DETERMINANTS OF CHOICE OF CESAREAN SECTION AMONG WOMEN OF CHILD-BEARING AGE IN KENYA

BY

ALBERTA ANNE ATIENO ODONGO

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(MSC. HEALTH ECONOMICS)

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DECLARATION

This Research dissertation is my original work and has not been presented for a degree in any other University or any other award. Where work of others has been used, it has been duly cited with the name of the author and year of publication.

25/11/2020

……..... ……

Signature Date

Alberta Anne Atieno Odongo

X53/73318/2014

This proposal has been submitted for examination with my approval as the University supervisor.

25/11/2020

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Signature Date

Dr. Urbanus Mutuku Kioko

Supervisor

DEDICATION

This work is dedicated to my aunt Patricia, my Grandmother fondly remembered as “Cucu” and my father fondly remembered as “Daddydums” to all who knew him, to my mother to whom my gratitude will never be fully expressed, to my brother James, whom I love dearly, to my lecturers and the many teachers who have walked with me thus far; finally, I dedicate this work to my community of well-wishers and friends– thankyou. Because of all of you I can be proud of this achievement.

ABBREVIATIONS AND ACRONYMS

ACOG	American College of Gynecology
ANC	Antenatal clinics
C-section	Cesarean section
CSMD	C-section on Maternal Demand
EMOCS	Emergency Medical Obstetric Care Services
DHLS	District Level Household Survey
DHS	Demographic and household Survey
FIGO	Federation of Gynecology and Obstetrics
FMHP	Free Maternal Healthcare Program
KDHS	Kenya Demographic and Household Survey
JSY	Janani Surksha Yohana
JSS	Janani Shishku Suraksha
LMIC	Low- and Middle-Income Countries
MOH	Ministry of Health
OECD	Organization of Economically Developed Countries
USDHH	United States Department of Health and Health Services
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
WHO	World Health Organization

ABSTRACT

Improving the availability, accessibility, quality and, use of maternal health services is an important WHO policy to reduce maternal mortality globally. The WHO sets a threshold of 10% -15% of live births as a quality indicator for adequate access to maternal health services. This threshold is assumed by the WHO to be representative of the proportion of pregnancies with medical risk indicators that would warrant surgical births in any given country. In Kenya, the rapid increase in c-section births over the past decade has been highlighted as an area of concern for health policy makers and healthcare providers. The aim of this study was to determine the factors that influence choice of c-section births among women of child-bearing age in Kenya. Data was obtained from the Kenya Demographic and Household Survey 2014. A Binary Probit Model was estimated to examine the effect of the following determinants on choice of c-section delivery in Kenya. Statistically significant predictors of c-section births were maternal age, educational attainment, residence, health insurance, place of delivery and multiple pregnancy order. Higher maternal age, increased wealth status, educational attainment, choice of delivery place, number of Antenatal clinic visits and, multiple pregnancy order increased the probability of choice of c-section delivery while being widowed and living in a rural area reduced the probability of choice of c-section delivery. Rural women, widowed women, less wealthy and less educated women were found to be less likely to choose c-section births regardless of the existing 'no-user-fee' government policy. Based on these study findings, the study recommends- 1. A c-section policy framework to regulate and standardize the threshold for medical indications that warrant c-section delivery 2. That private insurers consider introducing a reimbursement scheme to curb the increase in incentive for provider induced demand for c-section deliveries 3. That the allocation from the Ministry of Health Capitation fund be increased to meet the WHO threshold for c-section delivery rate especially given the evidence of possible inequity in the utilization of c-section delivery services among richer and higher educated women relative to the poorest and un-educated women as well as among rural residing women relative to urban residing women 4. That public and private sector health policy makers create policies that target rising maternal preferences for CS delivery and professional attitudes biased towards CS deliveries.

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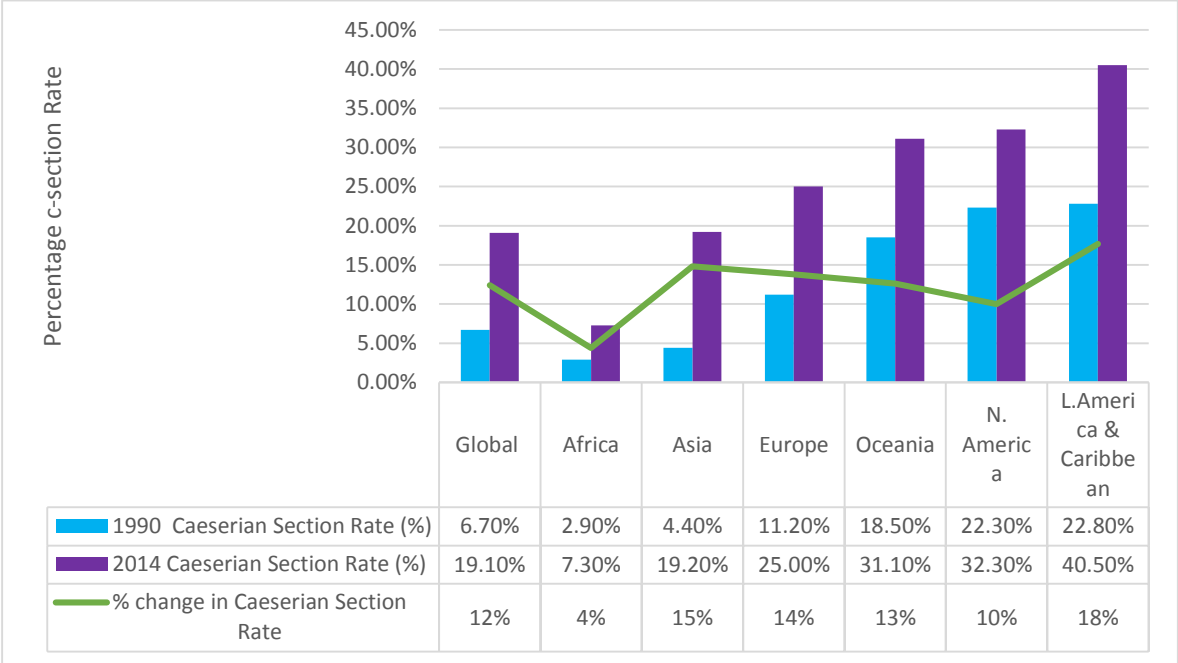
CHAPTER ONE

INTRODUCTION

1.1. Background

Improving the availability, accessibility, quality and, use of maternal health services during pregnancy, labor and, birth is a top World Health Organization (WHO) policy to reduce maternal mortality globally (Harrison & Goldenberg, 2016). The WHO sets a threshold of 10% -15% of live births as a quality indicator for sufficient access to maternal health services (WHO, 2009). The assumption by the WHO is that this figure is representative of the proportion of pregnancies with medical risk indicators for c-section births. However, an increasing number of women worldwide are choosing to have c-section deliveries with no pregnancy risk indications. This has raised c-section rate in many regions of the world above the WHO maximum 15% threshold (Hannah, 2004).

In the private health sector, the response to the growing patient-demand for surgical deliveries is taking a 'listen- to-the-patient" approach. As a result, physicians make decisions on whether to surgically deliver based on nonmedical factors (Bost, 2003). Globally c-section births account for 18.6% of all births (Vega *et al*., 2015). Figure 1 compares trends in c-section rates between 1990 and 2014.



	Global	Africa	Asia	Europe	Oceania	N. America	L.America & Caribbean
1990 Caeserian Section Rate (%)	6.70%	2.90%	4.40%	11.20%	18.50%	22.30%	22.80%
2014 Caeserian Section Rate (%)	19.10%	7.30%	19.20%	25.00%	31.10%	32.30%	40.50%
% change in Caeserian Section Rate	12%	4%	15%	14%	13%	10%	18%

Figure 1: C-section rates (%) in 1990 and 2014

Figure 1 above shows an increase in c-section births between 1990 and 2014. In Latin America and the Caribbean c-section births rose by 18% compared to Asia which rose by 15%, Europe 14%, Oceania 13% and, North America 10% (Vega *et al.*, 2015). In Africa, c-sections increased from 2.9% in 1990 to 7% in 2014, an increase of 4% (Vega *et al.*, 2015). Although this has remained lower than the rest of the world, it nonetheless highlights a conformity to the global trend of increasing c-section deliveries.

The c-section rate in Sub-Saharan Africa is below the WHO threshold rate for intervening against life threatening conditions of birth (Harrison & Goldenberg, 2016). Low and middle-income countries (LMIC) (which includes all Sub-Saharan Africa except South Africa) accounts for 99% of Global Maternal Mortality Rate. The number one evidence-based approach to reducing maternal mortality rates is delivery at a facility by a skilled birth attendant and access to cesarean section (WHO, UNFPA, & UNICEF, 2014).

As illustrated in figure 2 below, maternal mortality rates have dropped in the period between 1990 and 2013. This coincides with the rise in c-section rates as illustrated in figure 1.

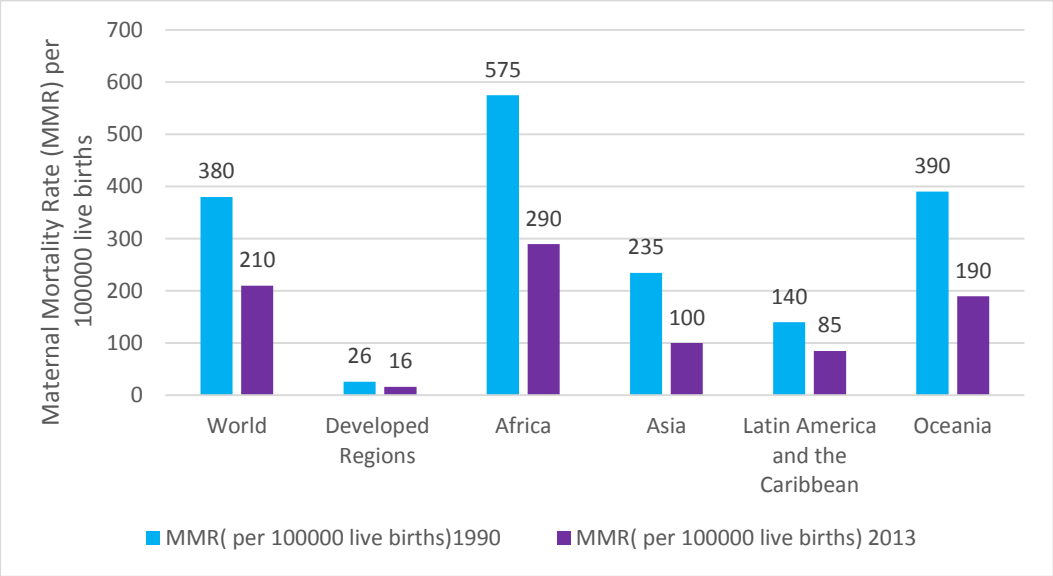
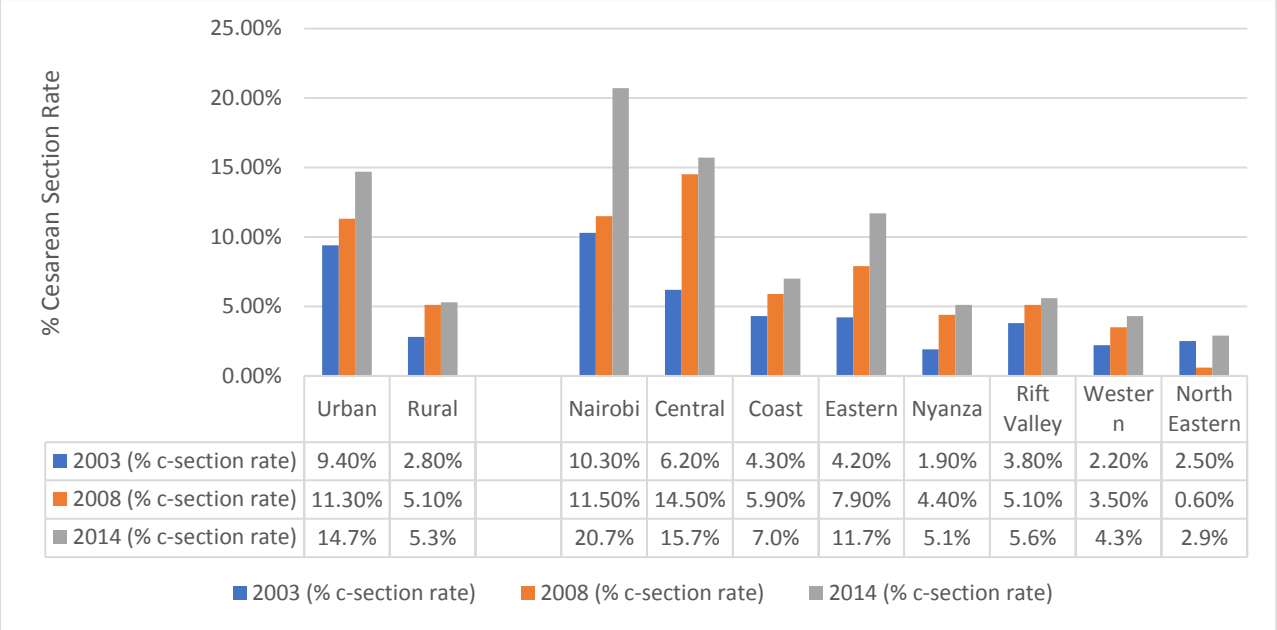


Figure 2: Maternal Mortality Rates (1990 and 2013)

1.2 Prevalence of C-section Rates in Kenya

According to KDHS (2014), urban c-section births were double the national average and are more prevalent among women residing in urban areas. Between 2003 and 2014, c-sections among urban residing women increased from 9.4% to 14.7% of births compared to women residing in rural areas who had a c-section rate of 2.3% in 2003 and 5.3% in 2014 (KDHS 2008, KDHS 2014;).



	Urban	Rural		Nairobi	Central	Coast	Eastern	Nyanza	Rift Valley	Western	North Eastern
2003 (% c-section rate)	9.40%	2.80%		10.30%	6.20%	4.30%	4.20%	1.90%	3.80%	2.20%	2.50%
2008 (% c-section rate)	11.30%	5.10%		11.50%	14.50%	5.90%	7.90%	4.40%	5.10%	3.50%	0.60%
2014 (% c-section rate)	14.7%	5.3%		20.7%	15.7%	7.0%	11.7%	5.1%	5.6%	4.3%	2.9%

Figure 3: Cesarean section rates in Kenya for the years 2003, 2008 and 2014

In June 2013, the government of Kenya announced the launch of Free Maternity Healthcare Program. This program initiative was included in the Kenya Essential Medical Service Package and was launched with an initial budget allocation of Kshs 3.8 billion for the financial year 2013/14 (Bourbonnais, 2013). The Free Maternity Healthcare Program budget has since grown to Kshs 4.3 billion in the financial year 2018/19 (MOH, 2019). From 2016, the free maternity budget has been implement through the NHIF (Mushangi, 2016).

The latest data from the National Hospital Insurance Fund (NHIF) shows that reimbursements for hospitals performing c-section surgeries are increasing both in monetary terms and in the number of c-section deliveries (Aketch, 2018). NHIF reimbursements for c-section deliveries increased from Kshs 273.8 to Kshs 5 billion in 2019 (MOH, 2019). The problem with this increase is thus: - As the proportion of the c-section reimbursements increases relative to the Free Maternity Health Package budget, the proportion of women who will be covered for normal delivery will reduce. Given the fact that the FMHP budget has remained more-or-less fixed and a c-section delivery is three times the cost of a normal delivery, the more surgical births are administered, the less health resources are available to allocate for routine (vaginal) birth-this is a crowding out effect.

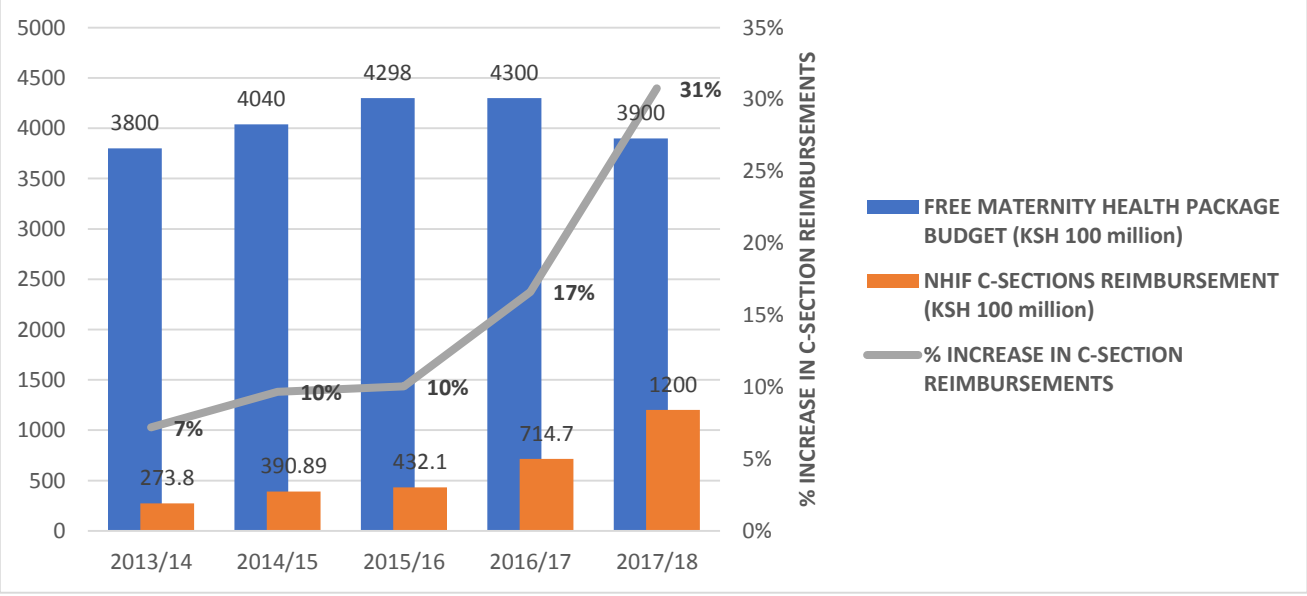


Figure 4: NHIF reimbursements vs Free Maternity Health Package Budget Allocation 2013-2019

1.2 Statement of the Problem

According to KDHS (2014) 42% of births in Kenya occur in a health facility (Vogels et al. 2015*)*. In 2014, 8.7% of Kenyan babies born were delivered by c-section (KDHS, 2014). Between 2010-2013, 11% of births experienced labour obstruction while 71.6% of stillbirths had occurred during the labor and birthing process (Harrison & Goldenberg, 2016). This implies a gap between women in need of c-section birth assistance and women who access the c-section services.

While there is obvious need for more surgically assisted deliveries, rising hospital c-section prevalence rates are a major concern to policy makers and medical insurance companies (Mbombo et al., 2018). The rise in c-section rates has been attributed to the increased demand for c-section services by women of child-bearing age. Chacha (2016) noted that the increase in c-sections may be linked to financial incentives to hospitals and doctors to prescribe medically unwarranted c-section deliveries. While Caesarean section (CS) is an important, lifesaving procedure for both the mother and the baby in certain medical conditions, unnecessary CS can lead to increased medical risks for both mothers and infants (Meri Tadevosyan et al, 2029; Otuki, 2018). The World Health Organization recommends a CS rate of 15% or less to balance the benefits and risks of c-section delivery (Bourbonnais, 2013). In adddition to potential health consequences of high rates of CS, the procedure increases financial burden on the health care systems (Bost, 2003).

Previous research had identified a number of patient and physician factors that are associated with high CS rates, including;- policies promoting CS and discouraging vaginal birth after cesarean, increased use of technology for monitoring labor, institutional fear of medical malpractice lawsuits in case of breech or forceps deliveries, childbearing patterns (older age of first time mothers), and reimbursement mechanisms such as health insurance payments (NPWF,

2016). Panda *et al*, (2018) found that a history of c-section (previous uterine scar) and fear of litigation especially when considered against a vaginal birth after c-section (VBAC) were important factors influencing the choice of c-section.

In Kenya, Oguta (2015) identified psychosocial factors (including birth anxiety and social support for natural birth) with the choice for c-section. Other researchers such as Thagicu *et al*, (2015) have associated medical indicators (such as non-progressive labor, fetal malpresentation and sexually transmitted infections such as HIV and Herpes) with increased c-section utilization in Kenyan hospitals. Other studies have examined the social characteristics of women at health care facilities such as marital status, primigravida (First pregnancy), education level and belonging to a health social group (Maalim *et al.,* 2017).

In the Kenyan health system, c-sections can be performed from level 3 to level 6 healthcare facilities. Majority of the studies on c-section conducted in Kenya were at level 6 referral hospitals and level 5 hospitals (Mboya, 2015). In such facilities, patients/mothers are mainly managed by obstetricians unlike in the lower tiers of the health system hierarchy where the use of midwives and birth attendants is prevalent (Sanni, *et al.,* 2018). Additionally, these facilities are theorized to be characterized by high risk patients who may not be representative of overall maternal risk profiles for the country (Maalim *et al.,* 2017) . This is especially since over half of births in Kenya are attended to outside the healthcare system-at home and hence are of unknown risk (KDHS, 2014). It is thus unclear whether the c-sections observed at level 5 and 6 facilities are because of medical referrals from lower-tiers in the healthcare system or a consumer preference by expectant women for higher-tier medical facilities such as referral hospitals. Additionally, there is still scanty information on the factors that are driving the increased c-sections in the country hence the justification for a country-wide study. Thus purpose of this study was to investigate factors contributing to the rapidly increasing rates of CS in Kenya.

1.3.Study objectives

The overarching objective of the study was to assess the factors influencing the choice of c-section births among women of child-bearing age in Kenya.

The specific objectives are:

1. To identify the determinants of choice of c-section delivery among women of child-bearing age in Kenya.
2. To estimate the effect of the determinants on the woman's choice of c-section birth in Kenya.
3. To draw policy implications based on the findings of the study

1.4. Significance of the study

The medical indicators for c-section births are similar across health systems world over (Mylonas & Friese, 2015). Absolute medical indicators for c-section deliveries are medical conditions that unequivocally require a c-section delivery to preserve the life of the mother and the baby. Despite extensive literature on the medical determinants of c-section deliveries, there are discrepancies between the population rates of medical indications for c-section births and population c-section rates. This implies that reasons other than medical factors influence a woman's choice of c-section birth. Hence, this study aims at identifying these non-medical determinants of c-section deliveries in addition to estimating their contribution to a woman's choice of c-section birth in Kenya.

NHIF reimbursements for c-sections have been proportionally increasing relative to the budget for the free maternal healthcare package in Kenya (Aketch, 2018). This rise is likely to constrain the national health insurer (NHIF) in expanding its coverage for more Kenyan women since the reimbursable amount for a single c-section birth is almost three times that of a normal delivery

(MOH, 2019). Therefore, this study additionally aims to provide targeted, findings-based public health policy suggestions to mitigate the factors that may be observed to contribute to increase of c-section deliveries in Kenya. Mitigating policy measures taken to limit the provision of c-section delivery services to medically indicated instances may expand the scope of the NHIF managed Free Maternal Healthcare Package budget to cover more women as more funds are availed to cover cheaper vaginal deliveries.

CHAPTER TWO

LITERATURE REVIEW

2.0. Introduction

This chapter reviews the theoretical and empirical literature on studies that have been done on the factors that influence the decision to choose c-section among expectant women, the characteristics of women who choose surgical births, and the structure of health systems that have wide spread prevalence of this mode of childbirth.

2.1. literature Review

Models of childbirth care are agreed upon by multiple scholars to have a stronger influence on c-section CS decisions than individual patient characteristics (Boost,2003). Childbirth care models influence; - the nature of the patient-physician relationship (whether close or impersonal), the financial incentives of the healthcare provider, health services utilization and CS rates. (Bost, 2003). The characteristics that describe a childbirth care model include: - the model of financing (private or public), the sources of health system funding, the systems of childbirth care provision, the birth setting (place of delivery), conflicts of interest etc. There are three models of childbirth care in operation around the world these are -the Highly Medicalized Childbirth care model HMC, the Low Technology Childbirth care model (LTC) and the Intermediate Technology Childbirth care model (ITC) (Mendoza-Sassi *et al*, 2011).

The Highly Medicalized Childbirth Care model (HMC) is characterized by the use of advanced medical technology utilizing high-tech machinery, drugs and, advanced medical technicians (such as anesthetists, obstetricians) (Grant, 2005). This model of childbirth care discourages the use of midwives who are the lowest ranked birth attendants by medical qualification (Patah

& Malik, 2011). This system is typical of childbirth care in countries such as, the United States, France, Russia, and the Czech Republic. In the HMC model of childbirth care the role of the private health-services sector (such as -private health insurers, private hospitals and privately practicing physicians) is predominant. This results in progressively increasing rates of caesarean deliveries due to the lack of effective government regulation of medical practice. The lack of government influence on health policy is due to the low level of government health care financing.

This is commonly observed because private sector's financial incentive in HMC care models shifts the decision power on the mode of delivery to the individual patient. Patient's often choose their physicians-typically obstetricians (childbirth specialist surgeons). These personal physicians are involved with the patient in the provision of maternal health services for the duration of the pregnancy. Obstetricians provide pre and antenatal care and perform deliveries either vaginal or surgical (Menacker & Curtin, 2006). In the HMC system, the risks of litigation (medical mal-practice lawsuits) are significantly high if obstetricians do not indulge the patient's preferred mode of delivery. Hence, defensive medical practice is common with rising incidences of medical malpractice lawsuits being attributed to medically unwarranted c-sections in countries where the HMC model operates (Menacker & Curtin, 2006; NIH, 2006).

The Low Technology Childbirth care model LTC is typical to Scandinavia and the Netherlands. This is a less medicalized model where mid wives are more involved and interventions occur less frequently and are extensively less intrusive than in the HMC model (Mendoza-Sassi *et al*, 2011). In low technology childbirth care models where, mid wives have greater involvement in childbirth care, regulations vary as to the extent of their involvement and medical policy is diverse in the acceptance of their practice. For instance; -in the Netherlands and England there is lower financial incentive to conduct more caesarean sections with up to 30% of low risk deliveries occurring at home under the supervision of trained midwives who refer higher risk

pregnancies to hospitals unlike in Belgium where obstetricians are encouraged via higher renumerations to encourage patients to seek hospital services (Mead *et al.,* 2007).

The final model of childbirth care is an Intermediate Model of Childbirth care IMC that has the characteristics of both the HMC model and LTC care model. The Intermediate Model of Childbirth care is a system of childbirth care that is typified in Australia, the United Kingdom, the Netherlands and, Canada (McIntyre, 2012). In IMC models, universal public health systems are common (McIntyre, 2012). This means that the government is the principle provider of medical insurance. Here, the government has greater governance over health care policy on childbirth care (Ontario Womens' Health Council, 2002). In LTC care models, strategies are employed to maintain a low rate of CS deliveries such as; - cultural sensitization which involves the normalization of vaginal delivery as a physiological default; the promotion of a multi-disciplinary frameworks to establish policy change in obstetric practice where appropriate; a health care model that promotes one-one nursing care during active labor, etcetera (Robson *et al.,*2009).

Publicly financed medical systems -with Universal Health Insurance coverage- such as in LMC and less so IMC health systems discourages medical decisions such as c-sections that are influenced by the client's ability to pay out of pocket. They also regulate the patient's medical autonomy such as the ability to choose their doctor preferred doctor which could impact the decision to have a c-section because there is no close doctor-patient relationship. (Dweik, *et al*., 2014). This closeness often results in the provider assisting the patient to choose their own preferred mode-of delivery (Mylonas & Friese, 2015). In public financed health care systems, pregnant women thus have limited options to negotiate the choice of delivery or choose their preferred doctor (Barros, 2005).

Also unlike in HMC's where the bulk of childbirth care, antenatal and postnatal care is allocated to gynecologists/obstetricians -resulting in long working hours- making cesarean section

deliveries are more likely LMC's and IMC's do not rely on obstetricians for the bulk of childbirth care rather they are a last resort in the event of a medically complicated birth or pregnancy (Patah & Malik, 2011). Because obstetricians-being surgeons- are the most highly paid category of birth attendants and labor is an unpredictable event of uncertain duration, cesarean sections are utilized in highly medicalized health systems to bypass national labor codes that limit work hours as well as to manage hospital resources such as hospital beds and staff wages (Schantz *et al.*, 2016). This is because the surgery has a much shorter duration than a naturally progressing birth hence it eases the management of obstetrician schedules (especially in health systems with poly-clinic obstetricians) and hospital schedules (Schantz *et al.*, 2016). As a result, this has incentivized hospitals to promote c-section deliveries in hospitals, especially in tertiary hospitals characterized by complicated pregnancy referrals, larger catchment areas and higher patient volume.

2.2 Empirical Literature Review

Reviewed findings on previous studies point to various individual, social, institutional and policy factors having influence on women's choice of mode of delivery -either c-section or normal delivery for instance: -

Tadevosyan *et al.*, (2019) studied the factors that contributed to the rapid increase in c-section rates in Armenia between 2000-2017 from 7.2% to 31%. They conducted a partially mixed concurrent quantitative-qualitative equal status study from; - interviews, self-administered provider surveys with obstetrician-gynecologists and, focus group discussions with women as well as retrospective reviews of mother and child medical files. The mean direct cost of c-section delivery was USD 216.19 compared to the cost of vaginal/normal birth USD 94.72. This exceeds the governments maximum reimbursement ratio of 1.64 the cost of normal birth. Given that c-sections cost 2.3 times more than a natural birth -the cost-balance must be met by private health insurance or out-of-pocket payments providing an incentive for healthcare providers to prescribe c-sections. They also found a high provider incentive for c-section births because of bonus payments to obstetricians for c-section deliveries -which were 11 times higher than for normal delivery providing a higher incentive for non-medically motivated c-section births (Tadevosyan *et al.*,2019*).*

Singh *et al.*, (2018) studied the prevalence of c-section births in private sector health facilities by analyzing the District Level Household survey DLHS-4 of India. Informed by the increase in c-section deliveries in India, and the increase in institutional births -the aim of this study was to quantify the prevalence of c-section births. They established the presence of a statistically significant relationship between c-sections and the type of medical institutions *(private hospitals or public hospitals)*. A higher Odds ratio for c-section deliveries was observed in the presence of these factors: - first delivery after 35 years of age (5.5; 95.5% CI 1.85-16.4)

delivery at private hospital 13.7%(95% CI ; 13.0-14.3), urban residence(OR 1.15; 95% CI 1.00-1.35) preeclampsia (OR 1.32; 95% CI 1.06-1.65) and breach presentation (OR 2.37; 95.5% CI 1.633.43) They established after analyzing secondary and primary data that c-section was 3 times more prevalent in private hospitals versus in public hospitals in India (Singh *et al,.2018*).

Lauer *et al.,* (2010) studied population level determinants of c-section trends from developed countries. Using national level data from 1980-2004-obtained from health statistical services, utilization rates for c-sections and their determinants were studied using cross country dynamic regression modelling. The model included variables such as Maternal Mortality, National Income, Hospital Infrastructure, Health System Financing and Human Resource Profile. The results were that a doubling in the following factors corresponded to an increase in c-section rates: -income corresponds to a 33% (95% CI 18%-46%); stock of hospitals 15% (95% CI 4%26%), government share of health expenditure 29.8(95% CI 9.6%-50%). A doubling in midwives however resulted in a 12% decrease (95% CI -18%-42%) in c-section rates. Comparing the same observation variables in South America, a much stronger effect was observed such that a doubling in income resulted in a 77% increase (95% CI 67%-87%). In comparison, a cross sectional analysis of c-section rates yielded a larger income effect compared to dynamic modelling.

Begum *et al.,* (2017) explored the indicators of c-sections and their socio-economic determinants in MATLAB, Bangladesh. Using Health and Demographic System Surveillance Data HDSS in a retrospective study design observed that when the effects for covariates were controlled; the probability of c-sections among the highest wealth quintile of women was 2 times that of women from the lowest quintile (OR: 2.47; 95%CI: 1.78-3.34). Advanced secondary educated compared to uneducated women were 2 times more likely to have a c-section (OR: 2.06 95% CI: 0.23-0.44). Women with parity greater than 3 were 68% more likely to deliver by c-section (OR: 0.32 95% CI: 0.23-0.44). Women who had previously attended

more than 3 antenatal clinics ANC's were 2 times more likely to have c-sections than women who had between 0-2 ANC clinics (OR: 2.19 95% CI: 1.67-2.82). Women with fetal loss were 1.5 times more likely to deliver by c-section than women who had good obstetric history (OR: 1.38; CI 1.10-1.73).

Soto-Vega *et al.,* (2015) conducted a systematically review to analyze some of the factors (public or private hospital, maternal age, level of education and socio-economic profile) associated with increment of c-section rates. Reviewing 22 studies from 18 countries they established an overwhelming prevalence of c-sections compared to the WHO threshold at 45.2% worldwide c-section rate. The rate of c-sections among women of maternal age >30 years ranged from 60% -82.5% of women in Mexico (Rebelo *et al.,* 2010; Redondo *et al.,2013*).

Maternal education (±12 years) was associated with a high c-section prevalence for instance; -77.2% prevalence in c-sections in Brazil (Barros *et al.,* 2015) compared to master's degree in Spain 22.7% and 35% in China for College degree educated women (Martinez Calderon *et al.,* 2011*;* Pang *et al.,* 2007*).* In Mexico, high mode of delivery was correlated to the socioeconomic status of the pregnant woman. Compared to the lowest income strata, the highest social class was 44% more likely to have a c-section (OR=1.44, 95% CI 1.12-1.83).

Gichangi *et al.,* (2001) studied the rate of Caesarean section as a process of safe motherhood programs in Kenya. They extrapolated information from several data sources including the Government's Ministry of Health records, the WHO/UNICEF manual on maternal mortality in Kenya, the Pumwani Maternity Hospital, the Nairobi hospital and the Kenyatta National Referral Hospital databases. They established that Kenya's hospital-based c-section rate was 6.3% (0.3%-37%) and that the population-based c-section rate was 0.95% (0.1%-4%) (Gichangi *et al.,*2001). They concluded that the Nation-wide rates of c-section were a valuable process indicator in identifying the gaps in personal care and are a useful tool for advocating healthcare improvements.

Nilsen *et al.,* (2011) studying women in the Kilimanjaro Christian Medical Center in Moshi district- Tanzania observed that clinical indications such as: dystocia, fetal mal-presentation, non-reassuring fetal status, antepartum hemorrhage and previous uterine scars were the most significant indicators of c-sections ($p>0.05$). The hospitals high c-section rate was established to be indicative of more comprehensive screening for pregnancy risks and the rise in referrals from other hospitals given that referrals accounted for 33% of c-section procedures at the hospital.

Contrarily, Mbombo *et al.,* (2018) performed a retrospective hospital case-study to establish the determinants of mode of delivery in Kenya. they collected data from the PCEA Kikuyu hospital. Their findings were that 65.1% of women who delivered at the hospital had spontaneous births (unmedicated vaginal deliveries). Among those that had c-sections, it was established by the study that parity, gravidity and previous c-section deliveries ($p>0.05$) were statistically significant determinants of c-section births. The study recommended that hospital administrators and policy makers should prioritize reducing hospital-based c-section rates through public awareness on mode of delivery outcomes (*such as;- patient education about the risk of surgical deliveries)*.

2.3 Overview of reviewed literature

Individuals and their environment (both physical and social) interact at multiple levels to influence health behavior, to produce health outcomes and, to promote health policies. Various socio-ecological factors influencing c-section deliveries have been discussed in different studies. The main determinants of c-section are output based wage structures where doctors' wages are determined by number of births attended (Tadevosyan *et al.,* 2019); method of

healthcare financing with private health insurance fostering close doctor-patient relations, encouraging patient autonomy and promoting elective c-section deliveries (Friese, 2015; Barros *et al.,*2005). Other factors include place of residence (Benova, Carvallho, & Campbell, 2017) and; social attitudes towards c-section deliveries (Nilsen *et al.*, 2014).

In summary,previous studies have established that previous c-section, maternal age, level of education, parity (Maalim *et al.*, 2017); paternal level of education, and tribal affiliation (Nielsen *et al,* 2014); private hospital birth (Vega *et al.,*2015 ;Singh *et al.*, 2018), wealth status and, low ANC attendance (Begum *et al.*, 2017) are main determinants of c-section.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0. Introduction

This chapter presents the methodology used to examine the factors that influence the choice of c-section among women of childbearing age in Kenya. The chapter discusses the theoretical framework, econometric model, definition of variables, data sources and estimation issues.

3.1 Theoretical Framework

3.1.1. The Social Ecological Model of Health (SEM)

Social Ecological Models are a subset of determinants of health models which describe the interactive characteristics of individuals and environments that underlie health outcomes (Golden & Earp, 2012). The socio-ecological Model SEM approach is an interactive and multilevel approach which is focused on assessing both population level and individual level determinants of health behaviors, health interventions and health outcomes (Cottrel *et al.*, 2009; NASPA, 2004). Health behavior in the SEM models is influenced and reinforced at multiple levels (McLeroy *et al.*, 1988).

Five different levels of influence are classified in the social ecological model health behavior with decision on cesarean section delivery being the outcome of interest for this study: i) Intrapersonal/individual factors consists of personal characteristics that affect health seeking behavior for instance personality traits, bio-characteristics (e.g. maternal age and the education level of individuals within the target population)' ii) Interpersonal factors such as family structure that provide role definition, social identity, and social support (e.g. marital status). This also includes the makeup of, behaviors, perceptions, and attitudes within social networks of the target population' iii) Institutional /organizational factors such as the education, training,

and skill enhancement of institution members, iv) Community factors such as regulated social networks and societal norms, attitudes and values and v) public policy factors which influence the intended health seeking behaviors such as legislation and national health policy. It also includes the perception and attitudes of policy makers, the public policy creation environment, and the capacity for policy advocacy to influence social norms. These dynamics are represented in figure 5 below.

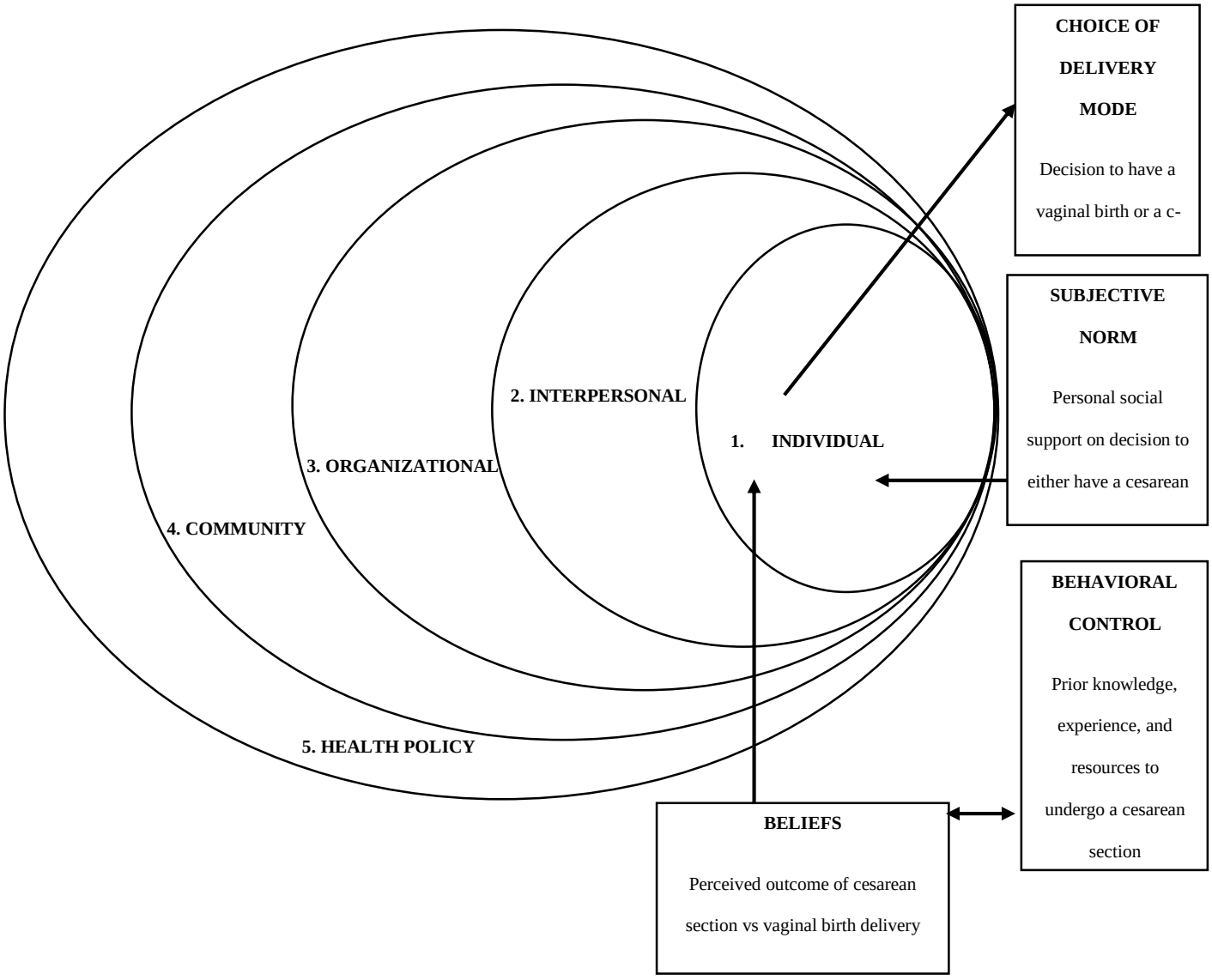


Figure 5: The Social Ecological Model SEM of Health

The SEM model has been chosen for its interactive multilevel approach which provides a useful template for explaining the determinants of cesarean section deliveries as influenced by individual, interpersonal, community and policy factors in Kenya. The SEM model expresses the reality that medical decisions such as choice of delivery mode are not exclusively by self-choice (Alzen, 2012).

3.2. Econometric Model

The decision concerning mode of delivery (c-section or vaginal delivery) as observed in the conceptual framework is a binary response thus the use of a Generalized Linear Regression Models GLiM such as the Probit model is appropriate. Generalized linear models GLiM have three components-a structural component, a link function (which connects the structural component and the response variable) and a response distribution component.

3.2.1. The Binary Probit Model (BPM)

Traditionally, the most common link function used for binary response data is the logit. However, in the event that the binary outcome (c-section delivery) is dependent on a hidden gaussian variable Z where $Z = \beta' X' + \in$ with $\in \sim N\ (0,1)$ the probit is the more suitable model (Koop, 2008).

Considering that a linear relationship exists between the unobservable (Z*) and the explanatory (Xi) variables, the model can be expressed as:

$$\boldsymbol{Z = \beta' X' + \mu_i} \qquad (1)$$

Where Z*= latent variable (probability of c-section delivery)

B = model parameters estimated

μ= error/disturbance term

X= a vector of independent variables (*such as wealth, education, age, etc*.)

Linking the un-observable variable Z* to the observed variable h the below expression can be derived where Z has a mean of 0 and a variance of 1.

$$\boldsymbol{Z} = \{^{\mathbf{1}\ if\ Z^{*}>0}_{\mathbf{0}\ if\ Z^{*}<0} \quad (2)$$

Where Z =1 refers to c-section delivery and Z=0 implies vaginal delivery

Because the Probit model follows a normal distribution of error term such that $N\sim(0,1)$ the study estimated the marginal effects of the independent variables. The transformation of X'β into probabilities yields equation (4) below:

$$\left(\boldsymbol{h} = \frac{\mathbf{1}}{X_i}\right) = \int_{-\infty}^{X_i\boldsymbol{\beta}} \frac{1}{-\infty\sqrt{\pi\sigma^2}} \boldsymbol{e}^{\frac{-z^2}{2\sigma^2}dz} = \boldsymbol{\phi X'\beta} \quad (3)$$

In the BPM model h= likelihood of a c-section delivery; X'= vector of independent variables such as age, wealth, residence and marital status. $X_i\beta$ isthe cumulative density function and is indicated by $\phi X'\beta$ which yields probabilities that can be interpreted as marginal effects.

The general specification of the estimated Probit model of the determinants of c-section choice among women of childbearing age in Kenya takes the form:

$$\boldsymbol{h} = \boldsymbol{B'X'} + \boldsymbol{E} \quad (4)$$

Where h is the dependent variable (c-section delivery); B'X' is a vector of variables and E is the error term.

3.3. Definitions, measurements and expected signs of Variables

Table 1: Table of variables and their hypothesized relationships

Name of Variable	Variable definition	Measurement	*Expected sign*
Dependent Variable			
C-section delivery	Occurrence of surgical delivery	A binary variable, taking the value of 1 if one chose c-section and 0 otherwise	
Independent Variables			
Age	Completed years at previous birthday	A discrete variable	Positive
Level of Education	Highest level of educational attained	A categorical variable taking the value of 1if No-education (Reference variable), 2 = Primary education, 3= Secondary education and 4 = Tertiary education	Positive
Residence	Place of residence	A binary variable taking the value of 1 if urban, 0 otherwise	Positive
Socio-economic status	Wealth status of the mother	An ordinal variable taking the value of 1 =**1st quintile (poorest) reference variable, 2 =**2nd quintile (poorer), 3=Middle quintile (middle), 4 =4th quintile (richer) and 5 =Highest quintile (richest)	Positive
Insurance Status	Medical insurance status	A binary variable taking the value 1 if mother has medical insurance, 0 otherwise	Positive
Marital status	Current marital status	A categorical variable taking the values: 1 = **Never in union (Reference variable), 2 =** Married, 3 =Living with partner, 4 =Widowed, Divorced, 5 =Separated/not living together	Positive
Multiple Pregnancy order	Singleton and higher order pregnancies	A categorical variable taking the value of 1 if **singleton (Reference variable), 2 if** twins, 3 if Triplets and 4 if higher-order multiple pregnancy	Positive

Place of Delivery	Facility at which delivery/birth occurred	A categorical variable taking the form; -1 = Government hospital (Includes level 4 (sub county hospitals), level 5 (county referral hospitals) and level 6 (national referral hospitals) in the Kenya health system hierarchy which are operated by the Government of Kenya.); 2=Government health center (level 3 healthcare facility operated by the Government of Kenya). 3 =Mission hospital (Includes level 3-6 healthcare facilities in the Kenya health system hierarchy operated by religious institutions.); 4=Private hospital (Includes level 3-6 healthcare facilities in the Kenya health system hierarchy operated by private sector operators); 5=Nursing home (level 3 healthcare facility in the Kenya health system hierarchy. It is considered a primary health care facility).	

3.5. Sampling and Sample size

The sampling technique which was applied is the non-probability sampling technique. This is because the relevant information to be analyzed is held by mothers of reproductive age *(women aged between 15-49 years who have previously given birth).* This age cohort is the focus group of the demographic household survey women's questionnaire. Exclusion criteria included last live births not within the 5-year survey recall period *(that is, July 2010 to August 2015*). These were women who had recorded no births within the past 5 years of the survey in the women's questionnaire. The KDHS consists of 36,430 pre-selected and surveyed Kenyan Households. The subsample for this analysis was for women of child-bearing age 15-49 years, who had given birth over the last 5 years preceding the survey date. Respondents were stratified by residence (rural/urban residence) and, wealth status (by quintiles). The final subsample comprised of 4,540 female respondents selected based on their completion of relevant survey responses from the KDHS 2014 Women's questionnaire.

CHAPTER 4

STUDY FINDINGS AND DISCUSSION OF THE RESULTS

4.0. Introduction

This chapter presents descriptive statistics and econometric results of the study. Descriptive statistics include summary tables of the variables under investigation for Kenya and by place of residence as well as pairwise correlations. Analytical statistics include a binary probit of the dependent variable against the independent variables in addition to marginal analysis of the probit model.

4.1. Descriptive Statistics

The results show that 8.7% of Kenyan women had delivered by cesarean section during the survey recall period with a standard deviation of 28.1% of c-sections. The average age of Sampled Kenyan women of child-bearing age was 35.2 years with a standard deviation of 7.9 years. The age range for women of child-bearing age was 15 years (minimum) to 49 years (maximum). Among surveyed Kenyan women of child-bearing age who had delivered within the survey recall- period, 4.2% had multiple order births (non-singleton births). The standard deviation for multiple order births was 26.1% implying that some regions may have a much higher rate of multiple order births compared to the national average.

Among surveyed women, the mean ANC attendance was 3.9~ 4 visits with a standard deviation of 1.8~2 visits implying some sample clusters had greater or lower averages for ANC visits. The minimum response for ANC visits was 0 visits and the maximum response was 20 visits. Among Kenyan women, 16.2% had health insurance with a standard deviation of 36.8%

implying the presence of population clusters with much higher proportion of health insurance coverage in comparison to the national average.

Summary statistics of education level yielded the following results; - 12.7% of women had no education with a standard deviation of 33.2% implying the existence of population clusters with higher than national average of women of child- bearing age who had no educational attainment. Sixty one percent 61% of women in the sample had a primary education with a standard deviation of 48.8% implying that there were population clusters with a lower than national average for primary school attainment among women of child-bearing age. Secondary educated women represented 20.4% of surveyed women with a standard deviation of 40.3% evidencing higher than national averages in some population clusters for secondary education attainment. Among surveyed women, 5.9% had a higher education with a standard deviation of 23.6% implying that in some population clusters higher education attainment is much higher than the national average.

On average 22.4% of surveyed women belonged to the poorest socio-economic strata with a standard deviation of 41.7% implying that some populations had an over representation of this socio-economic group compared to the national average among women of child-bearing age. Almost a quarter i.e. 21.2% of Kenyan women belonged to the poorer wealth quintile with a standard deviation of 40.9% implying the over representation of poorer women compared to the national average among some population clusters. Conversely, 20.9% of Kenyan women belonged to the middle wealth quintile with a standard deviation of 40.7% implying the over representation of middle-income women compared to the national average in some population

Approximately 3.8% of surveyed women had never been married/never been in union with a standard deviation of 19.2% implying over representation of never married women in some population clusters in comparison to the national average while 74.9% of surveyed women were married with a standard deviation of 43.4% implying an under representation of married

women among some population clusters surveyed. Kenyan women who were living with a partner constituted 6.3% of surveyed women with a standard deviation of 24.2% implying the existence of some population clusters with a higher than national average predominance of women in informal unions/cohabitation.

Widowed women comprised 6.8% of surveyed women of child-bearing age with a standard deviation of 25.1% implying an over representation of widowed women in some population clusters relative to the national average while 2.4% of surveyed women were divorced with a standard deviation of 15.3% implying an over-representation of divorced women in some surveyed population clusters. Separated women comprised 5.8% of women with a standard deviation of 23.5% implying the same.

Government hospital births comprised of 30.4% of births with a standard deviation 46.0% implying that among some population clusters the utilization of government hospitals was higher than the national average. Government health center births constituted 9.9% of births within the survey period with a standard deviation of 29.9% while 5.8% of births occurred in a government dispensary with a standard deviation of 23.4% implying a higher than national average utilization of government health centers and government dispensaries respectively in some population clusters. Missionary hospital births represented 9.15% of births with a standard deviation 28.8% while 5.3% of births occurred at a private hospital with a standard deviation of 22.5% and 0.7% at a nursing home/maternity home with a standard deviation of 8.4% implying a utilization rate higher than the national average in some population clusters of missionary hospitals, private hospitals and nursing/maternity homes respectively.

Table 2: descriptive statistics of variables used in the model

Variable	Obs	Mean	Std. Dev.	Min	Max
C-Section Birth	20,930	0.087	0.281	0	1
Age	83,591	35.2	7.9	15	49
Number of ANC visits	14,945	3.96	1.879	0	20
Insurance	39,929	0.16	0.368	0	1
Multiple Pregnancy Order	83,591	0.04	0.261	0	3
Education level					
No education	83,591	0.127	0.332	0	1
Primary education	83,591	0.610	0.488	0	1
Secondary education	83,591	0.204	0.403	0	1
Higher education	83,591	0.059	0.236	0	1
Wealth Status					
Poorest	83,591	0.224	0.417	0	1
Poorer	83,591	0.212	0.409	0	1
Middle	83,591	0.209	0.407	0	1
Richer	83,591	0.183	0.387	0	1
Richest	83,591	0.171	0.377	0	1
Marital Status					

Never married	83,591	0.038	0.192	0	1
Married	83,591	0.749	0.434	0	1
Living with partner	83,591	0.063	0.242	0	1
Widowed	83,591	0.068	0.251	0	1
Divorced	83,591	0.024	0.153	0	1
Separated	83,591	0.058	0.235	0	1
Place of Delivery					
Government hospital	20,850	0.304	0.460	0	1
Government health center	20,850	0.099	0.299	0	1
Mission hospital/clinic	20,850	0.091	0.288	0	1
Private hospital/clinic	20,850	0.053	0.225	0	1
Nursing/maternity home	20,850	0.007	0.084	0	1

4.2. Econometric Results

4.2.2 Marginal Effects

Marginal effects were derived after the Binary Probit Model to bring practicality of application to the Probit model's results. Age was found to be positive and statistically significant at 95% confidence level (*dy/dx* = 0.0008, *p* =0.001). Each additional year of maternal age raised the probability of c-section delivery by 0.0778~ 0.08%. This is in alignment with previous studies which have associated an increase in maternal age to higher risks of birth complications such as preeclampsia, gestational diabetes, etc. which are absolute medical indicators for c-sections especially among first time mothers (Berghott e*t al.*, 2019).

Being Poorer relative to the base/reference wealth category (poorest) was positive and statistically significant at 95% confidence level (*dy/dx* = 0.008, *p* =0.008). Relative to the base/reference wealth category (poorest)- an increase in wealth to poorer wealth status relative to the poorest wealth status increased the likelihood of c-section delivery by0.0075~ 0.08%. Belonging in the middle wealth status relative to the base/reference wealth category (poorest) was positive but not statistically significant at 95% confidence level (*dy/dx* = 0.128, *p* =0.008). Relative to the base/reference wealth category (poorest)- an increase in wealth to middle income relative to the poorest wealth quintile increased the likelihood of c-section delivery by 1.2%. This is in alignment with studies which have observed a lower than optimal utilization of c-section rates in low-resource/poor settings such that too few poor women access c-section deliveries despite their medical need for the procedure (Mcall, 2018).

Being Richer relative to the base/reference wealth category (poorest) was positive and statistically significant at 95% confidence level (*dy/dx* = 0.003, *p* =0.009). An increase in wealth to richer status relative to the poorest wealth status increased the likelihood of c-section

delivery by 2.9%. Similarly, belonging to the richest socio-economic category relative to the base/reference wealth category (poorest) was positive and statistically significant at 95% confidence level (*dy/dx* = 0.028, *p* =0.01) an increase in wealth to richest status relative to the poorest wealth status increased the likelihood of c-section delivery by 2.8%. This could be explained by the fact that the richest and richer mothers relative to mothers from lower socio-economic status are more likely to have financial access to lower regulated private health services which advocate more for the patient's wishes than for doctor/physician's recommendations (Vlieira *et al.*, 2015).

Being Primary educated relative to the base/reference education level (no-education) was positive and statistically significant at 95% confidence level (*dy/dx* = 0.018, *p* =0.007). Relative to no education, an increase in educational level to primary education increased the likelihood of c-section delivery by 18%. A secondary education relative to the base/reference education level (no-education) was positive and statistically significant at 95% confidence level (*dy/dx* = 0.018, *p* =0.007). Relative to the base educational level (no-education), secondary education increased the likelihood of c-section delivery by 2.3%. Higher education relative to the base/reference education level (no-education) was positive and statistically significant at 95% confidence level (*dy/dx* = 0.038, *p* =0.013). An increase in educational level to higher education increased the likelihood of c-section delivery by 3.8%. This could be explained by past studies that have observed a preference for c-section deliveries among higher educated women due to a perception of convenience (Panda *et al.,2018).* There also exists correlation between higher maternal age and higher socio-economic status (wealth) which implies that higher-educated mothers are more likely than their lower educated counterparts to be able to afford the direct and indirect medical costs of c-section deliveries (Ardic, 2018).

Rural residence relative to urban residence was negative and statistically significant at 95% confidence level (*dy/dx* =-0.014, *p* =0.006). Rural residence relative to urban residence decreased the likelihood of c-section delivery by 1.4%. Rural women are less likely than their urban counterparts to have physical access to obstetricians or hospitals equipped to conduct c-section deliveries (Adewuyi et al., 2019). Health insurance relative to no health insurance was positive and not statistically significant at 95% confidence level (*dy/dx* = 0.01, *p* =0.1). Health insurance cover increased the likelihood of c-section delivery by 1.1%. Except for widowed marital status relative to the base marital category (never in union/never married) (*dy/dx* = -0.05, *p* =0.002), Relative to the never in union marital category (the base/reference marital status category) and at 99% level of significance, being widowed reduced the likelihood of c-section delivery by 4.7%~5%. In Kenya, the lack of statistical significance could be as a result of the overall low penetration/uptake of health insurance among Kenyan women. In other studies, medical insurance has been significantly associated with higher preference for c-sectio deliveries (Tadevosyan *et al.,* 2018)

Delivery place was positive and statistically significant at 95% confidence Level (*dy/dx* = 0.06, *p* =0.05). Choice of delivery place (healthcare facility) increased the likelihood of delivery by c-section by 5.8%~6%. These results can be explained by the fact that not all delivery places in Kenya are equipped to offer c-section delivery services hence mothers who deliver at home, in dispensaries or level 3 hospital facilities in Kenya are the least likely to deliver by c-section compared to women who deliver at health facilities that are medically equipped to handle c-section surgical births (Sanni e*t al.*, 2018). Number of ANC visits was positive and statistically significant at 95% confidence Level (*dy/dx* = 0.007, *p* =0.05). The number of ANC visits increased the probability of c-section delivery by 0.7%. This is in alignment with previous study findings that observe a high correlation between c-section delivery and more ANC visits. This is because medical indicators for c-sections are more likely to be observed with higher

ANC visits (Barros *et al*.,2018). Finally, Multiple pregnancy order was positive and statistically significant at 95% confidence Level (dy/dx = 0.04, p =0.03). multiple pregnancy order (twin and higher order gestation/pregnancy) increased the probability of c-section delivery by 4.3%~4% at 99% level of significance. This is because of the higher risk of medical complications to the mother or fetus associated with multiple gestation (Sanni *et al.*,2018). Also, medical literature points to the increased risk of a combined vaginal and c-section delivery in multiples hence physicians may have a preference to simplify the potentially complicated delivery process by prescribing a c-section (Hofmeyr, Barrett, & Crowther, 2011)

Table 3: Marginal Effects

C-Section birth	dy/dx	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Age*	0.000778	0.000396	1.96	0.049	1.730E-06	0.001554
Wealth status (poorest)						
Poorer	0.00833	0.00753	1.11	0.269	-0.0064276	0.023088
Middle	0.01276	0.007837	1.63	0.104	-0.0026007	0.02812
Richer*	0.029659	0.008676	3.42	0.001	0.0126544	0.046664
Richest*	0.028099	0.009897	2.84	0.005	0.0087023	0.047496
Education level (no education)						
Primary education*	0.018107	0.007368	2.46	0.014	0.0036665	0.032548
Secondary education*	0.023385	0.008735	2.68	0.007	0.0062649	0.040506
Higher education *	0.038167	0.012403	3.08	0.002	0.0138573	0.062476
Residence*	-0.01429	0.00577	-2.48	0.013	-0.0256002	-0.00298
Insurance	0.011127	0.006732	1.65	0.098	-0.0020673	0.024322
Marital status (never married/never in union)						
Married	-0.00669	0.010395	-0.64	0.520	-0.0270613	0.013684
Living with partner	-0.01389	0.014125	-0.98	0.325	-0.0415762	0.013793
Widowed*	-0.04749	0.015415	-3.08	0.002	-0.077705	-0.01728
Divorced	0.035249	0.025563	1.38	0.168	-0.0148541	0.085352
Separated	0.010257	0.015166	0.68	0.499	-0.0194681	0.039982
Delivery place *	0.058824	0.003894	15.11	0.000	0.0511922	0.066455
ANC visits *	0.00707	0.003667	1.93	0.050	-0.0001168	0.014256
Multiple pregnancy order*	0.043285	0.006918	6.26	0.000	0.0297268	0.056844
Note: dy/dx for factor level s is the discrete change from the base level.						

(*) significant at 95% level of significance

4.2.1 The Binary Probit Model BPM

A Probit model was estimated with iterated categorical variables and the results are summarized in table **3** below. Positive coefficients among independent variables was observed to coincide with an increase in the Probit index/Z-score for a one unit change in the predictor/independent variable and vice versa (Osborne, 2014). Statistically significant co-efficient from the Binary Probit analysis were interpreted. The maternal age co-efficient was found to be positive and statistically significant at the 5% level of significance (ß =0.007, *p* =0. 0.49). An increase in age by one year (is associated with an increase in the z-score for c-section birth by 0.007.

Wealth status positively predicts c-section delivery. An improvement in wealth status from poorest to richer was found to be positive and statistically significant at 5% level of significance (ß = 0.264, *p* =0.001). Women from higher socio-economic status had a higher z-score for c-section delivery compared to those from lower socio-economic status such that; - An increase in socio-economic status from the poorest wealth status (reference wealth status) to Richer wealth status increased the Z-score of c-section delivery by 0.264. Similarly, an improvement in wealth status from Poorest to Richest was found to be positive and statistically significant at 5% level of significance (ß = 0.252, *p* =0.004) relative to the poorest wealth status, being from the Richest wealth status (statistically significant) increased the Z-score of c-section delivery by 0.252.

Relative to no-education (reference education level) an increase in education level to primary education was found to be positive and statistically significant (ß = 0.181, *p* =0.001). An advancement in educational attainment from no education to primary education was found to be positive and statistically significant (ß = 0.226, *p* =0.011). Relative to no-education (reference education level) an increase in education level to secondary education was found to

be positive and statistically significant (ß = 0.181, *p* =0.001). A secondary educated woman relative to an uneducated one had a higher z-score of c-section delivery by 0.226. An increase in education level to tertiary education was found to be positive and statistically significant (ß = 0.342, *p* =0.002). It increased the z-score of c-section delivery by 0.342. Rural residence was found to be negatively associated with c-section delivery and statistically significant (ß = -0.126, *p* =0.013). It reduced the z-score of c-section delivery by 0.126.

Relative to the reference marital status (never married/never in union), being widowed reduced the Probit score of c-section delivery by 0.568. Place of Delivery was found to be positive and statistically significant (ß = 0.5181, *p* =0.000) increased the z-score of c-section delivery by 0.518. Number of ANC clinics (antenatal clinic) was found to be positive and statistically significant (ß = 0.062, *p* =0.05). As ANC visits increased the z-score of c-section delivery increased by 0.062. Finally, Multiple pregnancy order was found to be positive and statistically significant (ß = 0.381, *p* =0.000). Each additional order of pregnancy increased the z-score of c-section delivery by 0.381.

Table 4: Binary Probit Model

c-section birth	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Age*	0.00685	0.003485	1.97	0.049	0.0000186	0.013681
wealth status (poorest)						
Poorer	0.084192	0.076418	1.1	0.271	-0.065585	0.233969
Middle	0.125208	0.077318	1.62	0.105	-0.026332	0.276748
Richer*	0.263817	0.078081	3.38	0.001	0.1107806	0.416853
Richest*	0.252011	0.087716	2.87	0.004	0.0800908	0.423932
education level (no education)						
Primary education*	0.180711	0.080038	2.26	0.024	0.0238406	0.337582
Secondary education*	0.225942	0.089307	2.53	0.011	0.0509035	0.400981
Tertiary education*	0.340209	0.107611	3.16	0.002	0.1292958	0.551123
Residence*	-0.12589	0.050778	-2.48	0.013	-0.225412	-0.02636
Insurance	0.09802	0.059286	1.65	0.098	-0.018179	0.214218
Marital status (never married/never in union)						
Married	-0.05723	0.086241	-0.66	0.507	-0.226257	0.1118
Living with partner	-0.12408	0.127264	-0.98	0.330	-0.373517	0.125351
Widowed*	-0.56785	0.237572	-2.39	0.017	-1.033478	-0.10221
Divorced	0.249358	0.166944	1.49	0.135	-0.077846	0.576562
Separated	0.080447	0.118534	0.68	0.497	-0.151875	0.312769
Delivery place *	0.518172	0.033868	15.3	0.000	0.4517918	0.584552
ANC visits *	0.062276	0.032273	1.93	0.050	-0.000977	0.125529
Multiple pregnancy order *	0.381297	0.060798	6.27	0.000	0.2621355	0.500458
Constant	-3.04248	0.20513	-14.83	0.000	-3.44453	-2.64044

(*) significant at 95% level of significance

4.3 Discussion of Results.

Statistically significant influences on c-section births were established by probit analysis to include individual factors such as;- maternal age, education level and, multiple order pregnancy; interpersonal factors such as widowed marital status (relative to never married marital status); organizational factors that describe access to maternal health services and health financing such as;-place of delivery, health insurance cover and number of Antenatal care clinic visits (ANC visits) and; community factors notably residence (rural or urban residence). The nature of the influence of the predictors on c-section births yielded the following results. As expected, a higher maternal age, urban residence, medical insurance, and multiple pregnancy order/ multiple gestation, were positively associated with increased probability of c-section deliveries. These findings are supported by the following studies which have presented collaborating results;- Benova *et al.,* (2017) found significant disparities in urban and rural utilization of c-section deliveries across thirty four countries in Sub-Saharan Africa in addition to a higher risk of c-section delivery prevalence among women with multiple gestation pregnancies and multiple pregancy risk status.

Contrary to expectations, marital status particularly; being married, living with a partner and, being divorced or separated relative to never having been in a union/never married, reduced the probability of c-section deliveries in Kenya. These results are consistent with previous studies such as Cegolon *et al.,* (2020) who observed a higher c-section rate among divorced and separated women in comparison to among married women. Other studies have also confirmed that advanced maternal age (35-49 years), belonging to richer households, multiple births and being the sole or biggest decision maker for example among unmarried women increased the odds of c-section delivery (Sanni *et al*, 2018).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary of the findings. It also includes conclusions and policy recommendations based on the empirical results in chapter four.

5.2 Summary

Older mothers are more likely to obtain c-section deliveries than younger mothers. Additionally, the higher the socio-economic/wealth status of the mother, the more likely she is to deliver by c-section compared to poor mothers. This can be attributed to among other factors; - the predominance of wealthier women residing in urban areas where physical access to c-section services is greater than in rural areas and, the fact that they are more likely to afford the indirect as well as the direct costs of c-section deliveries. An uneducated mother is the least likely to deliver by c-section. C-sections were observed to increase in likelihood as education level rose as education level increased. Higher educated women are more likely to be wealthier, reside in urban areas and are more likely to be older mothers at the time of delivery-all additional factors that observably increase the likelihood of c-section delivery. Health insurance coverage in Kenya is low- this could explain why medical insurance was observed not to be a statistically significant predictor of c-section birth.

Given that the procedure is covered by the NHIF-Kenya's largest insurer and private health insurers- it is plausible that mothers who are covered are more likely to elect c-section deliveries than those who are not and would hence have to pay the high medical costs associated

with c-section deliveries from out-of-pocket. Married women, women living with a partner and widowed women were less likely to deliver by c-section than never married women, but separated and divorced women were more likely to deliver by c-section than never married women. Among widowed women the result was statistically significant implying potential medical access challenges such as financial access to c-section services. Place of delivery impacted the likelihood of c-section delivery thus;- if a mother delivers at a facility where c-section delivery is not offered such as a dispensary, health clinic or residence that does not support a c-section birth -she will not deliver by c-section.

Additionally, the recommended minimum number of ANC visits during a pregnancy is 4 visits. Complicated pregnancies are more likely to have more ANC visits than normal pregnancies since they are more closely monitored hence the reason why c-section delivery is a statistically significant predictor of c-section births. Finally, multiple order pregnancies are automatically assigned high-risk status. For this reason, doctors tend to prefer c-section deliveries for multiple births especially given the risk of mixed births where the first baby is delivered normally and the subsequent baby/s by c-section delivery.

5.3 Conclusion

Kenyan women like their counterparts in developing countries -especially rural residing women are often employed in low-tier industries (such as: - the service sector, agriculture etc.). Rural women tend to be less wealthy and less educated than their urban counterparts (Neuman & Alock, *et al.,* 2014). Any interruptions in economic productivity due to childbirth results in wage losses and indirect medical expenditures such as labor substitution (hiring additional labor to substitute the lost value of the mother's labor) (Anderson, et al., 2017). This results in an increased risk of catastrophic medical expenditure (Dumond & L de Bernis, 2001). Hence, many women especially less wealthy and less educated women are less likely to choose c-section births regardless of an existing 'no-user-fee' government policy or medical necessity (Arsenault, et al., 2013). This is a wider societal dilemma indicating the existence of community factors/ the social environment (social norms, attitudes and culture) interacting with personal factors (such as; the mothers employment status, education level) to reduce Rural women's access to and utilization of CS services.

Similarly, Kenya like other developing countries faces disparities in CS rates between the public and the private health system hence the case for an accreditation system to regulate the financial incentives of private hospitals to administer CS in order to ensure its rational use (Farhan & Ali *et Al.,* 2020). There is evidence that CS is a preferred mode of delivery among urban, wealthier and higher educated women relative to rural, poorer and lesser educated women.

The NHIF has a reimbursement structure that limits the payments that they make to hospitals for cesarean deliveries unlike private hospitals which rely more heavily on user out-of-pocket payments and private medical insurance for revenue (Aketch, 2018). Private hospitals face no limitation on their charges for c-section delivery on out-of-pocket paying patients or on private insurers however since the NHIF is the largest medical insurer and reimbursement rates are

fixed. the incentive to maximize revenues by prescribing c-section deliveries with low indication of risk or at the request of the patient (typically higher educated, wealthier women) may be lower in private hospitals because the surplus in invoiced amount for c-sections would have to be met out-of-pocket unless the woman has private medical insurance. However, unlike government hospitals where higher health output is prioritized, private hospitals prioritize revenue maximization. This is especially so given that prior to 2015, the NHIF also provided advance reimbursements to private hospitals who administered treatment to their members (Kihuba *et al*, 2015).

The rate of c-section deliveries in Kenya is below World Health Organization WHO recommendations of 15%. Kenya's high maternal mortality rate in combination with low c-section prevalence implies that there is a significant population of Kenyan women who do not have access to c-sections. Given that in alignment to the expected results;- higher educational attainment relative to no education, being employed and higher wealth raised the probability of c-section delivery among Kenyan women -it is possible that the effect of unobserved variables such as the nature of employment, societal preference of Kenyan women for non-surgical births and the abolishment of user fees for maternity health services in all public health facilities by presidential directive on June 1 2013 (which coincided with the reference study period of this survey) have not had an effect on equitability of healthcare access to c-section deliveries and hence the choice of c-section births.

The findings of this study should be considered in the context of the following limitations:- 1. The KDHS survey format does not capture the exact nature of pregnancy complications among women. Given that first pregnancy is automatically assigned a high risk, the study could not attribute incidences of pregnancy complications to specific medical phenomena during the pregnancy hence there are significant methodological limitations in inferencing medical predictors of c-section at a national level 2. Because of the previous limitation -maternal risk

profiles are difficult to establish with greater accuracy at a national level and hence phenomena such as moral hazard in the prescription of c-section surgical births cannot be accurately inferenced 3. The implementation of Free Maternal Healthcare policy in Kenya may have influenced changes in health seeking behavior among women of childbearing age towards an increase in demand for and utilization of c-section surgeries especially among women of higher social-economic/wealth status and higher education attainment.

Further areas of study recommended by the study to address these gaps include: An analysis of regional disparities in the prescription of c-section deliveries among women of child bearing age in Kenya; A retrospective analysis of the determinants of choice of c-section in Kenya from 2008-2019 using the currently unpublished KDHS 2019 -expected to be publicly available in 2020; Maternal healthcare services utilization among widowed women of child bearing age in Kenya and; An analysis of the determinants of rural and urban disparities in c-section deliveries in Kenya.

5.4 Recommendations

Public health policy recommendations from this study are as follows: - 1. To increase the allocation from the Ministry of Health Capitation Fund- which is the source of reimbursement funds for c-section deliveries is increased to meet the WHO threshold for c-section delivery rate. 2. The study recommends a multi-sectoral approach to tackle this inequity in CS utilization through promoting policies such as education and economic policies to build the human resource profile of Kenyan women. 3. The implementation of a government monitoring agency specifically to assess maternal and neo-natal outcomes in the private health system and the adoption of a national c-section birth policy framework to regulate and standardize the threshold for medical indications that warrant c-section delivery. 4. The launching of public health campaigns aimed at sensitizing women on existing myths that CS is safer than normal delivery for all births. This is to alleviate concerns which have been raised by health industry stakeholders -most notably private medical insurers and the National Hospital Insurance Fund about the increase in the rate hospital re-imbursement budgets for c-section births. This is because -as observed in other regions of the world -with economic growth more Kenyan women will deliver in hospitals and thus c-section rates and reimbursement budgets will inevitably rise.

Private sector health policy recommendations from this study are: - 1.To further asses the reasons for potential higher probability of utilization of c-section delivery services among higher educated women relative to women who have no education and among women from the richer and richest wealth quintiles relative to the poorest women. 2. The study recommends that private insurers should take measures such as patient education for their clients 3. Additionally, training could be extended to medical professionals to improve patient experience of labor and delivery in addition to .4. That private insurers should; establish a reimbursement structure - similar to the NHIF to curb the incentive for provider induced demand given that revenue

maximizing incentive is prevalent in private hospitals; patient education should be undertaken to re-enforce the existing preference among Kenyan women for non-surgical births.

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