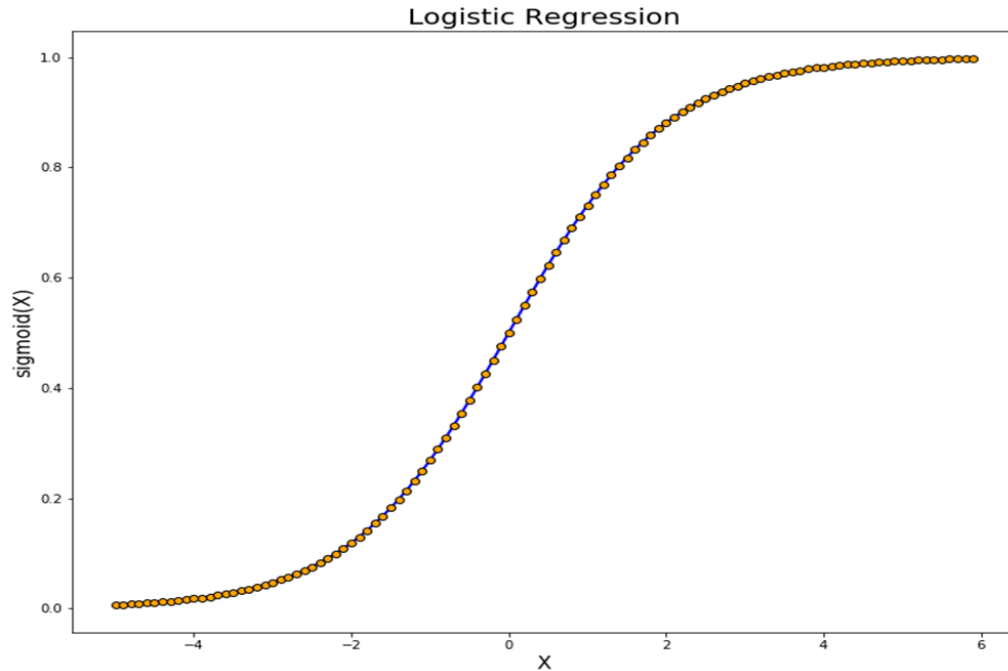


Figure 3.11.1. Logistic regression curve

$R_i^2$  - is the R squared value obtained after regressing the  $i^{th}$  predictor on the remaining predictors

To interpret the VIF; If the VIF value is less than 5, there is no Multicollinearity between the predictor variables ,if the VIF value is greater than 5, then the predictor variables are highly correlated.

### 3.11.3 Backward selection criteria

The study adopted the Backward selection criteria of variables. This method works as follows; the model is fitted with all the independent variables at first, then the variable that has the smallest F statistic is removed from the model given its p value is statistically not significant. This criterion keeps on recurring until the model is only left with variables that significantly predict the outcome.

### 3.11.4 Marginal Dominance analysis

Dominance analysis was utilized to ascertain the respective importance of each predictor to the outcome. Azen and Traxe established the dominance analysis for use with logistic regression. This procedure expands the approach developed earlier used to determine predictor importance in linear regression. Dominance analysis works through comparing pairs of predictors across all subsets of the predictors in a model to determine the supplementary contribution made by each predictor to the prediction model. A predictor

variable is considered important or more dominant when it contributes more to every possible subset of predictors than any of the other predictors.

### Significance of model fit

To determine if a relationship exists, I tested for the statistical significance of the fitted model using the likelihood ratio test. The test statistic is based on chi-square distribution. I seek to determine that a relationship exists between response and set of predictors, i.e., fitted model is a significant fit.

### Significance of predictors

The significance of the predictors is examined while having adjusted for all other predictors. Statistical significance of predictors implies a statistical association between the response and the predictor while adjusting for all other predictors.

**Table 3.11.2. Variables definition: Dependent variable**

Objective	Variables in the objective		Statistical method of analysis
	Dependent	Independent	
To determine the relationship between socio-demographic factors and contraceptive and non-use in rural households in Kenya	Contraceptive use or non-use	Socio-demographic variables (age, religion, total number of children ever born, marital status, gender of head of the household)	Binary logistic regression
To determine the relationship between socio-economic factors and contraceptive and non-use in rural households in Kenya	Contraceptive use or non-use	Socio-economic variables (education level, wealth index, literacy level)	Binary logistic regression

Table 3.11.3. Variables definition: All variables

<b>Independent variables</b>		
<b>Variable</b>	<b>Type of variable</b>	<b>Categories</b>
Age	Categorical	1.15-24 2.25-34 3.35-49
Age at first birth	Scale	NA
Age at first sex	Scale	NA
Marital status	Categorical	0. Never in union 1. Married 2. Living with partner 3. Widowed 4. Divorced 5. Sseparated
Number of children ever born	Scale	NA
Religion	Categorical	1. Roman Catholic 2. Protestant/ Other Christian 3. Muslim 4. No religion 96. Other
Education level	Categorical	0. No education 1. Primary 2. Secondary 3. Higher
Wealth index	Categorical	1. Poorest 2. Poorer 3. Middle 4. Richer 5. Richest
Gender of head of household	Categorical	1. Male 2. Female
Literacy level	Categorical	0. Cannot read at all 1. Able to read only parts of sentence 2. Able to read whole sentence 3. No card with required language 4. Blind/visually impaired
<b>Outcome variable</b>		
Contraceptive use or non-use	Categorical	0. Contraceptive Non-use 1. Contraceptive use

## 4 Chapter 4: Data Analysis and Results

This chapter entails analysis of the data and results.

### 4.1 Descriptive data analysis

In order to understand the distributions of the population under study, descriptive analysis was conducted. Nominal variables were represented using frequency tables while continuous variables were presented using graphs.

**Table 4.1.1. Age Distribution of Women**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15-19	500	4.8	4.8	4.8
	20-24	1698	16.4	16.4	21.2
	25-29	2207	21.3	21.3	42.6
	30-34	1841	17.8	17.8	60.4
	35-39	1692	16.3	16.3	76.7
	40-44	1306	12.6	12.6	89.3
	45-49	1105	10.7	10.7	100.0
	Total	10349	100.0	100.0	

Most of the women in the survey were between 25 – 29 (21.3%) years while the least represented women were between 15 – 19 (4.8%) years.

**Table 4.1.2. Highest level of education**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No education	1036	10.0	10.0	10.0
	Primary	6554	63.3	63.3	73.3
	Secondary	2245	21.7	21.7	95.0
	Higher	514	5.0	5.0	100.0
	Total	10349	100.0	100.0	

For every ten women who were interviewed, at least 6 had attained a Primary education. Only 5% of the surveyed women had attained a higher education level.

Nine out of ten women in the survey were Christians. Majority of them were protestant/other Christian (72.6%), the Roman Catholics were 21.5% of the surveyed women. The Muslim, no religion and other religion followed with 3.4%, 2.2% and 0.3% respectively.



**Table 4.1.3. Religion**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Roman Catholic	2221	21.5	21.5	21.5
	Protestant/ Other Christian	7518	72.6	72.6	94.1
	Muslim	350	3.4	3.4	97.5
	No religion	229	2.2	2.2	99.7
	Other	31	.3	.3	100.0
	Total	10349	100.0	100.0	

**Table 4.1.4. Gender of the head of the household**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	6586	63.6	63.6	63.6
	Female	3763	36.4	36.4	100.0
	Total	10349	100.0	100.0	

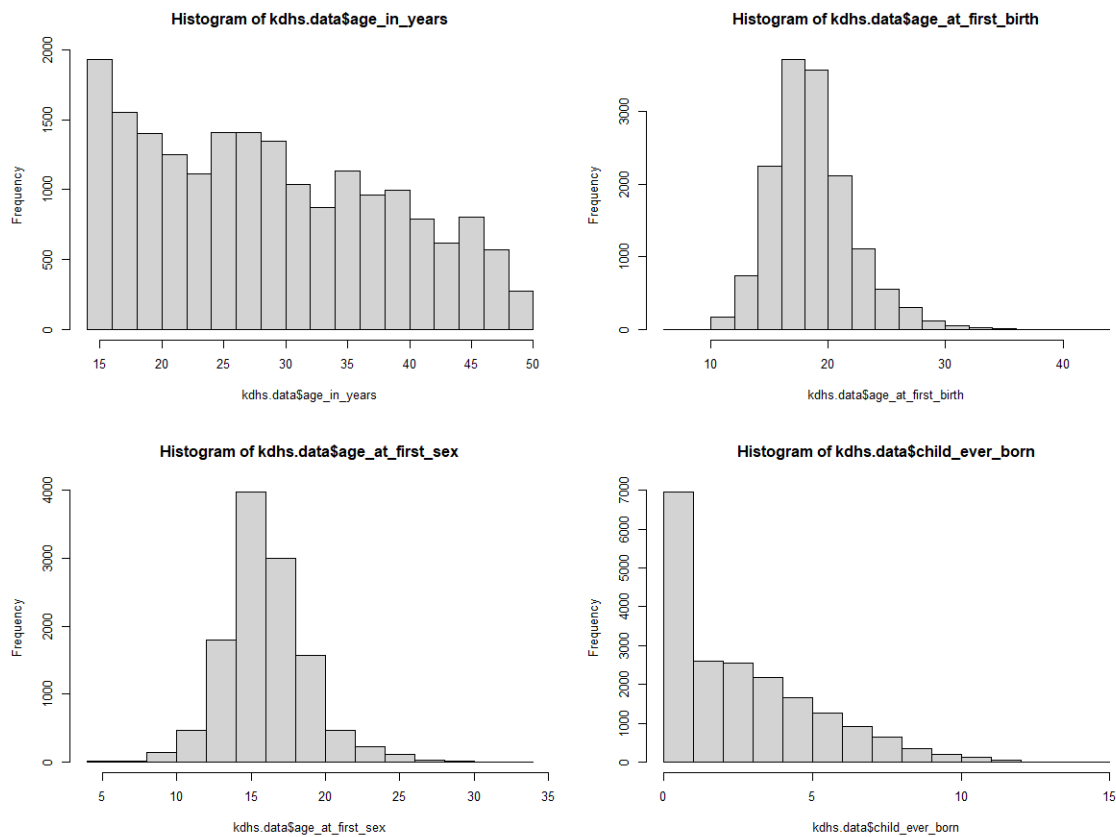
Most of the households under survey were male headed (63.6%) while the rest were headed by a female (36.4%).

**Table 4.1.5. Wealth index**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poorest	2541	24.6	24.6	24.6
	Poorer	2758	26.6	26.6	51.2
	Middle	2721	26.3	26.3	77.5
	Richer	1832	17.7	17.7	95.2
	Richest	497	4.8	4.8	100.0
	Total	10349	100.0	100.0	

More than half of the surveyed women were in the poorest and poorer wealth index 24.6% and 26.6% ,respectively.Slightly more than a quarter of the women were in the middle wealth index (26.3%).Women who were in the richer and richest wealth index represented 17.7% and 4.8% proportions respectively.

Of the women of childbearing age in the rural areas, the mean age at first birth was 19 (SD=3.5). The distribution of the age at first birth was skewed to below 20 years. Most of the women had less than 5 children to ever been born with a mean of 4 (SD=2.2) while most women reported to have had their first sexual intercourse between the ages of 14 and 16 with a mean of 16(SD=3).



**Figure 4.1.1. Histogram for age and children ever born**

## 4.2 Inferential analysis

**Model fit:**

$$\text{Log}(p/1 - p) = \beta_0 + \beta_1 X_{i1} + \dots + \beta_k X_{ik}$$

$$\begin{aligned} &= \beta_0 + \beta_1(\text{Age}) + \beta_2(\text{AgeAtFirstBirth}) + \beta_3(\text{Age At First Sex}) \\ &+ \beta_4(\text{Education Level}) + \beta_5(\text{Religion}) + \beta_6(\text{HH Size}) + \beta_7(\text{Gender Of HH Head}) \\ &+ \beta_8(\text{Literacy Level}) + \beta_9(\text{Wealth Index}) + \beta_{10}(\text{Marital Status}) \end{aligned}$$

**Table 4.2.1. Wealth index**

	GVIF	Df	GVIF <sup>1/(2*Df)</sup>
Age	2.301603	2	1.231708
Age At First Birth	1.883797	1	1.372515
Age At First Sex	1.726236	1	1.313863
Education Level	2.509158	3	1.165703
Religion	1.090352	4	1.010871
HH Size	1.408623	1	1.186854
Gender Of HH Head	1.314177	1	1.146375
Literacy Level	2.012671	3	1.123644
Wealth Index	1.582184	4	1.059027
Number Of Children Ever Born	2.82911	1	1.681996
Marital Status	1.632445	5	1.050229

The VIF values are all less than 5, hence there is no multicollinearity between the independent variables in the model.

### 4.2.1 Diagnostic plots

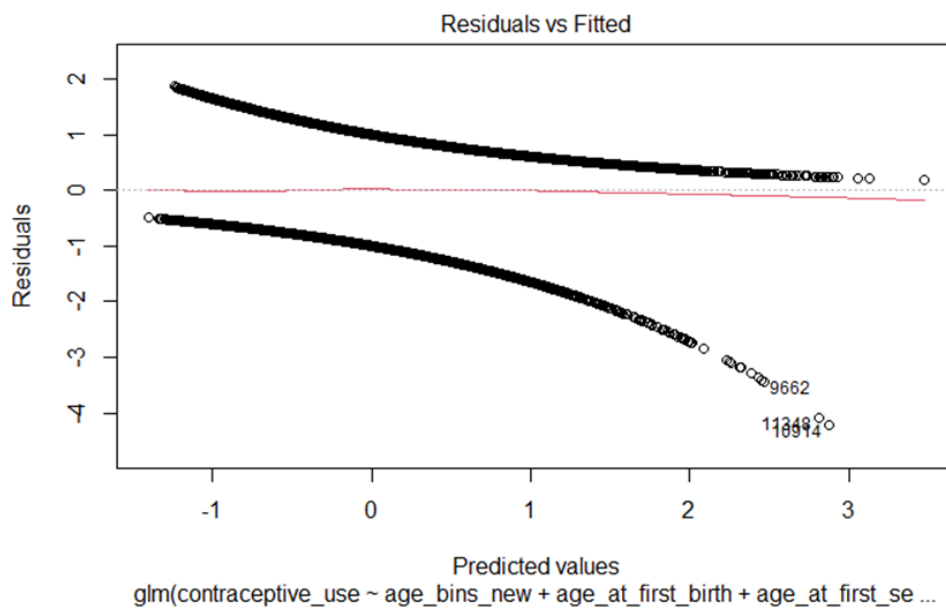


Figure 4.2.1. Residuals vs Fitted values

The plot as shown in figure 4.2.1 indicated non-linearity between the predictor and response variable since there is a distinct pattern.

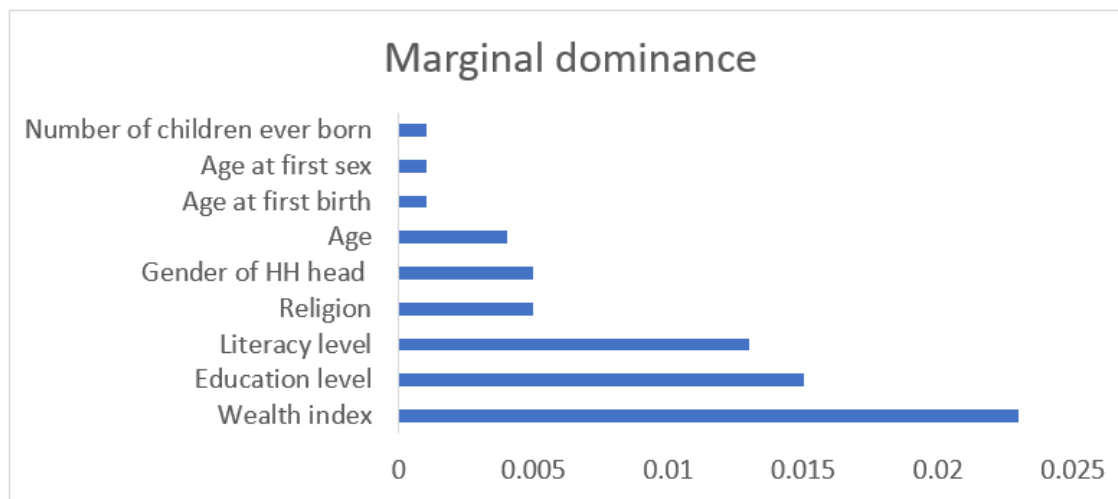


Figure 4.2.2. Dominance analysis results

As shown in figure 4.2.2, the rankings that resulted from dominance analysis varied slightly from that of the regression analysis in that wealth index was found to be the most influential predictor. Education level and literacy level are as well among the top 3 influential predictors. Religion and the gender of the household head influence the outcome in equal measure. Age at first birth, age at first sex and the number of children to ever been born are the predictors that influence the outcome the least. The size of the household was not an influential predictor.

## 4.2.2 Model Results and Interpretation

Table 4.2.2. Model results

	OR	lower95ci	upper95ci	Pr(> Z )
Age Bins (25 - 34)	0.758862	0.668238	0.861776	2.11E-05
Age Bins (35 - 49)	1.004967	0.85401	1.182607	9.52E-01
Age at First Birth	1.039566	1.022255	1.05717	5.92E-06
Age at First Sex	0.976706	0.9582	0.995569	1.57E-02
Education Level (Primary)	0.449938	0.365799	0.55343	4.00E-14
Education Level (Secondary)	0.456211	0.359759	0.578522	9.42E-11
Education Level (Higher)	0.442316	0.32862	0.595347	7.41E-08
Religion (Protestant/ Other Christian)	0.991211	0.895463	1.097197	8.65E-01
Religion (Muslim)	1.535139	1.184735	1.989179	1.19E-03
Religion (No Religion)	1.682899	1.209787	2.341031	2.00E-03
Religion (Other)	2.391044	0.911755	6.270424	7.64E-02
HH Size	0.99935	0.979322	1.019789	9.50E-01
Gender of HH Head (Female)	1.142186	1.035151	1.260288	8.09E-03
Literacy Level (Able to Read Only Parts of Sentence)	0.910327	0.757653	1.093767	3.16E-01
Literacy Level (Able to Read Whole Sentence)	0.682384	0.58286	0.798902	2.02E-06
Literacy Level (Blind/Visually Impaired)	1.603919	0.759891	3.385428	2.15E-01
Wealth Index (Poorer)	0.586787	0.518373	0.664229	3.50E-17
Wealth Index (Middle)	0.449256	0.394669	0.511392	9.80E-34
Wealth Index (Richer)	0.407319	0.35103	0.472635	2.53E-32
Wealth Index (Richest)	0.42111	0.335113	0.529176	1.16E-13
Number Of Children Ever Born	0.964695	0.935871	0.994407	2.02E-02
Marital Status (Married)	0.354879	0.302024	0.416984	2.38E-36
Marital Status (Living with Partner)	0.346941	0.274747	0.438105	5.94E-19
Marital Status (Widowed)	0.93647	0.731149	1.199449	6.03E-01
Marital Status (Divorced)	0.742941	0.530109	1.041223	8.45E-02
Marital Status (No Longer Living Together/Separated)	0.669494	0.54166	0.827498	2.06E-04

A binary logistic regression model was fitted to ascertain the effects of age, age at first birth, her highest education level, age at first sex, religion, household size, literacy level, wealth index, number of children ever born, gender of head of the household and marital status on the likelihood of women of reproductive age in the rural households in Kenya on use or non-use contraceptives.

For a one-year increase in age, a woman of childbearing age in the rural Kenya was 2% more likely to use contraceptive while adjusting for her age at first birth, her highest education level, her age at first sex, religion, household size, literacy levels, wealth index, number of children ever born, gender of head of the household and marital status. A woman between the ages (25-34) young adults in rural Kenya were 24% less likely to use contraceptives compared to the adolescent and young mothers (15-24.)

For a one-year increase in age at first birth, a woman of childbearing age in the rural Kenya was 4% more likely to use contraceptive while adjusting for her age, her highest

education level, her age at first sex, religion, household size, literacy levels, wealth index, number of children ever born, gender of head of the household and marital status.

For a one-year increase in age at first sex, a woman of childbearing age in the rural Kenya was 2% less likely to use contraceptive while adjusting for her age, her highest education level, her age at first birth, religion, household size, literacy levels, wealth index, number of children ever born, gender of head of the household and marital status.

Women who attained Primary, Secondary and higher education levels were 55%, 54% and 56% less likely to use contraceptives, respectively, compared to women with no education at all while adjusting for age, age at first sex, age at first birth, religion, household size, literacy level, wealth index, number of children ever born, gender of head of the household and marital status.

A woman from the Muslim religion and a woman with no religion are 54% and 68% more likely to use contraceptives, respectively, compared to a woman who is a Roman Catholic. A woman with other religion is 2.4 times more likely to use contraceptives compared to a woman who is a Roman Catholic while adjusting for age, age at first sex, age at first birth, household size, literacy level, wealth index, number of children ever born, gender of head of the household and marital status.

Female headed households are 14% more likely to use contraceptives compared to male head households while adjusting for age, age at first sex, age at first birth, household size, literacy level, wealth index, religion, number of children ever born, gender of head of the household and marital status.

A woman from the poorer wealth index was 41% less likely to use contraceptives, a woman from the middle wealth index was 55% less likely to use contraceptives, a woman from the richer and richest wealth index were 59% and 58% less likely to use contraceptives, respectively, compared to a woman from the poorest wealth index while adjusting for age, age at first sex, age at first birth, household size, literacy level, religion, number of children ever born, gender of head of the household and marital status.

For an additional child to ever been born, a woman of childbearing age in the rural Kenya was 4% less likely to use contraceptive while adjusting for her age, age at first sex, highest education level, age at first birth, religion, household size, literacy levels, wealth index, gender of head of the household and marital status.

For a woman who was married or was living with partner, they were 65% less likely to use contraceptives compared to a woman who was never in union, a woman who no longer lives together with spouse/separated was 33% less likely to use contraceptives, compared to a woman who was never in union while adjusting for age, age at first sex, age at first

birth, household size, literacy level, religion ,number of children ever born and gender of head of the household.

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## 5 Chapter 5: Conclusion and Recommendations

### 5.1 Conclusion

The study adopted a binary logistic regression model to determine some factors that are associated with the use and non-use of contraceptives in the rural households in Kenya. The backward selection method allowed for dropping of non-significant variables and retaining of significant variables in the model. All the predictor variables in the equation were statistically significantly associated with the outcome variable and hence during the elimination phase, none were dropped. The variables that were associated with the outcome variable were; age in 10-year brackets, age at first birth, highest education level, age at first sex, religion, household size, literacy level, wealth index, number of children ever born, gender of head of the household and marital status. Those women who were young adults (25-34) years were less likely to use contraceptives compared to the Adolescent Girls and Young Women (15-24) years. As the age at first birth of the women in the rural areas in Kenya increased, they were more likely to use contraceptives while for an increase in age at first sex of women in the rural areas increased their likelihood to use contraceptives. Women who had attained lower levels of education were less likely to use contraceptives compared to women who had no education at all. Those women who were Muslims, with no religion and other religions were more likely to use contraceptives compared to women who were Roman Catholics. Women from Female headed households were more likely to use contraceptives compared to male headed households. Women from poorer households were less likely to use contraceptives compared to those from richer households. In the rural areas, women with more children were less likely use contraceptives. Those women who are married or live with partners are less likely to use contraceptives compared to women who were never in union.

### 5.2 Recommendations

There are several factors that influence the use and non-use of contraceptives among women in the rural areas in Kenya as indicated from the study. Among the issues that need to be addressed to enhance uptake of contraceptives is the poverty in rural areas. Empowering women to be more self-reliant will ensure that those women can access contraceptives whenever they want. Empowering women through education will put them in a position where they can be taught and understand the advantages of family planning.



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