
Determinants of Obstetric Fistulas occurrence among Kenyan women

BY

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X53/64528/2013

**Submitted in partial fulfillment of the requirements for the Degree of Master of Science in
Health Economics and Policy at
The University of Nairobi**

November, 2018

Declaration

I Philip Ameka do declare that this is my original work and haven't presented the same for the award of any other degree or to any other University.

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This research proposal has been submitted for examination with approval of my university supervisors

Signature.....

Date.....

Dr. Martine Oleche

Acknowledgement

First and foremost I give Glory to the Most High God who has given me life, health and wisdom to be able to accomplish this work despite all the challenges involved. This work finally emerges from great time spent in classroom and in the field interacting with various professionals and intellectuals who have supported, challenged and positively criticized.

The contents of this paper were extensively discussed with my supervisors prior to submission, hence I do greatly appreciate the relentless, outstanding, unwavering support, constructive positive criticism, guidance and input from my supervisor Dr. Martine Oleche. Your time and energy that you invested in this work has finally come to fulfillment. Indeed it's my humble request that surely God may reward you abundantly.

Finally I render my acknowledgement to the major contribution of the members of staff School of Economics University of Nairobi for creating an enabling environment for me to carry out this work and for your great support, dedication and love that you endowed me throughout this research up to its completion.

Dedication

I do dedicate this work to my Dad Mr. Ambrose Ameka for the great encouragement and support you showed me throughout this research work, together with Mum Mrs. Teresia Ameka for your daily prayers and words of wisdom and encouragement.

It's my sincere wish that you may be greatly rewarded with good tidings as you continue to offer more

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Abbreviations and acronyms

ANC	Antenatal Care
DALY	Disability Adjusted Life Years

DRH	Division of Reproductive Health
EmOC	Emergency Obstetric Care
FIGO	International Federation of Gynaecology and Obstetrics
GDP	Gross Domestic Product
HRP	Human Reproduction Programme
ICM	International Confederation of Midwives
IPV	Intimate Partner Violence
KDHS	Kenya Demographic and Health Survey
KNBS	Kenya National Bureau of Statistics
MDGs	Millennium Development Goals
MMR	Maternal Mortality Rate
MNCH	Maternal, Newborn and Child Health
QALY	Quality Adjusted Life Years
RVF	Recto-Vaginal Fistula
SBA	Skilled birth attendant
SDGs	Sustainable Development Goals
SID	Supply Induced Demand
TBA	Traditional Birth Attendant
THE	Total Health Expenditure
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
VVF	Vesico-Vaginal Fistula
WTP	Willingness to pay
WHO	World Health Organization

ABSTRACT

This study was undertaken to explore the main indicators for obstetric fistula occurrence; a maternal childbirth injury that has been eradicated in developed countries yet it continues to be a debilitating and traumatizing maternal childbirth challenge in parts of Asia and Sub-Saharan Africa including Kenya. Obstetric Fistulas occurrence portray a disconnect between Maternal Health seeking Behavior and utilization (McNamee et al., 2014) of existing medical services, by proxy it's a representation of unmet maternal healthcare needs and unfinished Post-Millennium Development Global Maternal Health agenda.

The 69th World Health Assembly undertook the commitment to implement the Global Strategy for Women, children and Adolescents' Health (2016-2030) which is anchored on the strategy set to ensure that every woman, child and adolescent in any setting, anywhere in the world is able to survive and thrive by 2030.

This study investigates the determinants of obstetric fistulas, highlighting its impact with a focus on drawing lessons learnt so as to bridge the gap between adequacy of maternal healthcare services, unmet maternal healthcare needs and the scarce healthcare resources. The Study utilizes the nationally representative Kenya Demographic Health Survey 2014 data on Obstetric Fistulas among Kenyan women.

Obstetric fistulas prevalence among Kenyan women directly correlates with Adequacy in maternal healthcare utilization at all levels during pregnancy.

Key words: Obstructed labour, Obstetric Fistulas, Healthcare cost burden, Evidence Based Best Practice. Two Stage Residual Inclusion (2SRI).

CHAPTER ONE: INTRODUCTION

1.1 Background

The World Health Organization (WHO) overview on ¹Maternal Health depicts that giving birth in developed nations is an exciting and self-rewarding experience (WHO, 2008) due to the existence of advanced and robust basic comprehensive Maternal Healthcare systems. On the other hand in developing countries, Allen (2002); Mavalankar and Rosenfield(2005) underscored that pregnancy becomes a risky venture due to associated morbidity and mortality arising from pregnancy related complications potentiated by inadequate maternal healthcare services.

Despite a global reduction of up to 44 percent in Global maternal mortality over the decade (UNFPA, 2015), in many developing Nations, women still face unacceptable and undue risks of complications or death during pregnancy, labor, and delivery (Purandare & Adanu, 2015).

WHO (2014) *facts on state of Global health* estimate 800 maternal deaths daily due to pregnancy and childbirth complications. This translates to one maternal death in every two minutes, with 20 to 30 women encountering serious or long term complications (UNFPA, 2015). Literature shows that health promoting activities during and after pregnancy (Arthur, 2012) including adequate Antenatal care (ANC) and skilled delivery assistance (SDA) is associated with reduced maternal morbidity and mortality (Magadi, Madise & Diamond, 2001). Almost all maternal deaths are preventable by adequate skilled maternal care (WHO, UNICEF, UNFPA& The World Bank, 2015). WHO recommends minimum of four visits to a skilled maternal health attendant at 16th week, between 24-28 weeks, 32nd week and 36th week (USAID/Population council, 2006), this is without any complication but more visits recommended in case of pre-existing or current maternal or foetal complications.

The United Nations Population Fund in its 2014 report on *Obstetric Fistula*, defined Obstetric Fistula as a preventable gynecological injury occasioned by unassisted prolonged² and obstructed

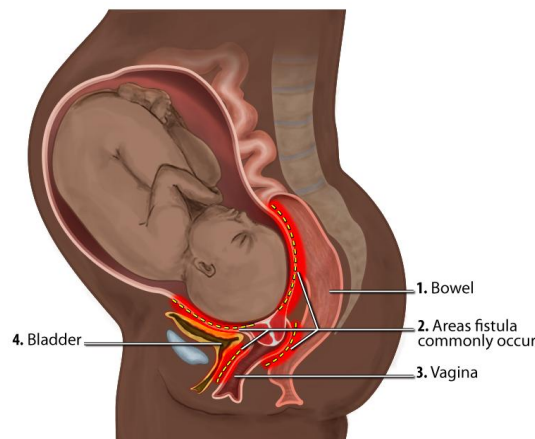
¹WHO report on *Maternal Health* (2008), refers the concept of Maternal Health as the health of women during pregnancy, childbirth and the postpartum period.

²Normal duration of labour for first time mothers is estimated between 10-12 hours, it's considered prolonged if it last more than 16 hours (Daftary et al., 2016).

labour where due to sustained pressure by the Foetal head on the mother's pelvic bones leading to deprivation of blood flow to the adjacent pelvic soft tissue that results into Tissue necrosis in that area(s) as illustrated in figure 1. The necrotic or dead tissues later slough off leaving an opening between the vagina wall and bladder known as Vesico-Vaginal Fistula (VVF) and /or the rectum also referred to as Recto-Vaginal Fistula (RVF). This connection becomes a constant source of either urine or stool incontinence and sometimes both.

WHO (2003) underlines that obstructed labour is a scenario where there is a mismatch or foetal-pelvic disproportion between the foetal presenting part and maternal pelvic brim. This hinders the foetus from progressing into the birth canal despite strong consistent uterine contractions. The trapped areas soon get deprived of blood supply leading to necrosis of adjacent maternal tissues and eventual sloughing off of these dead tissues leaving a fistula.

Figure 1: Common anatomical areas where obstetric fistula occurs



Sources: <http://www.continentalhospitals.com/blog/pregnancy-symptoms-top-5-early-pregnancy-symptoms/>

As a preventable childbirth injury (Temesgen, 2016), it's uncommon in the developed world but remains a frequent cause of distressing disability (Chamberlain, 1995), and a major challenge in developing countries, especially in sub-Saharan Africa due to inadequate obstetric services. Browning (2004) referred to it as a disease of poverty.

Economists' interest in maternal Healthcare is based on maternal healthcare investment and consumption (Mwabu, 2008), where good health is considered an integral part of Human capital

(Grossman, 1972). From a policy maker's perspective, Fistula occurrence and prevalence is a key indicator of inability of healthcare systems to deliver timely, accessible and appropriate intrapartum care as highlighted by World Health Organization report on *Maternal Health* (2014) and it's a key representation of unfinished post MDGs Global Maternal Health Agenda (Maheu-Giroux et al.,2016). Research depicts that Maternal death due to obstetric fistula complications is preventable with early diagnosis and access to emergency caesarean section, a service that is largely unavailable to most mothers in some developing countries (Pearson & Shoo, 2005; Paxton et al., 2006; Kayongo et al., 2006).

1.1.1 Maternal Health Services in Kenya

In June, 1, 2013 President Uhuru Kenyatta launched the free maternity program that focused on eliminating barriers to maternal healthcare uptake and utilization as well as capacity building through direct reimbursement to the health facility for each delivery conducted and reported to ensure more resources at facility level. This was a crucial milestone in terms of ensuring equity despite reported Quality and Efficiency issues (Kimani, Mugo & Kioko, 2016). Further illustration in Table 1 depicts how the monies were reimbursed:

Table 1: Maternal Healthcare Capacity building for Kenya health facilities

Health facility	Charges per delivery reimbursed (Ksh)
Dispensaries	2500
Health centers	2500
Level four hospitals	5000
Level five hospitals	5000
National Referral Hospitals	17500

Sources: www.health.go.ke

Some emerging issues include reimbursement challenges where total amount claimed doesn't match amount reimbursed and a slow process of reimbursement as noted by Ministry of Health Planning and Healthcare Division (MOH PHD, 2015). In 2014/2015 Ksh2.895 billion was claimed but Ksh1.436 billion was actually reimbursed with arrangements made to pay the balance later date. (MOH PHD, 2015).

1.1.2 Beyond zero campaign

The free maternity program was further boosted when the Kenyan first lady Mrs. Margaret Kenyatta promulgated The Beyond Zero countrywide campaign in January 2014, an initiative geared towards maternal health advocacy and ensuring safe motherhood through professional assisted delivery services by incorporation of fully equipped mobile clinics to assist in early and timely diagnosis and treatment of ³maternal disorders in all counties. By September 2016 a total of 47 fully equipped mobile clinics had been handed to the 47 counties (Beyond zero, 2016).

1.1.3 Maternal health care in Kenya and devolution

With the Devolved Government (Institute of Economic Affairs, IEA, 2010) including the Health, a number of challenges have emerged that subsequently affects healthcare access and utilization. Initially free maternity funding was channeled directly to the facility however this changed after the enactment of ⁴County Allocation Revenue Act, 2015. Delayed Payments (MOH PHD, 2015) channeled to the 47 county revenue funds where the county government then facilitates reimbursement to the health facilities within the county depending on the actual deliveries (births) conducted.

Other issues reported include; hospital personnel, delayed salaries, poor and uneven remuneration of health workers despite increased workload (Lang'at & Mwanri, 2015), leading to staff de-motivation, reported incidences of disrespect and abuse on patients during labor and delivery (Abuya et al, 2015) thereby undermining demand and maternal healthcare utilization. Staffing including inability to attract and retain qualified medical workers (Ojaka et al, 2014) within the county, frequent strikes by health workers due to delayed or non-payment of salaries, influx of counterfeit and unregulated medicines and medical products Rågo et al., (2014) compares no treatment. Thaddeus and Maine (1994) indicated that service quality informs decision making prior to health care utilization; hence the need of addressing negative public perception of healthcare in government funded healthcare facilities (Ansari et al., 2011).

³A maternal health disorder refers to “any health condition attributed to and/or complicating pregnancy and childbirth that has a negative impact on the woman’s wellbeing and/or functioning” (UNDP, UNFPA, UNICEF, WHO & World Bank, 2015).

⁴ County Allocation Revenue Act, 2015 as contained in the Kenya Gazette Supplement No.119, (Acts No.10)

1.2 Study Problem

Persistence and prevalence of obstetric fistulas in Kenya forms the basis of evaluating adequacy of maternal healthcare market to address unmet Maternal Healthcare need. This study undertakes a systematic review of fistula determinants that contribute to the magnitude and impact of obstetric fistulas among Kenyan women, while drawing lessons on structuring High Impact Preventive Strategies and guidelines for best healthcare practice.

Obstetric Fistula has virtually been eliminated in developed countries (Chamberlain, 1995) yet it continues to be a major maternal health challenge in sub-Saharan nations including Kenya. Despite concerted effort, reported fistula prevalence still remains high, Tuncalp et al., (2015) in WHO Report puts the Global estimates at between 50,000 to 100,000 new fistulas annually with additional 2 million women living with untreated fistulas. Kenya annual estimates are placed at 3000 women (Roka 2010; MOH/UNFPA, 2004; flying doctors Africa, 2014) of which only 7.5% have been reported and treated (MOH & UNFPA Kenya, 2004).

AbouZahr (2003) referred Obstetric fistula as "the single most devastating morbidity of neglected childbirth" while Browning (2004) reiterated that it's a disease of poverty. Wall (2012) further underscored that it be categorized among "neglected tropical diseases". The impact is deplorable, Women suffer double tragedy because, apart from the direct impact of the fistula on health and livelihood, more than 90% of women with obstetric fistulas end up with stillbirths too (Alkire, 2012).

Major reforms underpinned on WHO (2012) healthcare indicators include; (i) improved health outcomes, (ii) elimination or reduction in disease burden, (iii) quality and efficient utilization of scarce healthcare resources geared towards universal health coverage. This study is inter-linked with indicators (i) and (ii) where identifying the determinants of fistulas will support already existing efforts geared towards prevention, treatment and eradication of the same.

Scanty information exists on; nationally representative in-depth assessment programs addressing reasons why obstetric fistulas as a preventable maternal birth injury continues to vex mothers in Kenya and why it can't be eradicated as opposed to treatment only. Most studies and interventions focus on management side without effectively addressing the root cause of

Obstetric fistula occurrence which by proxy represents unmet maternal healthcare need. Existing studies show that more than 75% of the women who get fistulas would have had a prolonged labour of more than three days as per UNFPA report on Fistula (2014) with over 90% caused by obstructed labour (Hilton, 2001) hence the need to explore the underlying reasons for delay to seek medical assistance from a skilled or professional health worker. Furthermore we set to explore the underpinnings of maternal healthcare utilization decisions that greatly determine the probability of fistula occurrences.

1.3 Study objectives

The main research objective for this study is to establish key determinants that interact resulting in obstetric fistula occurrence among Kenyan women. The study addresses the following specific objectives:

- i. To establish the predisposing factors that largely contributes to the occurrence of fistulas in Kenya.
- ii. To highlight the impact as a result of obstetric fistula occurrence and experience among women.
- iii. To draw lessons that augment maternal health policy framework for Best Healthcare Practice.

1.4 Significance of the study

Health care resources over the years have remained scarce hence the need for a concerted effort on maximization of desired outputs and outcomes from these scarce resources without compromising on quality, efficiency and safety. By undertaking this study to explore on the determinants of fistula in Kenya, The study has been informed by the cost implication of Obstetric fistula as a maternal health problem (Andel et al., 2012) and how its occurrence increases healthcare cost burden both at household and national level (James & Savitz, 2011) given these scarce resources.

Fistula Foundation (2015), an organization assisting women with fistula, puts the cost of full fistula treatment at \$5865 per patient equivalent to Ksh.60334 which caters for surgery, post-

operative care and physical rehabilitation. Literature indicates that for one maternal death, additional thirty encounter severe injuries and complications such as obstetric fistula (UNDP, WHO, UNFPA, and World Bank, 2006). Identification and prevention of obstetric fistulas offers a double dividend by reduction in maternal healthcare cost while enhancing anticipated and preferred maternal health outcomes.

Risk factors identification informs policy makers on prioritizing on high impact interventions that addresses the vicious continuum of inadequate maternal healthcare-prolonged obstructed labour and fistula occurrence aiming at its prevention and subsequent elimination. Furthermore this study explores and addresses possible predisposing factors linked to Obstetric Fistula occurrence as a maternal preventable injury while highlighting the related economic impact on the mothers. The ultimate goal is to draw lessons for Best Healthcare Practice by investing in critical identification, prevention and management of potential healthcare errors that undermine full Maternal healthcare utilization.

1.5 Study Limitations

While undertaking this study, the researcher was fully aware of the shortcomings and limitations of the study with a full view that there lacks a detailed, nationwide elaborate fistula Tracking and Reporting system in the healthcare system. Furthermore lack of Kenyan published data on detailed iatrogenic (facility/provider mediated) factors that result in fistula occurrence. The main reason being that Hospitals and health institution unwillingness to reveal their medical or surgical errors since this might be viewed as a source of reprimand and punishment (Bayazidi et al.,2012), degrading their credibility and reputation, or a source of medico-legal lawsuits. Likewise majority of women with obstetric fistula reside in poor and low socioeconomic status mainly in far to reach marginalized rural areas (Roka et al., 2010) where inadequate appropriate maternal care is prevalent. The challenge of accurate estimation of the burden of obstetric fistula is due to lack of reliable data since its occurrence is skewed towards the poor and marginalized communities (Tuncalp et al., 2015) However the study utilized the 2014 Kenya Demographic and Health Survey (KDHS) which is a national representative data for the country to carry out the study.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

In this chapter we carry out theoretical and empirical literature analysis on the indicators of Obstetric Fistulas occurrence, its associated impact and the excess burden on maternal healthcare.

2.1 Theoretical literature

Obstetric fistula is a gynecological injury characterized by an abnormal connection between the vaginal wall and the bladder also referred to as Vesico-vaginal fistula or with the rectum known as recto-vaginal fistula. This occurs as a result of childbirth injury due to prolonged unattended obstructed labour, where sustained foetal head pressure on the pelvic bones results in compromised blood supply on the adjacent trapped maternal pelvic tissues. This leads to necrosis of the trapped tissue which sloughs off leaving the abnormal connection (WHO, 2006; Roka et al, 2010). Fistula occurrence has two major etiological components namely; (i) Obstetric cause directly resulting from obstructed labour (Adler, 2013) and (ii) iatrogenic causes as a result of; surgical errors, chemotherapy or pelvic radiation therapy (Price & Price, 2015). Rape and female genital mutilation has been mentioned in literature as an important indicator for fistula (WHO, 2014b).

Obstetric fistula is predominantly high in areas where emergency caesarian section is not easily accessible (Cowgill et al., 2015) since this forms the core of treatment. WHO (2006) gives a global estimation of 300 million women living with pregnancy and child birth related complications. This relatively invisible maternal ailment (Cowgill et al., 2015) continues to cause distress among mothers in resource-poor countries (WHO, 2006) and far to reach rural areas (Roka et al, 2010). Its preventable by adequate skilled maternal healthcare where labour obstruction can be predicted, detected, diagnosed and treated early, (WHO, 2006; Maheu-Giroux, 2016). Statistics indicate inaccessibility of adequate and timely maternal healthcare (Ochako, Fotso, Ikamari, & Khasakhala, 2011) with more than 75% of these women noted to have had prolonged labour of more than three days UNFPA (2014) and over 90% caused by obstructed labour (Hilton, 2001).

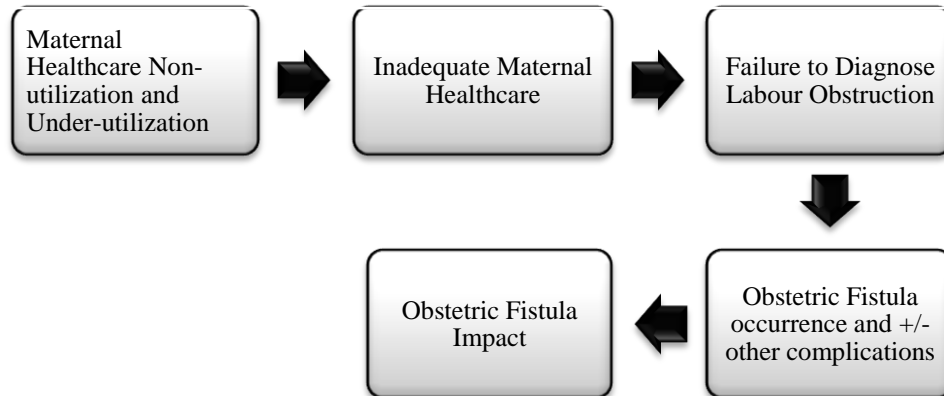
2.2 Epidemiology of obstetric fistula

Globally 210 million women become pregnant annually (Graham et al, 2016), in The Global burden of disease, Mathers, Fat and Boerma (2008) noted that obstructed labor as one of the leading etiology of obstetric fistula with its devastating contribution in terms of maternal morbidity and mortality. The magnitude of risk and the extent of harm remains a critical component of healthcare consumer safety. We review the prevalence, burden and predisposing factors of obstetric fistulas. Obstetric fistula as a preventable intrapartum injury (Wall, 2012), was once a major maternal catastrophe in Western countries, today is largely restricted to sub Saharan Africa as summarized by; Chamberlain (1995); Zheng et al.,(2009); Wall (2012) and WHO (2014b).The greatest challenge is the existence of scanty data on actual figures of Obstetric fistula often due to minimal studies (Adler, 2013) given that its more prevalent in far to reach (Roka et al, 2010) low resourced rural setup but WHO, Tuncalp et al., (2015) puts the Global estimates at between 50,000 to 100,000 new fistulas annually with additional 2 million women living with untreated fistulas.

2.3 Etiological Indicators of Obstetric Fistula

WHO *World health statistics* (2011) pointed out that Adequate Health Service Coverage has five key indicators that are used to estimate adequacy of healthcare and the extent of universal health coverage namely; (i) skilled antenatal and postnatal care, (ii) reproductive-health services (iii) childhood immunization, (iv) childhood vitamin A supplementation and (v) the treatment childhood, adolescents and adulthood diseases. Key to this study is skilled antenatal and postnatal care which is a significant indicator for the occurrence of fistula. This outcome is embedded and determined by (i) maternal healthcare utilization and (ii) adequacy of maternal healthcare services inclusive of a skilled birth attendant (SBA). Figure 2 summarizes the pathway to fistula occurrence;

Figure 2: Maternal Healthcare Consumption and fistula occurrence pathway



Sources: Author

2.3.1 Maternal Indicators for Obstetric Fistula Occurrence

Variables linked to obstructed labour and obstetric fistula occurrence include; lack of awareness on risk factors, access and utilization of family-planning services (Brodman, 2011) which is a determinant of parity. The higher the parity the greater likelihood of fistula occurrence in case of prolonged obstructed labour (Sih et al., 2016) due to weakened uterine wall tissue and probable maternal confidence in home delivery attained from previous pregnancies. Peterman and Johnson (2009) in Rwanda and Malawi and Temesgen (2016) in Ethiopia cited sexual violence as a risk variable in determining fistulas.

According to Alhusen et al (2015) negative sequelae of domestic violence and gender discrimination (Brodman, 2011), deters antenatal care utility thereby increased tendency of getting obstetric fistulas in case of obstructed labour. Ankama, et al (2014) and GSN, Newsgroup and Feed (2006) have cited the linkage between maternal physical violence and Female Genital Mutilation respectively as associated with adverse pregnancy outcomes. Nyabuti (2001) further highlighted that ⁵Perinatal complications are significantly increased by maternal (socioeconomic-demographic characteristics) and environmental factors such as; Maternal Education levels (Fotso et al., 2009); community awareness (Weston et al, 2011). Lack of awareness on the need

⁵ Perinatal refers the period from 22 completed weeks (154 days) of pregnancy to one week (7 completed days) after childbirth (WHO 2016).

for Skilled Birth Attendant accounts for 21.3% of Non-utilization of maternal healthcare services as reported in KDHS, (2008-09).

Furthermore, prolonged labour duration (McFadden et al., 2011) mainly due to delay in seeking or initiating care (Thaddeus et al.,1994) has been attributed to high prevalence of fistulas. Younger age, early marriage and childbirth before complete pelvic maturity as indicated by Browning, Allsworth, and Wall (2010) combined with lack of education which determines maternal healthcare utilization (Machio, 2016), have all been linked to an increased tendency of getting obstetric fistulas. Brodman (2011) on the other hand, explained the linkage between poverty, childhood malnutrition and young mothers with underdeveloped pelvis predisposing them to a greater likelihood of obstructed labour in cases of foetal-pelvic disproportion and absence of functional emergency obstetric care (EmOC). This is further compounded by foetal macrosomia⁶ (Pinton, 2016).

Maternal healthcare access logistics as an indicator occurs in terms of Geographical proximity (Qian et al., 2009) to the nearest facility, transport complexities (Tebeu et al., 2012; Liambila & Kuria, 2014),the mode, cost and other challenges such as traffic jams or state of infrastructural networks. Table 2 sums up reason among Kenyan women for not giving birth in a health facility:

Table 2: Reasons for not delivering in a health facility (women age 15–49)

Reasons	Percentage
Too far/ no transport	42.0%
Not necessary	21.3%
Abrupt delivery	18.1%
Cost too much	16.9%
Facility not open	4.2%
Not customary	1.4%
Husband/family did not allow	1.2%
Poor quality services	2.2%
No female provider	0.5%
Number of births not delivered in a health facility	2113

*Total includes 43 women missing information as to ANC visits. *Source:* DHS final report, Kenya 2008–2009

⁶Feotalmacrosomia describes a large newborn than average weighing 4000grams and above. Sources <http://www.mayoclinic.org/diseases-conditions/fetal-macrosomia/basics/definition/con-2003542>

A relevant modern concept of ⁷Supply Induced Demand is observed as noted by McGuire, Henderson and Mooney (1995) where maternal acceptance on healthcare utilization despite fact that mothers as healthcare consumers have choices and preferences yet they end up making decisions based on the influence of the supplier.

Literature acknowledges that Possession of Health insurance has been associated with enhanced maternal healthcare utilization (Bayou et al.,2016). Evidence on conditional cash incentive on utilization as implied by Largarde, Haines and Palmer (2007); You et al., (2016) and Khogali et al., (2014) has a positive impact on households' health and general nutrition, though this can highly contribute to over-utilization for monetary gain. Subsequently, its sustainability and accrued long term benefits to intended target group in sub-Saharan is a subject for further research (Till, Everetts & Haas 2015).

2.3.2 Maternal Healthcare Utility Constraint

This is a cluster of factors that determines maternal health consumptions that predisposes mothers to fistulas. It's based upon the complex healthcare utilization decision process (Thaddeus et al., 1994). This is illustrated by equation 1;

$$M_{hcu} = f(H_s, H_{cp}, I, T, Z_{cg}) \dots \dots \dots (1)$$

Where; M_{hcu} Maternal healthcare utility as a function of household income I , with allocated time T , H_s is the maternal endowed health status, H_{cp} is the maternal health care products, Z_{cg} these are other equally important competing goods and services. Investment in Health as a Capital good is a choice made by the consumer who values health as well as other home good, defined as all the goods made possible by using Income and Time (Folland et al., 2010). Hence a trade-off between Demand for health care and demand for other equally competing goods and services which they have to choose to satisfy or forego. In the perspective of antenatal mothers, they have to cater for their individual needs, the welfare of the unborn and other societal needs.

⁷ Supply Induced Demand is the change that occurs in Healthcare demand associated with the discretionary influence of providers especially; Doctors, Clinical officers and Nurses over the patient and usually driven by self-interest of providers rather than the patient healthcare need (Folland et al., 2010)

2.3.3 Role of Alternative Health care systems

Health Seeking Behavior does not always follow the scientific pathway as expected by the conventional laid down approaches. Rahman (2000) noted that for some reason(s), people will choose alternative healthcare services from practitioners such: traditional healers, village herbalists, seers and fortune tellers or untrained allopathic doctors above and over formally trained practitioners or government facilities. Data on self-care visits to unofficial medical channels are seen largely as something to be prevented with emphasis on encouraging people to opt first for official channels (Ahmed, Chowdhary & Bhuiya,2001) since these practitioners have unproven health safety record. Cultural complexities (Rahman, 2000) such as faith and prayers for healing act as a complete health care substitute with a perception of scientific health interventions as unbelief, compromise and doubting the faith system.

Studies show that certain religious organizations do not prescribe to scientific health interventions and prohibits medical procedures such as immunizations, blood transfusion, use of contraceptives, or surgery, and equally use faith and prayers to cure Health related problems. Such groups include Kavonokya church, Kanithawa Ngai (Church of God), Yeso Nyalo (Jesus Can) and Diniya Yesu as noted by Vaccine Confidence Project (2015). Sara, Nafisa, and Hermione (2004) argued that few studies have investigated why individuals choose alternative healthcare pathways and incorporate their preferences in a more responsive health care system. Services from ⁸*Traditional Birth Attendant* (TBAs) have been recognized due to the fact that they are readily available, perceived expertise, affordable, and easily accessible (WHO, 2009). In Kenya trained TBA referral system to a Skilled Birth Attendant (SBA) has had some positive impact on increased maternal healthcare demand and utilization (Tomedi et al., 2015; Byrne et al., 2016).

2.4 Systemic Indicators for Obstetric Fistula Occurrence

Handling maternal health challenges requires adequate capacity in terms of both infrastructural and Human Resource for Health. Fistula occurrence is a key indicator of inability of healthcare systems to deliver Timely, accessible and appropriate intrapartum care (WHO, 2014). World

⁸ World Health Organization (WHO, 1992) defines a *Traditional Birth Attendant* (TBA) as a person who assists the mother during childbirth and who initially acquired her skills by delivering babies herself or through an apprenticeship to other TBAs.

Health Organization (WHO, 2010) had estimates of about 287,000 pregnant women dying during antenatal or intrapartum stage, with the highest mortality rates occurring between birth and 24 hours later (Lewis & Bernis, 2006). By 2014, global estimates of women with pregnancy and childbirth health related complications rose to 300 million (Cabero-Roura & Rushwan, 2014) with majority being in Asia and sub-Saharan Africa. These mothers usually require timely, emergency treatment for prolonged and obstructed labor notably caesarean section (UNFPA, 2016). Kohn et al., (2000) attributed to lack of proper analysis surrounding legislation (the political environment), regulation (Government), and market activity (purchasers and providers) that influence quality of care and the resultant compromise on maternal health care.

Thaddeus and Maine (1994) underscored that service quality is one of the underlying basis for decision making prior to health care utilization, hence the need of addressing negative public perception of healthcare in government funded healthcare facilities (Ansari et al., 2011). Furthermore Caesarean delivery is recommended as the most cost-effective mode of delivery for obstructed labour (Alkire, 2012) though this may not be readily available in low resource settings. There's consistent International recommendation and advocacy for ⁹Skilled Birth Attendant for all expectant mothers including the postnatal period (WHO, ICM&FIGO, 2004). The proportion of maternal deliveries by caesarean section as per indication at the population level is an important variable for estimating maternal healthcare adequacy and capacity in averting maternal and neonatal morbidity and mortality (UNDP, UNFPA, UNICEF, WHO & World Bank, 2015).

Factors such as; insufficient qualified human resource (Thaddeus et al., 1994), attitude issues like disrespectful and abusive health staff (Abuya et al., 2015), poorly motivated staff (Reason, 2000), fatigued, negligent, poorly trained, under-staffed (Abuya et al., 2015), and unresponsiveness to patient need thus discouraging skilled antenatal care (Gessesew, et al., 2003). Delay factors such as lack of technical expertise in detecting warning signs of impending complication (Bhattacharyya et al., 2014), lack of hospital essential supplies, and lack of appropriate referral systems in place accompanied with administrative delays and clinical

⁹ A Skilled Birth Attendant is an accredited health professional (midwife, doctor, clinical officer, or nurse) fully trained and has competence and skills needed to manage normal antenatal, natal and postnatal periods in women and the ability to identify, manage and offer necessary referral in case of any complications (WHO, UNFPA, 2004).

mismanagement (Thaddeus et al., 1994) have been attributed to inadequacy in maternal healthcare and service delivery. ¹⁰Iatrogenic factors are Medical procedures that result in patient injuries, such factors that result in fistulas mentioned in literature includes; surgical errors, and pelvic radiation therapy (Price et al, 2015). In the Sustainable Development Goals (SDGs,2015), emphasizes Universal Health Coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.

2.5 Empirical Literature

The full scope of maternal challenges overrides clinical causes of morbidity and mortality and addresses the broader perspective of maternal healthcare problems namely; underutilization and or non-utilization (McNamee, Ternent & Hussein, 2014; Richard et al., 2010). Kraft et al., (2009) noted that delayed care is correlated with adverse health outcomes and high healthcare costs. Gessesew & Mesfin, (2003) established that 92.4% of women who developed Obstetric Fistula in Ethiopia had not received any antenatal care, while teenage and ¹¹primigravida constituted 47.3% and 40% respectively.

In a Zambian study constituting of 259 women with fistula, 78.1% of the babies were stillborn (Holme, Breen &MacArthur, 2007) which was attributed to delayed Emergency Obstetric Care (EmOC) as a result of transport logistics and delays at the health facility. Literature reveals that key to reduction in maternal mortality and morbidity is access to EmOC (Chamberlain, 1995; Mavalankar et al., 2005; WHO, 2014b; Allen, 2002). The Kenya household health expenditure and utilization survey (KHHEUS) in table 3 summarizes key reasons for Healthcare non utilization despite reporting illness.

¹⁰ Iatrogenic means induced inadvertently by a physician or surgeon or by medical treatment or diagnostic procedures(Merriam-Webster's dictionary, 1993)

¹¹Primigravida means first time pregnancy primigravida. (n.d.) *Medical Dictionary for the Health Professions and Nursing*. (2012). Retrieved November 10 2016 from <http://medical-dictionary.thefreedictionary.com/primigravida>

Table 3: Reasons for Healthcare Non-utilization

Reasons	2003 (%)	2007(%)	2013 (%)
Illness not considered serious	0	0	39.3
Self medication	37.2	34.5	30.7
High cost of care	39.4	37.7	21.4
Poor quality of service	1.7	0.5	0.5
Long distance to provider	16.4	11.2	1.8
Religious/cultural reasons	1.2	3.1	0.1
Fear of discovering illness	1.2	0.2	0
Other reasons	3	12.8	6.2
Total	100	100	100

Sources: Kenya household health expenditure and utilization survey 2013 report

Chamberlain (1995) affirmed the fact that Obstetric Fistula should not occur in countries where women have ease of access to well organized hospital based maternity services. This is under the precept that a fully functional healthcare system has the capacity to respond to the unmet maternal need (Allen, 2002) that catalyzes underutilization or non-utilization of healthcare services. Lewis and Chamberlin (1992) further observed that Obstetric Fistulas are a rare occurrence in western developed countries due to robustness of the healthcare systems in tackling maternal healthcare challenges including provision of free emergency caesarean sections for complicated labour hence the reason for sustained high impact strategies in combating and altogether eliminating its occurrence.

2.6 Impact of Obstetric Fistulas

Health care facilities strive to improve quality, cut cost and enhance operational efficiency (Andel et al., 2012) but these efforts are quickly eroded by the burden of preventable diseases (WHO, 2015). Effective maternal healthcare quality improvement is anchored on a preventive strategy approach, improving care “upstream” while eliminating drawbacks ”downstream” that erode gains (James & Savitz,2011). The impact of Obstetric fistulas on maternal health and on general wellbeing is multifaceted and includes but not limited to the following:

2.6.1 Social Vulnerability as a consequence of obstetric fistula

Social costs are the demoralizing effect of the illness (Hardwick, Khan & Langman, 1986) which is as a result of social vulnerability which fistula mothers encounter. These include Physical isolation, ostracized and stigmatized (Temesgen, 2016; Khisa et al., 2016; wall, 2012) and divorce (Ahmed & Holtz, 2007). Psychosocial consequences range from; psychological trauma (Khisa & Nyamongo, 2012), strained marital relationships, shame and depression associated with malodor (Weston et al., 2011) and marginalization with tendency of economic and physical vulnerabilities (Babatunde, 2013). Further debilitating psychological trauma as a result of Perinatal child loss (Stanton et al., 2007); (Khisa et al., 2012) chronic postpartum depression (Yonkers et al., 2001), documented suicidal ideation (Weston et al 2011) and inability to sustain employment (Hardwick et al., 1986) which impacts on livelihood.

WHO estimates 2 million fistula patients globally suffer physical and psychosocial effects as reported by Tuncalp et al., (2015), physical trauma, effects of a difficult delivery process due to obstructed labour (Siddle, Mwambingu, Malinga, & Fiander, 2013). Poverty entrapment has been cited as a result of abandonment, lost employment opportunities and lost source of livelihood (Babatunde, 2013). These private costs also come alongside with negative externalities in that Fistula occurrence predisposes one to have urinary and /or faecal incontinence as noted by Nielsen et al., (2009); Maheu-Giroux et al., (2016) with constant foul smell which is a negative externality to household members and other close associates leading to a loss social network and the highly needed support (Alio et al., 2011). Khisa et al., (2016) findings revealed that successful fistula repair only is not enough without dealing with the deep psycho-social impact which may hinder the fistula survivor from leading a meaningful productive life.

Fistula Social cost spreads across through lost ability for a gainful employment in society (Hardwick et al., 1986), loss of household income and overall increased dependency and some instances poverty (Khisa et al., 2016). Hardwick et al., (1986) emphasizes that such demoralizing effect of an illness can result in pessimism, with increased evidence of rampant family tension leading to domestic violence, divorce and family breakups. Apart from obstructed labor, other causes of fistula include; pelvic surgery, and sexual abuse before reaching physical maturity, pelvic malignancy and radiotherapy (Temesgen, 2016). Psychosocial impact after

corrective surgery reported in literature includes challenges in reintegration back to social life, stigmatization, and isolation (Stanton et al., 2007).

2.6.2 Medical Impact

Medical implications of fistula include; Secondary infertility, recurrent pelvic infections and foot-drop from lumbosacral nerve damage (Wall, 2012; Weston et al 2011), stillbirths (Alkire, 2012) chronic vulval dermatitis as a result of chronic wetness and skin irritation from urine and feces (Wall 2012). This is accompanied by hygiene challenges due to constant fecal incontinence.

2.6.3 The Microeconomic and Macroeconomic Impact of Obstetric Fistula

Economists' interest is how Obstetric fistula as a vexing health problem (Andel et al., 2012) increases healthcare cost burden both at household and national level (James & Savitz, 2011) given scarce resources. Literature extensively discusses impact of maternal illness through analyzing changes in health expenditures, reduced income generating time that necessitates market goods consumption (WHO, 2009). Direct assessment approaches (people prefer healthy days than less healthy) or indirectly by inability to enjoy Derived Utility from consumption of non-health goods and services, or compromised ability to pursue other economic objectives (WHO, 2009). As Health resources dwindle, and user fees sets in, and this may drive people to over the counter self-treatment, quackery and harmful traditional medicine (Harrison, 1996), leading to escalation of avoidable health complications. High maternal health care cost drives households into poverty and poverty makes maternal health care situation worse (Harrison, 1997).

At microeconomic level, ill health deprives maternal healthcare consumers' quality life interfering with economic household objectives and participation in economic activities (Adam, Collier, and Ndung'u 2010). Excess healthcare costs and associated productivity losses may result in household budgetary constraints (Onwujekwe et al., 2011) and in severe cases catastrophic expenditures and impoverishment (Chuma & Maina, 2015). Budgetary constraints may force households to cut down or withhold on consumptions of other market goods so as to optimize consumption of healthcare (Onwujekwe et al., 2011), reduction in household savings and investments (WHO, 2009) which negatively impact on human capital investment (Evenson

& Mwabu, 1996). This leads to failure to participate in economic activities which further jeopardizes household welfare (Séne et al., 2015). In some instances it results in liquidation of household assets (Kimani & Maina, 2015 in Flores et al., 2008), with a net effect of household poverty as allayed by Krishna (2006) and Séne et al., (2015) and this will generally contribute to increased household financial risks (Bennett & Dismuke, 2010; Chuma et al.,2012). Overholt& Saunders, (1996) underscored that Human capital is a key determinant of economic growth.

Fistula Foundation (2015) estimates the cost of fistula treatment to be \$586 per patient which includes surgery, post-operative care and physical rehabilitation. According to UNFPA (2016) Fistula corrective surgery at the Kenyatta National Hospital is heavily subsidized to a cost of Ksh. 38,000 equivalent to USD \$375¹² which is still prohibitive to many of the affected mothers with only 7.5% being able to access the treatment. In private hospitals these cost may be higher. Apart from the corrective surgical intervention, these patients also require post-operation rehabilitation which has additional cost together with social reintegration (Khaliyah et al., 2010). Hardwick et al.,(1986) categorized how loss of employment contributes to an overall increase in total costs ranging from social cost, cost to exchequer and economic costs. World Bank (1993) adopted Disability Adjusted Life years (DALY) as a variable of estimating overall disease burden expressed as years lost due to debilitating effects of an illness.

Janovsky (1996) reiterated that when estimating morbidity of an illness, it's the value placed on different health states using utilities of that health state and the length of time spent in it. Chassin et al., (1998) highlighted that the burden of errors in healthcare can be measured in lost lives (mortality rates), reduced functioning (morbidity) and wasted resources. Comprehensive methods suggested by World Bank (1993); and WHO (2009); for Measuring such losses incorporating estimates by using the number of days, months or years absent from work (DALYs, QALYs), sick leave duration, the amount of lost income due to the condition, and opportunity costs. Restorative surgical costs can be estimated in terms of the hospital bill at discharge.

¹²Prevailing exchange rates at the time of study 1 USD=Ksh 101.83 sources <https://www.centralbank.go.ke/rates/forex-exchange-rates/>

2.6.4 Cost to the Exchequer

The sick state impacts the macroeconomic performance through economic welfare losses by reducing labour-force participation, productivity losses (Andel et al., 2012) and the eventual rippling effect on both current and future Gross Domestic product (GDP). Sickness deters gainful economic activities negatively costing the Government through losses of revenue from missed tax collections. These losses according to Hardwick et al., (1986) include direct lost income tax and indirect tax losses due to reduction in spending power as a consumer including failure to remit insurance premiums.

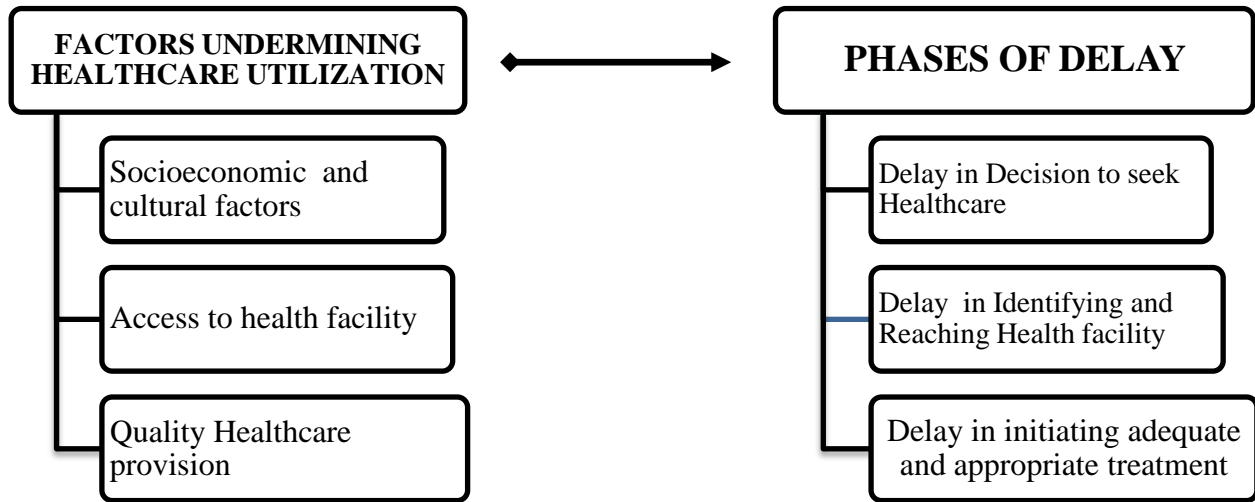
2.7 Theoretical Framework

Occurrence of obstetric fistula is embedded in a myriad of factors that predispose expectant mothers to this preventable injury. This paper utilizes The Andersen–Newman Behavioral Model of Health Service Use (Andersen, 1995; Andersen & Newman, 1973; Bradley et al., 2002) as the basis of understanding Health Seeking Behavior and fistula occurrence.

2.7.1 Delay Model for Obstetric Fistula occurrence

Figure 3 summarizes interplay between utilization and delay factors that contribute to fistula occurrences. Based on the works of Thaddeus et al., (1994) Delay concept in relation to: (i) Delay in decision to seek healthcare, (ii) Delay in identifying a Health facility and transportation to that facility, and (iii) Delay in initiation of adequate and appropriate treatment.

Figure 3: Determinants for Maternal Health Care Demand and delay levels



Sources: *Thaddeus and Maine (1994) and UNFPA 2014.*

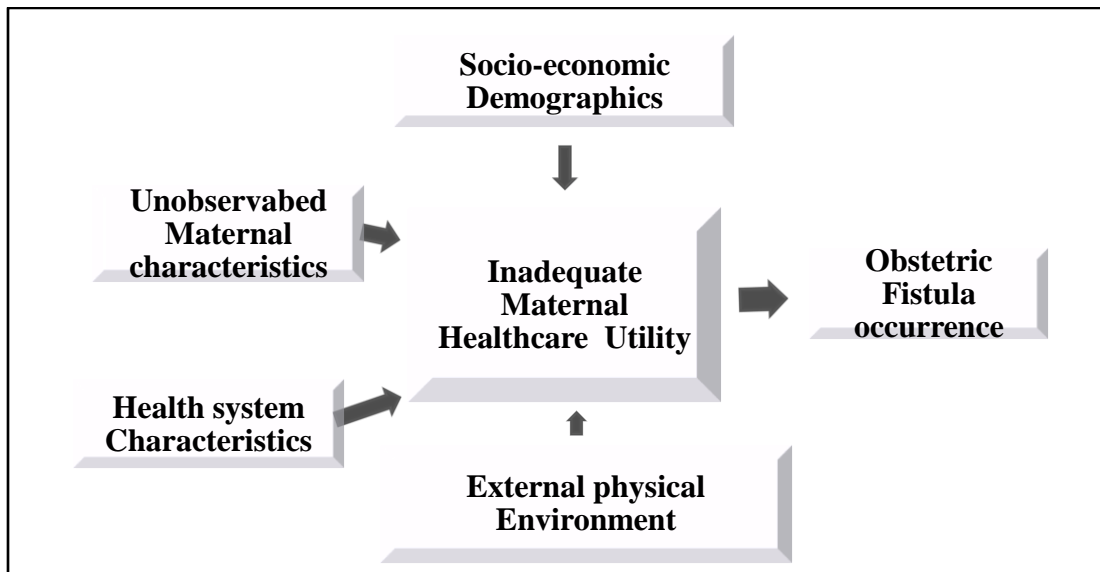
Delay in decision making to seek health care services triggers the delay chain. The Delays sequentially contribute to fistula occurrence among women with prolonged and obstructed labour. In situations of obstructed labour, time is of essence to avert Fistulas and other maternal and child complications. UNFPA (2014) highlights factors that contributes to decision making delays such as; lack of awareness on the importance of a skilled birth attendant, patients' Attitudes and knowledge (Bradley et al.,2002) and socio-cultural complexities of the individuals' surrounding (Tarekegn, Lieberman & Giedraitis, 2011), knowledge about the facilities (Musoke et al., 2014), previous negative experiences at a health facility(Abuya et al., 2015), and Patients perception of the quality of healthcare provided by a facility.

O'Donnell (2007) identified and classified four dimensions of access and utilization of health care as (i) geographical accessibility to the health facility, (ii) availability of the demanded or required health care services, (iii) affordability and (iv) acceptability of the provided services according to the consumer. Delay in accessing a health facility can be complicated by Geographical proximity issues (Thaddeus et al.,1994) and Transport complexities including the available mode, traffic situation and cost of transport (Tebeu et al., 2012; Liambila et al., 2014). The mix can be catastrophic in emergency situation where early initiation of medical intervention is required to avert complications.

2.8 Conceptual Framework

We can develop the conceptual model shown in Figure 4 for the analysis of the correlation between obstetric fistula and maternal healthcare utility.

Figure 4: Conceptual framework for Obstetric Fistula occurrence



Source: Author

Probability of an expectant mother j developing and experiencing the impact of an obstetric fistula is based on adequate and timely Maternal Healthcare Utility for the mother j (U_{mhj}) which in itself is determined by various multiple characteristics including individual characteristics, socio-economic characteristics (Fotso et al.,2009), robustness of the existing health system and external physical environment. It's represented by the equation (2):

$$OF_j = f(U_{mhj}) \dots \dots \dots (2)$$

2.9 Knowledge gaps

From available literature, Obstetric Fistula has been eliminated in the developed countries, yet it's still a maternal health problem in Kenya. This study aims at augmenting and strengthening the existing preventive and curative strategies which are crucial approaches for controlling Obstetric Fistulas incidences.

Of interest to policy makers is the understanding that persistent prevalence of Obstetric Fistulas has a tripartite etiological perspective namely; (i) Maternal non-utilization of healthcare, (ii) Inadequate capacity in handling maternal healthcare and (iii) Existing access barriers to maternal healthcare utilization predisposing mothers to fistula occurrences. Better knowledge on determinants of Fistulas informs county health planners on the need to focus on strategies aimed at building capacity at primary health facilities and promoting community awareness on maternal service utilization.

Furthermore an understanding on the predisposing factors that largely contribute to the probability of getting an obstetric fistula informs the general public and expectant mothers on the need to engage health professions during the prenatal, antenatal and postnatal periods so that any impending complication can be detected, diagnosed and treated early thereby averting adverse unintended outcomes in addition to excess avoidable cost burden.

Finally this paper aims at identification of past knowledge on obstetric fistula, what has worked and what doesn't in other nations, synthesizing and extracting lessons and best practice guidelines to add to the pool of knowledge so as to avoid misguided autonomy¹³ and repetition of the similar errors done elsewhere.

2.9.1 Summary of literature review

Occurrence of Obstetric Fistulas is largely dependent on a combination of various factors ranging from adequacy of healthcare system in combination with access and utilization of these services by antenatal mothers. Its existence and persistent represents unmet maternal healthcare needs that derails the already achieved health gains. Addressing factors that undermine utilization of maternal healthcare services will strengthen the already existing strategies in preventing obstetric fistula occurrence.

¹³ In healthcare, health personnel autonomy refers to the right and obligation of a health practitioner to use ones knowledge, skills, and judgment for the best interest of the patient within evidence based acceptable practice boundaries that is essential for providing quality, safe and professional standard care (Leape, 2015).

Table 4 provides a summary of obstetric fistula indicators and the related Literature.

Table 4: Indicators of Obstetric fistulas

Obstetric Fistula Indicators	Literature sources
Age (young age)	Browning et al (2010)
Marital status (unmarried)	Andersen (1995)
Domestic violence	Ankama et al (2014),Alhusen et al (2015),Peterman et al (2009) and Temesgen (2016)
Height (short stature)	WHO (2014b)
Parity (primigravida)	Sih et al.(2016)
Duration of labour (prolonged labour)	McFadden et al (2011), UNFPA (2014)
Proximity to health facility (long distance of travel)	Qian et al (2009),Roka et al(2010),Tebeu et al (2012), Liambila et al(2014), KDHS (2008-09)
Female circumcision	WHO (2014b)
Unemployment	Hardwick et al (1986)
Knowledge on fistulas	Weston et al (2011), Nyabuti (2001)
Place of delivery (home deliveries)	UNFPA (2014)
Antenatal care visits (less than 4 visits)	WHO (2006)
Maternal education levels	Browning et al (2010),Fotso et al (2009)
Residence (more in rural than urban)	Roka et al (2010)
Insufficient health workers	Thaddeus et al (1994);Abuya et al (2015)
Poverty	Brodman (2011)
Access to family planning services	Brodman(2011)
Large babies (foeto-pelvic disproportion)	Pinton(2016).
Delay in treatment	Thaddeus et al (1994), Ochako (2011)

Source: author

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes two research models namely the analytical and econometric models that were deployed in the methodology to arrive at the research objectives.

3.2 Theoretical Framework

Obstetric fistula occurrence is based on maternal healthcare utilization. We developed maternal healthcare consumption based on Grossman's framework taking into account that maternal Health as a consumption good is produced by combining time and purchased maternal healthcare inputs (Grossman, 1972). This is contrary to the principal-agent's framework where both healthcare consumer and provider determine level of consumption (Kimani et al, 2016). The expectant mother as a healthcare market participant is considered both a producer and consumer of health. It's out of these purchased products that health is produced and then consumed. It's of assumption that an expectant mother m maximizes on Derived Maternal Utility U_m from utilization of maternal health care goods and services H_m and OG is consumption of other goods and services over and above upon her current Health status H_{sm} , (representing the pre-existing health state) which is represented as follows:

$$U_m = f(H_m, OG, H_{sm}) \dots \dots \dots (3)$$

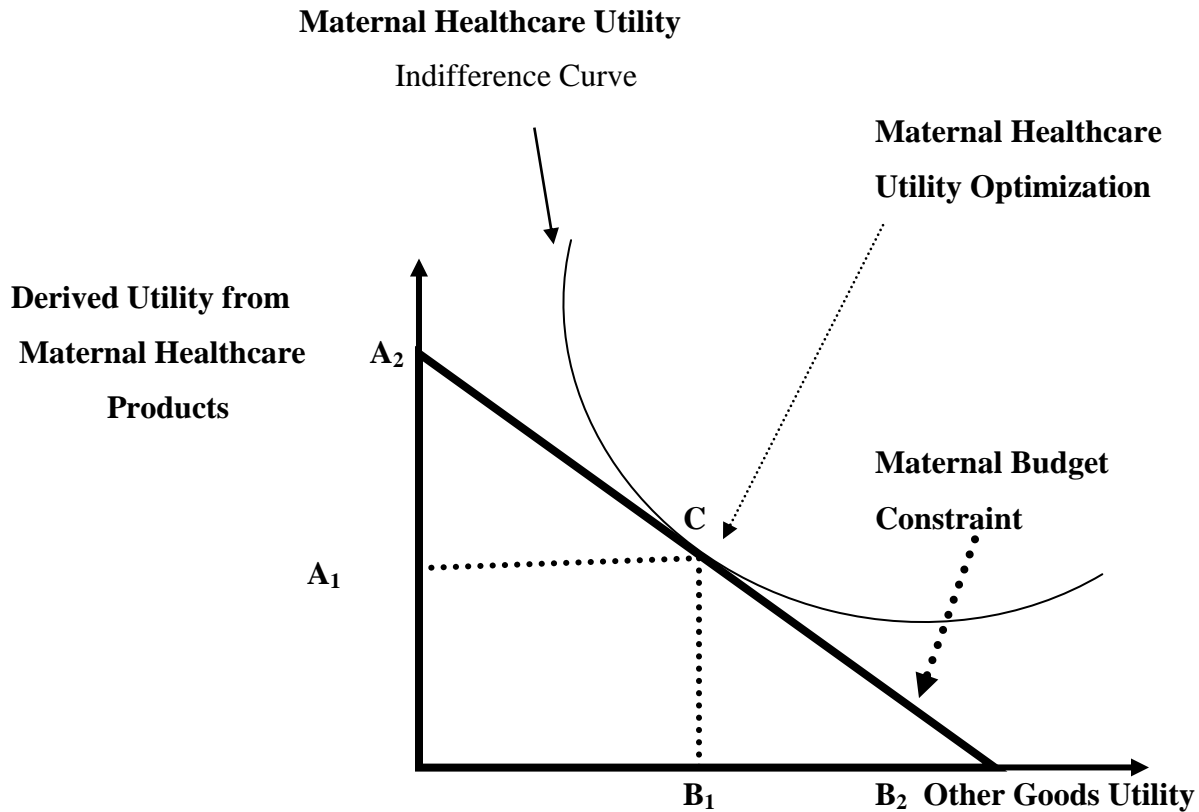
3.2.1 Maternal Budget Constraint

The antenatal mother is assumed to maximize her maternal Healthcare Utility based on her income and other household goods given a budget constraint which is represented as:

$$I_m = f(PH_m + POG + H_{sm}) \dots \dots \dots (4)$$

Where; I_m is the maternal income, PH_m is the price of maternal healthcare goods and services. POG is the unit price of other household goods and services, upon endowed health status of the mother H_{sm} . The indifference curve (figure 5) is a combination bundle of tradeoff maternal health care utility and other competing goods and services within the constrained budget margins.

Figure 5: Maternal Healthcare Utility Indifference Curve and Optimization points



Source: Authors Adopted from Mankiw et al., (2010), Folland et al., (2010)

The slope of the ¹⁴budget constraint (figure 5) measures the rate at which the expectant mother can trade Maternal Healthcare Utility with other equally competing goods and services, which in essence represents the opportunity cost of maternal health utility of a certain health intervention over other market goods and services (Folland et al., 2010). Since the mother cannot have all the goods and services (Mankiw et al., 2010), she optimizes so as to select the possible best combination bundle at the given level of income. The optimum point at C represents the best combination of Maternal Health Utility and Utility on other goods and services given a limited budget. Combining equations (3) and (4) we derive equation (5):

$$U_m = f(I_m, H_m, H_{sm}) \dots \dots \dots (5)$$

Where U_m is maternal healthcare utility, I_m is the maternal income, H_m is the maternal healthcare goods while H_{sm} is the maternal health status.

¹⁴ The line that constitutes collection of points representing a combinations of goods that the consumer is just able to afford given a limited budget (Folland et al., 2010)

3.3 Conceptual Model

The following conceptual model is developed based on the Figure 4 for the analysis of the effect of Maternal Healthcare utilization (U_m) on the probability of getting a fistula. Obstetric Fistula occurrence as a latent variable depicts the adequacy and extent of Maternal Healthcare Utility which in itself influenced by (i) Individual and Household socio-economic and demographic characteristics such as marital status, employment, parity, educational levels, age (Andersen, 1995; Andersen & Newman, 1973) genetic predisposition, maternal health status, nutritional status, height, female circumcision (WHO,2014b), knowledge of fistula, access and use of contraceptives, wealth quintile and prices (ii) Health system features such as availability and capacity of healthcare system, (iii) Environmental characteristics such as Geographical proximity to a health facility (Thaddeus et al, 1994), Transportation complexities which involves accessible Transportation infrastructure (air, roads, rail, water) means of transportation, traffic jams and delays, transport costs (Tebeu et al,2012; Liambila, 2014) (iv) Unobservable maternal/household tastes, preferences knowledge and attitude (Bradley et al.,2002; Abuya et al., 2015).

3.4 Estimation Technique

The probability of experiencing the outcome Obstetric Fistula represents Derived Utility from utilization or non-utilization of Maternal Healthcare products. We utilize the Probit model for the study informed by the fact that the dependent variable has dichotomous or binary outcome signifying presence or absence of outcome under study (Jones 2005).The binary dependent variable (Y) illustrated by equation (6):

$$Y_i = \begin{cases} 1 & \text{obstetric fistula occurrence} \\ 0 & \text{otherwise.....(6)} \end{cases}$$

By adopting the Probit model we made the assumption that the error term takes a normal distribution hence the use of maximum likelihood as statistically efficient estimator (Berndt, 1974; White, 1982). The choice of maximum likelihood method is further informed by the fact that it allows correction of biases due to endogeneity and heterogeneity in the model (Chesher, 1984; Mwabu, 2009). To specify the likelihood equation, the probability of suffering an

Obstetric Fistula p is given as follows:

$$p_i = \begin{cases} \Pr(Y_i=1|X) & \text{if } Y_i=1 \text{ is observed} \\ 1-\Pr(Y_i=1|X) & \text{if } Y_i=0 \text{ is observed} \dots\dots\dots(7) \end{cases}$$

With the assumption that the observations are independent, The Maximum Likelihood equation is given by the following equation:

$$L(\beta|Y, X) = \prod_{i=1}^N p_i \dots\dots\dots(8)$$

3.4.1 Model specification

Awiti (2014) in Long and Freese (2006, p.132) described Methods for deriving binary regression model include (i) Latent variable approach where assumption is made that there is an unobserved variable linked to the observed outcome variable of interest through measurement equation (ii) Use of probability model (iii) Generating the model as a random utility model. We hypothesize that in the Maternal Healthcare Utility function, the probability of an expectant mother developing an Obstetric Fistula is determined by an underlying latent variable which is linearly related to a set of socioeconomic and demographic explanatory variables.

$$Y_i = \beta X_i + \varepsilon \dots\dots\dots(9)$$

Obstetric Fistula model given by equation (8) where Y_i is the probability of experiencing the outcome (obstetric fistula) for expectant mother subscript i ; X_i is the vector of covariates; β is the associated vector of fixed parameters; and ε is the error term. In our obstetric fistula occurrence model, we assume that for an expectant mother i to experience fistula or not depends on unobservable utility index Y_i^* that is determined by other explanatory variables. We express how the latent variable equation Y_i^* is linked to Y_i as illustrated in the following equation:

$$Y_i^* = \beta X_i + \varepsilon \dots\dots\dots(10)$$

Dummy variables are introduced taking the value of 1 if the characteristic under study is present and 0 otherwise.

The latent variable was linked to the binary variable expressed as follows:

$$Y_i = \begin{cases} 1 & \text{if } Y_i^* > 0, \\ 0 & \text{otherwise.....} \end{cases} \dots\dots\dots(11)$$

Since $Y_i = 1$ when $Y_i^* > 0$ this yields;

$$\Pr(Y_i=1|X) = \Pr(Y_i^* > 0|X) \dots\dots\dots(12)$$

Substituting Equation (9) we derive the following:

$$\Pr(Y_i=1|X) = \Pr(\beta X_i + \varepsilon > 0|X) \dots\dots\dots(13)$$

When we substitute βX_i , Both sides this follows:

$$\Pr(Y_i=1|X) = \Pr(\varepsilon > -\beta X_i|X) \dots\dots\dots(14)$$

Consequently we derive;

$$\Pr(Y_i=1|X) = \Pr(\varepsilon \leq \beta X_i|X) \dots\dots\dots(15)$$

We further develop a binary response model by transforming βX_i into a probability:

$$\Pr(Y_i = 1|X) = F(\beta X_i) \dots\dots\dots(16)$$

This yield the Probit model which the probability of obstetric fistula occurrence given as X which is the cumulative density as evaluated at βX_i given by the cumulative density function F of the standard normal illustrated as:

$$\Pr(Y_i = 1) = \Phi(\beta X_i) \dots\dots\dots(17)$$

3.5 The description of Variable used in the Model

The dependent and independent variables for obstetric fistula model are summarized in table 5:

Table 5: Variables used in the Regression model

Dependent Variable		
Obstetric Fistula occurrence	1 =if present, 0 = otherwise	
Independent variables		Expected Sign
Maternal age	Continuous variable measured by the age of the mother in years	Positive
Number of Antenatal care visits	A discrete variable measured as: 1= 1 visit, 2= 2 visits, 3 = 3 visits, 4= 4 visits and above	negative
Residency (urban /rural)	Dummy variable measured as: 1 = rural resident, 0 = otherwise	Positive
Maternal educational levels	A discrete variable measured by educational levels 1= no education, 2 = primary , 3= secondary 4 = tertiary	Negative
Wealth quintile	A discrete variable measured as: 1=poorest, 2= poorer, 3 = middle, 4= richer,5=richest	Positive
Female circumcision	A dummy variable measured by: 1 = if circumcised and 0 =otherwise	Positive
Domestic violence	Dummy variable measured as: 1=experienced violence, 0=otherwise	positive
Parity	A continuous variable measured by the number of children a mother has	Positive

Source: author

3.6 Data Sources

This is a retrospective study that involved analysis of cross-sectional survey data obtained from Kenya Demographic Health Survey 2014 that is designed to produce nationally representative estimates used to monitor and evaluate population and health state of the nation. Done by trained personnel where Socio-demographic characteristics and Health information is collected through standard questionnaires. This household survey is routinely done after every five year period with some previous variables carried forward to the next survey so as to monitor and evaluate the progress health status of the nation and whether intended targets are being achieved. The target age was 15-49 years with a total of 40,300 households involved. The actual fieldwork across the

country took place from May 7th to October 20th 2014. The comprehensive results of the survey were released in the year 2015 by the Kenya National Bureau of Statistics.

3.7 Estimation issues of concern and Diagnostics tests

This study endeavored to get consistent and reliable estimates in the determinants of fistulas among Kenyan women hence a number of issues that would otherwise undermine the reliability of the results had to be addressed prior to proceeding to carry out full estimation. The following potential estimation issues were identified: data normality, endogeneity, correlation, Multicollinearity and Heteroskedasticity. These have to be addressed early to avoid inconsistent estimates.

3.7.1 Normality test

In statistics a number of normality tests have been fronted that determine normal data distribution which in the long run affects the validity of the outcomes, we utilized the Shapiro-Wilk Test for Normality to ascertain whether the sample used in the estimates came from a normally distributed population (Rochon et al., 2012)

3.7.2 Endogeneity

Wooldridge, (2002) describes endogeneity as any situation where the independent variable is correlated with the error term thereby violating exogeneity of explanatory variables. Terza, Basu and Rathouz (2008) noted that Endogeneity as a common estimation problem in applied Health Economics and Research occurs as a result of: (i) omitted confounder variable not included in the model, (ii) simultaneity occurring between the predictor and the outcome variables and (iii) when the error term is correlated with the regressor thereby producing inconsistent and unreliable results where the estimator does not converge to the population parameter hence biased coefficients (Hausman, 1978). The Two stage residual inclusion (2SRI) estimation has been identified as corrective measures (Terza et al., 2008; Geraci, Fabbri and Monfardini, 2014).

3.7.3 Heteroskedasticity test

In regression analysis it's assumed that the variance of the errors across the variables is constant referred to as homoskedasticity. This is not always true, its noted that its a major challenge with count data, with variance increasing with the mean (Wooldridge, 2002; Kimani et al., 2016). Hence we tested the null hypothesis of constant variance of errors among the variables using robust estimates of the standard errors also referred to as heteroskedasticity-robust standard errors (Wooldridge,2002) or the White's general heteroskedasticity test.

3.7.4 Multi-collinearity test

Multi-collinearity occurs when there is a linear correlation among the independent variables.

A point of consideration is that, Multi-collinearity is not a major econometric issue for cross sectional studies, because unbiased, consistent estimates and correct standard errors will still be obtained (Gujarat, 2008). It becomes an econometric issue in small samples. We utilize the variance inflation factor (VIF) to check for Multi-collinearity. Variance Inflation Factor of less than 10 is interpreted as absence of Multi-collinearity whereas it's present if otherwise.

3.7.5 Correlation Analysis

Worrall and Pratt (2004) envisaged that it's rare for observations in cross-sectional data to be independent along the time dimension. Correlation analysis is a statistical measure used to ascertain the degree of change that occurs in one variable that significantly affects other variables and whether this change can predict change in the other variable. If the coefficient of correlation is 0, implies absence of correlation, positive 1 being perfect autocorrelation and negative 1 being perfect negative correlation.

CHAPTER FOUR: RESULTS AND INTERPRETATIONS

4.1 Introduction

This chapter is based on the results and findings after carrying out the estimates of the fistula occurrence model with tabulation of both descriptive and econometric estimation.

4.2 Descriptive statistics

Table comprises of the descriptive statistics of the variables mainly the mean, standard deviation, frequency, minimum and maximum values of each variable in the fistula model.

Table 6: Descriptive statistics for obstetric fistula occurrence model

Variable	Observations	Mean	Std Dev.	Minimum	Maximum
Independent variables					
Mothers' age	14741	28.94308	9.377661	15	49
Antenatal visits	14945	4.039277	5.593544	0	98
Residence	31079	1.626307	0.4837913	1	2
No education	31079	0.13460		0	1
Primary education	31079	0.5023649	0.5000025	0	1
Secondary education	31079	0.2765533	0.4473008	0	1
Tertiary education	31079	0.864893	0.2810897	0	1
Poor Wealth index	31079	0.1920911	0.3939507	0	1
Middle Wealth index	31079	0.1913189	0.3933458	0	1
Richer Wealth index	31079	0.191705	0.3936486	0	1
Richest Wealth index	31079	0.1912224	0.3932701	0	1
Female circumcision	14289	0.3063195	0.4609802	0	1
Domestic violence	4506	0.1611185	0.367681	0	1
Parity	31079	2.68963	2.528136	0	15

Data source: KDHS 2014

The result in Table 6 reveals that the average age of women sampled was 28.94yrs with a minimum age of 15yrs and maximum of 49yrs. The study shows that about 40.39% of the mothers interviewed attended the minimum World health organization recommended four antenatal visits with 62.6% these women residing in the rural area. On education, 13.46% of the women sampled had no any form of education, 50.24% had primary education, while 27.66% had secondary and 8.65% had

education beyond secondary. On average all the women sampled ranked at 23.37% being the poorest, poorer were at 19.21%, middle quintile at 19.13%, richer at 19.17% and richest at 19.12% on the wealth index. Parity stood at 2.69 child per woman which on average translates into 3 children per woman. 30.63% of the responded reported to have undergone circumcision as opposed to 69.37% who hadn't. Physical and emotional violence by husband/ intimate partner was reported at 16.11%

4.3 Diagnostic tests

This study aims getting consistent and reliable estimates in the determinants that influence adequacy of antenatal care which predisposes the mothers to fistula occurrence. In our data we have identified data normality, Multicollinearity, endogeneity, correlation and Heteroskedasticity as potential estimation issues. These have to be addressed early to avoid inconsistent estimates.

4.3:1 Normality Test

A number of normality tests have been discussed in literature but in this study we utilize the Shapiro-Wilk Test for Normality to ascertain whether the sample used in the estimates came from a normally distributed population (Rochon et al., 2012). The null hypothesis is that the data is normally distributed. The Shapiro-Wilk test of normality yielded significant p -values as highlighted in the Prob>W values in table 7. With the level of significance set at 0.05 we fail to reject the null hypothesis that the data is normally distributed.

Table 7: Shapiro-Wilk W test for Data normality

Variable	Observations	W	V	Z	Prb>z
Mothers' age	14741	0.96994	208.442	14.438	0.00000
Antenatal visits	14945	0.23502	5365.982	23.228	0.00000
Wealth quintile	31079	0.99371	80.388	12.060	0.00000
Female circumcision	14289	0.99983	1.161	0.403	0.34358
Mothers' education	31079	0.99616	49.092	10.704	0.00000
Residency	31079	0.99998	0.212	-4.266	0.99999
Domestic violence	4506	0.99792	5.130	4.276	0.00001
Parity	31079	0.96945	390.360	16.404	0.00000

4.3.2 Endogeneity

We test for Endogeneity in the obstetric fistula occurrence model by testing the statistical significance of the coefficients of the generalized residuals whether they are significantly different from zero. The test reveals small p values hence, hence that the variables are exogenous and hence the treating of mothers' education variable as endogenous variable as summarized in table 8. Instrumented variable: mothers' education whereas the Instruments are: Antenatal care visits, mothers' age, female circumcision, wealth quintile, residency, domestic violence and parity.

Table 8: Test of endogeneity

Obs fistula occurrence	Coefficients	Standard error	z	p> z	95%confidence interval	
Mothers education	.0052852	.0049152	1,08	0.282	-.0043484	.0149188
Anc visits	.0011672	.0003457	3.38	0.001	.0004897	.0018447
Mothers' age	-1.45e-06	.0002894	-0.01	0.996	-.0005686	.0005657
Female circumcision	.0037296	.0048582	0.77	0.443	-.0057923	.0132515
Cons	-.0026428	.0108024	-0.24	0.807	-.0238152	.185296

Test of endogeneity

Ho: variables are exogenous

Durbin (score) $\chi^2 (1) = .514354$ (p=0.4733)

Wu-Hausman $F(1,2758) = .513344$ (p=0.4738)

Table 9: First stage regression summary statistics

Variable	R-sq	Adjusted R-sq	Partial R-sq	F(5, 2755)	Prob>F
Mothers education	0.3765	0.3749	0.2613	246.269	0.0000

Data source: KDHS 2014

The relationship between the endogenous variable mothers' education and the instruments used as depicted by the Partial R-sq of 0.2613 and the F statistics of 246.269 which is greater than the critical values shown on table 9 thereby rejecting the null hypothesis that the instruments used are weak.

4.3.3 Test of overidentifying

In the process of ascertaining the validity of the instruments used we tested the null hypothesis that valid instruments have been used and the fistula model has been correctly specified. The test of over identifying restrictions which is computed through Stata software yielded the following results:

Sargan score $\chi^2(4) = 2.75515$ (p=0.5996)

Basman $\chi^2(4) = 2.74892$ (p=0.6007)

The P values for both Sargan and Basman are large enough hence we fail to reject the null hypothesis that the instruments used indeed are valid.

4.3.4 Heteroskedasticity

Heteroskedasticity is addressed by using robust estimates of the standard errors also referred to as heteroskedasticity-robust standard errors (Wooldridge,2002) or the White's general heteroskedasticity test despite its limitation in identifying the contributing variables for heteroskedasticity but has the advantage of simplicity and capability of identifying both heteroskedasticity and specification errors (Gujarat, 2008). Taking our null hypothesis to be constant variance the results from Table 8 shows that all variables have p values significant at the set 0.05 level but are not significant at 0.01

Table 9: Heteroskedasticity

	coefficient	Robust std error	t values	p> t 	95% confidence interval	
Mothers' age	-0001476	.0003493	-0.42	0.673	-.0008325	.0005372
Antenatal visits	-0001195	.0010857	1.10	0.271	-.0009339	.0033239
Residency	-.0008468	.0045836	-0.18	0.853	-.0098343	.0081408
Mothers education						
Primary	-.0100788	.0063792	-1.58	0.114	-.0225872	.0024295
Secondary	-.0084231	.008347	-1.01	0.313	-.0247901	.0079439
Tertiary	.0100391	.0138818	0.72	0.470	-.0171805	.0372588
Wealth quintile						
Poorer	.0020905	.0054837	0.38	0.703	-.0086621	.0128431
Middle	.0010214	.0065635	0.16	0.876	-.0118485	.0138912
Richer	.003812	.00813	0.47	0.639	-.0121296	.0197535
Richest	.0069534	.0077713	0.89	0.371	-.0082848	.0221916
Female circumcision	-.0006455	.0039765	-0.16	0.8710	.0084427	.0071518
Domestic violence	.0047032	.0057907	0.81	0.417	-.0066513	.0160577
Parity	.0004512	.0012813	0.35	0.725	-.0020612	.0029636
Cons	.0124391	.0127706	0.97	0.330	-.0126070	.03748

Data source: KDHS 2014

Number of observations=2793

F(13, 2779)=0.60

Prob>F=0.8582

R-squared=0.0091

Root MSE =.09584

4.3.5 Multi-collinearity testing

We utilize the variance inflation factor (VIF) to check for Multi-collinearity. Variance Inflation Factor of less than 10 is interpreted as absence of Multi-collinearity whereas it's present if otherwise.

From our testing in Table 9, the variance inflation factor (VIF) is less than ten hence we fail to reject the null hypothesis absence of multi-collinearity.

Table 10: Variance inflation factor

Variable	VIF	1/VIF
Parity	2.42	0.412979
Mothers' age	2.10	0.475585
Wealth quintile	1.91	0.524493
Mothers' education	1.60	0.623504
Residency	1.36	0.737434
Female circumcision	1.22	0.816623
Antenatal clinic visits	1.03	0.973480
Domestic violence	1.02	0.985011
Mean VIF	1.58	

Data source: KDHS 2014

4.3.6 Correlation Analysis

We tested correlation among the variables by analyzing the correlation coefficient. If the coefficient of correlation is 0, implies absence of correlation, positive 1 being perfect autocorrelation and negative 1 being perfect negative correlation. Table 10 summarizes the various variables and their associated correlations. The variables used in the model show low correlations signifying absence of perfect correlation.

Table 11: Correlation matrix

	Mothers' age	Antenatal visits	Wealth quintile	Female circumcision	Mothers' education	Residency	Domestic violence	Parity
Mothers' age	1.0000							
Antenatal visits	0.0140	1.0000						
Wealth quintile	-0.0241	0.1315	1.0000					
Female circumcision	0.1018	-0.0834	-0.3479	1.0000				
Mothers' education	-0.0431	0.1113	0.5446	-0.3839	1.0000			
Residency	0.0941	-0.0808	-0.5039	0.1796	-0.2741	1.0000		
Domestic violence	0.0475	-0.0199	-0.0782	0.0629	-0.0619	0.0332	1.0000	
Parity	0.6846	-0.0701	-0.3171	0.2120	-0.3238	0.2324	0.1060	1.0000

Data source: KDHS 2014

4.4 Econometric Estimation

To gain better understanding on determinants of Obstetric Fistula among Kenyan women, the study analyzed systemic, socio-economic and demographic characteristics that influence both adequacy and of maternal healthcare in Kenya.

4.4.1 Marginal Effects

The study utilized the Probit regression model in estimating the effect of these characteristics on fistula occurrence. From the analysis we interpret the marginal effects on the probability of a woman developing an obstetric fistula given a set of explanatory variables holding all other factors constant. Table 11 summarizes the results. A small p-value of 0.8308 which is less than 5% implying that the obstetric model fits well in estimating the probability of developing obstetric fistula among Kenyan women. The Pseudo R² of 0.0311 which summarizes the proportion of variance in the dependent variable (probability of getting a fistula) that is explained by the independent variables used in the model. The study reveals that for every additional increase in maternal age on average there is a reduced likelihood of getting a fistula meaning the younger the mother the higher likelihood of getting an obstetric fistula in case of obstructed labour. Meanwhile the wealth index results shows

that the middle wealth index mothers are more likely to get fistulas as opposed to all other wealth quintiles. This is contrary to the notion that being poor is associated with fistulas. Having some form of education in comparison to no education significantly reduces the probability of getting an obstetric fistula except secondary education which seems to have a marginally negative effect. A mother living in urban setup has a less likelihood of developing a fistula by a margin of 0.09% maybe attributed to better facilities in urban setup as opposed to rural setup, similarly having a source of livelihood confers a less probability of getting a fistula which is linked to the wealth quintile where one falls. Increase in parity and presence of domestic violence have positive marginal effects on the probability of getting a fistula during pregnancy by 0.05% and 0.58% respectively.

Table 12: Marginal effects probability of developing an obstetric fistula

Delta method						
	Marginal effect(dy/dx)	Standard Error	Z scores	P> z	95% Conf interval	
Mothers' age	-.0000286	.0004289	-0.07	0.947	-.0008692	.0008121
Antenatal visits	.0010189	.0024794	0.41	0.681	-.0038405	.0058784
Wealth quintile						
Poorer	.0026042	.0054176	0.48	0.631	-.00801441	.0132224
Middle	.0018253	.0055658	0.33	0.743	-.0090834	.012734
Richer	.005426	.0065408	0.83	0.407	-.0073938	.0182457
Richest	.0065371	.008448	0.77	0.439	-.0100207	.0230949
Female circumcision	-.0017919	.0045558	-0.35	0.694	-.0107211	.0071374
Mothers' education levels						
primary	-.0101196	.0092129	-1.10	0.272	-.0281766	.0079374
Secondary	-.0083338	.0101161	-0.82	0.410	-.028161	.0114935
Tertiary	.0019498	.0153012	0.13	0.899	-.0280399	.0319395
Residency	-.0009606	.0044045	-0.22	0.827	-.0095933	.0076721
Dom violence	.0058599	.0047217	1.24	0.215	-.0033945	.0151143
Parity	-.0056255	.0013094	-0.04	0.966	-.0026227	.0025103
Probit regression						
Number of observations= 2625						
LR χ^2 (13) = 8.19, Prob > χ^2 =0.8308, Pseudo R ² =0.0311, Log likelihood =-127.76134						

Data sources KDHS 2014

4.5 Discussion of the study findings

The study findings depict that Maternal age has an implication on the probability of getting a fistula where the older the mother the less likelihood of fistula occurrence as opposed to younger mothers. This concurs with the findings of Browning et al (2010), which highlighted that younger mothers are more likely to encounter fistulas in comparison to their older counterparts. Similarly first time mothers or primigravidas are at more risk of fistula which was also highlighted by Sih et al (2016). This is attributed to underdeveloped pelvic bones and partly to lack of experience in determining warning signs of failure of labour progression.

Holding all other factors constant, the study shows that female circumcision doesn't necessary predict the probability of getting a fistula thus negating earlier findings by world health organization (WHO 2014b) on female circumcision that positively linked female circumcision to fistula.

Furthermore this study reveals that domestic violence which includes intimate partner violence has positively been identified as a determinant of fistula occurrence among Kenyan women. This can be explained by deterrence to seek skilled maternal healthcare which is also associated with home deliveries (UNFPA, 2014) and more prevalent among rural residents (Roka et al, 2010). This is further augmented by studies done by Ankama et al(2014), Alhusen et al (2015), Peterman et al (2009) and Temesgem(2016) on domestic/intimate partner violence.

Apparently primary and secondary education of mothers as opposed to no education has been identified to minimize the probability of fistulas. Browning et al (2010) and Fotso et al (2009) highlighted the importance of maternal education as key to maternal health and child survival. This is attributed to the maternal knowledge on the importance of full maximization on maternal healthcare consumption coupled with early identification and mitigation of imminent complications that can occur during pregnancy.

The study found out that parity which is the number of children a woman has a negative probability of getting a fistula, where the fewer the number of children a mother has the less the chance of getting an obstetric fistula. Studies highlighted by Sih et al (2016) portrayed a linkage between the number of children born to a mother with chances of getting obstetric fistulas. Being a resident in the urban setting confers a less likelihood of getting a fistula as opposed to rural residency. This can be attributed to the various challenges that hinder access and utilization of maternal healthcare services such as insufficient health workers (Thaddeus et al, 1994, Abuya et al, 2015), proximity (long distance) to a health facility (qian et al, 2009, Roka et al 2010, and Liambila et al 2014).

CHAPTER FIVE: SUMMARY AND POLICY RECOMMENDATIONS

5.1 Introduction

This chapter comprises of the study results exploring the leading determinants of obstetric fistulas among Kenyan women with highlighted key policy recommendation.

5.2 Summary of the study results

The current prevalence of obstetric fistula depicts existing disparity between access and utilization of maternal healthcare services among Kenyan women. This study analyzed both the demographic and socioeconomic indicators which included mothers' age, number of antenatal visits, her education levels, wealth index, working status, domestic violence, residency and parity that was used to predict the probability of occurrence of obstetric fistulas among Kenyan women.

Overall skilled antenatal care through the recommended antenatal visits plays a key factor in alleviating obstetric fistulas thereby avoiding additional medical costs incurred through corrective surgical and rehabilitative interventions. Having some form of education, economic empowerment and absence of domestic violence and female circumcision significantly been linked to a less chance of getting an obstetric fistula holding other factors constant.

5.3 Policy Recommendations

The study reveals that key to prevention of obstetric fistulas is anchored in adequate maternal healthcare through routine antenatal care visits with minimum being the 4 recommended by World Health Organization (WHO/USAID/Population council, 2006). This enhances early recognition of impending maternal complication and timely mitigation. The study recommends enhanced maternal education programmes in view of raising levels of awareness on maternal health, probable complications and warning signs during routine antenatal clinic visits which is paramount in fistula prevention. There is need for Capacity building of all primary Health facilities so that they are able to offer emergency caesarean sections which is the mainstay in treating obstructed labour along with other specialized management. This is vital due to the finding that being a resident in the rural area, one has an increased chance of getting an obstetric fistula as opposed to those residing in urban

setup. Furthermore this will also minimize lengthy hospital referrals thereby shortening delays in initiating treatment among women with obstructed labour.

Improved access to information goes hand in hand with raising education levels as well as levels of awareness on the knowledge about fistulas which is a key preventive strategy. Maternal working status has shown a marginal effect on probability of getting a fistula hence the need of women economic empowerment in which this study recommends Promotion of Universal healthcare insurance for all expectant mothers to minimize on the economic burden of healthcare. This will further enhance maternal healthcare access and utilization as well as minimizing out of pocket payments and related catastrophic expenditures.

Primary prevention of fistulas guided by the principle based on equity in healthcare resource distribution (rural verses urban setups) and Securing achieved Health Gains where Health gain is taken as "Adding years to life by preventing premature maternal complications/deaths and adding life to years by improving maternal quality of life" (FitzGerald et al., 1995). This can be achieved through a technical shift towards primary health care that emphasizes preventive approaches and maternal wellness through enhanced skilled deliveries.

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