

**INFLUENCE OF SERVICE PROVISION READINESS AND
LIVELIHOOD ON MATERNAL HEALTH SERVICES UTILIZATION
PATTERNS IN KENYA**

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DECLARATION

Declaration by the Student

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

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Declaration by Supervisor

This Research Project has been submitted with my approval as the University supervisor

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DEDICATION

This Research Project is dedicated to my late maternal grandmother, Hellen Aloo Oyamo. Knowledge is boundless and priceless. She would urge her grandchildren to search for it.

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I wish to acknowledge the dedication and contribution of my supervisor Dr. Japheth Awiti. Mwalimu was always available at all times whenever needed. I wish to also acknowledge my son, Fidel Omondi Okoth, for always ensuring the safe storage of my reading materials and for reminding me of the timelines.

ACRONYMS AND ABBREVIATIONS

ANC	Antenatal Care
DCT	Dynamic Capability Theory
FP	Family Planning
GIC	Geographical Information System
HIV	Human Immunodeficiency Virus
KDHS	Kenya Demographic Health Survey
KHSSP	Kenya Health Sector Strategic Plan
LITNONE	No Education
LITSOME	Some Primary Education
LITPC	Completed Primary Education
LITSOSEC	Some Secondary Education
LITSECC	Completed Secondary Education
FDENSITY	Facility Density
MCH	Maternal and Child Health
MDG	Millennium Development Goal
RBT	Resource Based Theory
READDIS	Dispensary Readiness
READHEAL	Health centre Readiness
READHOSP	Hospital Readiness
READCOMP	Composite Readiness
SARAM	Service Availability and Readiness Assessment and Mapping
WHO	World Health Organization

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ABSTRACT

This is a study report on the relationship between Maternal Service Provision Readiness and Maternal Skilled Delivery Services Utilization using Kenya's county level data. The report also contains the results of investigation of the relationship between nomadic livelihood and skilled delivery coverage. The broad objective was to determine if the current Maternal Services Utilization patterns across Kenya's counties could be explained by Maternal Services Provision Readiness and Nomadic livelihoods. The study was anchored on the theories of Health Seeking Behaviour (Rebhan, 2010) and Resource Based View (Barney, 1991). Service Provision Readiness is a measure of the supply side capacity to provide quality services (WHO, 2014) while utilization is used as a measure of access. The concept of Superior Utilization was introduced to benchmark the country's performance against sub-Saharan Africa's MDG achievement (United Nation, 2015) using the knowledge anchored on RBT. Benchmarking has become a standard management practice. The northern Counties of Kenya, predominantly nomadic, did not register improved health outcomes generally (KHSSP II). The study sought to answer the following questions: is there regional disparity in the production and consumption of maternal health services in Kenya? Is nomadic livelihood a constraint to access? Does investment in the supply side (readiness to provide maternal services) explain maternal skilled delivery differentials across counties of Kenya? The study focused on Readiness, Livelihood and Utilization of maternal skilled delivery services. A descriptive, cross-sectional design was used. County was the unit of analysis and both multiple linear regression and binary choice methods were employed in the analysis using STATA 12 statistical software. Data source on utilization was obtained from Kenya Demographic Health Survey (2014) while Readiness data was obtained from SARAM report (Government of Kenya, 2014). These data were linked and analysed according to the study objectives to answer the above research questions. The following were the findings of the study: disparities in preparedness exist at all levels of KEPH; disparity was least in health centre preparedness (CV, 18%) and highest in hospitals (CV, 23%); Health centres readiness was the only supply side factor which could explain maternal delivery pattern ($r= 0.307$, $p<0.05$); improving health centre maternal service provision readiness increases maternal skilled delivery coverage. Changing a county from nomadic improves maternal delivery coverage and increases its predictive probability for better performance. Nomadic livelihood reduces the likelihood of a county realizing acceptable utilization levels of maternal delivery services. Achieving Secondary education level for women significantly increases the likelihood of a county realizing acceptable skilled delivery coverage by 4.9%. Demand-side factors have the most influence on maternal skilled deliveries compared to the supply-side.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Access to healthcare is central to the achievements of health goals. Health level component of international commitments such as in the Millennium Development Goals (United Nations General Assembly, 2000) and Sustainable development goals (United General Assembly, 2015) are premised on achieving acceptable access to health care for the desired results. Similarly access to health care is key to the realization of Kenya Vision 2030 and Kenya Health Sector Policy Framework (2012-2030). Access to health care relates to the likelihood of someone receiving an effective and appropriate health care service whenever necessary (Savedoff, 2009). The concept of access therefore applies not only to people who need and get services but also to the experience of people who are currently healthy and are assured they will get necessary treatment in the event of an illness or injury (Tipping and Segal, 1995; Savedoff, 2009).

Utilization of health services is one of the most often used proxies for access (Tipping et al, 1995). Utilization may be measured in terms of the proportion of the relevant population receiving particular services. Supply induced demand (SID), iatrogenic medicine, and moral hazard represent some of the situations in which utilization of health services may overstate access. Conversely, in perfectly effective health systems, many health care services would be unnecessary because the conditions that require them would be prevented. Improved effectiveness, may result into fewer consultations with health care professionals leading to understatement of access. These are some of the weaknesses of using utilization as a measure of access. However in the area of maternal and neonatal health, utilization can be a good measure of access (Savedoff, 2009). This study used utilization as a measure of maternal health care access and was anchored on the assumption that the care provided would be beneficial, leading to improved maternal health outcomes.

Studies on healthcare utilization are mostly underpinned on theories and models of health care seeking behaviour (Rebhan, 2010). Sick role and general theory of help seeking stress the importance of individual autonomy and heteronomy as key factors influencing health care utilization. Individual autonomy and heteronomy are prevalent in parochial (conservative traditional societies) and cosmopolitan societies respectively. Rebhan (2010) noted too that

treatment availability via location, economic cost, psychological cost (stigma, humility etc), and treatment resources have influence on health service utilization.

Despite the progress in reaching the 5th Millennium Development Goal, *Improved Maternal Health- reducing the maternal mortality ratio and achieving universal access to reproductive health*, Kenya just like other sub-Saharan Africa countries, registers unacceptably high maternal mortality ratio-488 deaths per 100,000 live births (WHO, 2014). Many mothers unnecessarily die from preventable causes primarily related to access to antenatal, basic obstetric, basic emergency obstetric and comprehensive and skilled obstetric care during pregnancy, childbirth, and the postpartum period (Anderson et al. 1995; Kirigia et al. 2006 as cited by Wang et al, 2014). According to Kenya Demographic and Health Survey (KDHS, 2014), 60% of births take place in health facilities. 40% of Mothers do not deliver in health facilities and do not have access to emergency obstetric care and have higher chances of dying. Increasing utilization of maternal health services is therefore key to reducing both maternal morbidity and mortality.

There exists significant body of literature on factors that influence utilization of maternal health services. However, Wang et. Al (2014) noted that there has been more focus on the demand side factors than the supply side factors. Demand side factors include characteristics of women and their families, and some community level factors. Scarcity of suitable and quality data is a major reason for limited research on the supply side (Wang et al. 2014). Supply side information comes from the facilities and are then linked to individual women in order to explore the relationship between the supply side variable and women use of maternal services. Availability of geographic data from both household surveys and facility surveys, makes it possible to link population data and facility data within a geographic information system (GIC).

Service Provision Readiness is a concept developed by World Bank and used by countries to assess their readiness to perform quality health services in the general and specific health areas. Service Readiness looks at the capacity of health facilities to provide required services. This capacity is evaluated in terms of availability of basic requirements (Infrastructure, amenities, basic equipment, standard precaution for infection control, diagnostic tests, medicines and commodities) to provide services. Readiness is thought to be a critical element in assuring access to quality health services, which affect utilization patterns. Top quality health service is thought to be offered when service provision readiness is at 100%.

Most empirical studies analysing resources and performance in social science do so under resource based theory (RBT), Dynamic Capability theory (DCT) and efficiency models. RBT and DCT which are largely efficiency theories assert that performance differentials across organizations in a similar industry are explained by their resource heterogeneity (Barney, 1991; Barney, 2007; Penrose 1959 and; Wernerfelt, 1984). It is the possession of strategic resources that is responsible for differences in performance of firms in a given industry. These theories can be used to identify resources either acting singly or in combination that are most useful in producing performance. This study analysed the abilities of maternal services resources (dispensary preparedness, health centre preparedness, hospital preparedness) in relation to maternal skilled delivery service utilization with respect to counties in Kenya.

Presence of facilities and resources alone are not responsible performance but rather performance is generated depending on how resources are utilized such as to generate Service Provision Readiness (a higher level resource) which in turn should create demand for those services and hence increased utilization, a measure of access. Resources are defined broadly as tangible, intangible, and capabilities (Penrose, 1959; Barney, 1991; and Newbert, 2007). Service Provision Readiness is a much better variable to use as it captures a mix of resources that can be explored to explain performance differentials across counties in any specific service area of interest in a health system. Performance in this study refers to Maternal Services skilled delivery Utilization and such other achievements in the results hierarchy. This study was anchored on the theories of health seeking behaviour, RBT and DCT. Health seeking behaviour is of particular interest to the study of health care markets while RBT guided in the understanding and analysis of Service Provision Readiness as a supply-resource responsible for Maternal Health Services Utilization differentials across counties of Kenya.

1.1.1 Service Provision Readiness

General Service readiness is the overall capacity of health facilities in a defined administrative unit to provide general health services. Readiness is defined as availability and functionality of components required to provide services such as basic amenities, basic equipment, standard precautions, laboratory tests, and medicines and commodities (WHO, 2014). Service specific readiness is the ability of health facilities to offer a specific service and the capacity to provide that service measured through selected tracer items that include trained staff, guidelines, equipment, diagnostic capacity, and medicines and commodities.

Service readiness is a function of service input availability and functionality. Service readiness index is computed from data collected using standard core questionnaire and the results are comparable across countries or within countries.

Maternal Service Provision Readiness index is described by five domains consisting of tracer indicators in the areas of antenatal care, basic obstetric care, emergency basic obstetric care, comprehensive obstetric care and delivery care. These five domains are Staff and training, Equipment, Diagnostics, and Medicines and commodities. Each domain consists of a set of tracer items. Domain score is calculated by dividing the total number of items available in that domain by the size of the set of domain. Maternal health service provision readiness index is the mean score of domain scores as contained in the SARA reference manual (WHO, 2014). Weighting can also be applied. County Maternal services readiness score estimates the capacity of a county to provide maternal health services. For example a score or an index of 80% would mean that in that particular county out of 100 women seeking maternal service, 80 of them would get quality service. Countries are using this methodology to identify their service provision readiness gaps in specific areas of concern for purposes of health system strengthening.

East African countries of Rwanda, Tanzania and Kenya have all carried out this assessment with Kenya doing hers in the year 2013 and is contained in Kenya SARAM report (Government of Kenya, 2014), as baseline survey to enable counties identify opportunities for investments. Regions are heterogeneous in terms of resource endowment and priorities and are therefore not expected to have the same scores in terms of service provision readiness. It is not clear if heterogeneity in terms of service provision readiness whether in the general or specific area of health is responsible for utilization differentials currently observed across counties in Kenya. In this study, service provision readiness was one of the explanatory variables and was correlated with utilization, the dependent variable.

1.1.2 Nomadic Livelihood

Nomadic Livelihood exists in northern and other pastoralist counties of Kenya (Kibuuka, 2010; Kenya Literature Bureau, 2013). Despite advancement in medical technologies and medication there exists enormous gap between rural and urban environments. Larger gap is noted too between rural agricultural and nomadic pastoralist people. The end term review of 2nd Kenya health strategy framework observed insignificant change in health outcomes amongst the nomadic regions and especially in priority impact areas of maternal health. Does

being a nomadic county contribute to lower uptake of maternal health services in Kenya? Nomadic people of Kenya are identified with some counties. While the northern counties are predominantly occupied by nomadic people there are significant indigenous nomadic population in other counties as well. Information in the available literature only refer to Masai, Turkana, Samburu, Borana, Pokot, Orma and Northern Kenyan tribes as nomads (Mohammed, 1999; Walz, 1992; Schilling, 2012). Counties occupied by these people qualified as nomadic counties. The author also used his knowledge of the country to identify counties occupied by those nomadic tribes.

1.1.3 Controllable Variables

Several empirical studies have identified socio-economic, demographic and cultural factors as determinants of access. These potential determinants include poverty, urbanisation, and capacity of counties to meet their own cost of service delivery, literacy, autonomy/heteronomy and average distance between facilities among others. These factors were controlled for in the study. Poverty was operationalized as proportion of people living below poverty line. Urbanization referred to proportion of people living in urban areas. Anderson (1970) opined that individual autonomy increases along rural-urban continuum (parochial- cosmopolitan continuum). Education level was operationalized as proportion of population with various education levels (no schooling, some primary schooling, completed primary schooling, some secondary schooling, completed secondary schooling and above secondary schooling). Average distance between health facilities was replaced by facility density per 10000 people. The author is not aware of studies using Readiness or Livelihood to ascertain their influence on health care outputs and outcomes in Kenya.

1.1.4 Service Utilization

Utilization is the actual use of a health service, a realized access (Anderson, 1995). This study adopted this concept. Anderson (1995) explains that an individual's decision to utilize a health service is influenced by predisposing, enabling and need factors. Predisposing factors include characteristics such as age, race and health beliefs (the belief for example that seeking the service will help in curing the ailment). Enabling factors are characteristics such as family support, resources and health insurance. Need factors are the actual need for the service and perceived need. Utilization of a health service depends on the demand and the supply side factors. Supply side includes characteristics such as the reputation of the provider and the extent of service availability, provision readiness, and service price. Utilization in this

study referred to consumption of maternal skilled delivery services as measured in county skilled delivery coverage. The author is not aware of studies that have used service provision readiness to determine its influence on service utilization in Kenya.

The study on utilization of healthcare is important because society's resources should address societal goals such as equity, efficiency and access. This study sought to understand the relationship between the levels of county maternal service provision readiness and current county maternal skilled delivery utilization.

1.1.5 Superior Service Utilization

The concept of superior performance is derived from the works of Porter (1985, 1995) and Barney (1991). A firm's competitive performance is rated against the industry's average. Firms are classified either as inferior or superior performers depending on whether they are below or above the industry's average. While this concept is applicable to competitive and efficiency theories, the author intends to apply it from the perspective of global health in which health objectives are driven from multilateral collaborative campaigns that views progress of interventions as acceptable when they fall within and above the performance of their regions or economic grouping. These regions are Sub-Saharan Africa, North Africa and Asia sub regions amongst others. Developed and developing countries are an economic classification. According to MDG report in 2015(United Nations, 2015), developing countries achieved 71% in skilled deliveries and 56% in more than fourth antenatal coverage. Sub-Saharan Africa achieved 56% and 52% in skilled deliveries and antenatal coverage respectively and these were considered as success (United Nations, 2015) and were responsible for 49% improvement in maternal mortality. Kenya achieved 60% and 50% in skilled deliveries coverage and 4th antenatal visit respectively. The author used sub-Saharan Africa as the benchmark (standard) to compare Kenya's and its counties performance. This was largely the author's idea. Benchmarking has become attractive as a best practice management strategy in driving up performance.

Counties contribute to the national performance and over the years there has been intense competition across regions of Kenya in terms of maternal indicators coverage. In this study utilization is considered acceptable if it is above the sub-Saharan coverage and unacceptable if else. This study sought to understand the relationship between current maternal skilled delivery utilization levels and Readiness to Provide Maternal Service and Livelihood.

1.1.6 Service Readiness, Livelihood and Utilization

According to a priori theoretical model utilization assumes positive and negative coefficient signs with Readiness and Livelihood correlates respectively. The assumption is that the degree of preparedness to offer a service should correlate positively and significantly with the numbers receiving that service. An intervention that fails the test of cultural acceptability however may fail to realize expected utilization levels despite having impressive score in readiness to provide services. Since there are many factors affecting utilization, it is not known to what extent readiness and livelihood variables relate with utilization in the Kenyan context and especially in the specific area of maternal and newborn health. Andersen (1968) introduced the concept of mutability to refer to factors that can be influenced to bring desirable changes. Factors with high mutability favours policy development. The study sought to understand the relationship between utilization and these correlates for the possibility of policy development to improve maternal health outputs and outcomes.

1.1.7 Maternal and Neonatal Health in Kenya

Globally, maternal health services are run as a programme with the objective of reducing pregnancy related morbidity and mortality for both the mothers and the neonates. The focus is on preventing and treating anaemia and infection to reduce complications associated with child birth. Maternal health is an indicator of the state of healthcare and development in a country. Maternal and newborn health in Kenya has been a major area of Policy focus since 1987 and various strategies have been formulated to reverse the unacceptably high mortality rates from as high as 500 per 100,000 live births in 1987 to a desired 175 per 100,000 live births in 2015, an MDG commitment (United Nations General Assembly, 2000; Kenya Health Strategic Plan II). While mortality rates dropped to 414/100,000 live births (KDHS, 2003) in 2003, it rose again in the subsequent survey in 2008 to 488/100000 (KDHS, 2009). The situation is complicated further by the large disparities across counties in Kenya with the northern regions currently recording a high of over 800/100,000 mortality rates.

It is identified that to reduce maternal and neonatal deaths, there has to be increased access to maternal health services including skilled deliveries in the facilities, prenatal, and postnatal services (National Health Strategy Paper 2012-2017). Facilities therefore have to improve in areas of antenatal care, basic obstetric care, basic emergency obstetric care and comprehensive obstetric care and delivery. There is currently low consumption of maternal health services across counties of Kenya. Kenya has two distinct livelihoods, the nomadic

and the non-nomadic. The end term review of the second national health sector strategic plan covering the periods between 2005 and 2010, noted that health indicators did not improve in counties dominated by nomadic population (KHSSP2012-2017).

The current strategic focus is to increase the utilization of public and private maternal health services (MCH clinics and Delivery services) through support of community strategy (to provide the interface between the communities and the providers) and increasing the skills and proficiency in the frontline care givers in addition to providing necessary equipment, infrastructure and commodities. The policy environment has also been changing very fast with the latest activities being the presidential pronouncement on free maternal services and the country's first lady leading the campaign for maternal health. With such focus and the magnitude of investment in maternal and newborn health, it would be interesting to ascertain if readiness to provide maternal services shapes service utilization and the observed differentials. Clients do not meet the direct costs of maternal services in Kenya.

1.2 Research Problem

With the thinking that maternal morbidity and mortality can significantly reduce through increased utilization of formal maternal health services infrastructures, part of the effort needs to go towards evaluating the country's readiness to provide maternal services and if readiness can translate into facilities being utilized more. This is because there is currently increasing investment in the supply side. At a more aggregate level it would be worthwhile to investigate if the utilization differentials observed across the counties can be explained by their differences in readiness indices. Inequity is a concern to the discipline of health economics.

Readiness may not translate into improved numbers. A lot of studies have been done on utilization determinants both at the theoretical and empirical levels. Laura and Walker (2012) in their study of social barriers to healthcare in Asembo-Bay, Kenya, observed that HIV testing for mothers in the maternal health units discouraged some from utilizing the service. This only points out that some aspects of a beneficial service can also be an impediment to access. The readiness of service provision can also be an impediment to potential users. Resources are scarce and investment choices made should be able to produce acceptable results. Acceptable utilization results refer to levels which are above recognized bench mark from global health initiatives. This study used Sub-Saharan African coverage of 56% for skilled deliveries as the benchmark. The study focused on maternal skilled delivery service

utilization and sought to establish the relationship between it and maternal service provision readiness and nomadic livelihood.

Counties are different in terms of resource endowment and investment priorities and are therefore not expected to produce same readiness scores. These differences may be their idiosyncrasy. They are not expected to be at par in terms of utilization levels either. Impediments exist in resource allocation and utilization in varied degrees resulting in deferential production and consumption across counties. The author is not aware of any study that has investigated the relationship between maternal skilled delivery service utilization and either service provision readiness or nomadic livelihood. Likewise the concept of acceptable utilization has not been investigated. This study sought too to investigate the relationship between acceptable maternal skilled delivery utilization and both service provision readiness and nomadic livelihood in Kenya.

The fact that Kenya has poor maternal health indicators, a demonstrable better level of political and policy environment than its neighbours, and that there is considerable level of investments aimed at improving county health facilities service provision readiness, makes it necessary to inquire if there exists at the county level a relationship between service provision readiness and service utilization and by extension acceptable service utilization. What is the influence of service provision readiness and nomadic livelihood on the utilization of maternal skilled delivery service utilization? Are the current maternal skilled delivery utilization patterns observed across counties explained by their readiness and livelihood of their people? Are there disparities in the production and consumption of maternal health services in Kenya? The author is not aware of any study done either in the Kenyan or other context to answer these questions.

1.3 Research Objectives

The broad objective of the study was to determine the relationship between Maternal Skilled Delivery Service Utilization and both Maternal Service Provision Readiness and Nomadic Livelihood in Kenya.

1.3.1 Specific Objectives

1. To determine the extents of disparities in the production and consumption of maternal health services in Kenya.

2. To determine whether Service Provision Readiness and Livelihood can be of predictive value to Maternal Skilled Delivery Service Utilization for purposes of policy formulation, management and practice decisions.

1.4 Value of the Research

This study contributes to the existing literature and theory building. Researchers are expected to have a better understanding of the relationship between supply side factors and access. The study is expected to generate interest and stimulate more studies in the subject area. The findings of the study can influence policy and investment strategies in the area of maternal and neonatal health. County managers can use the findings to improve their performance drawing from the concept of mutability to become competitive. National Planners and policy makers can use the findings to correct regional disparities.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the theoretical, empirical, and methodological literature on maternal healthcare access and utilization, service readiness, and livelihood. The existing knowledge and gaps were identified and noted.

2.2 Theoretical Foundation of the Study

Studies in healthcare utilization are mostly underpinned in theories and models of health care seeking behaviour (Rebhan, 2010). Sick role (Parsons, 1951) and general theory of help seeking (Mechanics, 1978 as cited by Rebhan, 2010)) stress the importance of individual autonomy and heteronomy as key factors influencing health care utilization. Individual autonomy is prevalent in cosmopolitan societies while heteronomy is prevalent in parochial societies (conservative traditional societies). Mechanics theory recognizes in addition the influence of treatment availability via location, economic cost, psychological cost (stigma, humility etc), and treatment resources on health service utilization. It is multifaceted and more comprehensive assertion than Parsons model.

According to a model developed by Anderson (1970), the proclivity to use healthcare services is determined by predisposing characteristics, enabling characteristics and need based characteristics. According to Anderson(1970), under the predisposing characteristics, an individual is more or less likely to use health services based on demographics, position in a social structure and beliefs of benefits of health services. An individual who believes that a health service is useful to treatment of an illness will likely utilize that service. Enabling characteristics includes resources found within the family and the community. Family resources comprise economic status and the location of residence. Community resources incorporate access to health care facilities and the availability of persons for assistance. The need based category include the perception of need for health services, whether individual, social, or clinical evaluated perceptions of need (Wolinsky, 1988b). Anderson model is the most robust and has been the most used in terms of theoretical anchorage in studies involving utilization and access of health services.

According to choice model (Young, 1981), cost, availability and readiness of health services provision may have the most influence on health service utilization. All the theories and models reviewed provide the variables necessary in the study of healthcare utilization. While

the theories and models reviewed have identified many variables as significant, no single factor has been shown to be more essential than another. Nevertheless the theories and the models provide three central components under which many variables may be placed: access, social networks, and culture.

Although the models and theories provide an understanding of an individual's decision to utilize health care, they are generally lacking empirical support. However, Young's choice model has been shown to accurately predict behaviour. When Young's model was tested in a small Mexican community it was shown to predict a remarkable 94.7% of utilization behaviour (Young and Garro, 1981). This study was anchored on the choice model because it contains the variables of concern.

The second group of theories reviewed were the Resource Based Theory (RBT) and Dynamic Capability Theories (DCT). RBT attributes differentials in organizations performances to resource heterogeneity in terms of quantity, quality, and the way they are combined and utilized to produce goods or services of value to the customers (Barney, 1991). DCT is an offshoot from RBT and conceptualizes resources beyond the tangibles and intangibles. It proposes that static capability cannot ensure sustainable performance for it can easily be competed away. For sustainable superior performance according to this theory, organizations must possess dynamic capability that anticipates and aligns with customer tastes and preferences. These theories though used mostly in strategic management research are relevant in economic researches given that the discipline of strategic management borrows heavily from economics. These theories also define acceptable performance (competitive performance) as that which is equal to or greater than the industry's average.

The empirical models used to confirm resource based and dynamic capability theories often use correlations and regression analysis either with tangible or intangible resources as independent variables and performance as the dependent variable. Application of these theories to this study implied that service readiness and utilization were conceptualized as resources and performance respectively. The variables were drawn from the health seeking behaviour theories in general and heavily on choice model. The draw back in these studies are often in the unit of analysis. A single resource may not be responsible for performance. Output is generated by a combination of resources. This study used Service Provision Readiness index which takes into account combination of resources needed for a service.

The theories reviewed provided the knowledge base for investigating the influence of services provision readiness and livelihood on maternal health utilization.

2.3 Empirical Literature

In assessing how distance to a health facility affect women's use of reproductive health services, a few studies were carried out in sub-Saharan Africa using a methodology that linked DHS data with facility Survey (Kye et al. 2012; Lohela et al. 2012; Nesbitt et al. 2014 as cited by Wang et al. 2014). In Malawi and Zambia, by linking DHS clusters and facilities(from facility census), the authors found that in Zambia, a longer straight line distance from the DHS cluster to the closest facility offering obstetric care significantly reduced the likelihood of facility delivery by 65% for every 10 kilometres in distance. However, such a relationship was not observed in Malawi (Lohela et al. 2012 as cited by Wang et al. 2014). Another study in Zambia with same methodology but focussing on antenatal care found that distance to the closest facility had significant effect on content of antenatal care women received but not on the number of antenatal care visits and the timing of the first visits (Kye et al. 2012 as cited by Wang et al. 2014). In a rural setting in Ghana, Nesbitt et al. (2014) linked health facilities census data and health and demographic surveillance data from 600 villages and found a significant association between distance to the closest delivery facility and women's likelihood of delivering in a health facility.

Wang et al. (2014), in the study on the influence of Service readiness on use of facility delivery care in Haiti, using geospatial methodology, and based on 2012 DHS and the 2013 Service provision assessment and using multilevel logistic regression showed that rural areas were significantly associated with use of delivery service. However in urban areas only highest readiness score was statistically significant. No association was found between the total number of health facilities offering delivery services and use of delivery facility.

On assessing facility readiness of family planning(FP) services in Ghana, Hess(2007) found that there was an association between having minimum equipment for FP and caseload($p=0.04$) but there was no association between the level of caseload and the likelihood of meeting the criteria for minimum infrastructure or having adequate supplies.

These studies have contributed to establishing geospatial methodology in linking service provision and use. The methodology while superior and directly relates women's (and their background characteristics) use of facilities and the supply side factors, requires relatively

more resources to conduct. This study did not use geospatial methodology but rather aggregated county utilization data from KDHS (2014) reports. County service readiness secondary data (dispensary readiness, health centre readiness, and hospital readiness) from SARAM survey report (Government of Kenya, 2014) was directly linked to utilization data. This had implication on interpretation as group data cannot be inferred on individual members to avoid ecological fallacy.

Service provision readiness as a concept has been adopted by developing countries with the support of World Bank and standard tools have been used to assess and evaluate preparedness to offer services in the general and specific health intervention areas. Resources in a region are evaluated and scored against basic requirement. It is a tool that is used purposely to help increase access, improve quality and safety of health care services in health priority areas.

The reviewed literature explained the observed maternal services utilization in terms of supply-side (distance and service readiness) and women's background characteristics. The unit of analysis used was the facility which is the smallest administrative unit. Intra-country or regional disparities were not addressed. Would, for example, regional differentials in terms women's use of maternal services have been explained by their differences in readiness to provide the services? Resource allocation decisions in several countries are increasingly being decentralized to regional levels for purposes of efficiency, equity and community ownership. This study intended to fill the above gaps.

2.4 Overview of the Literature

According to the reviewed literature, there exists a number of comprehensive frameworks and models to guide a study on health service utilization and its determinants. These models or theories are complimentary and are covered under health seeking behaviour and RBT. These theories have largely been validated in various empirical research. Most of the studies use individual woman and health facility as unit of analysis. None of the studies in the literature used a higher administrative unit where major resource allocation, strategic and policy decisions are made. This study sought to address this gap by use of county rather than facility as the unit of analysis. From the supply side, most researchers have concentrated on facility distance in demonstrating its influence on facility utilization and where other facility factors such as readiness were investigated, the analysis were restricted to components scores rather than the composite scores. Resources do not act alone and therefore it may not be accurate to isolate the contribution of single resource. This study sought to address this gap

by use of composite readiness score computed from resource combinations. Again geospatial methodology used in the literature when facility is the unit of analysis often provides dilemma on how to deal with clusters that are within coverage of more than one facility. This dilemma was reduced in this study since regions (counties) have defined boundaries. Lastly the studies reviewed have not stated what defines good performance. By applying a benchmark for utilization this study attempted to address that gap.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research design, Conceptual and Empirical models used in the study. It also states the Population of the study, sources, nature and forms of data, data collection and storage, and finally methods used in the analysis of data.

3.2 Research Design

The study is a descriptive and cross-sectional design. It used secondary data from field survey reports gathered between the period 2009 and 2014 and covering all the 47 counties of Kenya as established under the constitution of Kenya (2010). Correlation and regression techniques were employed with the county as the unit of analysis. The study used a quantitative approach.

3.3 Conceptual Model

The study focussed on the relationship between Maternal skilled delivery service Utilization and both Maternal Service Provision Readiness and Livelihood. A county's score in Readiness for Service Provision and Livelihood position, explains its level of maternal service utilization. Other potential determinants of utilization are controlled for. Improved service provision readiness according to the model leads to increased utilization of maternal services and reduced maternal deaths and morbidities.

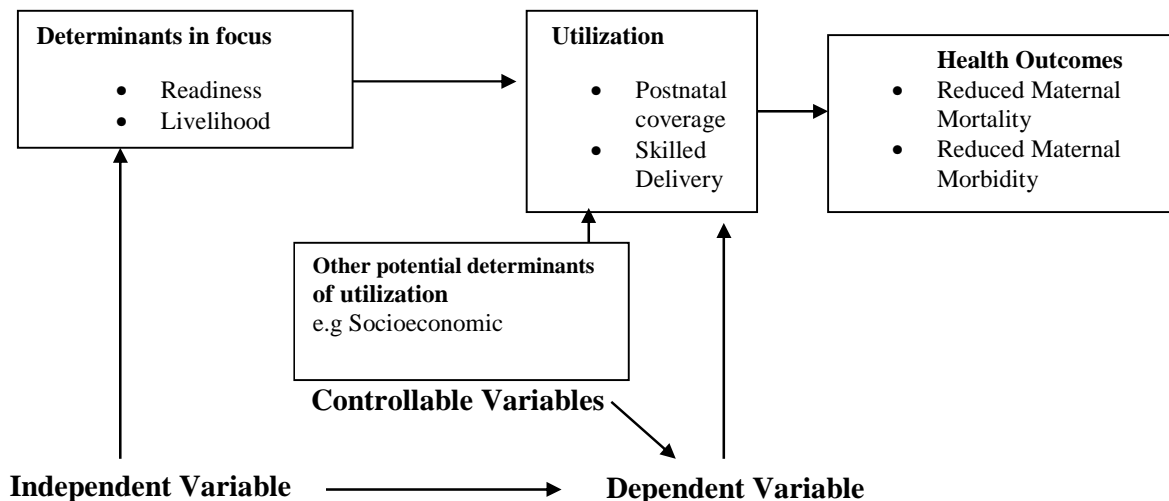


Figure 1: Author's own Conceptual Model

3.4 Empirical Model

The following are the specific empirical models used in the study:

1. Skilled Delivery utilization = $\beta_0 + \beta_1 (\text{Service Provision Readiness})_{i1} + \beta_2 (\text{Nomadic Livelihood})_{i2} + \beta_3 (\text{Education})_{i3} + \beta_4 (\text{Poverty})_{i4} + \beta_5 (\text{Urbanization})_{i5} + \beta_6 (\text{Facility Density})_{i6} + E_i$; where E is the error term and β are the respective coefficients. This is the specific multiple regression model for skilled delivery. Skilled delivery is treated here as continuous measure. (1)
2. The specific probit model function is stated thus: Probability (Acceptable Skilled Delivery)=1/x (service provision readiness, nomadic livelihood, education, poverty, urbanization, facility density) = $\Phi(\mathbf{x}) = \frac{1}{\sqrt{2\pi}} \int_0^x \exp(-v^2/2) dv$, where v is \mathbf{x} (Salvatore and Derrick, 2002). (2)

Prob (y= 1/x) = 1 as $\mathbf{x} \rightarrow \infty$ and similarly Pr (y=1/x) = 0 as $\mathbf{x} \rightarrow -\infty$. X is explanatory variable (readiness, livelihood, controllable variables) and β is coefficients that maximize the log likelihood function, and y represents maternal delivery services utilization (Skilled deliveries coverage) and defined as y= 1 if y \geq 56% for skilled coverage and y = 0 if otherwise.

The parameters β is estimated using maximum likelihood method (ML). The ML estimate of β is the particular vector β^{ML} that gives the greatest likelihood of observing the sample (y_1, y_2, \dots, y_n) , conditional on the explanatory variables x (Long, 1997). The probability of observing $y_i = 1$ is $\Phi(x_i)$ while $y_i = 0$ is $1 - \Phi(x_i)$. Therefore the probability of observing the entire sample is given by:

$L(y/x; \beta) = \prod_{i=1}^n \Phi(x_i)^{y_i} (1 - \Phi(x_i))^{1-y_i}$, and log likelihood is given by $\ln L(y/x; \beta) = \sum_{i=1}^n \{y_i \ln \Phi(x_i) + (1 - y_i) \ln [1 - \Phi(x_i)]\}$. The MLE of β maximizes this log likelihood function (Salvatore and Derrick, 2002)

3.5 Variable Definition

Table 1: Variable Definition

Variable	Variable Type	Measure	Type of Measure
Maternal skilled delivery service utilization	Dependent variable	proportion of women in a county who delivered by skilled attendants	Continuous measure
Maternal Service provision readiness	Independent variable	Mean score computed from antenatal care, basic emergency obstetric and comprehensive obstetric care. Done for dispensary, health centre and hospital. Mean Domain score(SARA reference manual)	Continuous measure
Nomadic livelihood	Independent variable	1= a county has predominant nomadic population or else 0	Ordinal measure
Education	Independent variable	Proportion of women in a county with no education, primary education only, not completed primary school, completed primary school, some secondary school, completed secondary school and those with higher than secondary school education	Continuous measure
Poverty	Independent variable	Proportion of county population living below poverty line	Continuous measure
Urbanization	Independent variable	Proportion of the county population living in the urban centres	Continuous measure
Facility Density	Independent Variable	Number of health facility per 10000 people in a county	Continuous measure
Acceptable Maternal Skilled Delivery Utilization	Dependent Variable	56% = 1 and 0 if otherwise. 56% is the sub-Saharan performance	Binary Outcome- Ordinal

Source: Author

3.6 Population of the Study

The study population is the 47 Counties of Kenya as established under the constitution of Kenya (2010). Data is drawn from all the 47 counties of Kenya.

3.7 Data Sources, Collection and Storage

County level maternal skilled delivery services utilization (the dependent variable) and Education data were collected from Kenya Demographic and Health Survey of 2014(KDHS, 2014) report. Maternal health utilization data is the skilled deliveries coverage. Education data includes proportion of mothers (between 15 and 49 years) with no primary education, some primary education but not completed, completed primary education, some secondary education and completed secondary education. The best correlate was taken as the proxy for education.

Readiness to provide maternal health services data was obtained from Kenya Service Availability and Readiness Assessment Mapping report (Government of Kenya, 2014). The data includes county level composite readiness index, dispensary readiness index, health centres readiness index, and hospital readiness index as computed in the report.

Poverty data captured county poverty index which indicates proportion of county population living below national poverty line and those suffering severe poverty. This data was obtained from spatial dimension of well-being in Kenya, a report based on 2009 census and disseminated through Kenya national bureau of statistics publication (KNBS, 2015).

County urbanization rate data was obtained from Kenya Fact Sheets of 2011 report, a publication of the Kenya Commission for Revenue Allocation (CRA, 2011). It provided county and ward level data on the proportion of population living in the urban areas. Only the county level data was collected. Information for identification of nomadic counties was obtained from studies on nomadic peoples of Kenya (Mohammed, 2002; Walz, 1992; Schilling, 2012) and the author's own knowledge of the country. Livelihood data is ordinal (nomadic county=1, and 0 if otherwise). A nomadic county was one with a dominant indigenous nomadic community. All these explanatory variables formed the background characteristics each county.

Data was collected directly from the above secondary sources into excel spreadsheet. Maternal health services utilization data was entered both as continuous variable and as binary outcome (acceptable=1 and 0 if otherwise, in relation to sub-Saharan performance). Education data are continuous variables and so are Maternal Readiness, poverty, urbanisation and facility density.

CHAPTER FOUR: DATA ANALYSIS AND DISCUSSION OF RESULTS

4.1 Introduction

This chapter provides how data was analysed, the findings and discussion of the results with respect to the study objectives. The chapter starts with descriptive statistics of all variables in the study and include mean, standard deviation, coefficient of variation and sample mean t-test. This responds to the first objective of the study which was to determine the existence and extents of maternal services production and consumption disparities. Results of the association between nomadic livelihood and unacceptable maternal skilled utilization using ² is given in this section too. The objective was to establish the validity of the claim of association between nomadic livelihood and poor access to maternal health services.

The next section gives the results of skilled delivery coverage and its correlates. The most correlated ((Pearson's moment of correlation at $p < 0.05$)) variable from each category of variables representing a concept proceeded for inclusion in subsequent analysis. This was not only to help pick the best proxy indicator but also to avoid multicollinearity in the subsequent regression analysis. Parametric assumption tests results which includes normality, multicollinearity and homogeneity of variance are given. The rest of the chapter concentrates on the results of regression (multiple linear regression and probit regression), regression diagnostics and discussion of the results. The section responds to the second study objective which was to determine whether Service Provision Readiness and Livelihood can be of predictive value to maternal skilled delivery Utilization for purposes of policy formulation, management and practice decisions. The discussion includes theoretical considerations and comparison with empirical findings from the literature. All statistical tests were done at 95% confidence level.

4.2 Data Analysis

Data from the various sources were entered directly into excel spread sheet. Skilled delivery coverage (dependent variable) data was entered as continuous and as binary outcome (1 for 56 and 0 if otherwise) measures. Nomadic Livelihood was entered as dummy variable (Nomadic county=1 and 0 if otherwise). Data was then screened to eliminate mistakes and ensure completeness and eventually exported to STATA-12 and SPSS-20 softwares for analysis. Data was initially explored to test parametric assumptions (normality, homoscedasticity and multicollinearity). Further analysis was done using STATA-12. The following analysis methods were deployed as per the objectives.

4.2.1 Descriptive Statistics

Tables 2a and 2b and 2c below contain Descriptive statistics (descriptives and frequencies), which includes mean, Standard deviation, coefficients of variation and selected frequencies. Frequency table for all the variables is given in appendix 4. Descriptive statistics helped to among others identify and quantify disparities in maternal services readiness (production) in the dispensaries, health centres and hospitals and similarly on consumption of skilled delivery services.

Table 2a: Descriptives Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Dispensary Readiness	47	17.00	42.00	29.2128	6.46709
Health Centre Readiness	47	27.00	58.00	43.2128	7.79614
Hospital Readiness	47	20.00	84.00	60.4894	14.19258
Composite Readiness	47	23.00	66.00	43.0213	12.68942
No Education	47	.20	76.90	14.7617	23.03134
Some Primary	47	8.90	51.60	27.2617	11.30232
Completed Primary	47	3.10	39.10	22.7426	8.69367
Some secondary	47	1.20	25.20	14.1830	5.99080
Completed Secondary	47	2.50	27.90	12.7489	6.46888
Poverty	47	21.80	87.50	49.0362	16.58668
Severe Poverty	47	1.20	30.80	5.8681	6.49662
Urbanisation	47	6.60	100.00	25.6638	20.16542
Nomadism	47	.00	1.00	.2979	.46227
Skilled Delivery	47	18.30	93.40	55.9617	19.72079
Acceptable Skilled Delivery	47	.00	1.00	.4681	.50437
Facility Density	47	.76	3.65	1.9223	.60702
Valid N (listwise)	47				

Source: SPSS 20. Output

Table 2a shows that counties differ in terms of results of their investments to improve maternal services provision readiness across all the three levels of health care as demonstrated by standard deviations in dispensaries (std. dev 6.47), health centres (std. dev.,7.8) and hospitals(std. dev, 14.19). The findings reveal that dispensaries were on average the least prepared (mean readiness score, 29.2%) followed by Health Centres (mean, 43.2%). Hospitals were on average most ready to provide maternal services (mean, 60.5%). Disparity in Service Provision readiness was least in health centres followed by dispensaries

and hospitals as revealed by their coefficients of variations (0.18, 0.22, and 0.23 respectively). Large disparities existed too in the utilization of maternal skilled delivery services (range 18% - 93.4%, and standard deviation 19.72% coverage). These findings are in support of RBT which asserts that organizations differ in terms of resource endowment and exploitation. They also differ in terms of performance and this could again be attributed to resource heterogeneities.

Frequency statistics presented below provides the distribution of nomadic livelihood countywise and maternal delivery coverage achievement relative to Sub-Saharan.

Table 2b: Frequency Nomadism

Nomadism				
	Frequency	Percent	Valid Percent	Cumulative Percent
.00	33	70.2	70.2	70.2
Valid 1.00	14	29.8	29.8	100.0
Total	47	100.0	100.0	

Source: SPSS 20 Output

Table 2c: Acceptable Skilled Delivery Frequency

Acceptable Skilled Delivery				
	Frequency	Percent	Valid Percent	Cumulative Percent
.00	25	53.2	53.2	53.2
Valid 1.00	22	46.8	46.8	100.0
Total	47	100.0	100.0	

Source: SPSS20 Output

Tables 2b indicates that nomadic counties represent approximately 30% of Kenya's counties. Table 2c shows that 46.8% of Kenya's counties achieved 56% skilled delivery coverage (1= acceptable skilled delivery coverage and Sub-Saharan average coverage = 56%). Majority of the counties performed below average.

4.2.2 ANOVA

Table 3 below is ANOVA results from SPSS 20 output on nomadic livelihood with maternal service provision Readiness (all levels) and maternal skilled delivery utilization. The

following hypotheses formed the basis for the tests: **Null Hypothesis 1:** There is no significant mean difference in maternal service provision readiness between nomadic and non-nomadic counties; **Null Hypothesis 2:** There is no significant mean difference in the utilization of maternal skilled delivery service between nomadic and non-nomadic counties; **Null Hypothesis 3:** There is no significant difference in acceptable maternal skilled delivery utilization between nomadic and non-nomadic counties.

Table 3: ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Dispensary Readiness * Nomadism	Between Groups	(Combine d)	146.736	1	146.736	3.716	.060
	Within Groups		1777.136	45	39.492		
	Total		1923.872	46			
Health Centre Readiness * Nomadism	Between Groups	(Combine d)	170.833	1	170.833	2.929	.094
	Within Groups		2625.039	45	58.334		
	Total		2795.872	46			
Hospital Readiness * Nomadism	Between Groups	(Combine d)	161.561	1	161.561	.799	.376
	Within Groups		9104.184	45	202.315		
	Total		9265.745	46			
Composite Readiness * Nomadism	Between Groups	(Combine d)	119.671	1	119.671	.739	.395
	Within Groups		7287.307	45	161.940		
	Total		7406.979	46			
Skilled Delivery * Nomadism	Between Groups	(Combine d)	6489.305	1	6489.305	25.614	.000
	Within Groups		11400.526	45	253.345		
	Total		17889.831	46			

Source: SPSS output

Null Hypotheses 1 is not rejected since computed probabilities > 0.05 . There was no significant difference in service provision readiness between nomadic and non-nomadic counties. However Null Hypothesis 2 is rejected since the computed probability is less than 0.05. There was significant difference in maternal skilled delivery service utilization between nomadic and non-nomadic counties. The implication of these findings is that maternal service provision readiness does not explain differences that exist in maternal skilled delivery

utilization between nomadic and non-nomadic counties. Nomadic counties had lower maternal skilled delivery service utilization compared to non-nomadic counties. There was disparity between nomadic and non-nomadic counties in terms of utilization of maternal skilled delivery service. Hypothesis 3 is tested in the subsequent section for the test of association.

4.2.3 Test of Association

It had been noted in the end-term review of KHSSP II that northern regions of Kenya did not perform well in terms of all health outcomes including in maternal health. Table 4 below is a contingency table of results extracted from SPSS 20 output.

Null hypothesis 3: There was no association between Nomadic livelihood and Acceptable Utilization of Maternal Delivery Services.

Table 4: Contingency Table

Nomadism 1	Acceptable Skilled Deliveries coverage 1	Unacceptable Skilled Deliveries Coverage 0	
1	2	12	14
0	20	13	33
	22	25	47

Pearson χ^2 (1) = 8.4707, Pr= 0.004, df2

Source: SPSS 20 Output

Since the computed value lies in the rejection area ($p=0.05$) of χ^2 distribution (computed > critical value), it is concluded that there was significant association between nomadic livelihood and poor skilled delivery coverage. This supports too the theory of health seeking behaviour as espoused by Anderson (1968). Nomadic populations have heteronomy characteristics in health decisions. The finding supports the assertion in the end term review that northern counties did not register improvements in maternal health outcomes relative to the rest of the counties. It also supports the assertion that maternal health outcomes are premised on access to maternal health services. Access is key to health outcomes improvements.

4.2.4 Correlation

Pearson’s coefficient of correlation (r) was used to analyse relationships between utilization and County background characteristics in order to isolate explanatory variables to be used for the multiple regression and probit model construction and analysis. The following guided the

interpretation of the results: Perfect correlation ($r=1$ or -1); near perfect correlation ($0.9 < r < 1$); very good correlation ($0.5 < r < 0.9$); good correlation ($0.3 < r < 0.5$); moderately good correlation ($0.1 < r < 0.3$); weak correlation ($0 < r < 0.1$); no correlation ($r=0$).

Table 5: Correlation

	readdis	readheal	readhosp	readcomp	litnone	litsomep	litpc
readdis	1.0000						
readheal	0.3660*	1.0000					
readhosp			1.0000				
readcomp	0.4222*			1.0000			
litnone		-0.2761			1.0000		
litsomep					-0.3346*	1.0000	
litpc					-0.8621*		1.0000
litsecsom	0.2492				-0.8457*		0.7297*
litsecc					-0.6384*	-0.3998*	0.6181*
poverty		-0.3186*			0.7785*		-0.6655*
Spoverty					0.5417*		-0.4231*
urbanisa						-0.4357*	
nomadism	-0.2762	-0.2472			0.7619*	-0.2716	-0.6875*
SKILLEDD		0.3073*			-0.6867*		0.7057*
fdensity							

	litsec-m	litsecc	poverty	Spoverty	urbanisa	nomadism	SKILLEDD
litsecsom	1.0000						
litsecc	0.5924*	1.0000					
poverty	-0.6821*	-0.7239*	1.0000				
Spoverty	-0.5856*	-0.4745*	0.6619*	1.0000			
urbanisa		0.5342*	-0.3876*		1.0000		
nomadism	-0.6889*	-0.4797*	0.6127*	0.2855		1.0000	
SKILLEDD	0.5458*	0.7485*	-0.7407*	-0.4415*	0.3828*	-0.6023*	1.0000
fdensity							

	fdensity
fdensity	1.0000

Source: SPSS 20 Output

The results in the table indicate that Skilled delivery is correlated with health centre readiness ($r= 0.307$, $p<0.05$), Education, poverty, urbanization and Nomadism. There is a good positive correlation with health centre readiness. Education variables with exception of some primary education are strongly correlated with skilled delivery. Lack of education is associated with decreasing skilled delivery coverage. Completion of secondary education had the strongest positive correlation ($r = 0.748$, $p< 0.01$) with skilled delivery. Poverty is more strongly correlated ($r= - 0.704$, $p< 0.01$) with skilled delivery than severe poverty ($r= -0.441$, $p<0.01$).

Increasing Poverty index was associated with low skilled delivery coverage. Urbanization had positive and good correlation($r=0.384$, $p < 0.01$) with skilled delivery. Nomadism is again associated with low skilled delivery($r = - 0.602$, $p < 0.01$). Interestingly facility density had no correlation with skilled delivery coverage. Facility density was picked as a proxy to distance. This result is not surprising since distance, from the literature review, drew mixed results (Kye et al. 2012; Lohela et al. 2012; Nesbitt et al. 2014 as cited by Wang et al. 2014). Wang et. al (2014) observed mixed results in the Malawi and Zambia study in regard to the influence of facility distance and consumption of maternal health services.

The demand side variables were more strongly associated with utilization compared to the supply side. Therefore Maternal delivery patterns noted across counties of Kenya could be explained by maternal health service provision readiness in health centres, proportion of women who have completed secondary education, Poverty index of a county, Urbanization and Nomadic Livelihood. These are the variables that proceeded to regression analysis.

4.3 Tests of Parametric Assumption

Parametric tests were carried out to ensure that regression assumptions were met. Normality tests done included Shapiro – Wilk test and normality plot on skilled delivery coverage, the dependent variable. Multicollinearity tests included variable inflation factor (VIF) while Homoscedasticity tests were levene and boxplot (skilled delivery and nomadic livelihood). These tests helped in the selection of appropriate method of analysis.

4.3.1 Normality Test

Data is considered normally distributed if the distribution of all scores are symmetrical around its mean. Normality tests were done on skilled maternal coverage, the dependent variable. Shapiro- Wilk was used because the data size was less than 50. Table 6a and 6b below provide Normality results for skilled delivery.

Table 6a: Test of Normality

	Tests of Normality					
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Skilled Delivery	.082	47	.200*	.976	47	.446

*. This is a lower bound of the true significance.

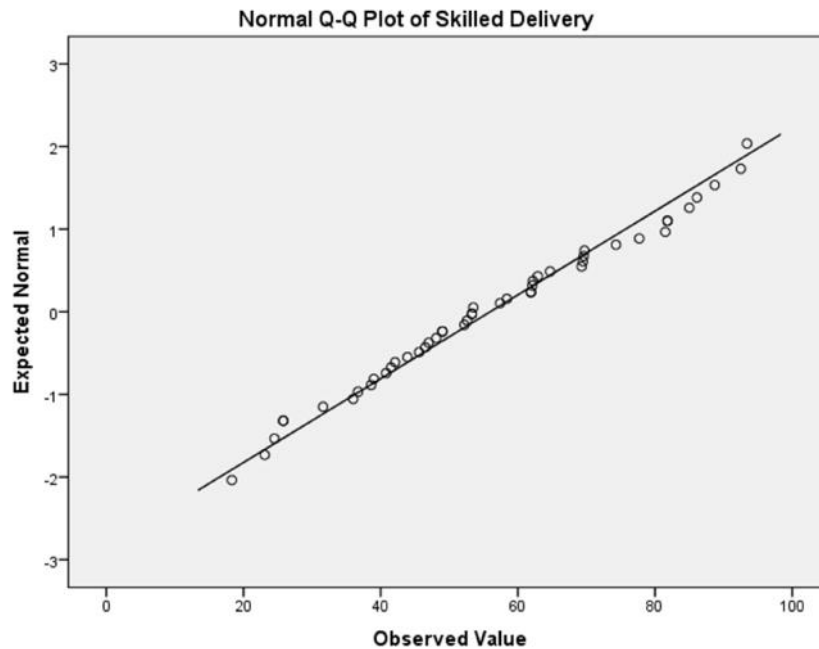
a. Lilliefors Significance Correction

Source: SPSS output

H₀ : There is normal distribution .

Probability value > 0.05 and therefore falls in the non-rejection area. Therefore Skilled delivery is normally distributed. Shapiro- Wilk statistic is 0.976 which is greater than 0.5 indicating normality. There is an agreement with the normality plot in graph 6 below. Skilled delivery data is normally distributed

Figure 2: Normality Plot



Source: SPSS 20 Output

4.3.2 Tests of Homoscedasticity

The study employed Boxplot visual and levene tests to test for equal variances in skilled coverage values and Nomadic livelihood. Table 7 shows the findings with skilled delivery data

Table 7: Test of Homogeneity of Variance

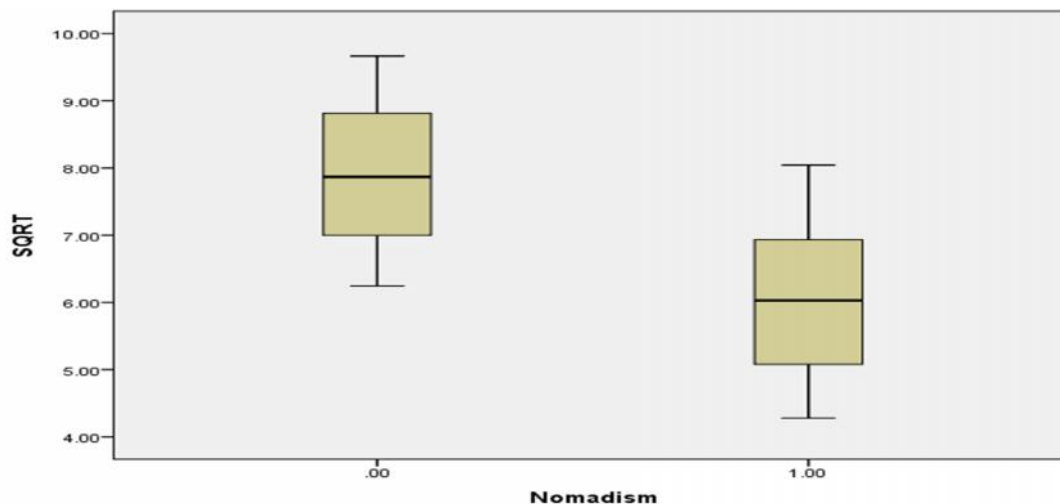
	Levene Statistic	df1	df2	Sig.
Based on Mean	.137	1	45	.713
Skilled Based on Median	.147	1	45	.703
Deliver Based on Median and with adjusted df	.147	1	43.093	.704
y Based on trimmed mean	.139	1	45	.711

Source: SPSS output

H_0 : Variance is constant

Probability > 0.05 implying that the null hypothesis is not rejected. The variance is constant and therefore there is homogeneity. Skilled Delivery can be used in regression analysis. Levene Statistic finding is supported by boxplot visual graph.

Figure 3: Boxplot



4.4 Multiple Linear Regression Model

Table 10 below provides the results of regression of skilled delivery on the selected explanatory variables (health centre readiness, education, poverty, urbanization and nomadic livelihood).

Table 8: Multiple Regression Model

```
. regress SKILLEDD readheal litsecc poverty urbanisa nomadism
```

Source	SS	df	MS	Number of obs = 47
Model	12156.0179	5	2431.20357	F(5, 41) = 17.38
Residual	5733.81319	41	139.849102	Prob > F = 0.0000
				R-squared = 0.6795
				Adj R-squared = 0.6404
Total	17889.8311	46	388.909371	Root MSE = 11.826

SKILLEDD	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
readheal	.2459971	.239937	1.03	0.311	-.2385654 .7305597
litsecc	1.328459	.4286913	3.10	0.004	.4626995 2.194219
poverty	-.3155075	.1743683	-1.81	0.078	-.6676514 .0366365
urbanisa	-.0059547	.103353	-0.06	0.954	-.2146804 .2027709
nomadism	-8.657634	4.800535	-1.80	0.079	-18.35251 1.037243
_cons	46.5167	17.6258	2.64	0.012	10.92068 82.11271

```
. estat vif
```

Variable	VIF	1/VIF
poverty	2.75	0.363452
litsecc	2.53	0.395325
nomadism	1.69	0.590118
urbanisa	1.43	0.699908
readheal	1.15	0.868857
Mean VIF	1.91	

Source: STATA 12 Output

Readiness of health centres (readheal), completion of secondary education (litsecc) were selected for the model because in their groups they were most correlated with maternal skilled delivery utilization. The model findings reveal that improving health centres readiness score by one unit would increase utilization of county maternal skilled delivery service by 24.6% with other factors held constant. Similarly increasing the proportion of girls completing secondary education by 100% would result into 132% increase in county maternal skilled delivery coverage, other factors remaining constant. On the other hand reducing poverty by one unit would result into increased maternal delivery coverage by 31.6%. While when a nomadic county changes to non-nomadic, skilled delivery according to the model reduces by 8.6 units , other factors kept constant. Urbanization produces approximately no change in skilled delivery utilization according to the model. 67.95% (R²)

of variations in skilled deliveries were explained by the explanatory variables in the model while 32.05% could be explained by errors and other variables not included in the model. However changes in Health centre scores and urbanisation cannot significantly change maternal delivery service utilization ($t < 2$). IVF is less than 10 indicating that there is no colinearity influence.

4.5 Probit Model

This model was used to analyse the likelihood of a county realizing acceptable level of performance (maternal skilled delivery coverage) given their current background characteristics. Table 9 below provides a STATA output of probit regression model with acceptable maternal skilled delivery utilization as a binary dependent variable and health centre readiness, nomadic livelihood, education and urbanisation as independent variables.

Table 9: Probit Model

```

Probit regression                Number of obs =      47
                                LR chi2(5)         =     25.96
                                Prob > chi2          =     0.0001
Log likelihood = -19.503527      Pseudo R2         =     0.3996

```

SKILLEDDACC	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
readheal	.0027628	.0322169	0.09	0.932	-.0603811	.0659068
litsecc	.1235114	.0549558	2.25	0.025	.0157999	.2312228
poverty	-.0216969	.0247914	-0.88	0.381	-.0702871	.0268933
urbanisa	.0059662	.0188792	0.32	0.752	-.0310363	.0429687
urbanisa	0 (omitted)					
nomadism	-.6086704	.6196541	-0.98	0.326	-1.82317	.6058294
_cons	-.7736215	2.256528	-0.34	0.732	-5.196336	3.649093

. mfx

```

Marginal effects after probit
y = Pr(SKILLEDDACC) (predict)
= .43182987

```

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]	X
readheal	.0010861	.01266	0.09	0.932	-.02373	.025902		43.2128
litsecc	.0485528	.02175	2.23	0.026	.005918	.091187		12.7489
poverty	-.0085291	.00966	-0.88	0.377	-.027465	.010407		49.0362
urbanisa	.0023453	.00745	0.31	0.753	-.012255	.016946		25.6638
nomadism*	-.2292661	.21667	-1.06	0.290	-.653933	.195401		.297872

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Source: STATA 12 output

The result of this analysis was intended to answer the following questions: Does maternal services readiness and livelihood influence county's ability to achieve acceptable performance (acceptable maternal skilled delivery coverage)? What is the predictive value of this model? These questions are captured by the second objective of the research. According to the model coefficients, readiness of health centres, education and urbanization would result in increased likelihood of a county realizing acceptable level of skilled delivery coverage (56%) while nomadic livelihood and poverty decrease that likelihood. However changes in all the variables with exception of education do not result in significant changes in predicted probabilities since $p > 0.05$ for the coefficients. The extents of these effects are captured by their respective marginal effects.

The marginal effects were computed with independent variables held at their means. The `mfx` command function of STATA computes marginal effects with independent variables held at their means (Long, 1997). According to the model, one unit increase in health centre readiness score increases the predicted probability of a county realizing acceptable skilled delivery utilization by Only 0.1% when all the other variables are held at their means. Moving a county from nomadic to non-nomadic causes the predicted probability of acceptable skilled delivery utilization to increase by 22.9% when the other independent variables are held at their means. Again a unit decrease in Poverty index increases the predicted probability of acceptable skilled delivery of a county by 0.85%, other factors held at their means. Education provides better changes of 4.9% under similar conditions. According to this model better performance by counties are driven by non-supply factors.

CHAPTER FIVE: SUMMARY OF THE FINDINGS AND CONCLUSION

5.1 Introduction

This chapter provides a summary of the findings and discussion as per the objectives. It also provides conclusion, recommendations, study limitations and suggestions for further research.

5.2 Summary of Findings and Discussion

There were regional county disparities in the production of maternal health services and in the consumption of skilled delivery services in Kenya. These disparities existed across all the three KEPH levels. Hospitals were the most affected in terms of readiness score disparity followed by dispensaries. Hospitals had on average higher maternal readiness score followed by health centres and dispensaries. Health centres had the least readiness score disparity. Health centres readiness was positively and significantly correlated with skilled delivery utilization. Therefore from the supply side, it was only the health centres which could explain skilled delivery utilization differentials across counties of Kenya. There was no significant difference in readiness scores between nomadic and non-nomadic counties. Therefore nomadic livelihood did not affect supply-side investment decision. Nomadic counties had significant poor skilled delivery coverage compared to non-nomadic counties despite absence of resource differences as determined by readiness scores. This performance disparity may be attributed to nomadic livelihood. The demand-side factors were more important than supply-side factors in explaining maternal skilled delivery utilization differentials (had stronger Pearson's coefficient of correlation).

Skilled Delivery Coverage) = 46.5167 + 0.249971(Health Centre Readiness) + 1.328459 (Education) – 0.31155075(Poverty) – 0.0059547 Urbanisation -8.6576(Nomadic Living), is the multivariate linear model explaining skilled delivery coverage in the counties of Kenya. Again significant changes in skilled delivery coverage can only be obtained by investing in improving women education, reducing the influence of nomadic living and poverty eradication programmes. This model however lacks predictive power due to larger standard errors. Binary choice model (Probit model) is also useful in estimating, explaining and predicting acceptable skilled delivery utilization possibilities across counties of Kenya. Health centres and nomadic living were influencer's of acceptable maternal skilled delivery utilization. The likelihood of obtaining and maintaining better performance (higher than sub-

Saharan delivery coverage, 57%) is affected most by woman's education. The other factors in the study were not significant in influencing predicted probabilities.

Disparities noted are in consonant with RBT which attributes differences in organizations performance in the same industry to resource heterogeneity. There was no evidence on dispensary and hospitals contribution to utilization differentials. According to RBT, not all resources are responsible for success. The study provided evidence that Health centre is a strategic resource driving performance in skilled delivery services. Nomadic livelihood was significantly associated with poor maternal skilled delivery utilization. This confirmed KSSH- II end term review which observed that the northern region of Kenya, a predominant nomadic population, registered poor performance improvement in maternal health outcomes compared to the rest of the regions. Maternal health outcomes are improved through increased utilization of health services. Nomadic population is heteronomic in the heteronomy- autonomy continuum in as far as general health care consumption is concerned. Heteronomy is prevalent in nomadic population and is known to contribute to poor health-seeking behaviour (Anderson, 1968). The influences of Nomadic livelihood, Poverty, literacy and health centre readiness on utilization confirmed the health seeking behaviour models as espoused by: Andersen (1968); Rebban (2010); Hess (2007). The nature and levels of influence of these factors depend on contexts which include time, regions and unit of analysis among others.

5.3 Conclusion

Disparities exist in the production and consumption of maternal health services in Kenya. Health centre is the most important supply-side factor driving maternal health delivery utilization differences across counties of Kenya. Nomadic livelihood drives down competitiveness of counties in the provision maternal skilled deliveries. Demand side factors more than supply exert influence on the utilization of skilled delivery services. Readiness to provide maternal health services in health centres and nomadic livelihood partly explain maternal skilled delivery utilization differentials in Kenya. The suggested predictive models though generally useful lack explanatory power and therefore may not be accurate in predicting the magnitude of changes but nonetheless provide a general direction for maternal health services investment. Facility density does not account for maternal utilization patterns in Kenya. This study supports the theories of health seeking behaviour and RBT.

5.4 Recommendations

Kenya's state department for health and the county governments should focus on investments in health centres to improve county health centre readiness scores so as to achieve equitable access to maternal skilled delivery services across the country. Investing in health centres as opposed to hospitals and dispensaries helps in reducing disparities in the utilization of maternal skilled delivery services in Kenya. Since education falls under the mandate of the national government of Kenya this study recommends the strengthening of policies to ensure improvements in the proportions of girls completing at least secondary education. Education is associated with better utilization of maternal skilled delivery services. Nomadic communities require special treatment. This study recommends that a study should be conducted further to find ways of minimizing the influence current nomadic livelihood on maternal health utilization.

5.5 Limitations of the Study

This study used secondary data and the quality of these data is not guaranteed. Again the study was a cross sectional design but with data obtained at different points in time. For example data on readiness reflected the situation of the counties as at 2013, the data on poverty was drawn from census report of 2009 and maternal utilization data obtained in 2014. It is not known to what extent the above issues could have affected the findings. Additionally it is recommended that regression analysis should have a minimum population of 50 (Carmen, 2007) but this study had 47 instead. This violation may have affected the findings. Again the derivation or concept of acceptable utilization was based on sub-Saharan performance. This is thought to be subjective and not based on scientific findings. Its use in this study was borrowed from management practice of benchmarking. This drawback however would affect comparative studies as scholars interested in the subject may use different benchmarks. Sub-Saharan, the performance benchmark, isn't static.

The last limitation is again on the use of cross-sectional data. Standard errors tend to rise with these data and the coefficients may not be stable as organizations change over time. Firm specific and time variations are never accounted for. It is generally recommended that pooled and cross-sectional data (Time series) would make generalization better with stabilized regression coefficients.

5. 6 Suggestions for Further Research

Opportunity for further research in the subject matter exists thus: it would be interesting to compare the findings with lower the units of analysis such as the sub-county. The population of the study would be much bigger; a second study is suggested to come up with a standard acceptable utilization levels. This will provide a standard upon which such studies can be replicated; thirdly, RBT is an efficiency theory. Utilization should therefore be premised on efficiency. Actual performance would then be calculated relative to expected performance given the level of readiness score. Deterministic and stochastic methods exist for estimating production frontiers. Such a method would help provide true performance given a level of resources. It would be interesting to compare the findings of such a study with this study; lastly a study is suggested using pooled cross-sectional data (with time series).

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APPENDICES

Appendix 1: Frequency Table

Statistics																
	Dispen sary Readin ess	Health Centre Readin ess	Hospita l Readin ess	Compo site Readin ess	NoEduca tion	Som e Prim ary	Comple ted Primary	Some second ary	Comple ted Second ary	Pove rty	Seve re Pove rty	Urbanisa tion	Nomad ism	Skille d Deliv ery	Accept able Skilled Deliver y	Facil ity Den sity
Valid	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47
N Missi ng	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Frequency Table

Dispensary Readiness				
	Frequency	Percent	Valid Percent	Cumulative Percent
	17.00	1	2.1	2.1
	19.00	1	2.1	4.3
	21.00	1	2.1	6.4
	22.00	5	10.6	17.0
	23.00	3	6.4	23.4
	24.00	4	8.5	31.9
	25.00	2	4.3	36.2
	26.00	1	2.1	38.3
	27.00	3	6.4	44.7
	28.00	3	6.4	51.1
	29.00	1	2.1	53.2
Valid	30.00	1	2.1	55.3
	31.00	2	4.3	59.6
	32.00	5	10.6	70.2
	33.00	2	4.3	74.5
	34.00	2	4.3	78.7
	35.00	2	4.3	83.0
	36.00	2	4.3	87.2
	39.00	2	4.3	91.5
	40.00	1	2.1	93.6
	41.00	1	2.1	95.7
	42.00	2	4.3	100.0
	Total	47	100.0	100.0

Health Centre Readiness

	Frequency	Percent	Valid Percent	Cumulative Percent
27.00	1	2.1	2.1	2.1
29.00	1	2.1	2.1	4.3
30.00	1	2.1	2.1	6.4
32.00	1	2.1	2.1	8.5
33.00	2	4.3	4.3	12.8
34.00	1	2.1	2.1	14.9
35.00	1	2.1	2.1	17.0
36.00	3	6.4	6.4	23.4
37.00	1	2.1	2.1	25.5
39.00	2	4.3	4.3	29.8
40.00	3	6.4	6.4	36.2
41.00	3	6.4	6.4	42.6
42.00	1	2.1	2.1	44.7
Valid 43.00	3	6.4	6.4	51.1
44.00	3	6.4	6.4	57.4
45.00	3	6.4	6.4	63.8
46.00	1	2.1	2.1	66.0
47.00	3	6.4	6.4	72.3
48.00	2	4.3	4.3	76.6
50.00	2	4.3	4.3	80.9
52.00	2	4.3	4.3	85.1
53.00	1	2.1	2.1	87.2
54.00	1	2.1	2.1	89.4
55.00	3	6.4	6.4	95.7
57.00	1	2.1	2.1	97.9
58.00	1	2.1	2.1	100.0
Total	47	100.0	100.0	

Hospital Readiness

	Frequency	Percent	Valid Percent	Cumulative Percent
20.00	2	4.3	4.3	4.3
32.00	1	2.1	2.1	6.4
40.00	1	2.1	2.1	8.5
41.00	2	4.3	4.3	12.8
45.00	1	2.1	2.1	14.9
46.00	1	2.1	2.1	17.0
48.00	1	2.1	2.1	19.1
50.00	1	2.1	2.1	21.3
54.00	1	2.1	2.1	23.4
55.00	1	2.1	2.1	25.5
56.00	2	4.3	4.3	29.8
57.00	1	2.1	2.1	31.9
58.00	1	2.1	2.1	34.0
60.00	5	10.6	10.6	44.7
Valid 62.00	1	2.1	2.1	46.8
63.00	1	2.1	2.1	48.9
64.00	2	4.3	4.3	53.2
65.00	2	4.3	4.3	57.4
66.00	2	4.3	4.3	61.7
67.00	1	2.1	2.1	63.8
68.00	2	4.3	4.3	68.1
69.00	1	2.1	2.1	70.2
70.00	4	8.5	8.5	78.7
73.00	4	8.5	8.5	87.2
75.00	2	4.3	4.3	91.5
76.00	2	4.3	4.3	95.7
79.00	1	2.1	2.1	97.9
84.00	1	2.1	2.1	100.0
Total	47	100.0	100.0	

Composite Readiness

	Frequency	Percent	Valid Percent	Cumulative Percent
23.00	1	2.1	2.1	2.1
24.00	2	4.3	4.3	6.4
25.00	1	2.1	2.1	8.5
27.00	1	2.1	2.1	10.6
28.00	1	2.1	2.1	12.8
30.00	2	4.3	4.3	17.0
31.00	1	2.1	2.1	19.1
32.00	1	2.1	2.1	21.3
33.00	1	2.1	2.1	23.4
34.00	2	4.3	4.3	27.7
35.00	2	4.3	4.3	31.9
36.00	3	6.4	6.4	38.3
37.00	2	4.3	4.3	42.6
38.00	2	4.3	4.3	46.8
40.00	1	2.1	2.1	48.9
41.00	1	2.1	2.1	51.1
Valid 42.00	2	4.3	4.3	55.3
43.00	2	4.3	4.3	59.6
44.00	1	2.1	2.1	61.7
48.00	2	4.3	4.3	66.0
50.00	2	4.3	4.3	70.2
51.00	2	4.3	4.3	74.5
52.00	1	2.1	2.1	76.6
53.00	1	2.1	2.1	78.7
55.00	1	2.1	2.1	80.9
59.00	1	2.1	2.1	83.0
60.00	1	2.1	2.1	85.1
62.00	1	2.1	2.1	87.2
63.00	2	4.3	4.3	91.5
64.00	2	4.3	4.3	95.7
65.00	1	2.1	2.1	97.9
66.00	1	2.1	2.1	100.0
Total	47	100.0	100.0	

NoEducation

	Frequency	Percent	Valid Percent	Cumulative Percent
.20	1	2.1	2.1	2.1
.30	1	2.1	2.1	4.3
.40	2	4.3	4.3	8.5
.50	1	2.1	2.1	10.6
.80	4	8.5	8.5	19.1
.90	3	6.4	6.4	25.5
1.10	2	4.3	4.3	29.8
1.20	2	4.3	4.3	34.0
1.30	1	2.1	2.1	36.2
1.50	1	2.1	2.1	38.3
1.60	1	2.1	2.1	40.4
1.70	1	2.1	2.1	42.6
1.90	2	4.3	4.3	46.8
2.00	1	2.1	2.1	48.9
2.30	1	2.1	2.1	51.1
2.60	2	4.3	4.3	55.3
3.90	1	2.1	2.1	57.4
4.00	1	2.1	2.1	59.6
4.10	1	2.1	2.1	61.7
Valid 5.80	1	2.1	2.1	63.8
6.60	1	2.1	2.1	66.0
9.30	1	2.1	2.1	68.1
13.40	1	2.1	2.1	70.2
15.50	1	2.1	2.1	72.3
17.00	1	2.1	2.1	74.5
18.00	1	2.1	2.1	76.6
20.40	1	2.1	2.1	78.7
21.70	1	2.1	2.1	80.9
33.80	1	2.1	2.1	83.0
39.70	1	2.1	2.1	85.1
41.70	1	2.1	2.1	87.2
55.70	1	2.1	2.1	89.4
61.90	1	2.1	2.1	91.5
64.10	1	2.1	2.1	93.6
72.70	1	2.1	2.1	95.7
75.90	1	2.1	2.1	97.9
76.90	1	2.1	2.1	100.0
Total	47	100.0	100.0	

Some Primary

	Frequency	Percent	Valid Percent	Cumulative Percent
	8.90	1	2.1	2.1
	9.60	1	2.1	4.3
	9.90	2	4.3	8.5
	10.40	1	2.1	10.6
	11.50	1	2.1	12.8
	12.80	1	2.1	14.9
	14.70	1	2.1	17.0
	15.90	1	2.1	19.1
	16.00	1	2.1	21.3
	17.10	1	2.1	23.4
	17.80	1	2.1	25.5
	18.80	1	2.1	27.7
	19.40	1	2.1	29.8
	19.80	1	2.1	31.9
	21.10	1	2.1	34.0
	21.60	1	2.1	36.2
	22.50	1	2.1	38.3
	22.60	1	2.1	40.4
	23.70	1	2.1	42.6
	24.10	1	2.1	44.7
	25.10	1	2.1	46.8
	27.70	1	2.1	48.9
	28.00	1	2.1	51.1
	28.60	1	2.1	53.2
	28.80	1	2.1	55.3
Valid	30.00	2	4.3	59.6
	32.00	1	2.1	61.7
	33.30	1	2.1	63.8
	34.10	1	2.1	66.0
	35.00	1	2.1	68.1
	35.40	1	2.1	70.2
	35.70	1	2.1	72.3
	35.80	1	2.1	74.5
	37.40	1	2.1	76.6
	37.80	1	2.1	78.7
	38.20	1	2.1	80.9
	38.70	1	2.1	83.0
	39.10	1	2.1	85.1
	39.30	1	2.1	87.2
	39.70	1	2.1	89.4
	39.80	1	2.1	91.5
	41.00	1	2.1	93.6
	41.20	1	2.1	95.7
	49.90	1	2.1	97.9
	51.60	1	2.1	100.0
	Total	47	100.0	100.0

Completed Primary

	Frequency	Percent	Valid Percent	Cumulative Percent
3.10	1	2.1	2.1	2.1
3.70	1	2.1	2.1	4.3
4.60	1	2.1	2.1	6.4
5.70	1	2.1	2.1	8.5
7.30	1	2.1	2.1	10.6
10.30	1	2.1	2.1	12.8
12.00	1	2.1	2.1	14.9
13.50	1	2.1	2.1	17.0
16.10	1	2.1	2.1	19.1
17.30	1	2.1	2.1	21.3
17.90	1	2.1	2.1	23.4
18.10	1	2.1	2.1	25.5
18.50	1	2.1	2.1	27.7
19.30	1	2.1	2.1	29.8
19.80	1	2.1	2.1	31.9
21.00	1	2.1	2.1	34.0
21.90	1	2.1	2.1	36.2
22.00	1	2.1	2.1	38.3
22.90	1	2.1	2.1	40.4
23.40	1	2.1	2.1	42.6
23.50	1	2.1	2.1	44.7
23.90	1	2.1	2.1	46.8
24.00	1	2.1	2.1	48.9
24.50	1	2.1	2.1	51.1
24.70	2	4.3	4.3	55.3
24.90	1	2.1	2.1	57.4
25.60	1	2.1	2.1	59.6
25.70	1	2.1	2.1	61.7
26.70	1	2.1	2.1	63.8
26.90	1	2.1	2.1	66.0
27.50	1	2.1	2.1	68.1
27.80	1	2.1	2.1	70.2
27.90	1	2.1	2.1	72.3
28.10	1	2.1	2.1	74.5
28.40	1	2.1	2.1	76.6
28.60	2	4.3	4.3	80.9
29.20	1	2.1	2.1	83.0
29.80	1	2.1	2.1	85.1
29.90	1	2.1	2.1	87.2
30.10	1	2.1	2.1	89.4
34.40	1	2.1	2.1	91.5
34.50	1	2.1	2.1	93.6
34.60	1	2.1	2.1	95.7
36.90	1	2.1	2.1	97.9
39.10	1	2.1	2.1	100.0
Total	47	100.0	100.0	

Valid

Some secondary

	Frequency	Percent	Valid Percent	Cumulative Percent
1.20	1	2.1	2.1	2.1
3.60	1	2.1	2.1	4.3
4.20	1	2.1	2.1	6.4
4.40	1	2.1	2.1	8.5
5.00	1	2.1	2.1	10.6
5.20	2	4.3	4.3	14.9
5.60	1	2.1	2.1	17.0
6.00	1	2.1	2.1	19.1
6.90	1	2.1	2.1	21.3
10.40	1	2.1	2.1	23.4
10.50	1	2.1	2.1	25.5
11.10	1	2.1	2.1	27.7
12.00	1	2.1	2.1	29.8
12.90	2	4.3	4.3	34.0
13.30	1	2.1	2.1	36.2
14.10	1	2.1	2.1	38.3
14.20	1	2.1	2.1	40.4
14.30	2	4.3	4.3	44.7
14.40	1	2.1	2.1	46.8
14.70	1	2.1	2.1	48.9
14.90	1	2.1	2.1	51.1
15.00	3	6.4	6.4	57.4
15.60	1	2.1	2.1	59.6
15.90	1	2.1	2.1	61.7
16.60	2	4.3	4.3	66.0
18.00	1	2.1	2.1	68.1
18.20	1	2.1	2.1	70.2
18.60	2	4.3	4.3	74.5
19.00	1	2.1	2.1	76.6
19.10	1	2.1	2.1	78.7
19.20	1	2.1	2.1	80.9
20.10	1	2.1	2.1	83.0
20.30	1	2.1	2.1	85.1
20.70	1	2.1	2.1	87.2
20.80	2	4.3	4.3	91.5
21.10	1	2.1	2.1	93.6
21.90	1	2.1	2.1	95.7
24.00	1	2.1	2.1	97.9
25.20	1	2.1	2.1	100.0
Total	47	100.0	100.0	

Valid

Completed Secondary

	Frequency	Percent	Valid Percent	Cumulative Percent
2.50	1	2.1	2.1	2.1
3.60	1	2.1	2.1	4.3
4.10	1	2.1	2.1	6.4
4.30	2	4.3	4.3	10.6
4.70	1	2.1	2.1	12.8
5.40	1	2.1	2.1	14.9
5.50	1	2.1	2.1	17.0
6.00	1	2.1	2.1	19.1
6.20	1	2.1	2.1	21.3
6.70	1	2.1	2.1	23.4
8.50	1	2.1	2.1	25.5
8.70	2	4.3	4.3	29.8
8.90	1	2.1	2.1	31.9
9.50	1	2.1	2.1	34.0
9.60	1	2.1	2.1	36.2
10.30	1	2.1	2.1	38.3
10.40	2	4.3	4.3	42.6
10.50	1	2.1	2.1	44.7
10.80	1	2.1	2.1	46.8
11.00	1	2.1	2.1	48.9
11.40	1	2.1	2.1	51.1
11.50	1	2.1	2.1	53.2
12.10	1	2.1	2.1	55.3
12.30	1	2.1	2.1	57.4
12.60	1	2.1	2.1	59.6
13.70	1	2.1	2.1	61.7
14.90	1	2.1	2.1	63.8
15.00	1	2.1	2.1	66.0
16.20	1	2.1	2.1	68.1
16.30	1	2.1	2.1	70.2
16.50	1	2.1	2.1	72.3
17.00	1	2.1	2.1	74.5
17.20	1	2.1	2.1	76.6
18.60	1	2.1	2.1	78.7
19.20	2	4.3	4.3	83.0
20.70	1	2.1	2.1	85.1
21.10	2	4.3	4.3	89.4
22.40	1	2.1	2.1	91.5
23.60	1	2.1	2.1	93.6
23.90	1	2.1	2.1	95.7
24.20	1	2.1	2.1	97.9
27.90	1	2.1	2.1	100.0
Total	47	100.0	100.0	

Valid

Poverty

	Frequency	Percent	Valid Percent	Cumulative Percent
21.80	1	2.1	2.1	2.1
24.20	1	2.1	2.1	4.3
25.90	1	2.1	2.1	6.4
27.60	1	2.1	2.1	8.5
31.00	1	2.1	2.1	10.6
32.30	1	2.1	2.1	12.8
33.20	1	2.1	2.1	14.9
33.50	1	2.1	2.1	17.0
33.80	1	2.1	2.1	19.1
34.80	1	2.1	2.1	21.3
35.30	1	2.1	2.1	23.4
38.00	1	2.1	2.1	25.5
38.20	1	2.1	2.1	27.7
38.80	1	2.1	2.1	29.8
38.90	1	2.1	2.1	31.9
39.30	1	2.1	2.1	34.0
39.90	1	2.1	2.1	36.2
40.00	1	2.1	2.1	38.3
41.00	2	4.3	4.3	42.6
41.20	1	2.1	2.1	44.7
42.60	1	2.1	2.1	46.8
47.30	1	2.1	2.1	48.9
47.90	1	2.1	2.1	51.1
48.40	1	2.1	2.1	53.2
49.20	1	2.1	2.1	55.3
49.60	1	2.1	2.1	57.4
50.40	1	2.1	2.1	59.6
50.70	1	2.1	2.1	61.7
51.30	1	2.1	2.1	63.8
51.40	1	2.1	2.1	66.0
52.20	1	2.1	2.1	68.1
52.70	1	2.1	2.1	70.2
58.40	1	2.1	2.1	72.3
58.90	1	2.1	2.1	74.5
60.40	2	4.3	4.3	78.7
60.60	1	2.1	2.1	80.9
65.30	1	2.1	2.1	83.0
66.30	1	2.1	2.1	85.1
70.70	1	2.1	2.1	87.2
71.40	1	2.1	2.1	89.4
75.60	1	2.1	2.1	91.5
75.80	1	2.1	2.1	93.6
84.20	1	2.1	2.1	95.7
85.80	1	2.1	2.1	97.9
87.50	1	2.1	2.1	100.0
Total	47	100.0	100.0	

Valid

Severe Poverty

	Frequency	Percent	Valid Percent	Cumulative Percent
1.20	1	2.1	2.1	2.1
1.50	1	2.1	2.1	4.3
1.60	2	4.3	4.3	8.5
1.70	1	2.1	2.1	10.6
1.80	1	2.1	2.1	12.8
2.00	3	6.4	6.4	19.1
2.10	2	4.3	4.3	23.4
2.20	1	2.1	2.1	25.5
2.30	2	4.3	4.3	29.8
2.50	1	2.1	2.1	31.9
2.80	1	2.1	2.1	34.0
2.90	2	4.3	4.3	38.3
3.00	2	4.3	4.3	42.6
3.10	1	2.1	2.1	44.7
3.20	1	2.1	2.1	46.8
3.30	2	4.3	4.3	51.1
3.50	1	2.1	2.1	53.2
3.70	1	2.1	2.1	55.3
3.80	1	2.1	2.1	57.4
Valid 3.90	1	2.1	2.1	59.6
4.00	1	2.1	2.1	61.7
4.10	1	2.1	2.1	63.8
4.40	1	2.1	2.1	66.0
5.30	1	2.1	2.1	68.1
5.50	1	2.1	2.1	70.2
6.00	1	2.1	2.1	72.3
6.10	2	4.3	4.3	76.6
7.10	1	2.1	2.1	78.7
7.20	1	2.1	2.1	80.9
8.00	1	2.1	2.1	83.0
8.80	1	2.1	2.1	85.1
9.60	1	2.1	2.1	87.2
11.40	1	2.1	2.1	89.4
15.20	1	2.1	2.1	91.5
15.30	1	2.1	2.1	93.6
20.80	1	2.1	2.1	95.7
28.80	1	2.1	2.1	97.9
30.80	1	2.1	2.1	100.0
Total	47	100.0	100.0	

Urbanisation

	Frequency	Percent	Valid Percent	Cumulative Percent
6.60	1	2.1	2.1	2.1
6.90	1	2.1	2.1	4.3
8.30	1	2.1	2.1	6.4
10.80	1	2.1	2.1	8.5
11.00	1	2.1	2.1	10.6
11.80	1	2.1	2.1	12.8
12.00	1	2.1	2.1	14.9
13.60	1	2.1	2.1	17.0
13.80	1	2.1	2.1	19.1
14.00	1	2.1	2.1	21.3
14.20	1	2.1	2.1	23.4
14.30	1	2.1	2.1	25.5
14.40	1	2.1	2.1	27.7
14.60	1	2.1	2.1	29.8
15.00	1	2.1	2.1	31.9
15.20	1	2.1	2.1	34.0
15.80	1	2.1	2.1	36.2
16.10	1	2.1	2.1	38.3
16.30	1	2.1	2.1	40.4
16.40	1	2.1	2.1	42.6
17.30	1	2.1	2.1	44.7
18.10	2	4.3	4.3	48.9
18.30	1	2.1	2.1	51.1
18.50	1	2.1	2.1	53.2
Valid 19.90	1	2.1	2.1	55.3
20.40	1	2.1	2.1	57.4
21.50	1	2.1	2.1	59.6
21.70	1	2.1	2.1	61.7
22.00	1	2.1	2.1	63.8
22.60	1	2.1	2.1	66.0
23.50	1	2.1	2.1	68.1
24.50	1	2.1	2.1	70.2
24.80	1	2.1	2.1	72.3
25.70	1	2.1	2.1	74.5
28.30	1	2.1	2.1	76.6
31.40	1	2.1	2.1	78.7
34.00	1	2.1	2.1	80.9
38.60	1	2.1	2.1	83.0
41.40	1	2.1	2.1	85.1
43.50	1	2.1	2.1	87.2
45.80	1	2.1	2.1	89.4
52.00	1	2.1	2.1	91.5
52.40	1	2.1	2.1	93.6
60.80	1	2.1	2.1	95.7
100.00	2	4.3	4.3	100.0
Total	47	100.0	100.0	

Nomadism

	Frequency	Percent	Valid Percent	Cumulative Percent
.00	33	70.2	70.2	70.2
Valid 1.00	14	29.8	29.8	100.0
Total	47	100.0	100.0	

Skilled Delivery

	Frequency	Percent	Valid Percent	Cumulative Percent
18.30	1	2.1	2.1	2.1
23.10	1	2.1	2.1	4.3
24.50	1	2.1	2.1	6.4
25.80	2	4.3	4.3	10.6
31.60	1	2.1	2.1	12.8
36.00	1	2.1	2.1	14.9
36.70	1	2.1	2.1	17.0
38.60	1	2.1	2.1	19.1
39.00	1	2.1	2.1	21.3
40.80	1	2.1	2.1	23.4
41.50	1	2.1	2.1	25.5
42.10	1	2.1	2.1	27.7
43.90	1	2.1	2.1	29.8
45.60	1	2.1	2.1	31.9
46.50	1	2.1	2.1	34.0
47.00	1	2.1	2.1	36.2
48.10	1	2.1	2.1	38.3
49.00	2	4.3	4.3	42.6
52.20	1	2.1	2.1	44.7
52.60	1	2.1	2.1	46.8
53.30	2	4.3	4.3	51.1
Valid 53.50	1	2.1	2.1	53.2
57.40	1	2.1	2.1	55.3
58.40	1	2.1	2.1	57.4
61.90	2	4.3	4.3	61.7
62.10	1	2.1	2.1	63.8
62.20	1	2.1	2.1	66.0
62.90	1	2.1	2.1	68.1
64.70	1	2.1	2.1	70.2
69.30	1	2.1	2.1	72.3
69.50	1	2.1	2.1	74.5
69.60	1	2.1	2.1	76.6
69.70	1	2.1	2.1	78.7
74.30	1	2.1	2.1	80.9
77.70	1	2.1	2.1	83.0
81.50	1	2.1	2.1	85.1
81.80	2	4.3	4.3	89.4
85.00	1	2.1	2.1	91.5
86.10	1	2.1	2.1	93.6
88.70	1	2.1	2.1	95.7
92.50	1	2.1	2.1	97.9
93.40	1	2.1	2.1	100.0
Total	47	100.0	100.0	

Acceptable Skilled Delivery

	Frequency	Percent	Valid Percent	Cumulative Percent
.00	25	53.2	53.2	53.2
Valid 1.00	22	46.8	46.8	100.0
Total	47	100.0	100.0	

Facility Density

	Frequency	Percent	Valid Percent	Cumulative Percent
.76	1	2.1	2.1	2.1
1.07	1	2.1	2.1	4.3
1.22	1	2.1	2.1	6.4
1.29	1	2.1	2.1	8.5
1.34	1	2.1	2.1	10.6
1.35	1	2.1	2.1	12.8
1.39	1	2.1	2.1	14.9
1.40	2	4.3	4.3	19.1
1.44	1	2.1	2.1	21.3
1.45	2	4.3	4.3	25.5
1.47	1	2.1	2.1	27.7
1.48	1	2.1	2.1	29.8
1.51	1	2.1	2.1	31.9
1.58	2	4.3	4.3	36.2
Valid 1.62	1	2.1	2.1	38.3
1.63	1	2.1	2.1	40.4
1.65	1	2.1	2.1	42.6
1.68	1	2.1	2.1	44.7
1.72	2	4.3	4.3	48.9
1.75	1	2.1	2.1	51.1
1.80	1	2.1	2.1	53.2
1.83	1	2.1	2.1	55.3
1.84	1	2.1	2.1	57.4
1.88	1	2.1	2.1	59.6
1.90	1	2.1	2.1	61.7
1.91	1	2.1	2.1	63.8
2.03	1	2.1	2.1	66.0
2.05	2	4.3	4.3	70.2
2.35	1	2.1	2.1	72.3

2.37	1	2.1	2.1	74.5
2.40	1	2.1	2.1	76.6
2.51	1	2.1	2.1	78.7
2.53	1	2.1	2.1	80.9
2.55	1	2.1	2.1	83.0
2.69	1	2.1	2.1	85.1
2.70	1	2.1	2.1	87.2
2.73	1	2.1	2.1	89.4
2.80	2	4.3	4.3	93.6
2.91	1	2.1	2.1	95.7
3.12	1	2.1	2.1	97.9
3.65	1	2.1	2.1	100.0
Total	47	100.0	100.0	

Appendix 2: Excel Data Spreadsheet

counties	readdis	readheal	readhosp	readcomp	lit none	lit somep	litpc	litsecsom	litsecc	poverty	S.poverty	urbanisa	nomadism				SKILLEDD	SKILLEDACC	
mombasa	26	39	66	50	5.8	18.8	26.9	15	23.6	34.8	4.4	100	0				81.8	1	
kwale	39	58	70	42	21.7	35	23.5	6.9	8.5	70.7	28.8	18.1	0				49	0	
kilifi	35	55	62	32	20.4	34.1	19.3	10.5	11.4	58.4	20.8	25.7	0				52.6	0	
Tana river	28	35	20	53	41.7	33.3	13.5	5.6	4.1	75.6	30.8	15	1				31.6	0	
lamu	35	30	67	36	17	39.1	21	10.4	6.2	32.3	9.6	19.9	0				43.9	0	
taita tavet	27	39	73	64	2.3	22.6	34.5	13.3	21.1	50.4	7.2	22.6	0				61.9	1	
Garissa	22	48	73	34	72.7	9.6	5.7	4.4	3.6	58.9	8	23.5	1				36.7	0	
wajir	24	27	55	51	76.9	9.9	4.6	4.2	2.5	84.2	15.3	14.6	1				18.3	0	
mandera	19	29	48	35	75.9	10.4	3.7	3.6	4.3	85.8	15.2	18.1	1				36	0	
marsabit	31	37	75	35	61.9	16	10.3	5	4.3	75.8	8.8	22	1				25.8	0	
isiolo	41	40	73	43	39.7	22.5	18.1	6	8.7	65.3	7.1	43.5	1				42.1	0	
meru	21	41	54	24	4.1	37.4	27.5	11.1	11	31	1.6	12	0				81.8	1	
tharaka ni	29	55	63	62	2	35.8	28.4	12.9	12.3	41	3	6.6	0				77.7	1	
embu	32	45	60	30	1.3	28.6	29.2	16.6	13.7	35.3	2.3	16.1	0				81.5	1	
kitui	22	33	64	28	3.9	35.4	34.4	12.9	8.7	60.4	6.1	13.8	0				45.6	0	
machakos	28	41	73	30	0.2	15.9	36.9	20.1	16.5	42.6	3	52	0				62.9	1	
makueni	32	32	70	34	0.9	21.6	34.6	24	10.4	60.6	6	11.8	0				53.3	0	
nyandarua	36	55	57	64	0.8	17.1	39.1	18	18.6	38.8	3.3	18.5	0				86.1	1	
nyeri	28	52	32	59	1.1	11.5	27.8	21.1	24.2	27.6	2	24.5	0				39	0	
kirinyaga	22	53	20	23	0.8	28	29.8	15	21.1	25.9	1.8	15.8	0				92.5	1	
muranga	39	47	60	66	1.6	19.4	29.9	20.8	20.7	33.2	2.5	16.3	0				85	1	
kiambu	32	54	58	40	0.5	9.9	27.9	15.9	22.4	24.2	2.1	60.8	0				93.4	1	
turkana	27	40	60	48	64.1	24.1	3.1	1.2	5.5	87.5	11.4	14.2	1				23.1	0	
west pok	23	45	76	44	33.8	41	12	5.2	4.7	66.3	5.3	8.3	1				25.8	0	
samburu	34	50	40	50	55.7	21.1	7.3	5.2	5.4	71.4	5.5	17.3	1				24.5	0	
tranzoia	24	47	50	43	2.6	39.3	22.9	19.2	10.8	41.2	2	20.4	0				41.5	0	
uasin gish	22	36	68	52	1.5	25.1	21.9	18.6	17.2	33.8	1.5	38.6	0				57.4	1	
elgeyo m	17	44	56	24	1.2	27.7	28.6	14.4	15	52.7	3.8	14.4	1				64.7	1	
nandi	23	45	56	51	0.8	37.8	23.9	16.6	12.6	40	2	13.6	0				46.5	0	
baringo	23	42	60	27	9.3	30	24.5	15	12.1	52.2	3.3	11	1				53.5	0	
laikipia	33	40	70	36	13.4	19.8	24.7	14.9	14.9	47.9	3.1	24.8	1				48.1	0	
nakuru	33	36	75	60	1.9	14.7	30.1	19	19.2	33.5	1.6	45.8	0				69.7	1	
narok	24	43	60	55	15.5	38.2	17.3	12	10.4	41	1.7	6.9	1				38.6	0	
kajiado	25	44	41	33	18	12.8	17.9	14.1	17	38	2.3	41.4	1				62.1	1	
kericho	25	33	84	31	0.3	32	24.9	15.6	16.3	39.3	2.1	28.3	0				62.2	1	
bomet	22	36	68	25	0.4	39.8	25.7	14.3	11.5	51.3	2.9	18.3	0				49	0	
kakamega	34	47	69	38	4	38.7	18.5	20.3	10.5	49.2	4	15.2	0				47	0	
vihiga	42	52	65	63	0.4	30	26.7	25.2	9.6	38.9	2.8	31.4	0				52.2	0	
bungoma	30	50	76	36	0.9	41.2	19.8	20.7	10.3	47.3	3.9	21.7	0				40.8	0	
busia	40	48	46	41	6.6	51.6	16.1	14.3	6	60.4	6.1	16.4	0				58.4	1	
siaya	42	57	70	63	1.9	35.7	28.6	18.6	9.5	38.2	2.2	10.8	0				69.6	1	
ki sumu	32	46	79	42	1.2	23.7	24.7	20.8	16.2	39.9	2.9	52.4	0				69.5	1	
homa bay	32	43	65	37	1.1	39.7	28.1	18.2	8.9	48.4	3.2	14.3	0				61.9	1	
migori	31	41	66	38	2.6	49.9	24	14.2	6.7	49.6	4.1	34	0				53.3	0	
kisii	27	43	64	37	0.9	28.8	22	19.1	19.2	51.4	3.7	21.5	0				69.3	1	
nyamira	36	34	45	65	0.8	17.8	25.6	21.9	23.9	50.7	3.5	14	0				74.3	1	
nairobi	24	44	41	48	1.7	8.9	23.4	14.7	27.9	21.8	1.2	100	0				88.7	1	

Appendix 3: Kenya's Counties as per Constitution (2010) Mombasa

Kwale	Samburu
Kilifi	Tranzoia
Tana river	Uasin gishu
Lamu	Elgeyo marakwet
Taita taveta	Nandi
Garissa	Baringo
Wajir	Laikipia
Mandera	Nakuru
Marsabit	Narok
Isiolo	Kajiado
Meru	Kericho
Tharaka nithi	Bomet
Embu	Kakamega
Kitui	Vihiga
Machakos	Bungoma
Makueni	Busia
Nyandarua	Siaya
Nyeri	Kisumu
Kirinyaga	Homa bay
Muranga	Migori
Kiambu	Kisii
Turkana	Nyamira
West pokot	Nairobi