MATERNAL HEALTH CARE SERVICES AND INFANT MORTALITY IN KENYA

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X53/ 73362/2014

A RESEARCH PROJECT SUBMITTED TO THE SCHOOL OF ECONOMICS, UNIVERSITY OF NAIROBI IN PARTIAL FULFILLMENT OF THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN HEALTH ECONOMICS

2020

DECLARATION

I declare that this is my original work and has not been submitted for the award of a degree in any other university or institution.

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SIGNATURE ……. DATE …….

This paper is submitted for the award of the degree of Master of Science in Health Economics and Policy with my approval as university supervisor.

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ACKNOWLEDGMENTS

I wish to express my gratitude to all those who provided me with support, guidance, assistance and encouragement for the thesis completion and submission.

I am grateful to Dr. Moses Kinyanjui Mureithi for his great supervisory role on research proposal preparation, thesis completion and submission.

I sincerely appreciate the office of Health Population and Nutrition leadership for offering me an opportunity to pursue my career. Special thanks to Ms. Lillian Mutea and Sonia Gloss from the Office of Economic Growth, USAID Kenya and East Africa for their continued support and encouragement in this research endeavor.

Last but not the least, I pay tribute to my dear wife for shouldering the entire responsibility of family care during my busy study and research period.

DEDICATION

I dedicate the thesis to my loving wife Leah Njeri Silah and my children, Caleb, Anne, Joel and Philip-Prince for their support, encouragement, and perseverance during the study.

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ABSTACT

Infant mortality is an important estimate used to measure the quality of healthcare service, welfare and socioeconomic status of a nation. Across the globe, remarkable strides have been made in decreasing child mortality rates over the last ten years. However, despite these strides, infant mortality remains high in developing countries, Kenya included. Policymakers in Kenya consider access to and utilization of antenatal care (ANC) and postnatal care (PNC) as some of the key policy tools that are critical in reducing the likelihood of infant mortality rates. Several policy initiatives such as universal health care (UHC), Linda mama and Beyond Zero initiatives have been adopted to enhance access and utilization of ANC and PNC as a strategy of reducing infant mortality rates. However, despite these efforts, infant mortality rates continue to be a major problem in Kenya. Because of this, this study sought to analyze the effects of maternal health care services, ANC, and PNC on infant mortality in Kenya. The study adopted the logit regression model as its econometric approach and used the 2014 Kenya Demographic Household Survey (KDHS) data. The study found that adolescent mothers attending at least one ANC visit and PNC significantly reduced infant mortality experienced by adolescent mothers. Additionally, the study established that adolescent mothers who delivered via cesarean section were more likely to experience infant mortality than those who delivered normally. On the socioeconomic factors, the study found that adolescent mothers with primary education were more likely to report infant mortality. Conversely, infants of second-order birth were found to be more likely to die during the first year of birth as compared to the first birth order children. Based on these findings, the study proposes coordinated efforts and interventions from the community development, education, and other stakeholders where comprehensive adolescent reproductive health services will be developed with the full support by the government and other stakeholders to help in turning the tide and protecting the young girls from teen pregnancies thus reducing infant mortality in Kenya.

CHAPTER ONE

INTRODUCTION

1.0 Background

Infant mortality rate, defined as the likelihood of an infant dying before the first year of birth, is considered an important estimate used to measure the quality of healthcare services (Vijay and Patel 2019) and welfare in a country (Gruber, Hendren and Townsend, 2014). Researchers, policymakers, and strategists in both developed and developing economies have used the infant mortality rate (IMR) indicator as a critical instrument in capturing the socioeconomic status of a nation.

Globally, the importance of the IMR was acknowledged within the policymaking circles when IMR indicators were integrated into the Millennium Development Goals (MDGs) goals, especially four and five that were developed and adopted by the nations across the world in 2000. Further, in 2015, development strategists retained the IMR in the Sustainable Development Goal (SDGs) that are to be achieved by the year ending 2030. More specifically, goal number three of the SDG explicitly aims at reducing IMR as it focuses on curtailing neonatal deaths to a low of twelve deaths in every 1000 live births and under-five deaths to a low of 25 deaths in every 1000 live births by the end of 2030.

Remarkable strides have been made in decreasing child mortality rates across the globe. According to data from UNICEF, tremendous steps have already been undertaken in mitigating child mortality rates in the world for the period 2000–2018 in comparison to the period of 1990–2000. A significant reduction in the annual child mortality rate has been recorded, from approximately 2 percent in the 1990s to 3.8 percent in 2000–2018. It is, however, recorded that

despite these strides, Sub-Saharan Africa (SSA) remains to be adversely affected by the uppermost child mortality. Data shows approximately 5.3 million children below five years died in 2018 across the globe, with half of the deaths being reported in SSA (UNICEF et al., 2020).

In 2017, UNDESA released a report that demonstrated child mortality rates around the globe have been reducing by an estimated 3 percent annually between the years 1990 to 2015. This reduction implies a decrease in the child mortality rate by an estimated 45 percent between the years 1990-1995 and 2010-2015 which translates to a decline of deaths from 91 to 50 deaths in every 1,000 live births. The report further demonstrates that between the years 2010-2015, the child mortality rate in less developed economies of Asia and Sub-Saharan Africa stood at 54 per 1,000 live births, being nine times as high as that reported in the developed regions (UNDESA, 2017). In Kenya, according to data from the KDHS, the under-five mortality in Kenya stood at 52 deaths in every 1000 live births while the infant mortality rate in Kenya reduced significantly from 77 deaths per 1000 births in 2003 to 39 deaths per 1000 live births in 2014.

Maternal health care services are the antenatal care (ANC) and postnatal care (PNC) offered to women when pregnant, delivery, and the postpartum period (WHO, 2015). Enhancing maternal health through has become a global issue since many women and children can be rescued through the provision of the ANC and PNC services (Kifle et al., 2017). Improving ANC and PNC has been considered as one of the key strategies that are infective in reducing IMR (Arunda, Emmelin, and Asamoah, 2017). The WHO (2016) defines ANC as the healthcare services offered by skilled personnel to ensure enhanced health conditions for the mother and baby during the term of the pregnancy.

Literature in health economics provides that ANC includes continuous and routine monitoring of the mother and baby during the pregnancy period, continuous knowledge and information sharing

on how to carry the pregnancy as well as the diagnosis of any problem (Joshi, 2014). Doku and Neupane (2017), also observes that ANC provides pregnant women with a chance to access preventive services since they are often screened for potential hazards during pregnancy. Further pregnant women are usually provided with iron-folic acid supplementation, tetanus shots, blood, and urine assessments together with health education touching on nutritional and risky health behaviors (Lozano et al., 2012).

Concerning PNC, the literature indicates that PNC is key in promoting the health conditions of both the mother and the child. It is widely considered that PNC is important because the largest proportion of deaths occurs after birth since mothers are more likely to develop serious and life-threatening complications after birth (WHO, 2016). The PNC is critical as it provides new mothers with education and advice on how well to care for the newborn.

Mitigating infant mortality however remains elusive and unattainable especially in developing countries where budgetary allocations constrain the efficient provision of maternal healthcare (Ekpenyong et al.,2019). Lincetto (2006) also argues that in sub-Saharan African countries, most of the pregnant women attend more than one ANC and therefore do not make up for the four minimum anticipated visits. Similarly, in Kenya, data obtained from the KNBS indicates that for a long-time, there has been a substantial decline in accessing and utilizing ANC services. The proportion of pregnant women attending at least four antenatal visits reduced from 64 % in 1993 to 52% in 2003 and 47% in 2008. In 2014, the proportion of pregnant women making more than four visits to healthcare facilities during their term of pregnancy stood at 58 percent. Owing to these constrained provisions and less than optimal access to maternal healthcare services such as ANC, the Kenyan government adopted strategies to promote access to maternal health services.

1.1 An Overview of Maternal Health Services in Kenya

The first national health policy concerning maternal services was first implemented in Kenya in 1989. The policy was aimed at introducing health user fees to support the functioning of the healthcare facilities. However, during the implementation of this policy, many of the poor who sought healthcare services were largely disadvantaged as the system at the time favored the rich and thus promoted inequality. In the year 1990, the user fees were thereafter abolished in part because it promoted social exclusion and inequality with regards to access to healthcare services (Gilson and McIntyre, 2005). Mwabu (1986) also argues that the policy was poorly implemented thereby leading to a significant decline in healthcare utilization.

In 1991, the Kenyan government re-introduced user fees on healthcare services citing tough economic challenges that the country faced. The re-introduction of the user fees policy allowed fees to be charged on drugs, injections, and laboratory services but excluded fees on any consultancy services sought by the health seeker (Mwabu, 1997). The policy further exempted user fees to all healthcare services provided to all children aged five and below as well as on the treatment of tuberculosis.

It is considered that the reintroduction of the user fees in the country led to increased out-of-pocket expenditure and limited access to health services. Owing to this, in 2004 the Kenyan government adopted a 10/20 rule in which healthcare seekers at all public dispensaries were charged only a minimal fee of Kenya shilling 10, and those who visited healthcare centers were charged and 20 shillings. The policy however offered fee exemption to all children aged five and below, the poor, and those with special conditions such as tuberculosis and malaria.

Further, in 2013 the Kenyan government abolished the 10/20 policy rule and launched the free maternal services program in all government health institutions. The main goal of this policy was to increase the utilization of maternal healthcare services, promote social protection for the vulnerable and marginalized, and reduce the likelihood of deaths. The free maternal services were operationalized by transferring all the healthcare costs from the patient to the Kenyan government. The Kenyan government covered all the maternal costs ranging from patient registration, drugs, examination, and delivery either normal or cesarean. Additionally, First Lady of the Republic introduced the Beyond Zero Initiative intending to enhance access to maternal healthcare services by the mothers.

1.2 Statement of the Problem

Researchers and policymakers consider access to and utilization of ANC and PNC as one of the key policy tools that are critical in reducing the likelihood of infant mortality rates. In Kenya, several policy initiatives and interventions have been adopted to enhance access and utilization of ANC as a strategy of reducing IMR. The adopted strategies include; the introduction of free maternal services (FMS) in all public health institutions to better the utilization of the maternal healthcare services and the Beyond Zero Initiative by the First Lady that aims to enhance accessing maternal healthcare services by pregnant women.

Despite these efforts on enhancing utilization of ANC and PNC in part focuses on promoting maternal health outcomes, infant mortality rates continue to be a major problem in Kenya. According to KDHS, infant mortality in Kenya reduced significantly from 77 deaths in every 1000 births in 2003 to 39 deaths per 1000 live births in 2014. The implication of this is that, in 2014, an estimated one child in every 26 died before becoming one-year-old. Even with this reduction, there

exist within-regional variations in the country that presents a worrying trend. The KDHS 2014 data further indicates that the highest IMR was reported in Nyanza and Nairobi at 50 and 55 deaths per 1,000 live births respectively. Also, data indicate that boys were more likely to die within the first year of life with 44 deaths per 1,000 live births as compared to girls at 37 deaths per 1,000 live births. It is widely considered that despite this overall reduction, infant mortality in Kenya is still considered to be high and not satisfactory in comparison to some of the other developing countries such as Rwanda, Botswana, and Mauritius. Based on this trend on the reduction of the IMR, it is evident that Kenya's path of attaining and surpassing the SDG by 2030 remains a challenge. Therefore, this study seeks to examine the effects of access to maternal healthcare services on the infant mortality in Kenya.

1.3 Research Questions

This study sought to answer the following set of questions:

i. What is the effect of maternal health care services on infant mortality in Kenya?

ii. What are the possible recommendations that can be drawn from the study?

1.4 Objectives of the Study

This study sought to analyze the effects of maternal health care services on infant mortality in Kenya. Specifically, the study seeks to:

1. Examine the effects of maternal healthcare services on infant mortality in Kenya
2. Draw insights and policy implications from the study

1.5 Justification of the Study

The study is significant in two main ways. First, the study focused on mothers of adolescents aged between 10 to 19 years who are considered to suffer a higher likelihood of complications and deaths because of pregnancy. Further, childbearing at an adolescent age often leads to adverse effects on both the mother and the born child. In Kenya, not so much is documented concerning the effect of ANC and PNC quality on infant mortality, especially among adolescent women.

Second, Kenya is still one of the countries that have a high IMR in SSA. Because of this, this study sought to add to the growing discussions in developing economies on the role of ANC and PNC on health outcomes of children by determining the effectiveness of ANC and PNC on infant mortality in Kenya. Evidence from this study would be significant to healthcare planners and policymakers as the results would be critical in helping them in making decisions on how cost-effective health policy can be designed in both the short and long-run. Moreover, the findings of this study would also provide more support in the efforts of enhancing the access and utilization of the maternal healthcare services to provide clinical monitoring, medical interventions, and health education and advice.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section discusses the theoretical and empirical studies concerning maternal health services and infant mortality in Kenya. In the theoretical literature section, human capital theory and the neoclassical utility theory are discussed while in the empirical literature section, a closer review of studies on the link between maternal health services and child mortality rates is presented and lastly, an overview of the literature is discussed in this chapter.

2.1 Theoretical Literature Review

2.1.1 The Human Capital Theory

Grossman (1972) developed the human capital theory based on the earlier works of Becker (1964) which is the main theory that this study relies on According to Grossman (1972), health is a factor that affects a consumer's utility both directly and indirectly. Grossman (1972) argues that health influences an individual's utility directly since it enters their utility functions like other commodities. It, however, tends to influence the consumer's utility indirectly because it influences the time an individual directs to the production of wage income in the market economies and commodities in the non-market economy.

In this theory, it is argued that health is a household producible good like other commodities where individuals inherit initial health stock at birth from their parents, but it declines with age.

The stock of health can, however, be enhanced by investment in health such as by the access to maternal healthcare services which includes both antenatal and postnatal healthcare services.

2.1.2 The Neoclassical Utility Theory

Consumer demand is the foundation of neoclassical utility theory. The theory avers that consumers, who are economic agents, are rational human beings who seek to maximize utility from consumption of goods subject to their budget constraints. According to Varian (1992), the theory further assumes that consumers have preference functions and that aim to maximize utility as would be allowed by their resources if their expenditures on consumption goods and services are lesser than or equal to their levels of income. The theory further provides that due to the duality concept, the consumers can achieve the same level of utility by either directly maximizing utility levels or minimizing the expenditures on the goods and services they seek to consume (Varian, 1992).

The neoclassical utility theory, however, offers a plausible explanation for the demand for goods and services but does not consider health as well consumed by consumers (Grossman, 1999). According to Grossman (1999), the neoclassical utility theory can be expanded to incorporate health as a commodity or a good that consumers derive utility from it.

2.2 Empirical Literature Review

Doku and Neupane (2017) undertook a study to examine the effects of the ANC on neonatal mortality among 57 developing economies. The study used survey data and focused on women within 15 to 49 years which are considered the most reproductive. In the study, the authors controlled for the mother's age, area of residence, household's wealth status, birth order, the gender

of the child as well as mother education. Doku and Neupane (2017) found that women who made first visits to the health facility within the first trimester as well as at least four visits to the health facility, were 55 percent less likely to report neonatal deaths, unlike those mothers who failed to adhere to the WHO health considerations. This finding implied that ANC proved to be beneficial to both the mother and the children in the sense that it promoted health-seeking behavior as well as necessary parenting skills that are always crucial in mitigating hazards and risks to both the mothers and the children.

Agha (2000) also examined the determinants of infant mortality in Pakistan using an integrated household Pakistani survey data. Using the logit regression model, the study found that differences in the socio-economic factors are crucial factors in explaining the infant mortality rates in Pakistan. In particular, the study established that mothers' and father's education were among the most important factors that are required in reducing infant mortality rates. More specifically, Agha (2000) argued that mother's schooling is a critical in explaining infant death since better-schooled mothers have higher chances of seeking longer birth intervals and as a result prefer to produce fewer children. Similarly, the education level of a father is also important in child mortality and survival rates, and that a better-educated father is often more productive, earns higher incomes, and ensures an improved level of household consumption of nutrition.

In Nepal, the study by Neupane and Nwaru (2014) focused on the effects of the utilization of prenatal care services on several infant care indicators such as infant mortality. The study benefited from the survey data that covered 4,136 women aging between 15 and 49 years who delivered 3 years before survey of 2006. Using the multilevel logistic regression technique, the study established that children of those mothers who had not made prenatal care visits were at an enhanced risk of neonatal deaths.

Upadhyay, Singh, and Srivastava (2020) examined the effects of the effectiveness of prenatal care on infant deaths in India using a nationally representative dataset. The study adopted the multivariable binary logistic regression models whilst taking into account the gender of the child, birth size, birth order, age of the mother, mothers' level of schooling, religion, wealth index, and place of residence. The authors found that enhancements in prenatal care quality were linked with the reduction in the infant and neonatal mortality rates Further, established that women who received education on pregnancy-related complications reported a reduced chance of neonatal mortality. Additionally, the study established that mothers with infants who were of mean or above-mean size at the time of birth were less likely to report neonatal mortality. Similarly, better-spaced birth-orders were less likely associated with infant mortality. Also, mothers with a better level of schooling and those from richer households were less likely to report neonatal and infant mortality in India.

Nabeen et al, (2019) examined the effects of antenatal care on infant death rate in Bangladesh using the study used the 2014 survey data. The authors adopted a multivariate survival regression analysis while at the same time controlling for the effect of sex of the child, birth spacing, household's wealth status, residence, and age of the mother, BMI, and schooling. The study established that the infants of the women who failed to receive ANC were four times more probable to die. Further, the authors found that the schooling level of mothers played a substantial part in reducing infant mortality rates and that first-born children had a higher propensity of dying before reaching a year old. Additionally, the study found that children of first-order birth have a higher risk of dying during the first year of their life. Concerning mothers' education, the evidence from the study indicated that maternal schooling had a substantial effect on mitigating the chances of infant mortality in Bangladesh.

In a similar study, Hossain (2015) examined how empowering women through improved education, independence in movements, and their involvement in household decision making affects infant mortality in Bangladesh. Using the survival method approach applied to the survey data and controlling for the contraception use, healthcare visits, gender of the child, access to electricity, wealth status, residence, child weight, and age at first birth. The paper established that infant mortality reduced significantly with the improvement of the mothers' level of schooling, independence on movements, and participation in household decision-making activities. Concerning the control variables, the study finds that mothers who made 2 to 3 ANC visits were at a reduced chance of reporting infant mortality. However, the effect was not significant for those making over 4 visits. Additionally, mothers residing in urban localities had access to electricity and were wealthier reported a reduced risk of experiencing infant mortality.

Roy and Haque (2018) used the logistic regression technique to estimate the effects of antenatal care on early neonatal deaths in Bangladesh. The authors found that mothers who were a recipient of antenatal care while pregnant had a lower risk of reporting neonatal mortality in comparison to those who were not able to receive antenatal care while pregnant. Concerning the household's level of income, the paper established that mothers from well-off richer households had reduced the risk of reporting neonatal deaths. In Tanzania, Ogbo et al., (2019) undertook a study to examine the determinants of child mortality in Tanzania from the period 2004 to 2016 by using the three waves of the Tanzania health data. Through the use of a cox regression methodology applied to survey data spanning three-waves, the authors established that infant mortalities were more likely to be reported among the mothers who did not give births normally and underwent cesarean section, those who were young and aged less than 20 years and those with a shorter birth interval.

Singh, et al., (2014) studied the effects of antenatal care programs on the neonatal mortality rates using household-level data collected in 2007-08 in India. The study examined the effects of ANC visits, ingestion of iron-folic acid tablets on neonatal mortality rates. Using a logistic regression technique and controlling for the mother's age at delivery, level of schooling, gender of the child, the household's wealth status, and the place of residence, the study found that mothers who made more than 4 ANC visits had significantly reduced the neonatal mortality rates.

In SSA, the study by McCurdy, Kjerulff, and Zhu (2011) also studied the effects of prenatal care on neonatal mortality in 17 SSA counties using Demographic and Health Surveys data that covered women who aged 15 to 49 years. In the study, neonatal mortality was measured in binary form taking the value of 1 for the live birth terminating in death in before a month from the date of birth and zero otherwise. By applying binary logistic regression, and controlling for residence, wealth and marital status, mother's age, and education, the authors established that prenatal care was linked with reduced neonatal deaths in SSA. In particular, the study established that prenatal care by trained personnel decreased the odds of neonatal deaths by 30 percent. Further, the authors found that blood pressure and weight measurements and assessments, tetanus immunizations, and over four visits during pregnancy were linked with reduced neonatal mortality. With regards to the controls, the study established that mothers who were married reported lower neonatal mortality rates than the unmarried. On the mother's age, the study established that first-time mothers were at a higher risk of experiencing neonatal mortality rates than those at an advanced age.

In yet another study, Taylor et al., (2009) examined the role of prenatal care on infant deaths in 10 West African countries using the demographic and health survey datasets that surveyed 35, 096 women across the countries covered in the study. In the study, the dependent variable which captured whether the infant mortality rate was constructed as a binary variable. In their model, the

authors controlled for the effects of maternal age, level of schooling, religion, marital status, the gender of the child, type of delivery whether normal or cesarean, residence, mother's occupation, and household's wealth status. The authors established that a mother attending prenatal care was negatively and significantly associated with infant mortality only for those belonging to the wealthiest of the quantile. The authors observed that mothers who were offered prenatal care had higher chances of benefitting from the education received during the visits. Also, the study found that mothers who reported higher mortality rates were less educated, fell in the poor category on the wealth index, and resided in the rural areas. Further, the results also demonstrated that adolescent mothers' higher risks of experiencing infant mortality risks as compared to mothers of advanced age. The West African countries covered by the study include Sierra Leone, Senegal, Niger, Mali, Nigeria, Liberia, Guinea, Ghana, Burkina Faso, and Benin.

Adebowale and Udjo (2016) studied the effects of access to maternal healthcare services on infant survival in Nigeria. The authors used the health dataset that surveyed 12511 women aged between age 15 and 49 years. By applying the cox-proportional hazard in their analysis, the authors found that the use of infant mortality was less experienced amongst mothers who had access to maternal healthcare services. In a relatively similar study, Makate and Makate (2017) studied the effects of PNC on child mortality rates in Zimbabwe using three waves of the demographic health surveys ranging from 199, 2005/06 to 2010/11. The study surveyed 11,288 mothers aging between 15 to 49 years who had an estimated 14,452 children below the age of five years before each survey that was carried out. To mitigate any confounding factors, the study controlled for the mother's schooling, the gender of the child, the wealth status of the household, and residence. Using a probit regression technique, the authors established that mothers who were the recipient of prenatal care were less likely to experience mortality rates. More specifically, the authors established that

improved quality of prenatal care by one unit reduced the chances of neonatal, infant, and under-five mortality rates by 42.33, 30.86, and 28.65 percent, respectively.

Ntenda, et al., (2014) undertook a study to look at the factors linked with infant deaths in Malawi. The authors used the Malawian demographic survey datasets for the period 2004 and 2010 and included the following as the explanatory variables for the infant mortality; the mother's education, household wealth status, region, residence, access to water, religion, birth order, mother's age, place of delivery, and gender and size of the child. By employing a multivariate logistic regression technique, the study established that household wealth had a protective effect on infant mortality as a wealthier household has lesser chances of being exposed to infectious diseases, lesser nutritious foods and even lack of adequate healthcare services. Further, the study established that mothers residing in rural areas were exposed to more danger due to socio-economic differentials and in such had a higher chance of being exposed to. Concerning infant's weight, the study established a greater risk of infant mortality for the babies born with smaller birth weight and size. According to the authors, the size of an infant at birth often acts as a good proxy for the mother's level of nutritional status and the health status of the mother at the pregnancy phase. Regarding the birth order variable, it was found that first birth was linked with a higher risk of infant mortality in comparison to the second birth. However, the risk of infant mortality increased with the increase in birth order due to an increase in the mothers' age, multiple births, and households' socioeconomic factors. In addition, the study established that sex of an infant was also an important predictor of infant mortality. Ntenda, et al., (2014) found that male babies had a higher risk of dying before turning one year old, because of their genetic and biological makeup where male infants are assessed weaker biologically and are more likely to suffer from diseases.

Dramani and Laye (2018) examined the link between prenatal care and infant health and subsequently infant mortality in Senegal by using the 1997 Senegal's DHS data. In the study, the authors applied both heckit and control function approaches to examine the effects of prenatal care on the infant's health. Whilst controlling for the child's birth weight, mothers' age and education, father's education, child's gender, the study established that immunization, increase in maternal age, and education level significantly improved infant's health and subsequently a decline in the infant deaths. In Ethiopia, Dube, Taha and Asefa (2013) employed a logistic regression method to examine the determinants of infant mortality in Ethiopia. In the study, using the survey data, the authors included religion, mothers' education status, occupation status, age, marital status, sex of the infant, birth order and interval as well as the availability of latrine in the household. The studies established that ANC visits, child weight, birth order and birth interval as well as handwashing practices by the mother are critical in reducing mother's reporting infant mortality.

In Kenya, Machio, (2018) undertook a study to examine the determinants of neonatal and under-five mortality rates in Kenya by using four-wave KDHS data from the period 1998 to 2014.
In particular, the study examined whether increasing the coverage and utilization of sufficient of skilled delivery and ANC services can effectively reduce the likelihood of neonatal and below five mortality. The author in this study adopted the use of the control function approach as a methodological approach, which in effect mitigates the endogeneity problem whilst including the age of the mother, schooling level of the mother, gender of the child, and the marital status as the control variables. The study established that substantial utilization of ANC significantly declined the chances of neonatal and under-five mortality in Kenya. Additionally, the study also found that the mothers who utilized skilled delivery care services were linked to a reduction in both neonatal and under-five mortality. Concerning the control variables, the study established that mothers'

level of schooling enhances the chances of a mother utilizing both the antenatal and skilled delivery services. Further, it was also found that the married women were better placed to efficiently use of the maternal health care services whilst mothers from the rural localities were less probable to use skilled delivery and ANC services.

2.3 Overview of literature

The reviewed empirical literature indicates that most studies find that access to maternal healthcare, both ANC and PNC by pregnant women tend to reduce infant mortality rates. Some studies, however, indicate that access alone does not reduce infant mortality rates but appropriate visits to healthcare facilities for maternal health care services as prescribed by the WHO significantly reduce infant mortality rates (see, for example, Nabeen et al, 2019; Doku and Neupane, 2017). Further, the review of the literature indicates that despite the various studies that have been done in this area, and specifically in developing economies, few of the studies have examined the effects of both access to ANC and PNC on infant mortality rates. Further, none of the studies has given attention to adolescent mothers. As such, this study sought to address this gap by empirically analyzing the impact of both ANC and PNC on infant mortality in Kenya by focusing on adolescent mothers only.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

Methodology that was adopted in analyzing the effects of maternal healthcare services on infant mortality in Kenya is discussed in this chapter. The chapter starts by presenting the theoretical approach, followed by the specification of the model that was used in the empirical analysis. Data and its source are also discussed in this chapter.

3.1 Theoretical Framework

This study closely followed the approach by Rosenzweig and Schultz (1983) in theoretically linking maternal health care services to infant mortality, which is a health outcome. According to Rosenzweig and Schultz (1983), the mother seeks to maximize utility from the consumption of the non-health-related goods as well as from the status of the child's health. The mother's utility maximization problem can, therefore, be written as:

$$U = U(H, C) \qquad 1$$

Where U denotes utility maximized by the mother, H is the health of the child in which the household derives utility in case of good health and disutility in case of poor child health. C denotes a composite good that is made up of the mother's health and other non-related goods. In equation 1, it is considered that the mother maximizes the utility function U which is assumed to be concave, continuous, and differentiable.

The health status of the child enters the mother's utility function directly because the mother derives utility from its consumption. According to Grossman (1972), a child is endowed with an initial stock of health that tends to decline with age but can be increased through specifically targeted investments such as access to healthcare services.

The implication from Grossman (1972) view of child health, which is the main theory that this study relies on, follows that the health of the child can be generated by the biological production function with inputs that influence its production including mothers' access to maternal healthcare services. We can, therefore, write the child health production function as:

$$H = H(H, X) \qquad 2$$

Where H is the health of the child and X is the consumption of medical care among other things by the child. The mother maximizes the utility function in the equation (1) subject to the child production function and the budget constraint as follows:

$$P_H + P_C + P_X = Y \qquad 3$$

Where P_H denotes the price of H, P_C price of C, P_X the price of X and Y is the mother's income. By setting the Lagrangian objective function and solving for the first-order condition for utility maximization, we obtain the demand functions for the child's health.

3.2 Model Specification and Estimation

In examining the effects of maternal health care services on infant mortality rate in Kenya, this study seeks to adopt the binary logit model as used in other studies such as Agha (2000), Neupane and Nwaru (2014), Singh, et al., (2014); Upadhyay, Singh, and Srivastava (2020) among others. The use of the logit model is considered in this study because the dependent variable is binary relating to whether the child dies within one year after the birth or not. The logit regression model limits the values of the regressors to range between zero and one and at the same time assume a logistically distributed error term.

The binary nature of our dependent variable allows us to define a latent variable Y_i^* which is unobserved that generates the observed values of a child dying within one year from birth or not by linearly linking it to an observed vector of regressors through a structural equation expressed as:

$$Y_i^* = X_i\beta + \varepsilon_i \qquad 4$$

Where is the Y_i^* is a latent variable and hence not observable, X_i denotes a vector of regressors, β relates to the parameters to be estimated and ε_i error term. Notice that Y_i^* being a latent variable is not observable and what is observable is a binary variable Y_i that captures whether a child dies within his/her first year of birth or not. We, therefore, connect the latent variable to observed values through the measurement equation expressed as:

$$Y_i = \{1\ 0 \quad if \ \frac{Y_i^* > 0}{Y_i^* \leq 0} \qquad 5$$

Where Y_i is a binary variable that captures whether a child dies within his/her first year of birth or not. Based on the formulation in equation 5, $Y_i^* \leq 0$, then Y_i=0 but when $Y_i^* > 0$, then Y_i =1. We can, therefore, express the probability of Y_i equals 1 given a vector of regressors if Y_i^* is greater than 0 as:

According to O'Connell (2006, 14), a generalized expression of the logistic regression can be written as:

$$\Pr(X) = \frac{e^{X_i\beta+\varepsilon}}{1+e^{X_i\beta+\varepsilon}} \qquad 6$$

Where Pr denotes probability, Y_i that captures whether a child dies within his/her first year of birth or not, X_i denotes a vector of regressors, β relates to the parameters to be estimated, e relates to the exponential parameter.

In equation 6 expressed above, the probability of Y_i equals 1 given a vector of regressors is non-linear in X_i and β. Non-linearity in regressors and parameters implies that the ordinary least squares (OLS) technique would not be an appropriate method of estimation in this study.

Since the likelihood of a child dying before the first birthday is given by equation 6 above, we can obtain the probability of a child not dying within the first year of birth as:

$$1\text{- }\Pr(X) = \frac{1}{1+e^{X_i\beta+\varepsilon}} \qquad 7$$

We can, therefore, combine equation 6 and 7 and obtain:

$$\frac{Pr(X)}{1- Pr(X)} = \frac{1+e^{X_i\beta+\varepsilon}}{1+e^{-X_i\beta+\varepsilon}} = e^{X_i\beta+\varepsilon} \qquad 8$$

Now by taking the natural logarithm of equation 8, we obtain our estimable equation written as:

$$\text{Log}\left(\frac{Y}{1-Y}\right) = X_i\beta + \varepsilon_i \qquad 9$$

Where Y is the dependent variable that equals 1 if a child dies within one year from birth, 0 otherwise, X_i is a vector of regressors that explains our dependent variable discussed in 3.3 and ε_i is the error term.

Our specified model that was estimated by the Maximum Likelihood Estimation (MLE) technique can, therefore, be written as:

$$y = \beta_0 + \beta_1 anc + \beta_2 pnc + \beta_3 age + \beta_4 educ_1 + \beta_5 educ_2 + \beta_6 educ_3 + \beta_7 educ_4 + \beta_8 childgender + \beta_9 residence + \beta_{10} wealth + \beta_{11} birthattend + \beta_{12} birthorder + \beta_{13} deliver + \beta_{14} inform + \varepsilon \qquad 10$$

Table 1: Variable Measurement and Definitions

#	Variable	Definitions	Measurement and description	Expected sign
Dependent variable				
1	Infant mortality	The likelihood of an infant dying before the first year of birth	Dummy variable. 1 if the child dies within one year of life, 0 otherwise	
Independent				
2	Antenatal care	Expectant mothers attending antenatal care	Dummy variable 1 if a mother attended at least four antenatal care; 0 otherwise	Negative (Roy and Haque, 2018)
3	Postnatal care	Expectant mothers attending postnatal care	Dummy variable. 1 if a mother attended for the postnatal care; 0 otherwise	Negative (Neupane and Nwaru, 2014)
4	Age	Mother's age at the time of delivery.	Dummy variable 1 for mothers above the age of 20.	Positive

			0 otherwise	(McCurdy, Kjerulff, and Zhu, 2011)
5	Education	Levels of education	1 if no formal, 0 otherwise, 1 if primary, 0 otherwise, 1 if secondary, 0 otherwise 1 if university, 0 otherwise.	Positive (Taylor et al., 2009)
6	Gender of the new-born	Whether male or female	1 if male, 0 if female	Uncertain (Singh, et al., 2014); Nkenda et al., 2014)
7	Residence	Place of residence	1 if urban, 0 if rural	Positive (Machio, 2018)
8	Attendance at delivery	Mother attended to by a health professional during giving birth	1 if the mother was attended, 0 otherwise	Positive (Machio, 2018)

9	Birth order	Order in which the child is born and that the first child is the oldest	Categorical variable. Classified as 1, 2, 3, or 4 and above.	Positive (Nkenda et al., 2014; Upadhyay, Singh, and Srivastava, 2020)
10	Delivery type	Adolescent mother delivery	1 if mother delivered through cesarean section 0 otherwise	Uncertain
11	Access to information	Ownership of TV set	1 if the adolescent mother has a TV in the household 0 otherwise	Positive

3.3 Estimation techniques

The dependent variable in this study is a dummy taking a value of 1 if the child was reported to have died within the first year of birth or not. The adoption of the Ordinary Least Squares (OLS) estimation technique commonly termed the Linear Probability Model (LPM) would produce biased and inconsistent results as well as the predicted probabilistic coefficients would go over and beyond the boundary of 0 and 1. In this study, the logit model is a class of discrete choice models, would be adopted to yield econometric results that are considered efficient and consistent because the outcome variable of interest is binary. In adopting the logit model, which was

estimated by the maximum likelihood estimation (MLE) technique, the assumption of a logistically distributed error term is made.

3.4 Data Source

The study utilized the KDHS data for the period 2014. The KDHS survey is nationally representative data that was sponsored by the USAID. The data contains information on reproductive health and history, demographic information such as gender, age, education, gender of the newborn, residence, wealth status and birth order. The 2014 KDHS surveyed 36,430 households out of the 39,679 sampled households.

3.5 Data Analysis

The 2014 KDHS data was analyzed through descriptive and inferential statistics. The descriptive entailed showing the measures of mean, standard deviation, frequencies, and skewness. The inferential analysis, through the application of the logit model, was used to achieve the objectives of this study. The logit regression technique was adopted to show the effect of the regressors on infant mortality, which is the outcome variable. The statistical tool, STATA version 14 was used in conducting the analysis.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

In this section, results from empirical estimation and their economic interpretations are provided. The section starts by presenting the descriptive statistics of the variables presented in the estimation model and then proceeds by examining the properties and suitability of the estimated model. Finally, the logit estimation results together with economic interpretations and discussion of the results are presented.

4.1 Descriptive statistics

Descriptive statistics are presented to determine the statistical properties of the data. The descriptive statistics show that, on average, 2 percent of the adolescent mothers experienced infant mortality. Concerning the utilization of maternal care services, statistics indicate that on average 93 percent of adolescent mothers attended at least one ANC visit. This statistic implies that more adolescent mothers considered the need to attend ANC visits during their pregnancy. Additionally, 30 percent of adolescent mothers received postnatal care. Concerning the care received by adolescent mothers during delivery, 5 percent of the mothers underwent a cesarean section during birth delivery. Further, an estimated 76 percent of the adolescent mothers reported having been attendant by skilled health personnel during delivery.

Table 2: Summary statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
Infant mortality	8,386	0.0237	0.152	0	1
Antenatal care	8,386	0.929	0.257	0	1
Postnatal care	8,386	0.297	0.457	0	1
Delivery type	8,386	0.0519	0.222	0	1
Skilled Attendance	8,386	0.762	0.426	0	1
Age	8,386	16.99	1.722	10	19
Education					
No education	8,386	0.202	0.402	0	1
Primary education	8,386	0.623	0.485	0	1
Secondary education	8,386	0.163	0.369	0	1
Tertiary education	8,386	0.0125	0.111	0	1
Gender of the child	8,386	0.515	0.500	0	1
Residence	8,386	0.300	0.458	0	1
First birth order	8,386	0.489	0.500	0	1
Second birth order	8,386	0.188	0.391	0	1
Third birth order	8,386	0.174	0.379	0	1
Fourth birth order	8,386	0.150	0.357	0	1
Access to information	8,386	0.360	1.121	0	7

With regards to socio-demographic variables, the average age of the adolescent mothers was 17 years, with maximum and minimum ages being 19 and 10 years. On education, summary statistics indicate that 20 percent of the adolescent mothers had no education, 62 percent had primary education and 16 percent had secondary education. Further, only a paltry 1 percent had attained tertiary education. The summary statistics further indicate that, on average, 52 percent of the newborn were boys. Additionally, 30 percent of adolescent mothers resided in urban areas.

4.2 Correlation matrix

Correlation analysis is a statistical approach of evaluating the direction and strength of association between two variables in an estimable model. Among the independent variables, the correlation matrix presented in table 3 shows that antenatal care has a positive relationship with all the other independent variables added in the model. Concerning the postnatal care, the correlation matrix

further indicates that the variable is positively correlated with all the variables, except for the gender of the child.

On the delivery type, the correlation matrix results indicate that the variable is negatively correlated with the skilled attendants and birth order. The correlation analysis also shows a negative correlation between infant mortality and utilization of ANC and PNC by adolescent mothers. This direction of association is consistent with theoretical proposition that infant mortality reduces with the utilization of maternal services.

Table 3: Correlation matrix

	Infant mortality	Antenatal care	Postnatal care	Delivery type	Skilled attendant	Age	Education	Sex of child	Residence	Birth order	Access to Information
Infant Mortality	1										
Antenatal care	-0.0268	1									
Postnatal care	-0.0191	0.0635	1								
Delivery type	0.0377	0.0481	0.0186	1							
Skilled Attendants	-0.0158	0.496	0.0565	-0.0005	1						
Age	-0.0201	0.0553	0.0066	0.0431	-0.0037	1					
Education	0.00110	0.204	0.0553	0.0947	0.0707	0.176	1				
Sex	0.0151	0.00900	-0.0067	0.0120	0.0121	0.0031	0.0153	1			
Residence	0.0107	0.0875	0.0080	0.0814	0.0169	0.0375	0.187	0.0018	1		
Birth order	-0.0104	0.0465	0.0106	-0.0054	0.0065	0.0045	0.0030	-0.010	0.038	1	
Access to information	-0.0152	0.0259	0.0107	0.0341	-0.0038	0.0481	0.108	-0.014	0.112	0.0028	1

4.3 Diagnostic results

4.3.1 Multicollinearity tests

This study employed the variance inflation factor (VIF) to test for the existence of multicollinearity in the estimable model. Economic literature provides that multicollinearity is a problem whenever VIF is greater than 10. The results in table 4 indicate that multicollinearity VIF values in all the independent variables are below the threshold level of 10. In our case, it is assessed that multicollinearity is not present and does not present any challenge to our estimation, and as such, no variable is dropped from our estimable model.

Table 4: Multicollinearity test

Variable	VIF	1/VIF
Secondary education	1.69	0.5921
Primary education	1.67	0.598551
Antenatal care	1.41	0.708408
Skilled attendant	1.33	0.749541
Second birth order	1.15	0.869882
Third birth order	1.13	0.884693
Fourth birth order	1.11	0.897407
Tertiary education	1.08	0.923404
Residence	1.06	0.945570
Age	1.04	0.964085
Access to information	1.02	0.976797
Delivery type	1.02	0.983196
Postnatal care	1.01	0.991370
Sex of the child	1.00	0.998179
Mean VIF	**1.19**	

Source: Author 2020

4.3.2 Heteroscedasticity tests

The study employed the Breusch Pagan Lagrange Multiplier to test for the existence of heteroscedasticity. The null hypothesis of the model is that the model has constant variance i.e homoscedastic. The test results outcome provided in table 5 indicates that a chi-square value of 862.14 and Probability > Chi-square of 0.0000 which is significant at 1%, indicating we fail to reject the null hypothesis implying that heteroskedasticity is not problem in the residuals.

Table 5: Heteroscedasticity tests

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity
Ho: Constant variance
Variables: fitted values of infant mortality
chi2(1) = 862.14
Prob > chi2 = 0.0000

Source: Author 2020

4.3.3 Normality test

This study used a Shapiro-Wilk test to examine the normality of variables included in the estimable model. The test determines that a variable is normal if the mode, median and mean are equal and offers four alternatives, W, V, Z and Probability value. Of all this tests, the p-value is used to conduct inferences for normality. That is, in the event the calculated p-value is greater than critical value then it is concluded that the variable is assessed as normal. However, in the event the calculated p-value is not greater as compared to critical value, the variable in question is assessed to be not normal.

Table 6: Normality test

Variable	Obs	W	V	z	Prob> z
Infant mortality	8,386	0.98993	43.034	10.023	0.00000
Antenatal care	8,386	0.99725	11.738	6.561	0.00000
Postnatal care	8,386	0.99968	1.371	0.840	0.20032
Delivery type	8,386	0.99551	19.197	7.872	0.00000
Skilled Attendance	8,386	0.99961	1.648	1.331	0.09168
Age	8,386	0.97808	93.669	12.095	0.00000
No education	8,386	0.99923	3.280	3.165	0.00078
Primary education	8,386	0.99994	0.246	-3.732	0.99991
Secondary education	8,386	0.99890	4.719	4.134	0.00002
Tertiary education	8,386	0.98100	81.208	11.714	0.00000
Gender of the child	8,386	0.99999	0.037	-8.753	1.00000
Residence	8,386	0.99969	1.328	0.756	0.22497
First birth order	8,386	0.99998	0.067	-7.192	1.00000
Second birth order	8,386	0.99913	3.736	3.512	0.00022
Third birth order	8,386	0.99900	4.259	3.861	0.00006
Fourth birth order	8,386	0.99875	5.327	4.457	0.00000
Access to information	8,386	0.61594	1641.526	19.724	0.00000

Source: Author 2020

From the results presented in table 6, it observed that nearly all the variables used in the estimation are normal. Infant mortality, antenatal care, delivery type and age were found to be normally distributed. Additionally, all education and birth orders except primary education and first birth orders were established to be normally distributed normally distributed with probability > z of less than 0.05. Having established that our estimable is better specified, we proceed to present estimation results.

4.4 Econometric Results

4.4.1 Logit model results

The logit regression results of the link between maternal health care and infant mortality among adolescent mothers are presented in Table 7. We used the logit regression techniques because the dependent variable is binary that takes value 1 if the child dies within one year of life, 0 otherwise,

and that we also assume the error term is logistically distributed. The maximum likelihood effects, obtained from a series of log likelihood iterations of maximum likelihood estimations, allow us to check for the nature of the relationship of the variables i.e. the sign of the relationship and its significance where a positive sign in a coefficient implies that an increase in the predictor variables leads to an increased probability in the dependent variable and a negative sign indicates a decrease in the dependent variable. Based on this, it is revealed that antenatal and postnatal care are significant predictor of infant mortality in Kenya. Concerning the control variables, the study finds that delivery type, primary education and second birth order were all significant predictor of infant mortality.

The logit regression results show that the model presented was correctly specified. The results indicate that estimated model is 97.64 percent correctly classified implying that the model is well specified. Also, the results indicate that the likelihood ratio chi-square of 42.03 with a p-value of 0.0001 informing us that the estimable model is statistically significant and that it fits better as compared to an alternative model that lacks predictors. Further, the Pseudo R squared of 0.3221 in Table 7, indicate that the variables in the model explains 32.21% variability in the dependent variable (infant mortality).

Table 7: Logit model results

Variables	Maximum likelihood ratio
Antenatal care	-0.602**
	(0.288)
Postnatal care	-0.287*
	(0.169)
Delivery type	0.828***
	(0.241)
Skilled attendant	-0.0469
	(0.197)
Age	-0.0710*
	(0.0404)
Education	
Primary education	0.403**
	(0.205)
Secondary education	0.281
	(0.271)
Tertiary education	-0.465
	(1.029)
Gender of the child	0.193
	(0.145)
Residence	0.197
	(0.158)
Birth order	
Second birth order	-0.716***
	(0.242)
Third birth order	0.0518
	(0.187)
Fourth birth order	-0.258
	(0.221)
Access to information	-0.130
	(0.0924)
Constant	-2.219***
	(0.702)
Observations	8,386
Log-likelihood chi-square	43.68
Prob > chi-square	0.0001
Pseudo R- squared	0.3221
Correctly classified	97.63%

*Notes: (i) Infant mortality is the dependent variable (ii) standard errors in parentheses (iii) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (iv) No education and first birth order are reference categories for education and birth order variables respectively.*

4.4.2 Marginal Effects of a logit model

Given that the coefficients of the binary logit model provided in table 7 cannot be interpreted directly to provide the marginal changes but can only help show the direction of effect and the significance, we computed the marginal effects, which we discuss in this section. The marginal effects of logit model results measure the change in the probability of infant mortality with a unit change in each independent variable, ceteris paribus. The marginal results provide an opportunity for interpreting the effect of changes in the independent variables on the dependent variable in the logit regression model, holding all factors constant. The marginal results are presented in table 8.

Table 8: Marginal effects of logit model

Variables	Marginal effects (dydx)
Antenatal care	-0.0126**
	(0.00599)
Postnatal care	-0.00601*
	(0.00350)
Delivery type	0.0173***
	(0.00500)
Skilled attendant	-0.000980
	(0.00411)
Age	-0.00148*
	(0.000841)
Primary education	
	0.00841**
Secondary education	(0.00424)
	0.00588
Tertiary education	(0.00564)
	-0.00971
Gender of the child	(0.0215)
	0.00403
Residence	(0.00302)
	0.00412
	(0.00330)
Birth order	
Second birth order	-0.0150***
	(0.00492)
Third birth order	0.00108
	(0.00391)
Fourth birth order	-0.00539
	(0.00461)
Access to information	-0.00271
	(0.00192)
Observations	8,386

Notes: (i) Infant mortality is the dependent variable (ii) standard errors in parentheses (iii) * *p < 0.10,* ** *p < 0.05,* *** *p < 0.01 (iv) No education and first birth order are reference categories for education and birth order variables respectively.*

4.5 Interpretation and Discussion of Results

The econometric results establish that adolescent mothers who attended at least one ANC visit were less likely to report infant mortality. In particular, the results indicate that adolescent mothers who attended at least one ANC were 1.26 percent less likely to report infant mortality. This result implies that when mothers attend ANC even once they significantly reduce the likelihood of infant mortality. This is because at the ANC, mothers have access to various counselling services including nutritional counselling, breastfeeding counselling, treatment of pregnancy related complications, folic and ferrous sulphate including laboratory services. These services are critical in ensuring the wellbeing of both the mother and infant during, at and after delivery. This result is consistent with the findings by Roy and Haque (2018) who found that mothers who were a recipient of antenatal care while pregnant had a lower risk of reporting infant mortality in comparison to those who were not able to receive antenatal care while pregnant. This finding implied that antenatal care improves maternal healthcare and increases the survival chances of an infant and the mother. Another study by Doku and Neupane (2017) found that women who made first visits to the health facility within the first trimester as well as at least four visits to the health facility, were 55 percent less likely to report neonatal mortality, unlike those mothers who failed to adhere to the WHO health considerations. Similarly, Nabeen et al, (2019) who studied the effects of ANC on infant death rate in Bangladesh established that the infants of the women who failed to receive ANC were four times more probable to die, further indicating the importance of ANC in promoting better health outcomes for both the mother and the infants.

Concerning PNC, the results establish that, PNC significantly reduces the likelihood of infant mortality rates. It found that adolescent mothers who attended PNC were 0.60 percent less likely

to report infant mortality rates. At PNC, the mothers have access to postnatal care services such as counselling on breastfeeding practices, cord care and hygiene, eye care, management of minor complications including immunization which are significant in the survival of both mother and the infant. This is in line with the finding from Nepal by Neupane and Nwaru (2014) who established that children of those mothers who had not made prenatal care visits were at an enhanced risk of neonatal deaths and that the utilization of PNC services were critical on providing care to infant and that it contributes to reduction in infant mortality. Similarly, in India Singh, and Srivastava (2020) also observed that PNC was effective in reducing infant mortality.

Regarding the delivery type, the results indicate that adolescent mothers who underwent a cesarean section were more likely to report infant mortality. In particular, the study finds that adolescent mothers who delivered via cesarean section were 1.73 percent more likely to experience infant mortality. This finding is also consistent with the one obtained by Ogbo et al., (2019) in Tanzania who established that that infant mortalities were more likely to be reported among the mothers who did not give births normally and underwent cesarean section. Additionally, the results can be viewed on a technical standpoint, that birth by cesarean section presents with great risk of complications compared to baby born vaginally. Most of these babies have difficulties breathing on their own because most of the time they are born preterm and their lungs not fully developed. This situation can also be associated with the mothers having not labored and especially among the adolescents because of their age. The babies develop serious complications that leads to admissions in newborn units where if infection prevention and control practices are not up to date, they risk contracting bacterial infections and hypothermia that are known as leading causes of infant mortality.

The econometric results also indicate that the education variable is an important predictor of infant mortality outcomes. The results also indicate that women with primary education were likely to experience infant mortality. Adolescent mothers with primary education were 0.84 percent more likely to have a child who died within one year of birth as compared to those with no education. Taylor et al., (2009) also established this finding where low levels of mothers' level of education was linked to higher likelihood of infant mortality. Additionally, the study by Nabeen et al, (2019) on ANC on infant mortality also found that enhanced maternal schooling had a substantial effect on reducing the chances of infant mortality in Bangladesh.

In regards to birth order, the results establish that the order in which the child is born is a significant predicator of infant mortality and that children of second order are 1.50 percent less likely to die within the first year of birth as compared to the first birth order children. This is consistent with the findings by Ntenda, et al., (2014) in their study that sought to examine the factors associated with infant mortality in Malawi and established that first birth was associated with infant mortality as compared to the second birth.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter begins by presenting a summary study and then goes ahead to give the conclusions drawn. The summary and conclusion section are then followed by the policy implications of the study. Lastly, we present the suggested areas for further studies.

5.1 Summary

The main objective of this paper was to analyze the effects of maternal health care services on infant mortality in Kenya. More specifically, the study sought to examine the effects of ANC and PNC on infant mortality in Kenya.

The study used the Kenya Demographic Household Survey (KDHS) 2014 dataset that had a sample of 8, 386 adolescent mothers. Logit regression model was adopted to analyze the data to achieve study objectives. On average, the age of the adolescent mothers was 17 years, with maximum and minimum ages being 19 and 10 years who had given birth.

Concerning the effects of ANC and PNC on infant mortality among adolescent mothers, the study found that adolescent mothers who had made at least one ANC visit were less likely to report infant mortality. Further, mothers who had attended PNC reduced the likelihood of infant mortality.

Regarding the delivery type, the study established that adolescent mothers who delivered via cesarean section were more likely to experience infant mortality than those who delivered normally. On the socioeconomic factors, the study found that adolescent mothers with primary

education were more likely to report infant mortality. Conversely, infants of second-order birth were found to be more likely to die before attaining the first year of birth as compared to the first birth order children.

Further studies need to be undertaken to evaluate the effects of advancing and financing health policies and initiatives such UHC, Linda Mama and Beyond Zero on access to maternal health services by the adolescent mother and its effects in reducing infant mortality in Kenya.

5.2 Conclusion

Infant mortality is an important estimate used to measure the quality of healthcare service, and welfare and socioeconomic status of a nation. Remarkable strides have been made in decreasing child mortality rates across the globe. Tremendous steps have already been made in reducing child mortality rates in the world over the last ten years. However, despite these strides, SSA remains to be adversely affected by the uppermost child mortality. Data shows approximately 5.3 million children below five years died in 2018 across the globe, with half of the deaths being reported in SSA. In Kenya, data from the KDHS shows infant mortality rate reduced significantly from 77 deaths per 1000 births in 2003 to 39 deaths per 1000 live births in 2014 which implies that an estimated one child in every 26 died before becoming one-year-old. Even with this reduction, it is widely considered that despite this overall reduction, infant mortality in Kenya is still considered to be high and not satisfactory in comparison to some of the other developing countries such as Rwanda, Botswana, and Mauritius.

Based on the above, this study sought to estimate the effect of ANC and PNC on infant mortality in Kenya. The study established that both ANC and PNC significantly reduced infant mortality among adolescent mothers. Plausible explanations advanced in explaining the role of ANC visits

and PNC is that when adolescent mothers receive these services, they significantly reduce the likelihood of infant mortality. This is because, mothers have access to various counselling services including nutritional counselling, breastfeeding counselling, treatment of pregnancy related complications, folic and ferrous sulphate, postnatal checkups, management of minor illnesses, immunization including laboratory services which are significant in the survival of both mother and the infant.

Based on the study findings, advancing and financing health policies such as UHC, Linda mama and Beyond Zero initiatives can play a critical role in increasing access and utilization of ANC and PNC services among the adolescent which will contribute significantly in the reduction of infant mortality in Kenya.

5.3 Policy recommendations

From the study, it is observed that maternal health services, especially ANC and PNC reduce the likelihood of infant mortality. This finding implies that efforts such as universal health care (UHC), Linda Mama, Oparanya Care and beyond zero initiatives need to be advanced and financed by the government in increase access and utilization of maternal health care services and especially, among the adolescent. These efforts are critical and can reduce infant mortality significantly in Kenya. This is because most of the risk factors associated with increased infant mortality can be averted via improved and appropriate care such as interventions on nutritional and presumptive malaria treatment. The findings of this study also propose the deliberate strategies and interventions to promote utilization of maternal health care services, especially ANC to adolescent mothers who often tend to not attend the globally required number of four visits to antenatal care. This is the case because addressing adolescent births will need coordinated strategies from the varied stakeholders where comprehensive adolescent reproductive health services will be

developed with the full support by the government and other stakeholders to help in turning the tide and protecting the young girls from teen pregnancies thus reducing infant mortality in Kenya.

5.4 Areas for further studies

Further studies should specifically focus on the universal health coverage (UHC) on reducing infant mortality that the Kenyan government is currently implementing it. At the moment, there is lack of enough representative dataset that can be used to examine the potential of UHC enhancing utilization of maternal health and its contributory effect on reducing infant mortality. Deeper investigation on the UHC would help provide policymakers in government with the empirical evidence on the efficiency and impact of the UHC which is one of the leading programme by the current government.

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