# URBAN-RURAL DIFFERENTIALS OF NEONATAL MORTALITY IN KENYA

BY

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Q56/88883/2016

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF SCIENCE IN POPULATION STUDIES OF THE UNIVERSITY OF NAIROBI

NOVEMBER, 2021

## DECLARATION

This research document is my original creation, and is not a repetition or copy of past papers presented for a degree award in any other institution.

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This research paper has been duly submitted with my express consent as the University Supervisor

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## DEDICATION

This research paper is dedicated to my family; my late mother for her ceaseless prayers, my father, brother and sisters for their love, encouragement and understanding. Not forgetting my two lovely daughters Melissa and Arianna for being the source of purpose to push through.

## ACKNOWLEDGEMENT

Several people, as in any intellectual work, have contributed directly or indirectly to the birth, growth and development of ideas relevant to this research paper. I greatly appreciate and acknowledge my lecturers, fellow students, my workmates and friends for their constant help and constructive criticism during the proposal writing period and nurturing of this work.

My most profound gratitude goes to my supervisors, Dr. Samwel Wakibi whose detailed insights have seen this project become a success. I want to also thank Dr. Boniface K'Oyugi for his technical support as well. I will forever be indebted to them.

Finally, I am compelled to assert a big "THANK YOU" to everyone else who contributed to this successful journey, since it will not be possible to mention them all here by name.

## ABSTRACT

Child survival is a key element to measure a country's developmental level in addition to help track and monitor progress made in achieving the 2030 Agenda. According to the publication on the child Mortality trends and levels report by Child Mortality Estimation United Agency Group (UN-IGME) 2019, child deaths need to be dealt with urgently. In 2018, the publication indicates that neonatal mortality rates globally contributed to 47 per cent, that is, almost half of all mortalities under-5. In Kenya, neonatal mortality's contribution to under-five mortality has shown a steady chronological increase from 29% in the year 2003 KDHS to 44 percent in 2014 KDHS. Neonatal mortality rates in urban areas have been low compared to rural areas from 2003 and 2008/09 KDHS, however, in 2014 the urban areas recorded higher rates in comparison to rural areas.

Understanding the rural-urban differentials provides a platform for policy-making and implementation of specific programs targeting predisposing factors of neonatal mortality. This study sought to identify factors (socioeconomic, demographic and healthcare seeking behavior) associated with urban-rural differentials of neonatal mortality in Kenya. The conceptual framework borrowed heavily from the Mosley and Chen theoretical framework of 1984 on child survival. Data used was drawn from the 2014 Health Survey for Populations in Kenya and data analysis was performed using SPSS where descriptive statistics, bivariate analysis (chi-square) as well multivariate regression analysis.

Marital status, maternal age at 1st birth, forthcoming birth interval, gender of child, size of the child, frequency of visits for antenatal care visits, timings of antenatal care sessions, and place of delivery had statistical association with neonatal mortality in either area of residence. The association was significant at 5 per cent level. Child size at birth and frequency of antenatal visits during pregnancy were found to considerably affect neonatal mortality rates in urban areas.

One of the key recommendations from the study is to formulate policies and programs that are tailored to meet specific needs from rural and urban areas in curbing neonatal deaths. Causes, effects and remedies of low birth weight should be addressed in urban areas of residence. Moreover, measures need to be strengthened or inculcated to encourage and advocate for pregnant women to attend antenatal care, in urban areas. Recommendations for further studies include a further breakdown of urban categories to include peri-urban, slum and non-slum urban areas to provide a basis for targeted intervention to minimize neonatal mortality rates in the urban residential areas.

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| | |
|---|---|
| ANC: | Antenatal Care |
| HIV: | Human Immunodeficiency Virus |
| IVF: | In Vitro Fertilization |
| KDHS: | Kenya Demographic Health Survey |
| MTP III: | Medium Term Plan Three |
| NHIF: | National Health Insurance Fund |
| NMR: | Neonatal Mortality Rate |
| NPPSD: | National Population Policy on Sustainable Development |
| SPSS: | Statistical Package for Social Sciences |
| SDGs: | Sustainable Development Goals |
| UHC: | Universal Health Coverage |
| USA: | United States of America |
| UNHCR: | United Nations Convention for Rights of the Child |
| WFS: | World Fertility Survey |
| WHO: | World Health Organization |

# CHAPTER 1: INTRODUCTION

## 1.1 Background

The focus on child survival gained its momentum in 1989, when the world committed itself to the protection and fulfillment of children's rights through the international legal and policy framework known as the United Nations Convention for Child Rights (UNCRC)[1]. The treaty defines a child as an individual less than eighteen years of age and acknowledges that children are human beings with their own rights who need space to develop, play, learn, flourish and grow with dignity (Mbise, 2017). Additionally, the fundamental role of parents and the family is to care and protect children and the State is obliged to help them in executing these duties. The UNCRC has 41 articles, each detailing different children rights which are grouped under four thematic areas including survival rights[2]. Children need to access various rights and freedom in order to survive, which include access to basic needs like shelter, foods among others. The UNCRC has been a great tool in transforming lives of children worldwide (Quennerstedt, Robinson & I'Anson, 2018).

Child survival is a crucial indicator for national development and for the overall progress towards achieving a sustainable future as recognized by the Sustainable Development Agenda of 2030, which offers a blue print for a better future through its 17 goals. According to Howden-Chapman *et al.* (2017), having healthy lives as well as promoting the well-being for all children is conceptualized in the Sustainable Development Goal (SDG) number 3. In addition, target 3.2 focuses on preventable deaths of newborns deaths and children who are below five years.

In the blueprint for transforming Africa into a global powerhouse for the future, the Agenda 2063 on Africa We Want, goal 3 under the 1st Aspiration, reiterates the importance of healthy and well-nourished citizens. Furthermore, the East African Community Vision 2050 targets infant mortality rate to decrease to 36 deaths per1,000 live births by 2050 and recognizes high

[1] The UNCRC was signed on 30th November 1989 in New York and came into force on 2nd September 1990. There are 196 countries that are party to the treaty which includes all members of the United Nations with the exception of United States.

[2] Other thematic areas include participation, protection and development rights.

rates of child mortality as a challenge that needs to be addressed with great concern (Guerrera, 2015).

In Kenya, the legal framework safeguarding children's rights is embedded in the Constitution of Kenya 2010 which is outlined under Article 53. Besides, the enactment of the Children Act, 2001 ensures that children are well protected. The country's vision 2030, underlines promotion of child survival through the health system and maternal health sector which is under the social pillar. Key among the incumbent government's Big 4 Agendas, is the Universal Health Coverage, which further reiterates efforts given by the government on provision of affordable quality health care to its citizens (Okech & Lelegwe, 2016).

Despite many years of international, regional and national policy commitments toward achievement of children rights, Kenya's efforts need to be accelerated in preventing children's deaths (Kilobi, 2009). Remarkably, considerable improvement has been seen in child survival over the past years but a lot needs to be done if at all we are to meet the Sustainable Development targets on under-five and neonatal mortality rates by 2030 which is to minimise neonatal deaths down to 12 deaths for every a thousand live births and under-5 mortalities down to 25 deaths for every a thousand live births.

According to the publication on the child death rates and Trends report by United Agency Group for Child Mortality Estimation (UN-IGME,2019) there is need for urgent efforts towards preventing child deaths. The report gives a full scope of child mortalities across the world and also progress made towards meeting the SDG targets on child mortalities by 2030. As per the report, there has been a 56 per cent drop on the number of deaths for children under 15 years from 14.2 million in 1990 to 6.2 million in 2018 globally. In 2018, 85 percent of all under-15 deaths were contributed by under-5 mortalities; these were 5.3 million deaths of which 47 per cent (2.5 million) were neonatal deaths (Li *et al.*, 2019). Li et al, further ascertained that over 33.3 per cent of neonatal fatalities are reported in the first day while 75 percent are reported within the first seven days of life. Majority of the neonatal fatalities are associated with infections (like pneumonia, sepsis and meningitis), complications arising during delivery and labour, and premature births. Notably, a large share of still birth is accounted for by complications during labour and therefore, ffocus should be put during the life-threatening periods before and immediately after birth.

Globally, under-5 mortality rates saw a 59 per cent drop from 93 down to 39 deaths for every a thousand live births over 28 years (1990-2018), while neonatal deaths saw a 52 per cent drop to 18 deaths down from 37 deaths for every thousand live births between 2018 and 1990. Further, under-five deaths decreased from 12.5 to 5.3 million between 1990 and 2018, indicating that about 15,000 children die daily before their 5th birthdays (UN-IGME, 2019). The same publication indicates that neonatal deaths in 1990 had dropped from 5 to 2.5 million by 2018; notably, neonatal mortality rates globally contributed a 47 per cent share of all under-5 deaths in 2018, up by 7% from a 40 per cent rate in 1990.

There exist inequities across the regions, among and within countries; for instance, the Sub-Saharan region of Africa has the highest prevailing rate of under-5 children mortality rate on a globally, with a 52% share of all under-5 deaths in 2018(UN-IGME, 2019). Central and Southern Asia region comes second at 29 percent. As of 2018, the two regions accounted for over 80 percent of all under-five deaths in the world, with half of that coming from five nations namely; Pakistan, Nigeria, DRC Congo, Ethiopia and India (UN-IGME, 2019).

It is predicted that about 52million children five-years and younger, will die between 2019 and 2030 if f the current trends go on (UN-IGME, 2019). Slightly over half of the under-5 deaths will be contributed by neonatal deaths which can be averted through access to quality health care, adequate coverage of high quality antenatal and postnatal care, trained birth attendants and care for the small and sick new-borns (UN-IGME, 2019). The report also indicates that in 2018, about 121 nations had achieved the under-5 mortality rate target for the SDG and they should be aiming at maintaining it, whereas, the 74 remaining countries need to accelerate efforts towards achieving the same by 2030.

### Situation in Kenya

In Kenya, changes in mortality over time appear to have paralleled the experience of other developing countries (Hamel, Adazu and Obor *et al.*, 2011). In the late nineteenth century neonatal mortality rates were very high. Famines were common, tribal warfare was always a threat, medical care was poor, and malnutrition was abundant. Kenya was ranked 48 globally in under-five mortality in 2018 (UNICEF Eastern and Southern Africa Media Center, 2018). It is also evident from KDHS-based studies that all childhood mortalities have been experiencing

declines over the recent years. The table 1.1 below presents early childhood mortality rates and their percentage reduction in Kenya from 2003 to 2014.

**Table 1.1 Early Childhood Death Rates and Percentage Reduction in Kenya from 2003 to 2014**

| Childhood Mortality[3] | 1999-2003(2003 KDHS) | 2004-2008(2008/09 KDHS) | 2010-2014(2014 KDHS) | Percentage Reduction from 2003 to 2014 KDHS |
|---|---|---|---|---|
| Neonatal mortality | 33 | 31 | 22 | 33% |
| Post neonatal mortality | 44 | 21 | 16 | 64% |
| Infant mortality | 77 | 52 | 39 | 49% |
| Child mortality | 41 | 23 | 14 | 68% |
| Under 5 mortality | 115 | 74 | 52 | 55% |

**Source; 2014 KDHS Report**

The early childhood mortality rates have decreased over the three KDHS surveys (2003, 2008/09 and 2014); however, neonatal mortality shows the slowest decline rate, 33 per cent compared to other childhood mortality rates.

Trends in neonatal mortality's contribution to under-five mortality rates in Kenya are shown in table 1.2 from 2003 to 2014 KDHS.

[3] Neonatal mortality (NM) is the likelihood of death within the first 4 weeks of life
Post neonatal mortality: the difference between infant and neonatal death rates.
Infant mortality (1q0): the likelihood of dying before the first 12 months.
Child mortality (4q1): the likelihood of dying between 12 and 60 months.
Under-5 mortality (5q0): the likelihood of death between birth and 60 months of age.

**Table 1.2. Trends in Percentage Contribution of Neonatal Deaths to Under-Five Deaths in Kenya from 2003 to 2014**

| KDHS Year | 2003 | 2008/09 | 2014 |
|---|---|---|---|
| Neonatal Mortality | 33 | 31 | 22 |
| Under-5 mortality | 115 | 74 | 52 |
| % contribution of Neonatal mortality to Under-5 Mortality | 29% | 41% | 44% |

*Source: 2014 KDHS Report*

From table 1.2, the percentage contribution of neonatal mortalities to under-five deaths has been on a steady increase, from 29 percent in 2003 KDHS to 44 percent in 2014, which is 1.5 times more in 2014 compared to 2003.

Differences in neonatal mortality rates within the country can be seen at regional level and in areas of residence. For instance, in 2003 KDHS, North Eastern had the highest neonatal death rate of 50 deaths for every a thousand live births, with Central and Nyanza regions having the lowest rates of 27 deaths in each region. In 2008/2009 KDHS, Western region had a neonatal death rate of 24 deaths per a thousand live births, presenting the lowest rate compared to all other regions. In the same data set, Nairobi county had the highest neonatal mortality rate of 48 deaths for every thousand live births. This was 1.5 times more compared to the country's NMR of 31deaths. In the 2014 KDHS, the same trend was observed; both Western and Nyanza regions showed a NMR of 19 deaths for every thousand live births, while Nairobi region had the highest NMR of 39 deaths for every thousand live births which was about 2 times higher than the country's NMR of 22 deaths.

A study by Kimani-Murage *et al.* (2014) on childhood mortality trends in Kenya showed that childhood mortality rates have declined between 1993 and 2008 in both areas of residence. The study also found that the rural areas experienced a more rapid decline than urban areas thus narrowing the urban-rural differentials over time attributable to the deplorable living

conditions in the slums found in urban areas. Figure 1.1 shows urban-rural differential on neonatal mortality rates.

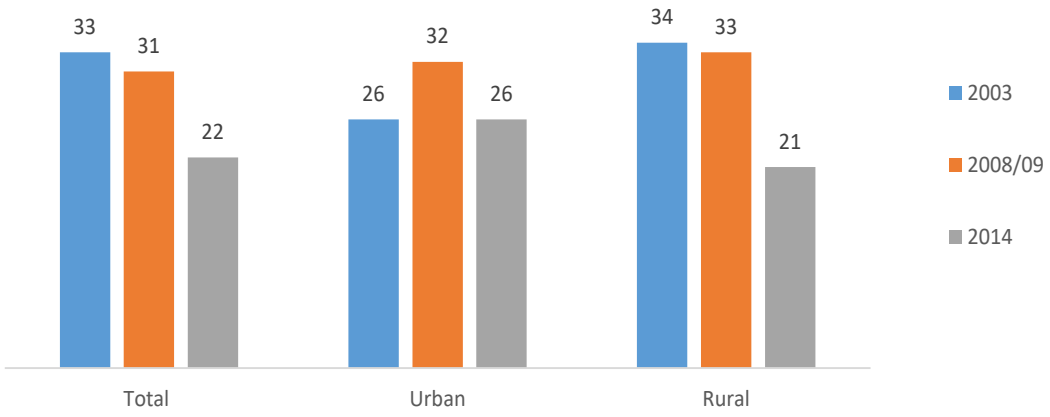


**Figure 1.1: Trends in Urban-Rural Differentials of Neonatal Mortality in Kenya from 2003 to 2014**

***Source: 2003, 2008/09 and 2014 KDHS Reports***

Neonatal mortality rates in urban areas have been low compared to rural areas in 2003 and 2008/09 KDHS; however, in 2014 higher rates were recorded in urban areas compared to rural areas. Lifestyle, health and living conditions are strongly linked to place of residence (Omedi & Nyauchi, 2012). Conditions influencing health like quality healthcare services, good housing, ease access to water and proper sanitation facilities were previously common in urban areas as opposed to rural areas (Kimani-Murage *et al.*, 2014). Nonetheless, due to rapid urbanization, slums settlements are increasingly growing and this has led to the poor conditions in urban areas. Slums are often characterized by poor living conditions, poor housing, poor health services, poor sanitation, and problems accessing safe and clean water and limited access to other essential social services (Chase, Gambrill and Gilsdorf, 2017).

Emerging evidence reveals that the urban population that has rapidly increased in Kenya is accompanied by poor health outcomes which are associated with high rates of poverty

(Wamukoya, Kadengye, Iddi and Chikozho, 2020). Consequently, infant and child morbidity incidences and mortality are significantly higher in urban slums and peri-urban compared to rural areas. This is further backed by the 2014 KDHS which revealed that the NMR was 26 deaths per 1000 live births in urban areas and 21 deaths per 1000 live births in rural areas.

Several interventions have been put in place by the Government of Kenya envisioned to ensure economic sustainability, improve urban investments, spur development planning, strengthen governance, and deliver infrastructure services. The realization of Kenya's vision 2030 is driven by various interventions touching on economic growth and poverty reduction. In 2010, Kenya adopted a new constitution which gives every citizen the right to life, as well as having the right to quality health services, including reproductive health. The Bill of rights examines child rights, specifically the rights to basic nutrition and healthcare. Further, the Kenyan government introduced the National Population Policy on Sustainable Development (NPPSD) in 2002 with a goal to improve citizens' health and welfare.

Through the MTPIII of the Kenya's vision 2030, the government recognizes inadequacy of emergency services during delivery and under-utilization of existent antenatal services, low health insurance coverage, high cost of health services, as well as inadequate skills of health workers among other challenges that the country is facing. The MTP III also prioritizes implementation of the big four initiatives which encompasses achievement of 100 percent Universal Health Coverage (UHC) which is important in reduction of childhood mortality. The government also partners with other key players on children welfare such as UNICEF, which offers support in a number of programs such as the current 2018-2022 UNICEF Kenya Country Programme. The aim of the program is to increase the proportion of pregnant and lactating mothers as well as vulnerable children in accessing quality health services.

The social health protection scheme that is run under the UHC is meant to make sure that everyone has access to National Health Insurance Fund (NHIF). Additionally, there exists a Linda Mama[4] Project, which is a programme under the NHIF that ensures expectant women

[4] The program has various services under Ante Natal Care (ANC) package and Post Natal Care (PNC) package. The ANC package covers antenatal profile and preventive services (Tetanus toxoid, malaria prophylaxis, deworming, iron and folate and prevention of mother-infant HIV transmission). In the PNC package covers post natal care to both mother and child within different time periods/intervals (48hours preceding a birth, 1-2 weeks preceding a birth, 4-6 weeks after birth and within 4-6 months after birth).

and children access affordable healthcare services. The Linda Mama program is expected to cover 1.36 million mothers and babies by 2022 (The National Treasury and Planning, 2018). The Beyond Zero initiative by the first lady, Her Excellency Margaret Kenyatta, is an additional initiative aimed at bettering mother and child health by preventing maternal and early childhood mortality.

Other commitments made by the government towards mother and child's health include: expanding the immunization programme; implementation of the mobile clinics countrywide; employing primary health care workers; introduction of free maternity services in public hospitals; establishing and operationalizing primary health facilities; establishment of newborn units in various public hospitals; expansion of community health care; and the decentralization of resources through the devolved government among others.

Reflecting on women and children's rights and concerns in the national strategies and budgets is very important. Spending on them is not a cost but rather an investment which ultimately leads to contribution to the well-being of the community at large which also contributes to the socioeconomic development of a nation. To this effect, the national government budget allocation on health services increased from 61.8 billion in 2017/2018 to 97.5 billion in 2018/2019 (KNBS, 2019). However, even with all these efforts to counteract childhood mortality in the country, neonatal mortality remains a key concern.

## 1.2 Problem Statement

The SDG targets for under- five and neonatal mortality rates are 25 deaths per 1,000 and 12 deaths per 1,000 live births respectively by 2030. Additionally, the Newborn Plan of Action goal targets to reduce neonatal death rates below 10 deaths for every a thousand live births within 2035.

Despite various efforts to curb neonatal deaths in Kenya, neonatal mortality remains high in the country. Evidence from the KDHS 2014 indicates that the Kenyan NMR is 22 deaths per a 1000 live births and has progressed at a slower rate than all the other early childhood mortality rates. Neonatal mortality is also the largest contributor of under-5 death rates and has progressively increased proportionally from 29% in 2003 KDHS to 41% in 2008/09 KDHS and 44% in 2014 KDHS. Urban areas have been at a reasonable advantage over rural

areas in terms of NMR/health outcomes but 2014 KDHS shows that neonatal mortality rates are higher in urban areas (26 deaths per 1000 live births) compared to rural areas, 21 deaths per a 1000 live births. With the rural neonatal mortality rates declining and urban rates stagnating or declining slowly, we shall have a slow progression towards meeting the SDGs targets on under-five and neonatal mortality.

It is imperative to understand the underlying causes of neonatal deaths in the two places of residence separately. The trend and causes of neonatal deaths brings out pertinent issues on health policy; in essence how various policies, interventions, and programs are needed to address neonatal mortality in urban and rural areas. Therefore, there is need to understand the disparities in the drivers of rural-urban neonatal mortality separately. Understanding the differences in neonatal mortalities between urban and rural populations is also important in assessing and addressing their different health needs.

## 1.3 Research Question

This study was directed by these questions:

i. What are the factors associated with urban-rural differentials of neonatal mortality in Kenya?

## 1.4 Objectives of the Study

The main objective of the study was to determine factors associated with urban-rural differentials of neonatal mortality in Kenya.

The specific objectives were to:

i. Determine the socio-economic factors associated with urban-rural differentials of neonatal mortality in Kenya.
ii. Determine the demographic factors associated with urban-rural differentials of neonatal mortality in Kenya
iii. Determine the healthcare seeking behavior factors associated with urban-rural differentials of neonatal mortality in Kenya.

## 1.5 Justification

Kenya has committed itself, internationally, regionally and nationally, to protect the rights of children. The call to "leave no one behind" is a key principle under the SDGs framework offering a blue print for a better and sustainable future for everyone by the year 2030. The goals address global challenges including good health and well-being of children.

Overcoming childhood mortality is absolutely critical, considering the fact that children are important resources for future economic growth. Childhood mortality presents one of the important indicators of a country's development. Therefore, investing in women's and children's health provides a sure way of country's progress to a better future. Additionally, child survival is a fundamental human right and the youngest and most vulnerable group in the planet needs to be protected.

As a country, more efforts are needed for us to achieve the SDG targets for under- five and neonatal mortality rates by 2030. Measures to reduce under-five mortality ought to focus on neonatal mortality rates which contribute the highest percentage on all under-five mortalities; as a matter of fact, the overall percentage of neonatal mortality as a component of under-five mortality has gradually increased over time. Additionally, the pace at which neonatal mortality rate is reducing over time is seen to be the slowest in comparison to other early childhood mortalities. Additionally, the differentials amid rural and urban areas on matters neonatal mortality show that the urban advantage is seemingly being wiped out; neonatal mortality gap between rural and urban areas is narrowing as observed from subsequent KDHSs. Notably, the neonatal mortality rates in the urban areas have been higher than the national average rates in the last two KDHSs (2014 and 2008/09) and in 2014 KDHS, neonatal mortality rate for urban was higher than that of rural.

The findings of this study aim to inspire the government to intensify its efforts to lower neonatal mortality and raise the level of child survival. Further, the study will be aligned towards achievement of the SDGs, Vision 2030 and the Big Four agenda with the aim of reducing inequalities in the health care services and improving on the child health indicators. This study intends to come up with recommendations that may be incorporated in improving access to quality health care, expand maternity protection for mothers and newborns, enhance

legal frameworks in promotion of reproductive rights and also inform on resource allocation for maternal, newborn and children.

Further, the study seeks to contribute to the growing research in understanding why neonatal mortality rate is higher in the urban than in rural areas in Kenya. This will facilitate advocacy towards better policies, effective program implementation and increased financing to accelerate child survival. It's against this backdrop that more preventive measures to curb neonatal deaths are needed and to further examine the factors associated with urban-rural differentials of neonatal mortality in Kenya.

## 1.6 Scope and Limitations of the Study

The study utilized the 2014 KDHS Survey data. The 2014 KDHS was a national representative survey where a sample of 32,172 women aged between 15-49 years was drawn but only 31,079 were interviewed successfully. The relevant data was extracted from the children's data file which has a record of children who were born five years preceding the 2014 KDHS, of all the women who were interviewed.

Some limitations of this study include; as secondary data was utilized; the study did not consider all known factors influencing neonatal mortality eg sepsis, congenital abnormalities etc., therefore, the study focused on variables available from the survey. Additionally, sampling and non-sampling errors were possible issues in terms of data quality for 2014 KDHS data. Non-sampling errors occurred during collection and processing of mortality data and unfortunately, they cannot be statistically evaluated. Full reporting of dead children, correct information on ages of death and accurate information of birth dates for both children who are alive or dead ensures reliability of normality estimates. Misreporting of age at deaths and dates of birth distorts the age rates and mortality trends (KDHS, 2014).

Additionally, selective omission of infants who died from the birth history could be a potential limitation resulting to underreporting. Reliable recording and reporting of births as well as deaths originates from the mother and the reporting mechanism. Moreover, norms and cultures play an important role in reporting of early deaths. Age heaping of age at death is another limitation, which would result in transferring death from one age group to the other. Moreover, recall errors are bound to happen to more distant retrospective periods.

The inability to fully operationalize the theoretical framework, Mosley and Chen Analytical Framework on child survival, was also a challenge. Proximate determinants such as environmental contamination, nutrition deficiency and injury were not conceptualized since the data set did not measure these elements. Lastly, KDHS data is only available for rural and urban places of residence. The data was not disaggregated into peri-urban and slum areas for urban Kenya, thus, it is difficult to understand deeply neonatal mortality differentials in urban areas. This could be attributed to KDHS samples that are generally not large enough to provide estimates for small geographical areas.

# CHAPTER 2: LITERATURE REVIEW

This chapter analyses scholarly works published on factors influencing neonatal mortality, a summary of literature review, the theoretical and operational frameworks and finally the definition of terms.

## 2.1 Overview of Urban-Rural Differential on Neonatal Mortality

Fewer studies have been done on urban-rural differentials in neonatal mortality, compared to other childhood mortalities. Yi, Wu, Liu *et al* (2011) conducted a research in Gansu providence in China on the influence of rural-urban disparities on neonatal mortality. The study analyzed neonatal mortalities using data from the provincial Child Death Surveillance System which was collected from 2004 to 2009. The study examining the cause specifics for neonatal deaths using chi-square tests to determine which study variables exhibited a relationship with the neonatal mortality. Findings from the study showed that NMR declined across rural and urban areas during the study period. However, neonatal rates in rural areas remained higher than in urban areas. In 2004, neonatal death rates were 2.5f times higher in the rural compared to urban areas and in 2008, the rate in urban areas was 2.8 times higher than in urban areas.

Neonatal death causes were classified as low weight at birth, asphyxiation, congenital malformation, pneumonia and any other causes were classified under "others". In both areas of residence, low weight at birth, birth asphyxiation, congenital malformation and pneumonia, were the major four leading causes of deaths. For every cause specific, rural neonatal mortality was high in rural areas. Sex of child, gestational age, birth weight, medical care before death, death season and death place, were the characteristics subjected to the chi-square test. Gestational age, birth weight, medical care before death and death place, were found to have a close association with neonatal mortality. The study concluded that as much as there was a profound decrease in neonatal mortality rates over time, disproportions existed between rural and urbanized areas which have been overlooked.

A retrospective study was done in China in 2016 on urban and rural neonatal mortality using data from the National Under-5 Child Mortality Surveillance System for the period between 1996 and 2013 (Lu *et al*, 2016). The prime objective of the study was to examine and understand the change and causes of neonatal mortality in urban and rural areas. Findings

showed that neonatal rates reduced for both areas of residence; rural neonatal deaths reduced from 26 down to 8.1 deaths per a thousand live births, while in urban areas it reduced from 11.0 to 4.0 in the same study period. Neonatal deaths in rural areas were consistently higher, about 2 times higher, than in urban areas from 2011 to 2013.

Cause-specific factors for neonatal mortality under the study were premature delivery, intra-partum related conditions, measles, septicemia, tetanus, meningitis, pneumonia, infectious diseases, non-infectious diseases, diarrhea and congenital abnormalities. Premature delivery, congenital abnormalities and intra-partum correlating conditions were the three top causes of early neonatal mortality (neonatal deaths within 7 days after birth) in both areas of residence. For late neonatal fatalities, the top three causes were other non-infectious diseases, premature deliveries and congenital abnormalities in urban areas, whereas in rural areas the causes were pneumonia, premature deliveries and congenital abnormalities. Premature deliveries led as a cause of neonatal death in both areas of residence. The study acknowledged that China has progressed in reducing neonatal mortality rates but urban-rural disparities still exist. The authors recommended that neonatal mortality could be reduced by putting more effort to prevent and manage congenital abnormalities and premature deliveries, especially in rural areas of residence.

In 2016, Adewuyi and Zhao did a study on neonatal mortality determinants in urban and rural areas of Nigeria. The data utilized was extracted from Nigeria's Populational Health Survey of 2013 and data analysis was done through uni-variate, bivariate and multivariate-logistics regression. Variables for the study were categorized into three domains; socio-economic predictors which included wealth index, paternal education, maternal education, occupation, cooking fuels, toilet facilities, electricity access, sources of drinking water, decision making on key aspects like healthcare needs, and maternal literacy levels. The second category was bio-demographic which included maternal age in the first birth, area of residence, sex of household head, size of child at birth, birth intervals, age of the mother, maternal BMI, birth order, sex of child, religion, ethnicity and maternal marital status. The third category was health/behavioral variables which included mode of delivery, assistance during delivery, iron intake, tetanus injection in pregnancy, breastfeeding initiation, and malaria prophylaxis.

Contrary to KDHS 2014, neonatal mortality rates in Nigeria from its Demographic Health Survey of 2013, was higher in rural than urban areas, at 36 and 28 deaths for every 1000 live births respectively. The study found that among socio-economic variables access to electricity exhibited association with neonatal deaths in urban areas. Notably, among bio-demographic variables, sex of the child, birth order, preceding birth interval, ethnicity, marital status, and birth size were found to be significantly associated with neonatal mortality in both areas of residence. Among health/behavioral variables, skilled delivery assistance, prophylaxis for malaria and mode of delivery were strongly associated with rural neonatal mortality whereas in urban areas, antenatal attendance was found to have an existing relationship with neonatal mortality. Multivariate analysis results found out that birth size, sex of the child and lack of electricity access, were significant in urban areas, whereas, in rural areas birth size and interval were significant. Moreover, caesarian delivery significantly determined neonatal mortality in both areas of residence.

### 2.2.1 Socio-economic Factors

Socio-economic features are critical in explaining neonatal mortality differentials. According to Kilobi (2009), not only do economic and physical environments determine peoples' wellbeing but also the social and cultural environments that they inhabit. Similarly, the problem of child deaths and poor child health has both biomedical and socio-cultural causes. In fact, the social and cultural sphere holds the key to improved child health and childcare in general. Socio-cultural beliefs and practices affect infant and child feeding habits, weaning practices, disease treatment, beliefs on child care, knowledge and use of preventive and curative medicine among others (Kilobi, 2009).

#### *Maternal Education*

According to Preston and Haines (2014), advances in female education may present a significance reduction in child mortality. It is argued that educated women have better understanding as well as appreciation for healthcare matters, hence likely to care for their children's health and consequently reduce childhood deaths. Further, they are likely to ignore the practices and norms that adversely affect their health and that of their children (Gyimah, 2005).

Maternal education may also affect infant survival by influencing their demographic factors like parity, child spacing, age at first birth and marriage, K'Oyugi (1992). Rutstein (2000) established a "U" pattern of correlation between maternal age during birth and neonatal mortality in a study on education and childhood mortality. He observed that educated women tend to marry late compared to non-educated women, starting childbearing late therefore reducing the risks of child mortality associated with early pregnancies. Additional, educated women were found to stop childbearing earlier, avoiding the inherent infant and child mortality risk associated with late age pregnancies.

Kilobi (2009) mentioned that educated women tend to use contraception more, broadening the spacing between births. She also found out that educated women seek more child medical care compared to the non-educated women, including services like immunization.

Kamal (2012) studied neonatal mortality in Bangladesh, using 2007 DHS; maternal education, maternal age, birth order, antenatal care and religion were significant predictors of neonatal mortality in Bangladesh. Fonseca et al (2017) also established that mother's education was a significantly predictor of neonatal deaths. However, Ikamari (2013) noted that maternal education had no significant association with the net effect of neonatal mortality, but significantly influenced post-neonatal mortality.

### *Wealth Quintile*

Wealth index is an established good proxy for measuring household economic status since measuring income in low-income countries might be hard (Omedi & Nyauchi, 2012). Low living standards are associated with limited access to quality health care as well and basic needs. Those in the high wealth index experience low child mortalities compared to those in low wealth index (Rarani et al., 2017). A study in Nicaragua by Peña, Wall and Persson (2000) focused on maternal education, social inequality and poverty as key determinants of neonatal mortality. The researchers found that absolute as well as relative levels of poverty were significant determinants of neonatal mortality in Nicaragua.

Wulandari *et al.* (2020) did a study in Indonesia on the neonatal mortality risk factors among female workers, using 2017 Indonesian DHS. Through binary logistic regression test, the study found out that maternal wealth status significantly affected neonatal mortality. Children of poor mothers were 0.738 times more likely to die before 28 days after birth, in comparison to

those from poorest mothers. Moreover, Hill and Amuzou (2015) established an inverse correlation between the economic statuses (as accounted for by the wealth index) and child mortality.

### *Marital Status*

Continuity and frequency of marriage has also been considered as a determining factor of child neonatal mortality (Mengesha & Sahle, 2017). Discontinuity in marriage was found to reduce the resource available for raising children. Separation between spouses means that at least one of them is not physically living with the child to provide the resources as normally expected. Traditionally, children were supposed to be born in a family consisting of a mother and father but this is rapidly changing and also girls getting pregnant earlier (Amato & Patterson, 2017).

In many Sub Saharan Africa countries, adolescent fertility is strongly condemned when out of wedlock but considered appropriate when in the adequate ritual framework of marriage (Ekholuenetale et al., 2020; Kembo & Van Ginneken, 2009). Hence, children born outside marriage are most likely to be exposed to higher risk of death that accompanies the trauma from rejection and economic hardship that follows single motherhood. According to Clark & Hamplova (2011), single mother children tend to fair worse in respect to their health outcomes, behavioral adjustment and cognitive behavior.

Kilobi (2009), highlights that there is an increase in number of single, divorced or separated and widowed women in Kenya today and majority of them face economic hardships that have both traditional and contemporary origins. For example, land utilization, housing, and transfer of them is under customary law regulation where majority of women are excluded from owning and inheriting property in many traditional societies in Africa (Richardson, 2004).

Marital status was found to be significantly associated with under-five mortality rates in the urban areas of residence (Kilobi, 2009; Clark & Hamplova, 2011). Some studies such as Adewuyi and Zhao (2016) and Mugo *et al.,* (2017), have found out that marital status is not a significant determinant of neonatal mortality.

*Religion*

Religious participation has been associated with either positive or negative health outcomes (Idler *et al.,* 2017). Positive health outcomes are associated where religion provides social ties and social support, promotes healthy behaviors, and access to social capital from religious groups (Idler *et al.,* 2017. Conversely, negative outcomes include situations where religion upholds some precarious beliefs and traditions influencing maternal and child health which directly impact child mortality (Cau *et al.*, 2013).

Cau *et.al.,* (2013) focused on the influence of religion on health outcomes for newborns. The study found that affiliation to religious organizations has a positive effect on child survival. The positive effects tied to Protestant and a Catholic church was associated with its positive link to the health sectors, whereas, for Apostolic churches the link to strong social ties and support from the Apostolic congregation was attributed to the positive effects. Some studies have found religion not be a significant determinant of neonatal mortality such as, Wolde, *et al.* (2019).

### 2.2.2 Demographic Factors

Demographic predictors such as mothers' age at child birth, birth intervals, birth orders, gestational age, sex of the neonate, birth weight of the child among others can influence child survival. The demographic factors used in this study were birth size of the infant, sex of the child, preceding birth interval, birth order number and the mother's age in first birth.

*Mothers Age at 1ST Birth*

Mental health and maturity develops and improves over the course of life and therefore, younger mothers and parents have fewer skills and may not be emotionally prepared for parenthood (Duncan *et al.,* 2018). Child health development is greatly influenced by maternal emotional and social characteristics (Duncan, *et al.,* 2018). Therefore, maternal age at first birth can be used as a proxy for mother's physiological, mental and emotional maturity

.

According to Rutstein (2000), infants born to women over 35 and below 20 years were more likely to experience higher mortality risk within the first 4 weeks of life. Physical immaturity and declined efficacy of the reproductive system were associated with increased mortality rates among young and elder women respectively. Limited knowledge and confidence in child care leads to high infant mortality among young mothers (Mishra *et al.*, 2018). A study by Wu, Liu et al (2020) found that neonates born to young mothers below the age of 25 years and older

mothers, 30 years and above had increased likelihood of experiencing neonatal mortality. However, Adewuyi and Zhao (2016) did not find any correlation between mother's age at 1st birth and neonatal mortality in their study.

### *Birth Order*

According to Mishra et al. (2018), first births and those of very high orders compared to 2 or 3 birth orders, were strongly associated with high neonatal mortality. First-born infants are mostly raised by mothers having limited experience and skills, a situation which increases their chance of neonatal mortality. Children born of high order have mothers who have reduced efficiency reproductive system due to previous pregnancies. Infants born to aged women are more likely to suffer from low birth weight and fetal growth retardation (Mishra *et al.,* 2018). According to Baqui *et al.* (2020), infants of higher order face competition of resources with other children, as well as competition for parental care.

Kibet (2010) established higher and first order births had a higher likelihood for experiencing neonatal mortality. He concluded that high infant mortality was attributed to mothers' inexperience in handling infants, resultant birth complications, and generally the young age of the mother which was associated with physical immaturity. Omedi and Nyauchi (2012) pointed out that child survival was enhanced for 2nd and 3rd birth orders, those from wealthier households, those with a long birth interval of over two years, and those from households with access to better water and sanitation.

### *Preceding Birth Interval*

Short birth intervals have been associated with increased childhood mortalities. For instance, Hobcraft (1993) established that timings of births had significant effects on the survival of infants, which was influenced by maternal depletion and sibling competition. Further, Lindstrom and Berhanu (2000) observed that sibling and maternal competition for household resources was a possible linked to short birth intervals and resulted to increased infant mortality. They further argued that successive births likely depleted mothers of nutrition and stamina to mount healthy pregnancy, leading to preterm births and complications, increasing risk of infant deaths. Febriyuna (2015) established that longer inter-birth intervals had positive significant effect on infant survival.

Lindstrom and Berhanu, (2000) noted that disease transmission was associated with increased infant mortality in short birth interval, and especially in closely spaced buildings and slums. Adewuyi and Zhao (2017) found that short birth interval, <2 years, were significant determinants of neonatal death in rural areas (AOR, 2.149; 95% CI: 1.760-2.624). Akinyemi, Bamgboye and Ayeni (2015) found that antenatal care, birth intervals, under24 months, and facility where delivery took place were significant factors influencing neonatal mortality. Mutwiri (2016) also identified birth interval to determine neonatal mortality significantly.

### *Sex of the Neonate*

The sex of the neonate is positively correlated with neonatal mortality, whereby, infant mortality is on the higher side for boys than girls in most countries; this is attributed to differences in genetics and biological make up (Pongou, 2013). The author further states that biologically boys are fragile and more predisposed to diseases and early deaths. Adewuyi and Zhao (2017) established that in urban areas, boys were at a higher risk of dying within 28 days after birth than girls (AOR, 1.666; 95%CI: 1.215-2.284). He additional argued that boys are more susceptible to infections and immunodeficiency, than female newborns. Kabagenyi and Rutaremwa (2013) conducted a study in Uganda where they established higher childhood mortality among boys compared to girls.

Sahu *et al.* (2015) associated the value given to children especially on specific sex and continuity of the society, with child survival. For example, a family might invest economically on child expecting some forms of returns. The study gave examples of Kenya, where young girls are treasured for bride price leading to higher survival rates of female infants. In India however, the situation is different, where female dowry is likely to drive a relatively higher infant/neonatal mortality for girls. Febriyuna (2015) on the other hand associated the differentials between female and male child mortalities to medical care practices and feeding practices.

### *Birth weight/size*

The World Health Organization (WHO) clearly defines low-birth weight (LBW) as birth weight under 2.5 Kgs or 5.5 pounds. According to UNICEF (2010), children weighing less than 2.5kg were had about twenty times higher likelihood of death compared to higher birth weights. According to the University of Rochester medical center, babies born with low birth weight are not as strong as those born with normal birth weight. They may have a hard time feeding, fighting infections, and staying warm since they don't have much fat on their bodies.

Most of these babies are physically immature with complications such as lungs that are not fully developed which hamper their oxygen intake.

Hoque et., (2010) established that birth weight was a significant determinant of neonatal mortality, logistics regression showed that extremely low birth weight (OR=1.633, 95% CI:5.757; 33.656). The study also noted that deaths of low birth weight (LBW) babies could be prevented by offering care services like proper hygiene, warmth, feeding as well as proper treatment of infections common among pre-term babies. Yanping *et al.* (2010) reported similar findings in China where a combination of LBW and pre-term birth significantly increased neonatal mortality.
Maniruzzaman et al. (2018) also established a strong statistical correlation between neonatal deaths and birth weights in three Asian countries, New Guinea, India and Bangladesh; there was a consistent increase in risk of death among the LBW newborns. Similarly, in a study in Uganda, Kananura et al., (2016) noted that weight at birth was a significant factor influencing neonatal survival.

### 2.2.3 Healthcare Seeking Behavior Factors

The health seeking behavior factors discussed in this section are; antenatal care (number and timings) and place of delivery.

#### *Antenatal Care*

According to WHO (2016), maternal well-being is considered critical during pregnancy. The WHO guidelines for ANC, expectant mothers need to attend at least four antenatal visits. The guidelines emphasize on the need for first trimester clinic visit which informs the nature of care for the other two trimesters. During the first visit, mothers with conditions like hypertension and diabetes are advised to frequently go for more ANC visits, preferably more than four visits.

Antenatal care significantly determines neonatal mortality and they decrease the risk of neonatal mortality (Wondemagegn *et al.*, 2018). Arunda, Emmelin & Asamoah (2017) established that ANC is associated with positive outcomes for maternal and newborn health which enables access to proper healthcare for the pregnant mothers and their unborn children. The authors further found out that lack of proper checkups during pregnancy, lack

of tetanus injection and unskilled ANC providers had a close association with neonatal deaths in Kenya.

Neonate survival is closely linked to mothers' state of health as reported by Hatupopi (2017). This implies that improving the health of the neonate largely depends on improving the health of the mother through provision of the required antenatal visits. During ANC visits supplements like iron, folic acid, and vitamins are provided for the pregnant mother thus enhancing her health and consequently supporting survival of the child. Further, proper diets are also associated with preventing pre-term delivery, prematurity and birth asphyxia (Devlieger, Martens & Bekaert, 2005). Wulandari et al. (2020) also established that the number of ANC visits significantly predicted neonatal mortality; working mothers who visited ANC four times or more had 0.331 probability of experiencing neonatal deaths in comparison to those who made less than four ANC visits.

### *Place of Delivery*

Studies have presented strong correlation between delivery at health facilities, and attendance by health care personnel, with improved neonatal survival (Debelew, Afework & Yalew, 2014). Further, having adequately trained and equipped birth attendants improves survival rates for neonates. Attendance by skilled birth attendants and in a functional fully equipped facility could prevent about 23 per cent of neonatal deaths (Tura, Fantahun & Worku, 2013). It is assumed that skilled birth attendants can recognize as well as manage complications arising from mothers and newborn babies, in addition to making the necessary referrals.

Rhoda et al. (2018) neonatal mortality could be controlled if necessary care during pregnancy, at labor and during birth is accorded to all pregnant women. This is supported by Rajab and Ghareba (2013) in a study done in Ghanaian Teaching Hospital where inadequate care during delivery was found to be a determinant of neonatal deaths. The study also associated majority of the neonatal complications to poor or no assistance during delivery. Post-natal care (number and timings) for the mother and new-born is also critical in minimizing neonatal deaths.

## 2.3 Literature Review Summary

From the various literature reviewed, there is significant relation between various socioeconomic, demographic and healthcare seeking behavior factors and neonatal mortality. Child survival, as per the reviewed literature, was strongly linked to enhanced socio-economic

status, especially mother's education level which is directly proportional to child survival. Education provides the mother with a lot of information on proper nutrition, spacing of births, knowledge and measures to take on childhood illnesses and contraception. Literature also indicates that a household's income, religion and mother's prevailing marital status significantly affect the survival prospects of neonatal mortality.

Neonatal mortality is observed to be higher among young and aged women. High and first order births are likely to be more vulnerable to neonatal mortality due to maternal depletion and sibling competition for higher birth orders and inadequate skills in child development for 1st birth orders. Low birth weight is also associated with higher risks of neonatal deaths since it is linked with prematurity which predispose newborns to infections, low body temperature among other risks that decrease their survival chances. Moreover, longer the birth interval increases chances of neonatal survival. Sex of the neonate is also associated with neonatal deaths; the risks are higher for male newborns due to immunodeficiency and high susceptibility to infections.

Literature has also indicated healthcare seeking behavior factors are a major determinant of neonatal deaths. Antenatal care for pregnant mothers is important and the earlier they are started the better to be able to detect any issues that would risk neonatal survival early enough. The number of times pregnant mothers attend the antenatal care visits also matters as the chances of neonatal survival increase as the visits increase. Notably, the health of the neonates cannot be enhanced without the proper state of mothers' health. Pregnant mothers are able to detect and prevent early complication such as hypertension through screening, learn on the required nutrition during pregnancy, given important vitamins for them and their unborn babies and also prenatal classes are provided during antenatal visits. Place of delivery is also a key determinant of neonatal deaths. Deliveries at home are most likely not going to be attended by a skilled person and incase of any complications during delivery chances are that they will not be taken care of in time. Notably, delivery facilities should be well equipped and have enough birth attendants who are properly trained.

## 2.4 Theoretical and Operational Frameworks

### 2.4.1 Theoretical Frame Work

The study utilized the Mosley and Chen (1984) child survival framework. The framework was among the first developed for explaining variations in child survival based on biomedical factors, which were termed as "proximate determinants." The framework was selected as it is among the most popular frameworks that have been widely used to explain child survival in many studies. Further, it is considered crucial as well as comprehensive among other systematic analytical frameworks for understanding child survival across the world as it encompasses a bio-social approach to child survival. It is a flexible model that is modified to suit particular situations.

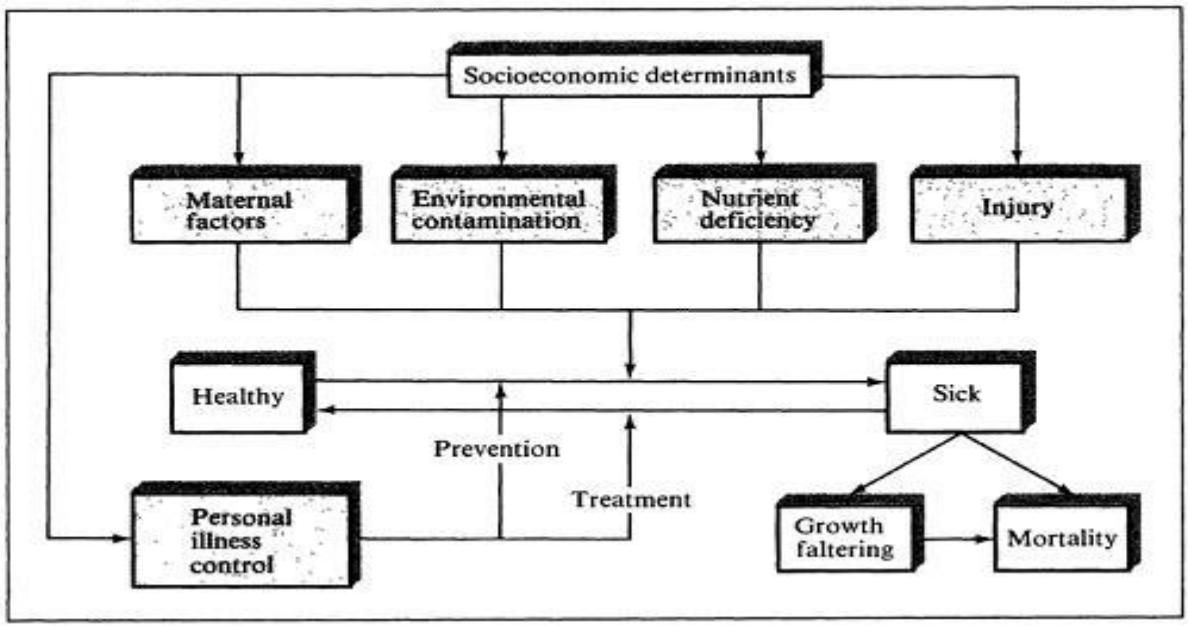


**Figure 1.2 Mosley and Chen Analytical Framework**

**Source: Mosley, W. and L. Chen. (1984) "An Analytical Framework for the Study of Child Survival in Developing Countries", Population and Development Review 10: 25-45**

### 2.4.2 Operational Frameworks

The operational framework depicts how study variables interact. In this study, independent variables were grouped into socio-economic, demographic and healthcare seeking behavior factors. Socio-economic factors included; maternal education, wealth quintile, marriage status and religion. Demographic factors examined in the study were maternal and neonatal factors (maternal age at 1st birth, order of births, preceding birth interval, sex and birth size of the neonate). The health care seeking behavior factors included; antenatal care (number and timings), and place of delivery. Proximate variable for this study was the area of residence categorized as either rural or urban, whereas, the dependent variable was established as neonatal mortality.

Full operationalization of Mosley and Chen theoretical framework on child survival was not achieved. Proximate determinants that influence the risk of child morbidity and mortality are grouped into five categories by the framework; maternal factors, environmental contamination, nutrition deficiency, injury and personal illness control. Maternal factors (age, parity and birth interval) were all conceptualized in the study through demographic factors that included neonatal sex and birth weight. Environmental contamination which essentially is the transmission of infectious agents to mothers and children was not measure in the study due to unavailability of these elements in the data set (2014KDHS). Nutrition elements, calories, protein and micronutrients, were also not examined in the study since they were not measured in 2014 KDHS. Injury whether accidental or international, was also not conceptualized in the study due to the same reasons. Lastly, personal illness control that is personal preventive measures ad medical treatment was conceptualized through antenatal care visits (number and timings) and place of delivery.

Socio-economic determinants from Mosley and Chen are grouped into three categories, individual, household and community level variables. The study conceptualized socio-economic individual level variables through mother's religion and education, whereas wealth status was examined from the household level perspective.

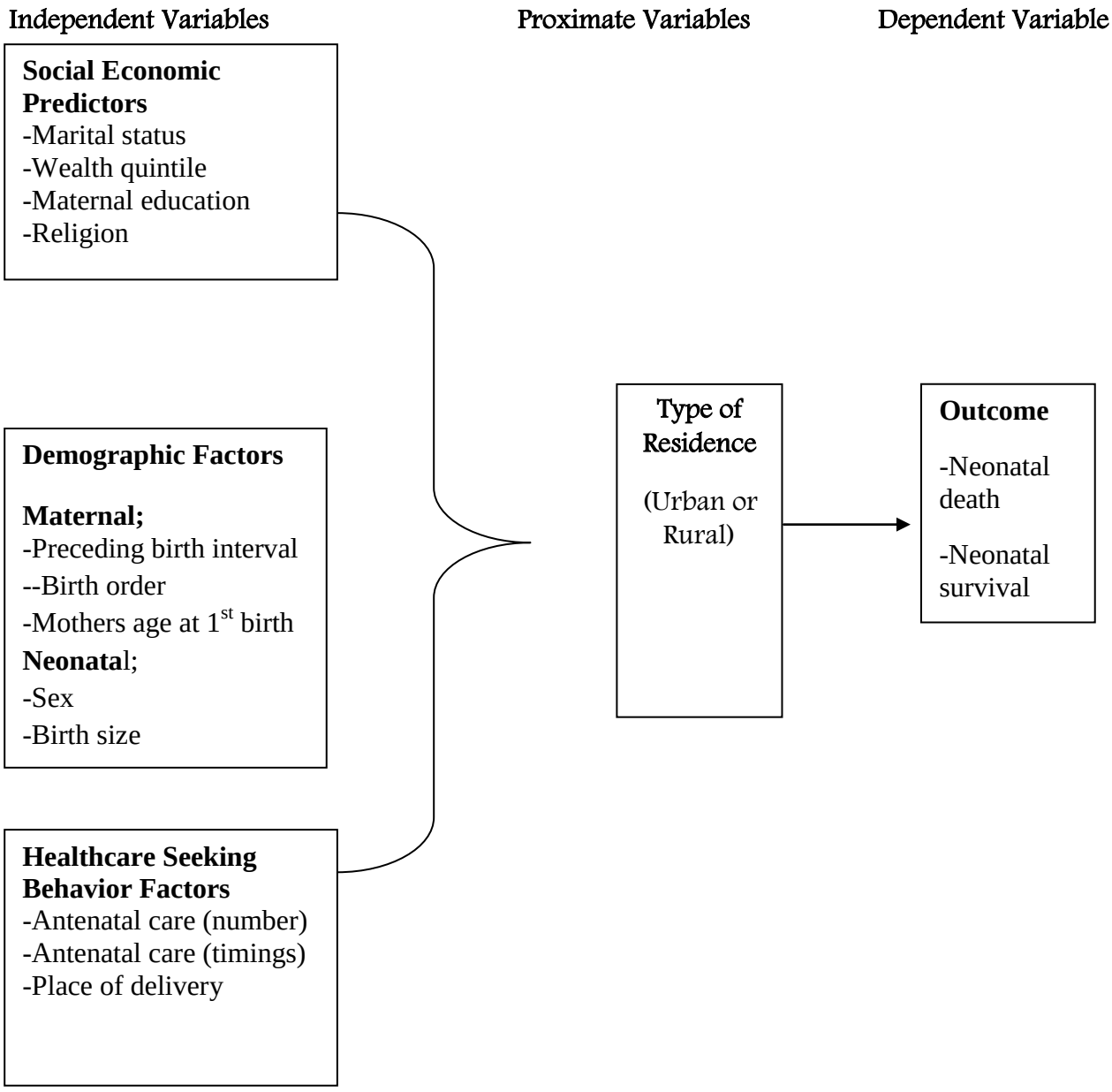


Figure 1.3: Operational Framework

Source: Mosley and Chen (1984)

## 2.5 Definition of Terms

This section defines variables analyzed in this study and their measurements.

### 2.5.1 Dependent Variable

In this project, the dependent variable was neonatal mortality. It measured the survival status of a child in the first 28 days after birth. It was categorized as dead or alive. This variable was derived from the information on child survival status at the survey's beginning time and it was measured as; '1' for neonatal survival and '0' for neonatal death.

### 2.5.2 Independent Variables

The independent variables were catalogued under socio-economic, demographic and healthcare seeking behavior factors.

#### Socioeconomic variables

***Maternal Education***

Maternal education was defined as the highest formal schooling attained by the mother. It was intentionally for the measurement of knowledge and the skills of the mother in infant care as well as acting as a proxy for household income. It was categorized into three categories; 1- no education, 2-primary complete, and 3-secondary+ complete

***Wealth quintile***

Wealth quintile was based on family ownership of car, motorbike, bicycle, telephones, refrigerator, and vehicles among other physical assets. It also included presence/absence of electricity, quality of housing, flooring material used, and the type of roofing used. It served as a proxy for measuring disposable income as well as household wealth. The variable was classified as 1= poor, 2= average, 3= rich

***Marital Status***

Marital status refers to the mother's marital status. Two categories were created; 1= never married, 2=ever married

***Religion***

Religion refers to the religious group to which the mother belonged to. It was categorized as; 1-Roman Catholic, 2-protestant and other Christians, 3- Muslim and 4 for those with no religion or others belonged to any other religion.

#### Demographic factors

***Maternal Age at 1st birth***

Maternal age at the first birth was proximally placed against for mother's physiological, mental and emotional maturity as well as the mother's experience with child care. It was classified as; 1=<20 years, 2= 20-29 years, and 3=30+ years.

*Birth Order*

This variable refers to the child birth order and was categorized as; 1=1, 2=2-3, 3=4+.

*Precedence of Birth Interval*

This variable refers to the time in months difference between the current and previous birth. It was categorized as; 1= < 24 months and 2= 25 months+

*Sex of the neonate*

This is the sex of the infant either a boy or a girl. This was classified as; 1= male and 2= female

*Birth Size*

The variable refers to the child size at birth which was categorized as follows; 1=small, 2= average, 3=large

Healthcare Seeking Behavior Factors

*Antenatal care (number of visits)*

The variable is the regular medical attendance given to women with child. The variable was categorized into three categories: 1=none, 2=1-3 times and 3=4+.

*Antenatal care (timings)*

The variable describes the number of (with-child) months at time of first ante-natal care visit; categorized as 1=less than 4 months, 2=4-5 months and 3=6 months +

*Delivery Place*

This refers to the place of delivery. This variable was categorized in two categories which were 1= health facility and 2=home

| SNO. | VARIABLE NAME | MEASUREMENT |
|---|---|---|
| 1 | **Dependent Variable** | |
| | Neonatal mortality | (0) Neonatal death (1) Neonatal survival |
| 2 | **Independent Variables** | |
| | **Social Economic Factors** | **Maternal education:**<br>1 = No education, 2= Primary Complete and 3= Secondary+ complete<br>**Wealth quintile:**<br>1= Poor, 2= Average, 3= Rich<br>**Marital status**:<br>1= never married, 2= ever married<br>**Religion:**<br>1= Catholic, 2= Protestant/ other Christian, 3= Muslim and 4=No Religion/ other. |
| | **Demographic Factors**<br>*Maternal and Neonatal* | **Mothers age at 1st birth:**<br>1= <20, 2= 20-29 3=30+<br>**Birth order:**<br>1=1, 2=2-3, 3=4+.<br>**Preceding birth interval:**<br>1= < 24 and 2= 25 months +<br>**Neonatal**;<br>**Sex:**1= male 2= female<br>**Birth size:**<br>1= small, 2=average 3=large |
| | **Healthcare Seeking Behavior Factors** | **Antenatal care (*number*):**<br>1=none, 2=1-3 and 3=4+<br>**Antenatal care (*timings*):**<br>Gestation periods length at time of first ante natal care visit;1=less than 4 months 2=4-5 months 3=6 months +<br>**Place of delivery:**<br>1= health facility and 2=home |

# CHAPTER 3: RESEARCH METHODOLGY

This chapter outlines data source and methods of data analysis.

## 3.1 Data Source

The study utilized data from the 2014 Health Survey on Demographics in Kenya (KDHS); a national survey conducted after every half decade to get data for population evaluation and national health. The sample was drawn from the Fifth National Sample Survey and Evaluation Program (NASSEP V) Master sampling frame maintained by the Kenya National Bureau of Statistics (KNBS).

The survey consisted of two sampling stages where 1612 (617 in Urban and 995 in Rural) clusters were selected during the first sampling stage. At the second level, 25 residences were selected per cluster giving a sample of 40,300 houses. A total of 39,679 households were chosen and out of this, 36,812 qualified for interviews. A total of 36,430 households were interviewed successfully (response rate of 99%). Further, a representative sample of 32,172 women ranging between 15-49 years, were eligible for interview and 31,079 were interviewed successfully (response rate of 97%).

This study used the children's data file which has records of every child of interviewed women. The information contained in this file includes: information on child's pregnancy, post-natal care, immunization, and data for the mother among others. The file has a total of 20,961 cases analysed using version 23 of the Social Sciences' Statistical Package.

## 3.2 Data Analysis:

In this study frequency, cross tabulations (incorporating chi-square) and logistics regression were used for data analysis.

### 3.2.1 Frequencies, Cross Tabulations and Chi-Square

Frequencies and cross tabulations were used in the examination of the background characteristic of independent variables in relation to neonatal mortality. A chi- square mechanism was then used to associate independent variables with the neonatal deaths. This was later followed by binary logistical regressional analysis to examine if the variables were determinants of neonatal mortality.

### 3.2.2 Logistics Regression Analysis

The logistic regression, also termed as Logit model, is a predictive analysis which is utilised when the dependent variable is of a dichotomous nature. The Logit model explains data and correlates a dependent binary variable and one or more ratio-level, ordinal, interval or nominal independent variables. Essentially, in regression analysis, two or more dependent variables are used to explain or predict the outcome of the dependent variable. It was used to calculate the survival chances of the infants based on the existing predictor variable, comparing them to urban and rural areas. The odds of occurrence were used to measure the probability of neonatal survival.

The logistic regression function is shown as:

$$P = \frac{e^{a+bX}}{1+e^{a+bX}}$$

Where:

P= the probability of event occurrence

E= natural logarithm, which is equal to 2.71828

α and b= the model coefficients

x= independent variable

The method assumes that the outcome variable should be normally distributed and sample size should be large enough and randomly drawn. Additionally, it also assumes observations are independent of each other in the dataset. In other words, observations are not related to each other or they do not come from repeated measurements of the same individual.

# CHAPTER FOUR: DATA ANALYSIS AND RESULTS

## 4.1 Introduction

This chapter is apportioned into three sections; Section 'A' presents the description of background characteristics of respondents, Section 'B' examining the association of independent variables to the dependent variable using chi-square and Section 'C' describes logistic regression analysis.

## 4.2 Section A: Univariate Analysis

Table 4.1 shows the percent distribution of background characteristics of the respondents at national level and area of residence. Data is for births and neonatal deaths that occurred to women, five years prior the 2014 KDHS.

## Table 4.1: Distribution of background characteristics by area of residence

| Variable | Category | TOTAL | | URBAN | | RURAL | |
|---|---|---|---|---|---|---|---|
| | | N=19561 | Percent | N=7023 | Percent | N=12538 | Percent |
| Type of residence | Urban | 7023 | 35.9 | | | | |
| | Rural | 12538 | 64.1 | | | | |
| Child Survival Status | Dead | 427 | 2.2 | 176 | 2.5 | 251 | 2.0 |
| | Alive | 19134 | 97.8 | 6847 | 97.5 | 12287 | 98.0 |
| Highest level of education completed | No education | 2306 | 11.8 | 381 | 5.4 | 1925 | 15.4 |
| | Primary complete | 10978 | 56.1 | 3159 | 45.0 | 7819 | 62.4 |
| | Secondary + complete | 6277 | 32.1 | 3483 | 49.6 | 2794 | 22.3 |
| Wealth Index | Poor | 8641 | 44.2 | 965 | 13.8 | 7676 | 61.2 |
| | Average | 3525 | 18.0 | 765 | 10.9 | 2759 | 22.0 |
| | Rich | 7395 | 37.8 | 5292 | 75.3 | 2103 | 16.8 |
| Marital Status | Never Married | 1377 | 7.0 | 523 | 7.4 | 854 | 6.8 |
| | Ever Married | 18184 | 93.0 | 6500 | 92.6 | 11685 | 93.2 |
| Religion | Roman Catholic | 3513 | 18.0 | 1349 | 19.2 | 2165 | 17.3 |
| | Protestant/Other Christian | 13808 | 70.7 | 4905 | 69.9 | 8904 | 71.1 |
| | Muslim | 1662 | 8.5 | 662 | 9.4 | 1000 | 8.0 |
| | No Religion/Other | 548 | 2.8 | 99 | 1.4 | 449 | 3.6 |
| Mothers Age at 1st Birth | <20 years | 10873 | 55.6 | 3164 | 45.0 | 7708 | 61.5 |
| | 20-29 years | 8639 | 44.2 | 3680 | 52.5 | 4725 | 37.7 |
| | 30+ | 53 | 0.3 | 179 | 2.5 | 105 | 0.8 |
| Birth order number | 1 | 5104 | 26.1 | 2445 | 34.8 | 2659 | 21.2 |
| | 2-3 | 7669 | 39.2 | 3165 | 45.1 | 4504 | 35.9 |
| | 4+ | 6789 | 34.7 | 1413 | 20.1 | 5376 | 42.9 |
| Preceding birth interval | < 24 months | 2055 | 21.2 | 859 | 18.9 | 2196 | 22.3 |
| | > 24 months | 11330 | 78.8 | 3681 | 81.1 | 7650 | 77.7 |
| Sex of child | Male | 9936 | 50.8 | 3485 | 49.6 | 6451 | 51.5 |
| | Female | 9625 | 49.2 | 3539 | 50.4 | 6087 | 48.5 |
| Size of child at birth | Average | 1387 | 15.2 | 534 | 15.9 | 863 | 14.7 |
| | Small | 5428 | 58.9 | 1951 | 58.3 | 3477 | 59.3 |
| | Large | 2389 | 25.9 | 864 | 25.8 | 1525 | 26.0 |
| Number of antenatal visits during pregnancy | None | 573 | 4.0 | 102 | 1.8 | 470 | 5.3 |
| | 1-3 | 5505 | 38.1 | 1670 | 30.0 | 3835 | 43.2 |
| | 4+ | 8365 | 57.9 | 3789 | 68.1 | 4576 | 51.5 |
| Timing of 1st antenatal check | Less than 4 months | 5682 | 41.1 | 2645 | 48.5 | 3037 | 36.2 |
| | 4-5 months | 3334 | 24.1 | 1251 | 23.0 | 2083 | 24.8 |
| | 6 months+ | 4823 | 34.9 | 1554 | 28.5 | 3270 | 39.0 |
| Place of Delivery | Health facility | 11969 | 62.1 | 5762 | 83.1 | 6207 | 50.3 |
| | Home | 7309 | 37.9 | 1174 | 16.9 | 6132 | 49.7 |

### 4.2.1 National

This section presents results from **table 4.1** at national level by socio-economic, demographic and health seeking behaviors variables. Nationally, a total of 19,561 births were realized and 427 (2.2 percent) neonatal deaths occurred from these births.

#### *Socio-Economic Variables (National)*

Majority of the women for the study had completed primary school education, 56 percent, whereas uneducated women accounted for the smallest proportion, 11.8 percent. According to the wealth index, poor women were the majority, 44.2 percent, followed by rich women at 37.8 percent. Few women had never been married (7 percent) compared to ever married women (93 percent) and almost three quarter of women in the study affiliated themselves with the protestant religion.

#### *Demographic Variables (National)*

Mothers aged 20 years and below at their 1st birth, were the majority while mothers aged 30 years and above were the minority at 0.3 percent. The distribution for births order varied, with the first birth order having the smallest proportion, about 26 percent, and the 2-3rd category of birth order is the highest, about 39 percent. The proportion of boys was slightly higher than that of girls, 51 percent, and 49 percent respectively. In terms of size of child at birth, averagely sized neonates were the minority, 15.2 percent; while, small sized neonates were the majority, about 59 percent.

#### *Health Seeking Behavior Variables (National)*

Mothers who went for antenatal checks 4 times or more during pregnancy made the highest proportion, about 58 percent. Moreover, majority of pregnant women went for their first antenatal check while they were less than four months pregnant and most of the deliveries occurred at health facilities.

### 4.2.2 Urban

This section presents results from **table 4.1** for urban areas of residence by social-economic, demographic and health seeking behaviors variables. The total number of births and neonatal deaths realized in urban areas of residence were 7,023 and 176 (2.5 percent) respectively.

*Socio-Economic Variables (Urban)*

In urban areas, half of the women for the study had completed secondary education and three quarter of them were rich. Majority of the women were ever married (92.6 percent) whereas women who were never married accounted for 7.4 percent. In terms of religion, 70 percent of the women affiliated themselves to protestant, and 1.4 percent did not belong to any religion.

*Demographic Variables (Urban)*

About 53 percent of women were between 20-29 years, when they gave birth gave birth to their first child. Majority (45.1 percent) of the women were at their 2nd to 3rd birth order and an interval exceeding 24 months (81.1 percent) prior to their previous birth. There was a 50/50 representation on both sexes of the neonates. Small sized neonates had the highest proportion (58.3 percent), followed by large sized neonates (25.8 percent).

*Health Seeking Behavior Variables (Urban)*

Majority (68.1 percent) of the women sought antenatal care on at least four sessions in the course of pregnancy. Moreover, almost half of these women went for their first antenatal within their first four months of pregnancy and 83.1 percent of births occurred in health facilities.

### 4.2.3 Rural

This section presents results from **table 4.1** for rural areas of residence by socio-economic, demographic and health seeking behaviors variables. The total number of births and neonatal deaths realized in rural areas of residence were 12, 538 and 251 (2 percent) respectively

*Socio-Economic Variables (Rural)*

Women who had completed primary school formed the highest proportion, 62.4 percent, while women with no education were the minority, 15.4 percent. Majority of women in the rural areas are poor, 61.2 percent. About 93 percent of women have ever been married and about 71 percent are Protestants.

*Demographic Variables (Rural)*

The proportion of women in rural areas aged 20 years and less at their first birth was about 61 percent, whereas, very few women (0.8 percent) reported to have had their first birth aged 30

years and above. Three quarters of the women reported that the preceding birth interval was more than 24 months. About 52 percent of the neonates were boys and small sized neonates had the biggest proportion (59.3 percent) in terms of size of the child at birth.

### *Health Seeking Behavior Variables (Rural)*

Slightly above half of the women went for antenatal visits during pregnancy more than four times; 39 percent of women went for their first antenatal check when they were 6 months or more pregnant. 50% of births were at home and the other half done in health facilities.

## 4.3 Section B: Bivariate Analysis

This section presents bivariate results between the independent and dependent variable by areas of residence and at national level. The chi-square test is used to determine existence of any statistical significant relationship between independent variable and neonatal mortality.

**Table 4.2: Bivariate Results between Independent Variables and Neonatal Deaths by Area of Residence**

| Variable | Category | TOTAL | | | URBAN | | | RURAL | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | N=19561 | Percent Dead | Sig. | N=7023 | Percent Dead | Sig. | N=12538 | Percent Dead | Sig. |
| Type of residence | Urban | 7023 | 2.5 | 0.02 | | | | | | |
| | Rural | 12538 | 2 | | | | | | | |
| Highest level of education completed | No education | 2306 | 2.2 | 0.98 | 380 | 2.9 | 0.61 | 1925 | 2.1 | 0.14 |
| | Primary complete | 10978 | 2.2 | | 3159 | 2.3 | | 7819 | 2.1 | |
| | Secondary + complete | 6277 | 2.2 | | 3484 | 2.6 | | 2793 | 1.5 | |
| Wealth Index | Poor | 8641 | 2.0 | 0.37 | 966 | 2.7 | 0.82 | 7676 | 1.9 | 0.51 |
| | Average | 3525 | 2.3 | | 765 | 2.2 | | 2760 | 2.3 | |
| | Rich | 7396 | 2.3 | | 5293 | 2.5 | | 2103 | 1.9 | |
| Marital Status | Never Married | 1377 | 0.9 | 0.00 | 523 | 1.3 | 0.08 | 854 | 0.5 | 0.00 |
| | Ever Married | 18185 | 2.3 | | 6500 | 2.6 | | 11684 | 2.1 | |
| Religion | Roman Catholic | 3514 | 2.3 | 0.59 | 1348 | 2.8 | 0.78 | 2164 | 2.0 | 0.32 |
| | Protestant/Other Christi | 13809 | 2.1 | | 4905 | 2.5 | | 8904 | 1.9 | |
| | Muslim | 1663 | 2.4 | | 662 | 2.1 | | 1000 | 2.5 | |
| | No Religion/Other | 547 | 2.7 | | 99 | 2.0 | | 449 | 2.9 | |
| Mothers Age at 1st Birth | <20 years | 10872 | 1.8 | 0.00 | 3163 | 2.2 | 0.01 | 7708 | 1.7 | 0.01 |
| | 20-29 years | 8405 | 2.6 | | 3681 | 2.6 | | 4725 | 2.5 | |
| | 30+ | 284 | 3.9 | | 179 | 5.6 | | 105 | 1.0 | |
| Birth order number | 1 | 5104 | 2.3 | 0.46 | 2445 | 2.9 | 0.34 | 2659 | 1.7 | 0.17 |
| | 2-3 | 7668 | 2.0 | | 3165 | 2.3 | | 4504 | 1.8 | |
| | 4+ | 6789 | 2.3 | | 1413 | 2.3 | | 5254 | 2.3 | |
| Preceding birth interval | < 24 months | 3055 | 2.6 | 0.00 | 858 | 2.1 | 0.55 | 2196 | 2.7 | 0.01 |
| | 25 months+ | 11330 | 1.8 | | 3681 | 1.8 | | 7650 | 1.8 | |
| Sex of child | Male | 9936 | 2.3 | 0.17 | 3484 | 2.4 | 0.46 | 6451 | 2.3 | 0.01 |
| | Female | 9626 | 2.0 | | 3538 | 2.6 | | 6087 | 1.7 | |
| Size of child at birth | Average | 1396 | 4.1 | 0.00 | 534 | 4.1 | 0.00 | 862 | 4.1 | 0.00 |
| | Small | 5428 | 1.3 | | 1952 | 1.6 | | 3477 | 1.1 | |
| | Large | 2389 | 2.7 | | 864 | 3.2 | | 1524 | 2.4 | |
| Number of antenatal visits during pregnancy | None | 573 | 3.5 | 0.00 | 103 | 2.9 | 0.06 | 471 | 3.8 | 0.00 |
| | 1-3 | 5505 | 2.1 | | 1670 | 2.5 | | 3825 | 2.0 | |
| | 4+ | 8364 | 1.5 | | 3789 | 1.6 | | 4575 | 1.5 | |
| Timing of 1st antenatal check | Less than 4 months | 5682 | 1.1 | 0.05 | 2645 | 1.1 | 0.00 | 3037 | 1.2 | 1.00 |
| | 4-5 months | 3333 | 1.7 | | 1251 | 2.6 | | 2083 | 1.2 | |
| | 6 months+ | 4824 | 1.2 | | 1553 | 1.0 | | 3269 | 1.2 | |
| Place of Delivery | Health Facility | 11969 | 2.1 | 0.62 | 5761 | 2.3 | 0.01 | 6083 | 2.0 | 0.24 |
| | Home | 7306 | 2.0 | | 1174 | 3.6 | | 6132 | 1.7 | |

### 4.3.1 National

This section presents results from **table 4.2** at national level by social-economic, demographic and health seeking behaviors variables. The proportion of neonatal deaths in regards to area of residence was slightly higher in urban areas (2.5 percent) compared to rural areas (2 percent). Area of residence was found to have a statistical significant association with neonatal deaths at 5 percent level.

*Socio-Economic Variables (National)*

Mother's highest education completed was found to not have any statistically significant association with neonatal deaths at 5 per cent level, nationally. There was negligible difference in the proportion of neonatal deaths by the categories of the highest level of education completed; each category contributed to 2.2 percent of neonatal deaths. Wealth index was also found to have no statistical significant association with neonatal deaths nationally, at 5 per cent level. Whether rich, average or poor, the proportion of neonatal deaths was also similar (about 2 percent).

The study found out that marital status was statistically associated with neonatal mortality at 5 percent level. The proportion of contribution to neonatal deaths by mothers who were never married was lower (0.9 percent) compared to mothers who were ever married (2.3 percent). In addition, religion did not have any statistical significant association with neonatal deaths at 5 per cent level. Mothers who did not belong to any religion accounted for a slightly higher percentage (about 3 percent) of neonatal deaths compared to mothers who affiliated themselves to Catholic, Protestant or Muslim.

*Demographic Variables (National)*

Mother's age at first birth was found to bear a statistical association with neonatal mortality, which was significant at 5 per cent level nationally. In regard to this, the highest proportion of neonatal deaths was from older mothers aged 30 years and above (about 4 percent) compared to other age categories; 20-29 years (about 3 percent) and < 20 years (about 2 per cent). Birth order number was found to have no existing statistical significant association with neonatal deaths, at 5 per cent level nationally. However, preceding birth interval was found to have a strong statistical association with neonatal mortality on a national level. The association was significant at 5 per cent level. The proportion of neonatal deaths contributed by mothers whose

preceding birth interval was under 2 years, was higher (2.6 percent) compared to preceding birth interval of 25+ (1.8 percent).

Sex of the child, was found to have no statistical association with neonatal mortality at 5 per cent level nationally. The proportion of neonatal deaths did not differ with either sex of the child. Size of child at birth was found to have a statistical association with neonatal mortality, which was significant at 5 per cent level nationally. Contribution of neonatal deaths by averagely sized neonates was higher, about 4 percent, compared to small and largely sized newborns.

*Health seeking behavior Variables (National)*

The number of antenatal visit was found to have an association with neonatal deaths. This association was significant at 5 percent level nationally. Mothers who had never gone for antenatal checks during pregnancy contributed to 3.5 percent of neonatal deaths. Whereas, those who went for ANC visits 1-3 times and 4 times or more their proportion for neonatal deaths was lower at about 2 per cent each.

Timing of 1st antenatal visits was also found have a statistical significant association with neonatal deaths nationally, at 5 percent level. Mothers who went for the checks between 4-5 months pregnant for the first time, had a higher share of neonatal deaths (about 2 percent) compared to those who went for their first ANC visit when they were less than 4 months pregnant and 6 months or more. Finally, place of delivery was found to have no significant statistical association with neonatal deaths at 5 per cent level nationally. Delivery at either a health facility or at home was found to have similar proportions (about 2 percent each) of neonatal deaths.

### 4.3.2 Urban

This section presents results from **table 4.2** for urban area of residence by socio-economic, demographic and health seeking behaviors variables.

*Socio-Economic Variables (Urban)*

Mother's highest level of education completed was found to have no statistical significance association with neonatal deaths at 5 per cent level in urban areas of residence. The proportion of neonatal deaths by the mother's highest level of education completed was

varying slightly by different education categories; for mothers with no education and who have completed secondary school and above, the proportion was about 3 percent in each of the categories. Averagely wealthy mothers contributed to a slightly lower proportion, about 2 percent, of neonatal deaths compared to poor (about 3 percent) and rich mothers (about 3 percent). Wealth index was also found to have no statistical significance association with neonatal deaths at 5%, in urban areas.

The study found out that no statistical significance association existed between marital status and neonatal deaths in urban areas, at 5 per cent level. The proportion of neonatal deaths from mothers who had never married was lower (1.3 percent) compared to mothers who had ever married (2.6 percent). Mothers who belonged to catholic and protestant religion accounted for a slightly higher proportion, 3 percent each, of neonatal deaths compared to other categories of religion. Religion was also found to have no existing statistical association with neonatal deaths in urban areas, at 5 percent level.

*Demographic Variables (Urban)*

From the study, there existed a statistically significance association at 5 per cent level between neonatal deaths and mothers age at 1st birth in urban areas. Mothers aged 30 years and above at their 1st birth, had the highest neonatal deaths (about 6 percent), which was three times higher compared to those aged less than 20 years. Birth order number was found to have no statistical association with neonatal deaths at 5 per cent level in urban areas. The proportion of neonatal deaths attributed to the 1st birth order was 2.9 percent, slightly higher than 2nd -3rd birth order and 4th and above birth order at 2.3 percent for each category.

Preceding birth interval was found to have no existing statistical association with neonatal deaths at 5 per cent level, in urban areas. The proportion of neonatal deaths contributed by both categories of preceding birth interval was about 2 per cent each. In urban areas, sex of the child was also found to have no existing statistical significant association with neonatal deaths at 5 per cent level. The share of female neonatal deaths was slightly higher than that of male newborns, 2.6 percent and 2.4 percent respectively. Size of child at birth was found to have a statistical association with neonatal mortality in rural areas, significant at 5 per cent level. Averagely sized neonates contributed to the highest number of neonatal deaths, about 4 percent, followed by largely sized neonates (3.2 percent).

*Health seeking behavior Variables (Urban)*

The study established that there was no statistically significant association between number of antenatal checks and neonatal deaths in urban areas, at 5 per cent level. Mothers who had never gone for antenatal checks during pregnancy had a slightly higher contribution to neonatal mortality, 2.9 percent, compared to those who went 1-3 times (2.5 per cent) and 4 or more times (1.6 per cent

Timing of 1st antenatal visit was statistically associated with neonatal mortality. The association was significant at 5 per cent level in urban areas. Mothers who went for their 1st ANC check while 4-5 months pregnant, had a high share (about 3 percent) of neonatal deaths, 3 times more, compared to the other categories. Moreover, there was an existing association between place of delivery and neonatal deaths which was statistically significant at 5% in urban areas. Children delivered at home had a higher risk of experiencing neonatal deaths than neonates born in health facilities.

### 4.3.2 Rural

This section presents results from **table 4.2** at rural area of residence by socio-economic, demographic and health seeking behaviors variables.

*Socio-economic Variables (Rural)*

The proportion of neonatal deaths by all categories of the mother's highest education level completed was about 2 per cent for each. No statistical significant association was found to exist between neonatal deaths and the highest level of education completed in rural areas, at 5 per cent level. Wealth index was found to have no statistical significant association at 5 per cent level in rural areas. Poor, averagely rich and rich women contributed to about 2 percent of neonatal deaths in each category.

The share of neonatal deaths contributed by ever married women (2.1 per cent) was higher compared to women who never married (0.5 per cent). The study found out that there was a significant statistical association between marital status and neonatal deaths in rural areas, at 5 percent level. Religion was found to not be statistically associated with neonatal deaths in rural areas, at 5 per cent level. Muslim mothers and those who did not belong to any religion accounted for a slightly higher percentage, about 3 percent each, of neonatal deaths compared to other religion categories.

*Demographic Variables (Rural)*

Mother's age at 1st birth was found to be statistically associated with neonatal deaths at 5 percent level in rural areas. The proportion of neonatal deaths contributed by mothers aged 20-29 at their 1st birth was about 3 percent. Consistently, across all categories of birth order number, the proportion of neonatal deaths was about 2 percent each. Birth order number was found to have not to be statistically associated with neonatal deaths on a significant scale; at 5% in rural areas. Preceding birth interval was found to have a strong statistical correlation with neonatal deaths in rural areas at 5%.

Sex and size of the child were found to have a statistical association with neonatal deaths in rural areas; the association was significant at 5% level. The proportion of neonatal deaths did not seem to differ whether the neonate was male or female (about 2 percent for each sex) in rural areas. Averagely sized neonates contributed to the highest proportion of neonatal deaths, about 4 percent, compared to the small and largely sized newborns in rural areas.

*Health seeking behavior (Rural)*

Mothers who had never gone for antenatal checks during pregnancy were contributed to 4 percent of neonatal death in rural areas. The study established that there was an existing statistical association between the number of antenatal checks and neonatal deaths, at 5 per cent level in rural areas.

The study found that both timings of 1st antenatal visit and place of delivery had no statistical significant association with neonatal deaths in rural areas at 5 per cent level. There were no differentials in regards to the proportions of neonatal deaths caused by different categories of timings of 1st antenatal visit (1.2 per cent in each category). Neonates delivered at home had a slightly lower proportion of neonatal deaths, 1.2 percent, compared to those born at the health facility, 2.0 per cent.

In summary, mothers' age at 1st birth, preceding birth interval, number of pregnancy antenatal visits, timings of 1st antenatal visits and place of delivery were found to be statistically associated with neonatal deaths at 5% in urban areas. Whereas in rural areas, marital status, mothers' age at 1st birth, preceding birth interval, sex of the child, size of the child at birth, number of antenatal visits during pregnancy, timings of 1st antenatal visits and place of

delivery were also found to have a statistical significant association with neonatal deaths at 5 percent level.

## 4.4 Section C: Multivariate Analysis

For multivariate analysis, all variables that were found to have an association with the independent variable were subjected to a logistic regression analysis. The results are shown in table 4.3a, table 4.3b and table 4.3c at national, urban and rural areas respectively.

### Model 1

**Table 4.3a: Logistics Regression Analysis of Neonatal Survival at National Level**

| Variables | Categories | B | Sig. | Exp(B) | 95% C.I.for EXP(B) | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| | Constant | 2.771 | 0.031 | 15.970 | | |
| Type of residence | Urban(RC) | | | | | |
| | Rural | 0.187 | 0.563 | 1.205 | 0.640 | 2.269 |
| Marital Status | Never Married(RC) | | | | | |
| | Ever Married | -0.247 | 0.827 | 0.781 | 0.085 | 7.193 |
| Mothers Age at 1st Birth | <20 years(RC) | | 0.676 | | | |
| | 20-29 years | 0.286 | 0.376 | 1.331 | 0.707 | 2.506 |
| | 30+ | 16.970 | 0.998 | 23445980.349 | 0.000 | |
| Preceding birth interval | < 24 months(RC) | | | | | |
| | 25 months+ | -0.051 | 0.907 | 0.950 | 0.401 | 2.251 |
| Sex of child | Male(RC) | | | | | |
| | Female | 0.200 | 0.520 | 1.221 | 0.664 | 2.246 |
| Size of child at birth | Average(RC) | | 0.001 | | | |
| | Small | 1.474 | 0.000 | 4.365 | 2.062 | 9.237 |
| | Large | 0.637 | 0.089 | 1.890 | 0.907 | 3.938 |
| Number of antenatal visits during | 1-3(RC) | | | | | |
| | 4+ | 1.022 | 0.009 | 2.778 | 1.296 | 5.955 |
| Timing of 1st antenatal check | Less than 4 months(RC) | | 0.417 | | | |
| | 4-5 months | 0.017 | 0.966 | 1.017 | 0.463 | 2.236 |
| | 6 months+ | 0.503 | 0.260 | 1.654 | 0.689 | 3.971 |
| Place of Delivery | Health Facility(RC) | | | | | |
| | Home | 0.214 | 0.532 | 1.238 | 0.634 | 2.419 |

### 4.4 1 National

This section gives a highlight of results from **table 4.3a** on multivariate analysis at national level.

*Demographic Variables (National)*

Size of child at birth (OR 4.365, 95% CI 2.062 -9.237), was found to be a determinant of neonatal survival at national level. One category on birth size, small, was found to be significant. Neonates who were small in size at birth are 4 times more likely to die within their first month, compared to neonates who are averagely sized at birth. The variable was significant at 5 percent level.

*Health Seeking Behavior Variables (National)*

The number of antenatal visits during pregnancy (OR 2.778, 95% CI 1.296 -5.955), was the only variable found to be a significant determinant of neonatal deaths nationally. The odds (OR 2.778, 95% CI 1.296 -5.955) of newborns dying within the first 28 days of their life, are higher for neonates born by mothers who went for their antenatal checks 4 times or more, compared to mothers who went for the same checks between 1 to 3 times. Number of antenatal checks for pregnant mothers was significant at 5 percent level.

Model 2

Table 4.3b: Logistics Regression Analysis of Neonatal Survival for Urban Areas of Residence

| Variables | Categories | B | Sig. | Exp(B) | 95% C.I.for EXP(B) | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| | Constant | 1.956 | 0.249 | 7.069 | | |
| Marital Status | Never Married(RC) | | | | | |
| | Ever Married | 0.496 | 0.690 | 1.642 | 0.144 | 18.746 |
| Mothers Age at 1st Birth | <20 years(RC) | | 0.467 | | | |
| | 20-29 years | 0.663 | 0.217 | 1.941 | 0.677 | 5.564 |
| | 30+ | 17.178 | 0.999 | 28864892.988 | 0.000 | |
| Preceding birth interval | < 24 months(RC) | | | | | |
| | 25 months+ | -1.224 | 0.228 | 0.294 | 0.040 | 2.151 |
| Sex of child | Male(RC) | | | | | |
| | Female | -0.167 | 0.749 | 0.846 | 0.304 | 2.354 |
| Size of child at birth | Average(RC) | | 0.003 | | | |
| | Small | 2.461 | 0.001 | 11.721 | 2.878 | 47.742 |
| | Large | 0.684 | 0.225 | 1.982 | 0.656 | 5.987 |
| Number of antenatal visits during | 1-3(RC) | | | | | |
| | 4+ | 1.953 | 0.002 | 7.049 | 2.041 | 24.339 |
| Timing of 1st antenatal check | Less than 4 months(RC) | | 0.075 | | | |
| | 4-5 months | 0.636 | 0.325 | 1.890 | 0.532 | 6.709 |
| | 6 months+ | 1.663 | 0.023 | 5.274 | 1.257 | 22.131 |
| Place of Delivery | Health Facility(RC) | | | | | |
| | Home | 0.230 | 0.716 | 1.258 | 0.365 | 4.333 |

### 4.4.2 Urban

This section gives a highlight of results from **table 4.3b** on multivariate analysis at urban areas of residence.

### *Demographic Variables (Urban)*

Size of child at birth (OR 11.721, 95% CI 2.878 -47.742), was found to have a significant relationship with neonatal survival in urban areas. Only one category for birth size, small, was significant. The odds (OR 11.721, 95% CI 2.878 -47.742) of newborns dying within the first 28 days of their existence are significantly higher for neonates who are small in size at birth than those who are averagely sized at birth, in urban areas. In other words, small sized neonates at birth are 12 times more likely to die compared to averagely sized neonates in urban areas. The study found that that size of child at birth was significant at 5 percent level.

*Health Seeking Behavior Variables (Urban)*

The study established a significant relationship between the number of times a pregnant woman goes for ANC visits (OR 7.049, 95% CI 2.041 -24.3395). The odds (OR 7.049, 95% CI 2.041 -22.131) of dying within the first month, for neonates born by mothers who went for antenatal checks 4 or times, are higher compared to mothers who went for the same checks between 1 to 3 times. Number of antenatal visits during pregnancy was found to be significant at 5 percent level.

Model 3

**Table 4.3c: Logistics Regression Analysis of Neonatal Survival for Rural Areas of Residence**

| Variables | Categories | B | Sig. | Exp(B) | 95% C.I.for EXP(B) | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| | Constant | 19.772 | 0.997 | 386306187.854 | | |
| Marital Status | Never Married(RC) | | | | | |
| | Ever Married | -16.586 | 0.997 | 0.000 | 0.000 | |
| Mothers Age at 1st Birth | <20 years(RC) | | 0.984 | | | |
| | 20-29 years | 0.072 | 0.859 | 1.075 | 0.484 | 2.391 |
| | 30+ | 16.881 | 0.999 | 21435482.447 | 0.000 | |
| Preceding birth interval | < 24 months(RC) | | | | | |
| | 25 months+ | 0.367 | 0.468 | 1.443 | 0.536 | 3.883 |
| Sex of child | Male(RC) | | | | | |
| | Female | 0.403 | 0.317 | 1.496 | 0.680 | 3.294 |
| Size of child at birth | Average(RC) | | 0.173 | | | |
| | Small | 0.934 | 0.066 | 2.544 | 0.942 | 6.871 |
| | Large | 0.463 | 0.379 | 1.588 | 0.567 | 4.451 |
| Number of antenatal visits during | 1-3(RC) | | | | | |
| | 4+ | 0.474 | 0.336 | 1.607 | 0.611 | 4.224 |
| Timing of 1st antenatal check | Less than 4 months(RC) | | 0.683 | | | |
| | 4-5 months | -0.444 | 0.412 | 0.641 | 0.222 | 1.854 |
| | 6 months+ | -0.166 | 0.782 | 0.847 | 0.262 | 2.737 |
| Place of Delivery | Health Facility(RC) | | | | | |
| | Home | 0.298 | 0.463 | 1.348 | 0.608 | 2.989 |

### 4.4 1 Rural

This section gives a highlight of results from **table 4.3c** on multivariate analysis at rural areas of residence

The study did not establish any significant relationship between any variable and neonatal deaths at urban areas.

The study did not establish any socio-economic variable that was a significant determinant of neonatal mortality. On demographic variables, size of child at birth was found to be a significant determinant factor of neonatal survival in urban areas. In regards to health seeking behavior factors, number of antenatal visits during pregnancy was found to be a significant determinant of neonatal deaths in urban areas.

# CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

## 5.0 Introduction

This chapter documents the summary, conclusions for the study as well as the recommendations.

## 5.1 Summary

The first chapter introduced the study, drawing on the state of neonatal mortality globally, regionally as well as in Kenya based on urban and rural areas. The chapter briefly highlighted the policy background on child survival both internationally and nationally. Various efforts by the government to ensure quality and affordable maternal and child care were also highlighted. The chapter also presented the problem statement, research questions and the objectives which sought to establish the socio-economic, demographic, and health seeking behavior factors associated with urban-rural differentials of neonatal mortality in Kenya. Justification of the study and the limitations were also presented.

Chapter two presented literature review, structured to cover an overview of urban-rural differentials in childhood mortality and literature review on various variables based on the three domains from the objectives. The chapter offers comparison among studies focusing on urban-rural childhood mortality differentials, citing selected studies from Asia, Europe, Africa and in Kenya. Chapter two also presented the summary of literature review, the theoretical framework for child survival and the operational framework to guide the study. The chapter finally presented definition of terms (dependent and independent variables) and how the variables were categorized.

Chapter three explained the research methodology, covering data source and data analysis. Results are presented in three sections; section A shows the univariate analysis, section B represents bivariate analysis and section C presented the multivariate analysis, in chapter 4. Finally, chapter five presents the summary, conclusion of the study as well as the recommendations.

## 5.2 Findings and Discussions of the study

### 5.2.3 Discussion on Socio-economic factors

From bivariate results, there were no major disparities on the proportion of neonatal deaths from the different level of mother's education in both areas of residence. Moreover, mothers level of education was found not to be a significant neonatal mortality determinant which was similar to findings from Ikamari (2013), however, the results were a reverse of findings from Kamal (2012) and Fonseca et al (2017). This could be attributed to different programs being implemented by the government and NGOs that promote free and quality maternal and newborn health care. The programs ensure that information and health care services are available at a subsidized price, if not for free, and are accessible to everyone. The also enable majority of women whether educated or not, have a better understanding of healthcare matters. Some of the programs include, UHC, mobile clinics, maternal shelters, free maternal health care through Linda Mama program and campaigns such as beyond zero campaign (The National Treasury and Planning, 2018).

Wealth index was also found not to be a significant neonatal mortality determinant contradicting findings from; Peña, Wall and Persson (2000), as well as Wulandari *et al.* (2020). The share of neonatal deaths from various categories of wealth index differed slightly in both areas of residence as shown in the bivariate results. This could also be credited to the availability of free quality healthcare services as mentioned above, which are meant to be accessible to all. Therefore, access to health care services is not limited to low income earners.

Although marital status was not found to be a significant determinant of neonatal mortality, the proportion of neonatal deaths is higher for ever married women than women who have never married, in both areas of residence. Results from this study supports the studies like Mugo *et al.,* (2017) and Adewuyi and Zhao (2016), who found no significant effect of marital status on neonatal mortality. This could be attributed by several factors. Most importantly, in the current contemporary world, the connection between sexuality and reproduction has seen profound changes as well as the assumption that parenthood is as a result of pregnancy (Leon, 2006). Availability of safe abortions, contraception, adoption options, and assisted reproductive technologies (eg *in vito fertilization* -IVF) among other factors, detach sexuality from reproduction and offer divergent ways on pathways to parenthood (Leon, 2006). Women whether married or not are also having fewer children while others are opting not to have any

children and some suffer from childlessness, which has contributed to a decrease in fertility rates globally (OECD, 2011).

The study also found religion not to be a significant neonatal mortality determinant, reflecting findings from Wolde, *et al.* (2019). This could be as a result of the decline in people's faith and their attachment to religion, characterized by the rise of secularization in the contemporary world (Kimathi, 2017)

### 5.2.4 Discussions on Demographic Factors

Findings from the study support the study done by Adewuyi and Zhao (2016) which found out that mothers age at 1st birth was not a significant determinant of neonatal mortality, but contradicts findings from Rutstein (2000). Parental skills and emotionally preparedness on parenthood are imparted to mothers through various initiatives put forward by the government as mentioned earlier with antenatal and post-natal care playing a big role in this.

Preceding birth interval was also found not to significantly determine neonatal mortality contradicting findings from Adewuyi and Zhao (2017), Akinyemi, Bamgboye and Ayeni (2015), and Mutwiri (2016). Similarly, birth order number was found not to be significant determinants of neonatal mortality, but the variable was found to be significant from Kibet (2010), Sahu *et al.* (2015 and Omedi and Nyauchi (2012) studies. Element of maternal depletion, such as maternal malnutrition, are addressed in various ways through strategies such as the Kenya Economic Stimulus Program, the big four agenda (food and nutrition security), Hunger, Safety Net Programs among others (The National Treasury and Planning, 2018). These efforts help in ensuring that availability and access of nutritious foods for pregnant and breastfeeding women is improved. Additionally, availability of iron and folic acid supplements meant to improve maternal diet during pregnancy are accessed during ANC visits (Devlieger, Martens & Bekaert, 2005).

The study did not find sex of the child to be a significant neonatal mortality determinant. However, size of child at birth was found to be a significant determinant of neonatal survival in urban areas. From the study, small sized neonates at birth are 12 times more likely to die compared to averagely sized neonates. The findings support a study done in Nigeria on determinants of neonatal mortality in rural and urban areas in 2017, by Adewuyi and Zhao.

With rapid urbanization experienced in the country, slums in urban areas are becoming overcrowded and characterized by poor hosing conditions, poor livelihood opportunities, poor sanitation, inadequate health services and other social services (Kimani-Murage *et al.*, 2014). Therefore, availability and accessing of critical care services to neonatal survival such as, proper hygiene, warmth, feeding as well as proper treatment of infections common among pre-term babies, becomes a challenge Hoque et al., (2010). Antenatal care is the best way to prevent pre-term and low birth weights since health care providers are able to check the health of mother and child as well as advice on what to do, especially on following a healthy diet and avoiding use of drugs during pregnancy (University of Rochester, 2021)

### 5.2.5 Discussions on Health Seeking Behavior Factors

The number of antenatal visits during pregnancy was a significant determinant of neonatal deaths in urban areas of residence. This is in support of studies like Wulandari et al. (2020), Wondemagegn *et al.*, (2018) and Hatupopi (2017). This can also be attributed to rapid urbanization and the unfavorable living conditions in the slums (Kimani-Murage *et al.*, 2014) hampering access to ANC. Consequently, availability and access of proper healthcare for the pregnant mothers and their unborn children is difficult. However, timings of antenatal visits during pregnancy was found not be a significant determinant of neonatal mortality in either area of residence.

The study did not find place of delivery to be a significant determinant of neonatal mortality, contradicting findings from Akinyemi *et al.,* (2015) and Rajab & Ghareba (2013). This could be ascribed to the fact that deliveries at home are not necessarily un-assisted and home births are also safe. Pregnant mothers are making informed decisions to deliver at the comfort of their homes with skilled birth attendants (doulas, trained traditional midwifes etc.) on site (Naylor Smith *et al.* (2018).

In conclusion the urban-rural differentials reflect the gaps between the two areas of residence. It is therefore, very important to understand and examine the differences of neonatal deaths in order to formulate tailored policies, programs and strategies that will ultimately improve the health of mothers and infants.

## 5.3 Recommendations

Recommendations for policies or program implementations;

1. Policies and programs to curb neonatal mortality should be tailored to address the differentials in rural and urban areas of residence;
    I. Causes, effects and remedies of low birth weight should be addressed to avoid giving birth to underweight babies who are more susceptible to neonatal deaths in the urban areas of residence
    II. Measures should be put in place to encourage and advocate for ante natal care visits to health facilities for pregnant women in urban areas of residence
2. Un-targeted interventions addressing factors (marital status, mothers age at first birth, preceding birth interval, sex of the child and place of delivery) that were found not to be significant determinants of neonatal mortality in either place of residence, to be strengthened for the entire population in order to reduce neonatal mortality rates in the country at large

Recommendations for Further Study

1. A similar study would be recommended using the upcoming 2022 KDHS data and the 2019 Kenya Population and Housing Census data to examine the trends and determinants of neonatal mortality by expanding the scope of variables from what was used in this study
2. A further breakdown into different categories of urban areas would be needed to demystify urban neonatal mortality. Urban areas of residence can be categorized as peri-urban, slum and non-slum urban areas to further provide a basis for policy implementation and comparison between the risk populations
3. Lastly, a decomposition analysis on variables that are found to be significant determinants of neonatal mortality can be done in future

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