DETERMINANTS OF CHILD SURVIVAL IN NIGERIA

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DEDICATION

This Project is dedicated to my Inspiration, Counsellor, Friend and Stable Standby. Holy Spirit.

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CERTIFICATION

I certify that this work was carried out by **Miss Opeyemi Latona** in the Department of Epidemiology, Medical Statistics and Environmental Health, Biostatistics Unit, University of Ibadan.

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ABSTRACT

Under-five mortality remains a major public health problem particularly in Nigeria. Studies have shown that socio demographic, environmental, bio-demographic and maternal factors influence the under-five mortality. This study identified some key predictors of child mortality and assessed the influence of housing conditions, household size, socio-demographic and bio-demographic factors on child mortality in Nigeria.

There were a total of 3201 under-5 deaths of the 28647 children whose records were present in the Nigeria Demographic and Health Survey (NDHS) 2008. The outcome variable was 'child alive', while the explanatory variables against socio-demographic variable, bio-demographic variables and basic housing conditions. Pearson's Chi Square test and Cox proportional hazard regression, using forward likelihood ratio method was performed. We defined time to event for the children that were alive as their current ages and how many months lived for children that were dead. Hazard Ratios (HR) with 95% confidence intervals (CI) were used to depict association among variables.

The Under-five Mortality rate was 157 per 1000. The hazard ratio for under-five mortality by region of residence showed that mortality was about two times higher for children of mothers residing in the South South (HR=2.031; 95% C.I= 1.272 – 3.243 , $p<0.05$) and 10 times higher for children residing in the North Western region (HR = 10.053; 95% C.I= 6.665– 15.162, $p<0.05$) compared with children from mothers in the North Central region. The risk of dying before the fifth birthday was higher for children whose mothers are Muslims (HR = 2.343; 95% C.I= 1.407 – 3.903, $p<0.05$) and lower for children whose mothers are traditional worshipers (HR = 0.053; 95% C.I= 0.030 – 0.095, $p<0.05$) compared with children whose mothers are Christians.Children from the mothers belonging to "Rich" wealth index category had higher chances of surviving (HR = 0.785; 95% C.I= 0.620 – 0.996, $p<0.05$) and those from the middle category of wealth indices had twice the chance of surviving till their fifth birthday (HR = 0.435; 95% C.I= 0.337 – 0.563, $p<0.05$) compared with children from relatively poor mothers.

Furthermore, the odds of surviving was higher for children with mothers from homes with basic toilet facilities and household size less than five than from mothers from homes without any toilet facility(HR = 0.776; 95% C.I= 0.628 – 0.958, $p<0.05$) and household size greater than 5

respectively (HR = 0.810; 95% C.I= 0.678 – 0.969, p<0.05). The risk were about two times higher for children whose mothers use biomass cooking materials than children of mothers who use non-biomass cooking materials.(HR = 0.448; 95% C.I= 0.354 – 0.567, p<0.05).

The findings showed that Under-five mortality is still high in Nigeria and factors influencing it include region of residence, religion, wealth index, household size, condition of floor, availability of good toilet facility, cooking fuel material, size of baby at birth and mother's postnatal visit within the first 2months of birth. Therefore, there is need to focus on improving child survival particular in Northern region. In addition, educating mothers on the danger of several births to reduce household size, awareness on the danger of using biomass materials for cooking, improving housing conditions and the importance of postnatal visits for check-ups should be encourage.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Children represent the future and ensuring their healthy growth and development ought to be prime concern of all societies. It reflects a country's level of socio-economic development (UNICEF,2012). Child mortality is a key indicator of planning and implementation of child survival interventions as well as for social and economic development in general. It is also among the best indicators of socio-economic development, because a society's life expectancy at birth is determined by the survival chances of infants and children (UN Report, 2011).

Human health is directly threatened by serious environmental problems that arise in and around people's homes. According to McGranahan, et al (1997), inadequate sanitation, insufficient or contaminated water, smoky cooking fuels as well as insect infestation are all correlated with human health, particularly children's. These pathways are complicated by the socio-economic background of mothers in Sub-Saharan Africa. Also, children, the elderly and women are particularly vulnerable to health hazards emanating from the home environment because these group of people spend longer time in or around the homes. Child survival is therefore a function how clean the environment is and access to basic needs to support life at both the family and health facility levels (McGranahan, et al 1997) .

Research has shown that at least three million children die before their fifth birthday due to environment related diseases (WHO, 2004). For instance, acute respiratory infections killed an estimated two million children under the age of five years and as much as 60% of these infections, world-wide, are related to environmental conditions especially contaminated water and inadequate sanitation. The quality of community environment is therefore essential for health of both adults and children (WHO, 2004).

Demographers have for a long time been interested in the study of mortality which is one of the components of population change. Numerous studies on infant and under-five mortality in developing countries indicate that most of these deaths are from preventable causes – such as diarrhea, pneumonia, measles, malaria, HIV and AIDS, and the underlying malnutrition – and suggest that the goal of reducing childhood mortality by two-thirds by 2015 could be

achieved if few known and effective child survival interventions could reach population groups that need them most (Morris, 2003).

Other causes include immunization, safe water and sanitation, micronutrient supplementation, nutrition counseling, and in malaria-prone areas, insecticide- treated bed nets .the task of scaling up child health interventions to full coverage in countries with the highest mortality is within reach, and resources should be mobilized to match governments' and development partners' commitments with action (Mason, 2005).

This explains why concerted effort has been directed towards the improvement of environment as a sustainable strategy for the improvement of overall health of the people. This is hinged on the belief that specific diseases and injuries are impacted by environmental risks. It is important to note that the influence of the environment on child health is also mediated by socioeconomic as well as neighbourhood conditions of urban residents. In other words, the magnitude of the impact of various environmental conditions on child health is determined by, among other factors, the household economy, family hygiene, water quality and availability as well as the presence of environmental services at the household and community levels (WHO, 2004)

The developing countries, particularly Sub-Saharan Africa (SSA) are lagging in these factors. This is why child survival is more threatening in this region than any other regions in the world.. Since 1990s, declines in under five child mortality has reversed in many countries in the region, while in others they have either slowed or stalled, making it improbable to meeting the target of reducing child mortality by two thirds by 2015 by the majority of the countries in the region. Under-five mortality rate in SSA varied from 185 (per 1,000 live births) in 1990 to 172 in 2003 (UNAIDS 2003, UN 2005).

1.1.1 The Nigeria Situation

Nigeria's estimated population of 140million in 2006 (projected from the 2006 national population census) makes it the largest country in Sub-Saharan Africa and the tenth most populated country worldwide. Nigeria's population is largely rural, with 63.7 percent of the population living in rural areas. Currently, about 45 percent of Nigeria's total population is less than age 15, with about 20 percent (24 million) under age five. The sheer numbers

involved, therefore, demand that child survival issues be placed in the forefront of the national agenda (Policy Project/Nigeria 2006).

Nigeria has an under-five mortality rate of 157 per thousand, this is high when compared to other developing countries (NPC/ICF Macro, 2009). In Nigeria the need to reduce infant and child mortality is one of the greatest challenges confronting the government. Despite the efforts of various successive governments to tackle the problem the results have been dismally poor. Various researchers who are interested in child health in Nigeria have identified some key factors that may be adduced to this problem and some of these factors include poverty (Owumi and Ezeogu, 2003); ignorance by mothers (Bradley and Gilles, 1984); and the lack of political will by the Federal Government (Iyun and Oke, 2000). For these and other similar reasons, the rate of mortality from childhood diseases continues to be high.

Nigeria is said to be one of the major contributors to infant mortality rate globally The situation is tragic, especially as most of these deaths are due to preventable causes such as intrapartum-related injury, infections, and prematurity. While some progress has been made to reduce deaths afterthe first month of life (the post-neonatal period), there has been no measurable progress in reducing neonatal deaths over the past decade (FMOH,2011) Even though there is evidence of increased improvement, Nigeria is still not on track to meet MDG4. Very often, the thrust of government's well-intentioned and capital-intensive intervention programmes appears to be more responsive (treatment-based) than pro active (prevention-based). This calls for more attention to be given to other 'non-health sector' interventions, such as integrated approaches that include safe water and sanitation (Nigeria MDG Report, 2010).

1.1.2 Nigeria: Interventions Till Date

The World Summit for Children in 1990 called for a worldwide reduction in child mortality to below 70 deaths per 1000 livebirths (or a one-third reduction if this yielded a lower mortality rate) by the year 2000. Unfortunately, investments in health systems and interventions necessary to achieve such a reduction in the 1990s were not commensurate with needs. The mortality reduction target was reached for only five of 55 countries with an under-5-year mortality rate of 100 or more in 1990(Lancet2003) . Nigeria FMoH then set reproductive health targets for 2006 to reduce infant mortality rate; neonatal morbidity by

30%, Due to inadequate investments in the health system and lack of interventions, regrettably the above reductions were not met.

In 2002, as part of the UN millennium development goals (MDGs-4), nations pledged a two-thirds reduction in child mortality by 2015, so in December 2006, the Federal Education Commission (FEC) of Nigeria approved 60 billion naira (approximately $60 million) to reduce infant and maternal mortality rates in the country by two-thirds by 2015

1.2 PROBLEM STATEMENT

Mortality rates for children under 5 years of age remain high in Sub-Saharan Africa including Nigeria. Childhood mortality has remained one of the critical challenges that public health practitioners and development agencies have been grappling with for the past one and half decades. The survival of new-borns is influenced by access to basic health services and the quality of socio-economic services that are made available to the population. (Worku, 2011)

In spite of the introduction of Primary Health Care (PHC), the expanded programme on immunization (EPI) and other childhood illness monitoring programs (WHO Integrated Management of Childhood Illness (IMCI)), 75 infants out of every 1,000 live births die before the age of one year and for those who survive the first year of life another 157 out of every 1,000 die before the age of five (NPC/ICF Macro, 2009).

1.3 JUSTIFICATION OF STUDY

United Nations agencies work with member states in Africa with a view to reducing child and maternal mortality, and have set up indicators for monitoring and evaluating progress made in terms of the reduction of the burden of disease and in terms of improvement in health service delivery. Based on these indicators, sub-Saharan African countries have failed to make satisfactory progress to date (UN MGDs Report 2007). Identifying determinants of under-five mortality (U5M) is essential for formulating appropriate health programmes and policies in order to meet the United Nations MDG goal (i.e. to reduce childhood mortality by two-thirds by 2015) and it is worthwhile to know how far Nigeria has gone in this regard.

Furthermore, several studies have been conducted to identify the determinants of U5M, however some of these studies did not consider certain important covariates such as sanitation, antenatal and post natal visits, in their research which might have confounding

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effect. According to Adebayo, 2002, from a methodological point of view, he focused on discrete-time survival model and recommended that an extension to continuous-time models, such as the Cox proportional hazard model would be desirable.

Hence, ~~predictors/determinants~~ have been studied with parametric approach. This study explored a semi ~~parametric~~ statistical approach (Cox Proportional Hazard Regression) to determine factors associated with Child Survival in various regions in Nigeria.

1.4 OBJECTIVES OF STUDY

1.4.1 Broad Objective

To determine factors that affects under-five years mortality in Nigeria

1.4.2 Specific Objectives

The specific objectives of the study are to :

- assess the effect of housing on child mortality..
- explore regional differentials in child mortality rates
- determine influence of child spacing on childhood mortality
- identify socio demographic factors influencing childhood mortality.

1.5 OPERATIONAL DEFINITIONS

The following definitions are adopted from the World Health Organization or else otherwise stated.

- **Child mortality**: the deaths between the first and fifth birthday
- **Under-five mortality (U5MR)**: deaths between birth and age five years.
- **Infant mortality**: deaths between birth and exactly one year of age expressed per 1,000 live births.
- **Life expectancy at birth** The number of years newborn children would live if subject to the mortality risks prevailing

- **Infant mortality**: deaths between birth and exactly one year of age expressed per 1,000 live births.

- **Life expectancy at birth** The number of years newborn children would live if subject to the mortality risks prevailing

- **Fetal death (Still birth):** Death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation, the fetus does not breathe or show any other evidence of life such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles.

- **Neonatal death**: Number of deaths during the first 28 completed days of life per 1,000 live births in a given year or period.

- **Live birth:** is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.

- **Hazard Ratio:** The hazard ratio is an expression of the hazard or chance of events occurring in the treatment arm as a ratio of the hazard of the events occurring in the control arm.(Martin Duerden,2009)

- **Censoring:** is when an observation is incomplete due to some random cause. The cause of the censoring must be independent of the event of interest if we are to use standard methods of analysis.

- **Right Censoring** the censoring occurs after the subject has been entered into a study i.e. to the right of the last known survival time:

- **Left Censoring:** occurs when the survival time is incomplete at the left side of the follow up period.

- **Interval Censoring:** - occurs when subjects are known to have experienced an event within an interval of time

- **Event:** Death, disease occurrence, disease recurrence, recovery, or other experience of interest

- **Time:** The time from the beginning of an observation period

- **Survival Function:** S(t) is the probability that a subject survives longer than time t.

- **Hazard Function** : h(t) is a function of the probability of an event in the time interval [t, t+i], *given that the individual has survived up to time t.*

- **Survival Time:** the duration a child lived before death

CHAPTER TWO

LITERATURE REVIEW

2.1 GLOBAL VIEW: SUB-SAHARAN AFRICA IN VIEW OF MDGs

Statistics have shown that some 11 million children under the age of five years die annually worldwide, out of which over 10 million deaths occur in the developing world (UNICEF, 2004). In particular, Sub-Saharan Africa continues to be the most affected region as it accounts for more than one-third of all deaths amongst children under the age of five years and majority of these deaths are preventable (WHO, 2004).

The fourth Millennium Development Goal (MDG 4) aims to reduce the 1990 mortality rate among under-five children by two thirds. Child mortality is also closely linked to MDG 5- to improve maternal health. Since more than one third of all child deaths occur within the first month of life, providing skilled care to mothers during pregnancy, as well as during and after birth, greatly contributes to child survival. Millennium Development Goals adopted by the United Nations in 2000 aim to decrease child deaths worldwide by 2015 (WHO, 2005).

More than one billion children are severely deprived of at least one of the essential goods and services they require to survive, grow and develop—these include nutrition, water, sanitation facilities, access to basic health-care services, adequate shelter, education and information. As a result almost 9.2 million children under-five die every year. A further 3.3 million babies are stillborn. Most of the 25,000 children under five that die each day are concentrated in the world's poorest countries in Sub-Saharan Africa and South Asia, where the child mortality rate is 29 times greater than in industrialized countries: 175 deaths per 1000 children compared with 6 per 1000 in industrialized countries. (WHO, 2011)

Child survival prospects remain dismal in Africa given the HIV and AIDS pandemic, the impact of poverty, famine and war. Sub-Saharan children who die before the age of five years are often characterized by poverty, illiteracy, the burden of occupational and communicable diseases, large family sizes, poor immunization coverage rates and poor access to basic health and socio-economic services. (UNAIDS, 2009)

A UNICEF (2001) report on U5MR also shows that about 11 million under five deaths occurred all over the world in year 2000, one percent of them in the industrialized countries, 4 percent in Latin America/Caribbean, 6 per cent in the Middle East and North Africa, 1% per cent of them in East Asia/pacific, 34 per cent in South Asia, CEE/CIS recorded only 2 per cent and forty percent in Sub-Saharan Africa

In Sub-Saharan Africa under-five mortality is two to three times the average compared to any other region in the world. In over half of the 29 countries surveyed in Sub-Saharan Africa, the mortality rate for children aged less than five years exceeds 150 deaths per 1000 live births. Under-five mortality levels are over 200 in the Democratic Republic of Congo, Burkina Faso, Mali, and the Central African Republic, and reach 259 deaths per 1000 live births in Niger (WHO Statistical Information System, 2009).

UNICEF (2007) has reported that the Sub-Saharan average mortality rate for children younger than five years, in 2007, was 79 per 1000 live births. The World Bank (2009) has reported a similar finding. In 2000, countries in Central Africa had the highest under-five mortality rate with a median value of approximately 180 deaths per 1000 live births, indicating that there were no improvement from 1990 to 2000 (UAP, 2009). Countries in East Africa showed a median of 160 deaths per 1000 live births, demonstrating a slight improvement from 1990 to 2000. The median for the West African region oscillated around 170 deaths per 1000 live births revealing that there were improvements from 1990 to 2000. African region reduced under-five mortality from a median of 60 deaths per 1000 live births to a median of 50 deaths per 1000 live births between 1990 and 2000 (UAP, 2009)

According to the World Bank (2009), the highest under-five mortality rate for an African country in 2005 was 168 deaths per 1000 live births. This figure was registered in a Sub-Saharan African country. Progress has been particularly slow in sub Saharan Africa following civil disturbances and the HIV and AIDS epidemic. According to the most recent data available, only 35 countries are making enough progress to be able to reduce under-five mortality rates to one-third of their 1990 level by 2015.

2.2 LEVELS AND TRENDS IN CHILD MORTALITY, 1990–2010: SUB-SAHARAN AFRICA

For Sub-Saharan Africa as a whole there has been a decline in U5MR concentrated largely in the period between 1965 and 1990, during which the median U5MR dropped from 232 to 170 per 1000. Since 1990, the trend seems to have stalled. The pattern of this overall trend also characterizes each region, though at different levels and speeds. The countries of the West region had the highest U5MR in 1960, with a median value around 290 per 1000 live births. This level fell below 200 per 1000 by 1985, a level similar to that of the Middle region, which had a median around 260 per 1000 in 1960. The East region median oscillated around 200 per 1,000 prior to 1975 before declining to 170 per 1000 in 1990. The Southern region had the lowest median U5MR in 1960 (around 200 per 1000) and experienced the sharpest decline to about 60 per 1000 by 1990. Declines appear to have stalled in all regions in the 1990s. The West and Southern regions thus experienced the fastest declines from 1960 to 1990, with the countries of the Middle and East regions showing the slowest improvement. (Amouzou & Hill 2004)

2.3 LEVELS AND TRENDS IN CHILD MORTALITY, 1990–2010: NIGERIA

In Nigeria, the 1999 Nigeria Demographic and Health Survey (NDHS) shows some improvement in IMR and U5MR (see Table 2.1 below), these rates still fall short of the World Summit for Children (WSC) national goals for reducing IMR (50/60 per 1,000) and U5MR (70/80 per 1,000) by one third by 2000. The 1999 NDHS report cautions, however, that its mortality rates are likely to be underestimates. The huge variations in these rates among different parts of the country, notably urban and rural areas and north and south, are striking (Table 2.1).

Table 2.1: Comparison of Rates between 1990, 2003 NDHS and 2008 NDHS

	1990	1999	2008
IMR	97	99	75
U5MR	199	187	157

Source:NPC/ICF Macro, 2009)

2.4 INTEGRATED MANAGEMENT OF CHILDHOOD ILLNESSES (IMCI).

Mortality and morbidity in children under five in Nigeria are largely due to five major childhood illnesses, chief of which is malaria. The other illnesses are ARI (pneumonia), diarrhoea, measles, and malnutrition. The IMCI strategy was developed by the WHO and UNICEF in 1995 in response to the challenges of providing quality health care for children, since prior to the strategy's conception most efforts were limited to vertical programmes, such as Control of Diarrhoeal Diseases (CDD), ARI Control, and others. These programmes were not very successful in reducing mortality in developing countries, partly because most of these activities were donor-driven in Nigeria as in most other developing nations. This strategy is a sector-wide health approach that has proven effective, cost-beneficial, and which has the greatest potential to reduce the burden of childhood diseases in Nigeria (World Bank, 2002).

IMCI ensures accurate identification and treatment of childhood illnesses, prompt referral of severe cases, a strengthening of preventive and promotive activities in the home, communities, and health facilities (such as routine immunization and growth monitoring). Its three main components are: Improvement of case management skills of health workers, Health systems improvement to support IMCI and Improvement of family and community practices that support child survival.

The Nigerian government, with support from the WHO and UNICEF, began implementing IMCI in 1997 following adoption at the National Health Council as the main thrust of all child survival efforts. Since its introduction, IMCI has gone through the early implementation phase, principally in six LGAs, each representing the geopolitical zones of the country. IMCI is now in the expansion phase in these six sites and is planning to increase its geographical spread to 200 LGAs. IMCI is also implemented in the USAID/BASICS supported LGAs; however, since its inception, IMCI has been largely donor-funded, receiving poor budgetary allocations arising from little political commitment. It is yet to be integrated into any health policy as the last Maternal and Child Health Policy (1994) and the National Health Policy (1996) both predate its introduction.

2.5 MAJOR CAUSES OF CHILDHOOD MORTALITY

Child survival in Nigeria is threatened by nutritional deficiencies and illnesses, particularly malaria, diarrheal diseases, acute respiratory infections (ARI), and vaccine preventable diseases (VPD), which account for the majority of morbidity and mortality in childhood. (POLICY Project/Nigeria 2002).

Although, several studies by health actuaries exists on child mortality, evidence on why the rates is still high in Nigeria in spite of various action plans and interventions made remain sparse. Possibly, the cause of disease and death over which not much controversies and uncertainties exist is the total environment of man (Adeyemi et al.,2008). Ogunjuyigbe (2004) viewed morbidity and mortality of the child to be influenced by the underlying factors of both biological and socio-economic that operates through proximate determinants.

Research carried out by UNICEF/FOS in 2000 found that one in seven Nigerian children die before his or her fifth birthday (FOS/UNICEF, 2000). A baby born in Nigeria is 30 times more likely to die before age five than one born in an industrialized country (NPC/UNICEF, 2001). Infant and child mortality rates are exceedingly high, and Nigeria ranks 12th highest in the world among countries with high under-five mortality (UNICEF, 2006). The Lancet's Child Survival Series (2003) shows that six conditions account for about 70% of all child deaths: acute lower respiratory infections, mostly pneumonia (19%), diarrhea (18%), malaria (8%), measles, (4%), HIV/AIDS (3%), and neonatal conditions, mainly pre-term birth, birth asphyxia, and infections (37%). The relative contribution of HIV/AIDS to the total mortality of children under-five, especially in Sub-Saharan Africa, has also been increasing steadily. Malnutrition is a factor in more than half of the children who die after the first month of life.

The United Nations Statistics Division (2009) study indicates that child mortality and morbidity could not be reduced significantly in most Sub-Saharan African countries as a consequence of severe economic crisis, lack of economic and political stability, and the inability of national governments to make the necessary resources and infrastructure available to the rural population. The authors argue that mortality rate trends of children less than five years could be substantially reduced if governments were to demonstrate political commitment to meet the basic needs of children and mothers (Appendix I).

Sub-Saharan Africa is the region most affected by poverty, which leads to child mortality and accounts for more than one-third of all deaths of children younger than five years. Numerous studies have shown a close association between child mortality and poor socio-economic status. Examples of socio-economic factors that adversely affect the survival of children in Nigeria, amongst others, are Low income, Illiteracy amongst women aged 15 and above .The percentage of the population living in poverty .The high influx of rural people to urban areas in search of livelihood ,poor nutrition ,incomplete immunization of infants , lack of access to clean water ,lack of access to sanitation facilities (United Nations Statistics Division 2009)

The World Bank (2009) has reported that the majority of deaths amongst children under the age of five years are attributable to poverty, lack of access to basic health services and poor infrastructure. The main causes of death are prenatal conditions closely associated with poverty, diarrheal diseases, malaria, pneumonia and other lower respiratory tract conditions. Malnutrition increases the risk of dying from these diseases and contributes to more than half of all deaths of children younger than five years. A number of studies have identified a negative relationship between per capita income and mortality rate (UNAIDS 2009).

There is a clear association between low household income and high mortality rate. As household income increases, the mortality rate amongst under-five children decreases. In most sub- Saharan African countries, poverty and under-five mortality are positively correlated (Worku, 2011). In a similar way as with income, urbanization and illiteracy affect the mortality rate amongst children less than five years in the expected direction. He further stated that the higher the percentage of the population living in urban areas, the lower is the mortality rate amongst children younger than five years, and the lower the percentage of illiterate women, the lower is the mortality rate amongst children younger than five years. The mortality rate amongst children less than five years is widely recognized as an important indicator of development. It is also the broadest, and hence most inclusive, widely used measure of child survival.

According to the UNICEF (2009), the root causes of mortality amongst under-five children in Africa, including Nigeria, are: Poor nutrition, the level of awareness of the mother about basic health services, access to basic health and education services ,the level of immunization , the ability of the mother to prepare oral rehydration solutions at home , the availability of food , sanitation, cleanliness and safety of the living environment of the child.

2.5.1 Urban Rural Differentials In Child Mortality

The urban advantage in health indicators in Africa dates back to the nineteenth century with the establishment of urban enclaves that were set up to provide social services for the immigrant colonial settlers (Gould 1998). Disproportionate provision of water, sanitation, health care, and other social services in urban areas created huge disparities in health outcomes between urban and rural residents.

In his review of trends in rural-urban differences in child mortality in Africa, Gould (1998) argued that rural mortality has remained higher than urban mortality for more than a century after the arrival of the immigrant colonial settlers. This urban health advantage, coupled with the fact that most Africans live in rural areas, has led to a focus on rural areas in development planning and poverty reduction. However, with rapid urbanization in Sub-Saharan Africa, a new picture is emerging. Between 1980 and 2000, the region's urban population grew by about 4.7% per year, compared with 3.5% for the developing countries as a whole (United Nations Population Division 2006). Rapid urbanization in Africa is caused by a high natural increase in urban areas and the influx of mostly young adults migrating rural areas to cities in search of better livelihood opportunities. While the region has been experiencing rapid urban population growth, per capita gross domestic product (GDP) fell by an annual average of 0.8% between 1980 and 2000 (World Bank 2004). As a consequence of the sluggish economic performance and increasing levels of urbanization, large proportions of the urban population in many African countries are living in abject poverty and in overcrowded housing structures that do not have basic amenities, such as safe drinking water, sanitation, and garbage disposal services (APHRC 2002;Montgomery 2009; United Nations Human Settlements Programme [UN-Habitat] 2003). The rapid growth of the urban poor population in Africa has renewed interest in rural-urban and intra-urban differences in health and development indicators (Harpham 2009; Montgomery 2009; UN-Habitat 2003).

Although improvement in rural health was the main cause of the narrowing of the gap between rural and urban mortality during most of the past half century, the declining urban advantage in African cities in recent times has been attributed to the stalling, and sometimes worsening, urban health indicators (Gould 1998; UN-Habitat 2003).

Experience from the history of developed countries suggests that the direction and extent of rural-urban differences in child mortality depends on the level and rate of urbanization as well as the urban areas' economic capacity to generate employment opportunities and provide basic amenities. If the projected increase in African urbanization to more than 48% in 2030 (UN Population Division 2006) is realized without substantial improvement in economic performance and urban governance, it looks inevitable that the urban health disadvantage that characterized the major Western cities at the turn of the nineteenth century will be more pervasive in Africa (Gould 1998; Harpham 2009; Williamson and Galley 1995; Winter 1979; Woods and Hinde 1987). In recent years, monitoring rural-urban demographic and health differences has been made possible by the availability of data, such as those collected under the DHS program. Although the DHS program does not collect migration histories that would enable analysts to take complete account of residence during a reference period, it collects information on duration of stay in the current place of residence and, for migrants, on the point of origin. This enables some reconstruction of migration status during the reference period for most respondents. Using DHS and other types of data, some studies have demonstrated the value of taking into account migration when assessing rural-urban differences of demographic and health indicators in developing countries. Although a few of these studies found no significant difference in health outcomes between migrants and non-migrants (Coast 2006), the vast majority have found that migrants generally exhibit markedly different health and demographic outcomes compared with populations in their places of origin and destination, even if the direction of the association varies across countries and by the health issue under consideration (Brockerhoff and Yang 1994; Chattopadhyay et al. 2006; Kiros and White 2004; Konseiga et al. 2009; McKinney 1993; Ssengonzi et al. 2002; Stephenson et al. 2003).

2.5.2 Mother's Education And Child Spacing

There is a growing body of literature on the effect of two key variables, length of previous birth interval and mother's education, on infant mortality. Longer birth intervals improve the succeeding child's survival chances, even after controlling for a variety of socio-economic, behavioural, and biological factors. There are a number of explanations of why a shorter birth interval may be associated with increased risk of the following infant's death (Das Gupta 1990; Koenig et al. 1990; Miller et al. 1992; United Nations 1994, Michael Murphy et al, 2001). It may

deplete the ability of the mother's body to recuperate, thereby possibly affecting the succeeding infant's health. A short preceding interval may be the result of a premature birth, rather than reflecting a causal relationship per se (although the presence of a young infant may exacerbate the problems of coping with a premature baby). There may be competition for resources within families, which is likely to be particularly acute if a closely following birth occurs. Finally, there is an increased likelihood of transmission of infectious diseases.

The relationship between mother's education and infant mortality has become a major theme in developing country demography. Child mortality has been found to be higher among children born to mothers with limited education, and this finding continues to be endorsed by analyses of recent Demographic and Health Surveys (DHS) (Bicego and Ahmad 1996). The ways in which increased mother's education leads to lower child mortality have been discussed in detail (Caldwell and Caldwell 1991; Caldwell 1994; Michael Murphy et al, 2001).

In addition, there is the possible impact of the educational level of the society as a whole. In Sub-Saharan Africa, education has been held to be the most rapid way of reducing both child mortality and fertility levels - especially the education of girls (Michael Murphy et al, 2001). The education of females is important in its own right (Boehmer and Williamson 1996; Michael Murphy et al, 2001) and as an aspect of women's wider status. The latter consideration has been an additional reason for encouraging increases in their education, particularly at the secondary level (Hadden and London 1996). The education of females is the only socio-economic variable included in the World Bank's population projection model, where it is assumed to affect both fertility and mortality (World Bank 1994; Michael Murphy et al, 2001)

2.5.3 Cooking Fuel Materials And Household Environments

Globally, almost 3 billion people rely on biomass (wood, charcoal, crop residues, and dung) and coal as their primary source of domestic energy Opening the door to their homes makes for a hazy welcome: thick grey smoke fills the air, making breathing unbearable and bringing tears to the eyes. The inefficient burning of solid fuels on an open fire or traditional stove indoors creates a dangerous cocktail of hundreds of pollutants, primarily carbon monoxide and small particles, but also nitrogen oxides, benzene, butadiene, formaldehyde, polyaromatic hydrocarbons and many other health-damaging chemicals. Day in day out, and for hours at a time, women and their

small children breathe in amounts of smoke equivalent to consuming two packs of cigarettes per day. Where coal is used, additional contaminants such as sulphur, arsenic and fluorine may also be present in the air. (WHO, 2006).

Lack of access to clean, efficient, modern energy in the home can impact health in many ways. The most important direct health effects result from the air pollution caused by burning solid fuels, often indoors on open Ares and simple stoves (Bruce et al. 2000; WHO 2006). The indoor use of open fire or inefficient stoves in households releases large amounts of smoke from incomplete combustion of solid fuels—primarily wood, but in many cases coal, animal dung, and/or crop wastes. Breathing this smoke affects the health of all members of the family, but especially that of women and their young children.

According to Fayehun (2010) the physiological characteristics of children place them at risk of death due to an unhygienic household environment. In her study, she examined patterns of household environmental health hazards in the selected Sub-Saharan countries including Nigeria and concluded that the source of drinking water has a profound implication for the health outcomes of both mother and child. According to her findings, household where the cooking fuels is non-biomass has the risk of childhood diarrhoea significantly decreases by 20% for the low mortality group, and 38% for the high-mortality group, compared with households that use biomass fuel such as charcoal, firewood, and straw Improved sources of drinking water are less likely to be contaminated, while other sources, such as surface water and open wells, are more likely to carry disease-causing agents and that lack of availability of a sanitary facility can be a public health concern and can have adverse implications for child health.

2.6 PREVIOUS METHODS OF ESTIMATING DETERMINANT OF CHILDHOOD SURVIVAL

Several studies on infant and child mortality have been carried out using census and survey data. Most of these studies have estimated child mortality using indirect methods such as Trussel's technique and Preston method (Mojekwu & Ajijola, 2011; Jada, 1992; Omariba, 1993; Okumbe, 1996, Wanjohi, 1996). In Nigeria, Ogunjuyigbe (2004) combined Samoza method and univariate and bivariate analysis to calculate mortality indices for each woman in Ondo and Ekiti state. Ozumba and Nwogu-Ikojo (2008) applied multiple regressions with autocorrelation adjustment

to estimate mortality. Antai et al. (2010) employ the multilevel logistic regression while Doctor (2011) uses multivariate logistic regression to explore various determinants of Childhood mortality. All these studies find demographic, socio-economic and environmental factors (source of drinking water, sanitation facilities) to be significantly related to infant and child mortality.

Espo (2002) in his study, use indirect methods to estimate levels and trends of mortality in Malawi. The results indicate that source of drinking water and sanitation facilities are strong predictors of child mortality. Also, Folasade (2000) in her study to determine the relative significance of environmental and maternal factors on childhood mortality in southwestern Nigeria find that child mortality rate continued to be a function of an environmental factor namely: source of drinking water and a child care behaviour factor, where the child was kept when mother was at work. Similarly, Timaeus and Lush (1995), in a comparative study of rural areas of Ghana, Egypt, Thailand and Brazil, discover that children's health is affected by environmental conditions and the economic status of the household. Hala (2003) utilized duration modeling to assess the impacts of water and sanitation on child mortality in Egypt. Though sanitation is found to have more pronounced impact than water, the results also show that access to municipal water reduces the risk of mortality.

A Bayesian geoadditive survival model was introduced by Adebayo et al. (2002) to analyze child mortality in Nigeria. The results show the existence of a district-specific geographical variation in the level of child mortality. Klaauw and Wang (2003) developed a flexible parametric hazard rate framework for analyzing child mortality. Their model predicts significant correlation between child mortality and access to electricity, provision of sanitation facilities, improving maternal education and reducing indoor air pollution.

Jacoby and Wang (2003) in a related study, examine the linkages between child mortality, morbidity, and household quality and community environment in rural China using a competing risks approach. Their findings among others show that the use of clean cooking fuels, access to safe water and sanitation reduces the risks of child mortality. In examining the environmental determinants of child mortality in Ethiopia, Wang (2003) constructed three hazard models (the Weibull, the piecewise Weibull and the Cox model) to study three age-specific mortality rates by location, female education attainment, religion affiliation, income quintile, and access to basic

environmental services (water, sanitation and electricity). The results show a strong statistical relationship between child mortality and poor environmental conditions.

Adebowale et al (2011) sought to examine implication of parity progression and Birth Interval on Under-five mortality in Ekiti state. The result among others found that the level of education, place of residence), religion and birth interval were significant with under-five mortality. He concluded that Cox-proportional hazard multivariate model revealed that, increased under-five mortality risks were found to be associated with birth intervals of less than 24 months

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CHAPTER THREE

METHODOLOGY

3.1 STUDY AREA

The study uses data from the Nigeria Demographic and Health Survey (NDHS) 2008 and the annual abstract of statistics of the National Bureau of Statistics (NBS) 2009. The 2008 NDHS is a nationally representative survey of 33,385 women aged 15 to 49yrs and 15,486 men aged 15 to 59yrs in randomly selected households across the six geo-political zones in Nigeria. It was designed to capture information from 37 states (36 states plus the Federal Capital Territory, Abuja) of Nigeria. The sampling frame used was the 2006 Population and Housing Census of the Federal Republic of Nigeria conducted in 2006, provided by the National Population Commission (NPC).

3.2 DATA COLLECTION PROCEDURES

At Stage 1 NDHS sample was selected using a stratified two-stage cluster design consisting of 888 clusters, 286 in the urban and 602 in the rural areas. At Stage 2 an average of 41 households was selected in each cluster, by equal probability systematic sampling. All women aged 15-49yrs who were either permanent residents of the households in the 2008 NDHS sample or visitors present in the households on the night before the survey were eligible to be interviewed.

Childhood mortality estimates are based on information from women's birth histories collected from a special survey questionnaire for women called the women questionnaire. For each of these births, information was collected on sex, month and year of birth, survival status, and current age; and, if the child had died, the age at death is collected.

3.3 METHODS OF ANALYSIS

Frequency tables and graphs were used to present relevant variables. Descriptive statistics such as means, medians, ranges and SD was used to summarize quantitative variables, while categorical variables was summarized with percentages. Pearson's Chi-square test of association was used to investigate association between survival and the independent variables. Survival of children was analyzed using Cox Regression Model. Hazard ratios and

95% confidence intervals were presented. The Cox regression was done using the Forward Likelihood Ratio method and the model was terminated after 10 iterations given a final model with 10 variables included. All analyses were conducted at the 5% level of significance using SPSS 15.0.

3.4 SURVIVAL ANALYSIS: COX PROPORTIONAL HAZARD REGRESSION

Survival analysis is a collection of analytical techniques used to study and model the time to event occurrence. The techniques of survival analysis focus on examining the distribution of survival times and its relationship to predictor variables. The survival times are measured from a well-defined starting point, and can take on values in units of years, months, weeks, or days from the start of the study until the event takes place. There is a broad range of events that can be considered, such as death, disease incidence, disease recurrence, recovery, etc. A key issue in time to event analysis is censoring, or when the survival time is incomplete. Censoring occurs because some subjects are not observed to have the event during the length of their participation in the study. The three general reasons for censoring are the subject does not experience the event by the end of the study, the subject is lost to follow-up, and the subject withdraws from the study, due to death from other causes or adverse drug reaction. Censoring is the main basis for the use of survival analysis, because linear regression is an inappropriate technique to analyze incomplete data (Kleinbaum and Klein.2005)

Cox Proportional Hazard Regression was used to determine factors that affect survival. it is a semi-parametric survival analysis approach and is preferred in child survival analysis because classical parametric regression models have challenges with estimating small area effects and time constrained variables. Usually, conventional parametric approaches require high number of parameters for modeling purposes, which may result in unstable estimates with high variances,

A key reason for the popularity of the Cox model is that, even though the baseline hazard is not specified, reasonably good estimates of regression coefficients, hazard ratios of interest, and adjusted survival curves can be obtained for a wide variety of data situations. This means it is a "robust" model and it closely approximate the results for the correct parametric model. (Kleinbaum and Klein, 2005)

The Cox PH model is usually written in terms of the hazard model formula shown below

$$h(t|x, x, \ldots, x)) = h_0(t)\exp(\beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p x_p)$$

$$h(t, \boldsymbol{X}) = h_0(t) exp^{\Sigma_{i=1}^{p} \beta_i X_i}$$

$$Where\ \boldsymbol{X} = (X_1, X_2, \ldots . X_p)$$

This model gives an expression for the hazard at time *t* for an individual with a given specification of a set of explanatory variables denoted by **X**. That is, **X** represents a collection (sometimes called a "vector") of predictor variables that is being modeled to predict an individual's hazard.

The Cox model formula says that the hazard at time *t* is the product of two quantities. The first of these, $h_0(t)$, is called the unspecified **baseline hazard** function corresponding to the hazard function when all covariates take a value of 0. The second quantity is the exponential expression *e* to the linear sum of $\beta i\ Xi$, where the sum is over the *p* explanatory *X* variables. An important feature of this formula, which concerns the proportional hazards (*PH*) assumption, is that the baseline hazard is a function of *t*, but does not involve the *X*'s. In contrast, the exponential expression shown here, involves the *X*'s, but does not involve *t*. The *X*'s here are called **time-independent** *X*'s and $\beta_1, \ldots . \beta_p$ are regression parameters for the covariates.

3.5 BASIC ASSUMPTIONS OF COX PROPORTIONAL HAZARD REGRESSION

The Cox Proportional Hazard Regression follows no particular assumption, that is, it is a flexible approach. However some basic guidelines it follows includes: the hazard for any individual is a fixed proportion of the hazard for any other individual. Basic Cox Model assumes that the hazard functions for two different levels of a covariate are proportional for all values of t.

3.6 BASIC SURVIVAL FUNTIONS

3.6.1 The Cumulative Distribution Function

The cumulative distribution function (cdf) is very useful in describing the continuous probability distribution of a random variable, such as time, in survival analysis. The cdf of a random variable T, denoted FT (t), is defined by FT (t) = PT (T < t). This is interpreted as a function that will

give the probability that the variable T will be less than or equal to any value t that is chosen. Several properties of a distribution function F(t) can be listed as a consequence of the knowledge of probabilities. Because F(t) has the probability $0 < F(t) < 1$, then F(t) is a non-decreasing function of t, and as t approaches ∞, F(t) approaches 1. (Kleinbaum and Klein, 2005)

3.6.2 The Probability Density Function

The probability density function (pdf) is also very useful in describing the continuous probability distribution of a random variable. The pdf of a random variable T, denoted fT(t), is defined by

$$fT(t) = \frac{d\,FT\,(t)}{dt}$$

That is, the pdf is the derivative or slope of the cdf. Every continuous random variable has its own density function, the probability $P(a < T < b)$ is the area under the curve between times a and b. (Kleinbaum and Klein, 2005)

3.6.3 The Survival Function

Let $T > 0$ have a pdf f(t) and cdf F(t). Then the survival function takes on the following form:

$$S(t) = P\{T > t\}$$

$$= 1 - F(t)$$

The survival function gives the probability of surviving or being event-free beyond time t. Because S(t) is a probability, it is positive and ranges from 0 to 1. It is defined as $S(0) = 1$ and as t approaches ∞, S(t) approaches 0. (Kleinbaum and Klein, 2005)

3.6.4 Hazard Function

The hazard function h(t) is given by

$$h(t) = P\{\, t < T < (t + \Delta) \mid T > t\}$$

$$= f(t) / (1 - F(t))$$

$$= f(t) / S(t)$$

The hazard function describes the concept of the risk of an outcome (e.g., death, failure, hospitalization) in an interval after time t, conditional on the subject having survived to time t. It is the probability that an individual dies somewhere between t and (t + Δ), divided by the probability that the individual survived beyond time t. The hazard function seems to be more intuitive to use in survival analysis than the probability density function because it attempts to quantify the instantaneous risk that an event will take place at time t given that the subject survived to time t.(Kleinbaum and Klein, 2005)

3.7 HAZARD RATIO

In survival analysis, the measure of effect typically obtained is called a **hazard ratio;** as with the logistic model, this hazard ratio is expressed in terms of an exponential of one or more regression coefficients in the model. The hazard ratio, although a different measure from an odds ratio, nevertheless has a similar interpretation of the strength of the effect. A hazard ratio of 1, like an odds ratio of 1, means that there is no effect; that is, 1 is the null value for the exposure–outcome relationship. A hazard ratio of 10, on the other hand, is interpreted like an odds ratio of 10; that is, the exposed group has ten times the hazard of the unexposed group. Similarly, a hazard ratio of 1/10 implies that the exposed group has one-tenth the hazard of the unexposed group. In general, a hazard ratio (*HR*) is defined as the hazard for one individual divided by the hazard for a different individual. The two individuals being compared can be distinguished by their values for the set of predictors, that is, the *X*'s.

We can write the hazard ratio as the estimate of $h(t, X^*)$ divided by the estimate of $h(t, \mathbf{X})$, where X^* denotes the set of predictors for one individual, and **X** denotes the set of predictors for the other individual.

$$HR = \frac{h(t, X^*)}{h(t, X)}$$

Where $X^* = X_1^*, X_2^*, \ldots\ldots X_p^*)$ and $X = (X_1, X_2, \ldots\ldots X_p)$ denotes the set of X's for two individuals.

3.8 LIST OF STUDY VARIABLES

3.8.1 The Outcome (Dependent) Variable, Y_{it}

The outcome variable denoted by Y, and has only two possible outcomes: survival death or alive at the end of age of 5 years.

The event

$Y = 1$ denotes the death of an under-five child, whereas the event

$Y = 0$ denotes the survival of a child under 5 years

3.8.2 Independent Variables Of The Study ($X_1, X_2, \ldots, X_P$)

The independent variables consisted of several socio-economic, demographic and environmental variables that are associated with under-five mortality. For the purpose of performing survival analysis, the following variables were used for data analysis (Table 3.1):

TABLE 3.1: LIST OF VARIABLES

VARIABLES	RESPONSES
Region of Residence	North Central, North East, North West, South East, South West, South South
Place of Residence	Rural, Urban
Religion	Christianity, Islam, Traditional
Mother's Age	<20 years, 20-24 years, 25-34 years, ≥35 years
Wealth Index	Rich, Middle, Poor
Level of Education	None, Primary, Secondary and above
Household Size	≤ 5, < 5
Condition of Floor	Good (*Finished*) Poor (*Natural, Rudimentary*)
Condition of Wall	Good (*Finished*) Poor (*Natural, Rudimentary*)
Availability of Toilet facility	Yes, No
Availability of Electricty	Yes, No
Source of Drinking Water	Controlled, Uncontrolled
Category of Cooking Materials	Biomass (*Wood, crop residue, dung cake, straw, lignite. Charcoal*) Non-Biomass (*Electricity, LPG, Biogas*)
Place of delivery	Hospitals, Others
Size of Baby at Birth	Small, Average, Large
Preceding Birth Interval	≥2, < 2
Number of Antenatal Visit	None, 1-3 times, More than 4 times
Postnatal Visit within 2 months	Yes, No

CHAPTER FOUR

RESULTS

4.1 CHARACTERISTICS OF STUDY SUBJECTS

Of the 28647 children, 14604 (51.0%) were males and 14043 (49.0%) were females. A total of 3201(11.2%) of the 28647 children had died prior to their fifth birthday whereas, 25446 were alive at the time the survey was conducted.

Majority of the children were from households in urban areas (73.4%) compared with 26.6% from rural areas. About 12% of children born in the rural environment did not survive until their fifth birthday compared with 8.3% from the urban area. (χ^2 = 85.401; p<0.05) A larger proportion of children were from North West region (27.7%) compared with 8.6% from the South east. (Table 4.1)

The mean age of mothers was 29 years. About 50% of the mothers were between the ages of 25 and 34years, 50% had no formal education and about 27% had secondary education and above. Out of 3201 children that suffered mortality 12.5% of their mothers were 35 years and above, 11.9% between 20-24 years and 10.1% for age range 25-34 years. (χ^2= 32.984; p<0.05) (Table 4.1)

Majority (56.8%) of the mothers were Muslims. 18.1% of children whose mother works away from home were dead before their fifth birthday compared 7.1% whose mother works at home (χ^2=525.540; p<0.05). (Table 1)

TABLE 4.1: DISTRIBUTION OF GENERAL CHARACTERISTICS OF MOTHERS BY CHILD MORTALITY

Variables	CHILD IS ALIVE		TOTAL	χ^2	P
	Yes (%)	No (%)	N (%)		
Age Category					
<20 years	1396 (88.1)	188 (11.9)	1584 (5.5)		
20-24 years	4991(88.1)	674(11.9)	5665(19.8)	32.984	p<0.05
25-34 years	12684(89.9)	1427(10.1)	14111(49.3)		
≥ 35 years	6375 (87.5)	912 (12.5)	7287(25.4)		
Total	**25446(88.8)**	**3201 (11.2)**	**28647(100.0)**		
Mean(SD)	29.28 (7.078)				
Level of Education					
Secondary& above	7064(92.0)	618(8.0)	7677(26.8)	124.628	p<0.05
Primary	5831 (89.0)	721(11.0)	6552(22.9)		
None	12551(87.1)	1867(12.9)	14418(50.3)		
Total	**25446 (88.8)**	**3201(11.2)**	**28647(100.0)**		
Residential Area					
Urban	6980 (91.7)	633 (8.3)	21034(73.4)		
Rural	18466(87.8)	2568 (12.2)	7613(26.6)	85.401	p<0.05
Total	**25446(88.8)**	**3201 (11.2)**	**28548(100.0)**		
Religion					
Christianity	8993 (76.6)	2745 (23.4)	11738(41.3)		
Islam	15763(97.6)	389 (2.4)	16152(56.8)		
Traditional	503 (92.0)	44 (8.0)	547(1.9)	3018.968	p<0.05
Total	**25259(88.8)**	**3178 (11.2)**	**28437(100.0)**		

Working Status					
Not working	8322 (92.1)	713 (7.9)	9035 (31.5)	143.292	p<0.05
Working	17123 (87.3)	2488 (12.7)	19611 (68.5)		
Total	**25445 (88.8)**	**3201(11.2)**	**28646 (100.0)**		
Region of Residence					
North Central	4511 (90.0)	501(10.0)	5012 (17.5)		
North East	5714 (87.5)	817(12.5)	6531 (22.8)		
North West	6888 (86.8)	1047 (13.2)	7935 (27.7)	125.379	p<0.05
South East	2145 (88.7)	272 (11.3)	2417 (8.4)		
South West	2924 (90.1)	323 (9.9)	3247 (11.7)		
South South	3078 (93.4)	218(9.9)	3296 (11.8)		
Total	**25446(88.8)**	**3201 (11.2)**	**28647 (100.0)**		
Working where					
Home	8793 (92.9)	675 (7.1)	9468 (48.6)		
Away	8191 (81.9)	1810 (18.1)	10001 (51.4)	25.540	P<0.05
Total	**16984 (87.2)**	**2485 (12.8)**	**19469 (100.0)**		

The distribution of households according to household conditions showed that 60% of 28647 respondents had household size greater than 5, and 12.8% of children born into such homes died before their fifth birthday against 10.1% from home size lesser than 5 (χ^2 = 49.274; p<0.05) (Table 4.2).

Furthermore, 51.2% and 45.2% had good floor and wall condition respectively, of the 3159 children who died before their fifth birthday; 1342 (9.3%) were born to mothers who reported they have good wall condition against 1817 (13.2%) who reported a poor flooring condition. (χ^2 = 108.273; p<0.05) About 67%) had access to basic toilet facilities and 11099 had access (39.1%) to electricity. Furthermore, about 49.7% had access to controlled source of drinking water. Of the 3199 children who experienced mortality, 1310 (9.8%) had mothers who reported controlled source of drinking water compared with 1889(12.4%) who reported uncontrolled source. (χ^2 = 48.583; p<0.05) (Table 4.2).

The lowest wealth index category-Poor, consists of 50.5% of the households. A total of 502(3.5%) children who died before their fifth birthday were from poor homes compared with 678(21.1%) from middle income homes and 2021(23.6%) from rich homes. (χ^2 = 2203.176, p<0.05). About 60% of the households in this study were poor and 1.5% of the 28374 households use High Pollution fuel for cooking (Table 4.2).

TABLE 4.2: DISTRIBUTION OF HOUSEHOLD CONDITIONS AND CHILD MORTALITY

Variables	CHILD IS ALIVE		TOTAL	χ^2	P
	Yes (%)	No (%)	N (%)		
Household Size					
≤5	10082 (87.2)	1475 (12.8)	11557 (40.3)		
>5	15364 (89.9)	1726 (10.1)	17090 (59.7)	49.274	p<0.05
Total	**25446(88.8)**	**3201 (11.2)**	**28647 (100.0)**		
Condition of Floor					
Good	13141 (90.7)	1342 (9.3)	14483 (51.2)		
Poor	11985(86.8)	1817 (13.2)	13802 (48.8)	108.273	p<0.05
Total	**25126 (88.8)**	**3159 (11.2)**	**28285 (100.0)**		
Condition of wall					
Good	11573(91.1)	1124 (8.9)	12697 (45.2)	127.903	p<0.05
Poor	13360 (86.9)	2019 (13.1)	15379 (54.8)		
Total	**24933 (88.8)**	**3143 (11.2)**	**28076 (100.0)**		
Availability of Toilet facility					
Basic types	16768 (88.6)	2151 (11.4)	18919 (66.5)	2.150	p>0.05
None	8492 (89.2)	1027 (10.8)	9519 (33.5)		
Total	**25260(88.8)**	**3178 (11.2)**	**28438 (100.0)**		
Availability of Electricity					
Yes	10094(90.9)	1005 (9.1)	11099 (39.1)		
No	15099 (87.4)	2167 (12.6)	17266 (60.9)	83.127	p<0.05
Total	**25193 (88.8)**	**3172 (11.2)**	**28365 (100.0)**		
Source of Drinking Water					
Controlled	12076 (90.2)	1310 (9.8)	13386 (49.7)	48.583	p<0.05

Uncontrolled	13361(87.6)	1889 (12.4)	15250 (53.3)		
Total	**25437 (88.8)**	**3199 (11.2)**	**28636 (100.0)**		
Category of Cooking Fuel Material					
Non-Biomass Fuel	22855 (93.2)	1663 (6.8)	24518 (86.4)	3456.166	p<0.05
Biomass Fuel	2359 (61.2))	1497 (38.8)	3856 (13.6)		
Total	**25214 (88.9)**	**3160 (11.1)**	**28374 (100.0)**		
Wealth Index					
Poor	13973(96.5)	502 (3.5)	14475 (50.5)		
Middle	4931 (87.9)	678 (21.1)	5609 (19.6)	2203.176	p<0.05
Rich	6542 (76.4)	2021 (23.6)	8563 (29.9)		
Total	**25466 (88.8)**	**3201 (11.2)**	**28647 (100.0)**		

Uncontrolled	13361(87.6)	1889 (12.4)	15250 (53.3)		
Total	**25437 (88.8)**	**3199 (11.2)**	**28636 (100.0)**		
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The Largest Proportion of the 28647 children whose records were present in the survey were given birth to in facilities other than the Hospital (66.3%) compared with 33.7% whose delivery took place in the hospital.(χ^2= 33.580; p <0.05) 84.9% of the children were above average size at birth and about 77% were born at least 2 years after the previous birth, out of which 9.3% did not survive to their fifth birthday compared with 17.6% from children born with less than 2 years preceding birth interval (χ^2= 289.596; p <0.05) (Table 4.3).

About 42.1% of 23255 mothers did not go for antenatal care clinic. The median for antenatal attendance was 3 (Range = 50), 6.9% went less than four times, 67.3 % went more than four times. Of the 2867 children who did not survive up to their fifth birthday, 13.3 % had mothers who attended antenatal care more than 4 times, 7.0% from mothers who attended less than 4 times. (χ^2 =451.309; p<0.05). However, only 12.4% visited the clinic for postnatal attention within the first two months of birth.(χ^2 =195.377; p<0.05) (Table 4.3)

TABLE 4.3: DISTRIBUTION OF CHILD MORTALITY BY SIZE OF BABY AT BIRTH, CHILD SPACING AND HEALTH CARE FACTORS

Variables	CHILD IS ALIVE		TOTAL	χ^2	P
	Yes (%)	No (%)	N (%)		
Place of Delivery					
Hospitals	8724 (90.3)	2268 (11.9)	9657 (33.7)		
Others	16722 (88.1)	933 (9.7)	18990 (66.3)	33.580	p<0.05
Total	**25446 (88.8)**	**3201 (11.2)**	**28647 (100.0)**		
Size of Baby at Birth					
Less than Average	3643 (85.9)	596 (14.1)	4239 (15.1)	66.223	p<0.05
Average	9602 (85.9)	1130 (10.5)	10732 (38.4)		
Above Average	11759 (90.4)	1253 (9.6)	13012 (38.4)		
Total	**25004 (89.4)**	**2979 (10.6)**	**27983 (100.0)**		
Preceding Birth Interval					
≥ 2 years	16220 (90.7)	1660 (9.3)	17880 (76.9)	289.596	p<0.05
< 2 years	4427 (82.4)	948 (17.6)	5375 (23.1)		
Total	**20647 (88.8)**	**2608 (11.2)**	**23255 (100.0)**		
Number of Antenatal Visit					
None	6711 (95.7)	302 (4.3)	7013(42.1)	451.309	p<0.05
1-3	1825 (93.0)	138 (7.0)	1963 (6.9)		
More than 4	16026 (86.8)	2427(13.3)	18453 (67.3)		
Total	**24562 (89.5)**	**2867 (10.5)**	**27429 (100.0)**		
Median	3				
Range	50				

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Median	3				
Range	50				

Postnatal Visit within 2months					
Yes	1243(84.7)	224 (15.3)	1467 (12.4)	195.377	P<0.05
No	9810(94.5)	572 (5.5)	10382 (87.6)		
Total	**11053 (93.3)**	**796 (6.7)**	**11849 (100.0)**		

4.2 RESULTS FROM SURVIVAL ANALYSIS

The hazard ratio for under-five mortality by region of residence showed that mortality was about two times higher for children of mothers residing in the South South (HR=2.031; 95% C.I= 1.272 – 3.243 , p<0.05) and 10 times higher for children residing in the North Western region (HR = 10.053; 95% C.I= 6.665– 15.162, p<0.05) compared with children from mothers in the North Central region (Table 5). The risk of dying before the fifth birthday was higher for children whose mothers are Muslims (HR = 2.343; 95% C.I= 1.407 – 3.903, p<0.001) and lower for children whose mothers are traditional worshipers (HR = 0.053; 95% C.I= 0.030 – 0.095, p<0.001) compared with children whose mothers are Christians (Table 4.4).

Children from the mothers belonging to "Rich" wealth index category had higher chances of surviving (HR = 0.785; 95% C.I= 0.620 – 0.996, p=0.046) and those from the middle category of wealth indices had twice the chance of surviving till their fifth birthday (HR = 0.435; 95% C.I= 0.337 – 0.563, p<0.001) compared with children from relatively poor mothers.

Furthermore, the odds of surviving was higher for children with mothers from homes with basic toilet facilities and household size less than five than from mothers from homes without any toilet facility(HR = 0.776; 95% C.I= 0.628 – 0.958, p=0.019) and household size greater than 5 respectively (HR = 0.810; 95% C.I= 0.678 – 0.969, p=0.021). The risk were about two times higher for children whose mothers use biomass cooking materials than children of mothers who use non-biomass cooking materials.(HR = 0.448; 95% C.I= 0.354 – 0.567, p<0.001).

Children whose mothers attended postnatal clinic within the first 2 months of birth had better chances of surviving to their fifth birthday (HR = 0.755; 95% C.I= 0.620 – 0.920, p=0.005) compared with children whose mothers did not go for the postnatal visits (Table 4.4).

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TABLE 4.4: COX PROPORTIONAL HAZARD REGRESSION OF UNDER-FIVE MORTALITY

Variable	B	S.E	p-value	Hazard Ratio	95% Confidence Interval	
					Lower	Upper
Region of Residence						
North East	1.066	0.222	<0.001	2.903	1.879	4.484
North West	2.308	0.210	<0.001	10.053	6.665	15.162
South East	1.512	0.206	<0.001	4.536	3.030	6.790
South West	0.947	0.254	<0.001	2.579	1.568	4.242
South South	0.708	0.239	0.003	2.031	1.272	3.243
North Central				1		
Religion						
Islam	0.852	0.260	0.001	2.343	1.407	3.903
Traditional	-2.937	0.296	<0.001	0.053	0.030	0.095
Christianity				1		
Wealth Index						
Middle	-0.831	0.131	<0.001	0.435	0.337	0.563
Rich	-0.242	0.121	0.046	0.785	0.620	0.996
Poor				1		
Household Size						
≤ 5	-0.210	0.091	0.024	0.810	0.678	0.969
> 5				1		
Availability of Toilet Facility						
Basic Types	-0.254	0.108	0.019	0.776	0.628	0.958
None				1		
Condition of Floor						
Good	-0.468	0.106	<0.001	1.596	1.297	1.963
Poor				1		

Cooking Fuel Material						
Non Biomass	-0.803	0.121	<0.001	0.448	0.354	0.567
Biomass						
Size of Baby at Birth						
Small	0.539	0.117	<0.001	1.284	0.464	0.734
Large	0.322	0.118	0.006	0.725	0.575	0.914
Average				1		
Preceding Birth Interval						
<2	-0.454	0.092	<0.001	0.635	0.530	0.761
≥2				1		
Postnatal Visit within 2 months						
Yes	-0.281	0.101	0.005	0.755	0.620	0.920
No				1		

CHAPTER FIVE

DISCUSION, CONCLUSION AND RECCOMENDATIONS

5.1 DISCUSSION

According to the NDHS 2008 report, U5MR for Nigeria is 157 per 1000 live births. This is quite high compared to neighbouring countries like Ghana, 74 per 1000 live births, Togo, 103 per 1000 live births, Cote d'Ivoire 123 per 1000 live births and Republic of Benin, 115 per 1000 live births. However developed countries like United states of America has U5MR of 8 per 1000 live births, 4 per 1000 live births for both France and Germany and 2 per 1000 live births for Iceland.

The study showed that survival of children to their fifth year birthday in South west Nigeria was better than those residing in the North central. Similar studies have shown that children tend to survive better in regions with better agricultural output than those regions with low output (Kayode et al, 2012). This may be associated with spatial inequality in social development in the community within regions, population Density, differential levels of regional development, Political and religious situations, vegetations across regions as well as varying economic Resources. (Kayode et al, 2012, Adebayo et al, 2002).

It was also discovered that being born to a mother who practiced "traditional" religion was significantly associated with risk of U5M. This may be linked to religious myths they may have concerning child birth. This finding is supported by Adebowale et al (2011) who concluded that traditional worshippers might be losing more under five due to Low patronage of modern health facilities in terms of acceptability and use of local herbs that have not been scientifically tested.

This study also revealed that children from poor mothers had higher U5MR and good toilet facilities at home can reduce mortality among Under 5. Maluleke and Worku (2009) Reported that ownership of flush toilets is a reliable indicator of wealth and social status, while Worku (2011) concluded that children from parents who do not have access to flush toilet facility are more likely to die before celebrating their fifth birthday compared to children from parents with access to good toilet facility.

Findings also showed that children that were small at birth were more likely to die before their fifth birthday than those with average birth weight. This is consistent with the report of Uthman

(2008); who reported that more than one in every ten preterm babies in Nigeria do not survive to their first birthday. A possible explanation for this can be that preterm births due to the immaturity of their organs, have more difficulty adapting to extra-uterine life. Most premature babies are prone to have sepsis which is one of the major causes of Under 5 Mortality (Kayode et al, 2012)

The findings also showed that children from home where household size is greater than five had low mortality rates. These children had child mortality rate of about 23% compared with those from household size less than five. According to Amankwaa (1996), possible reasons for this might be competition for food, basic infrastructures and other resources which are essential for child survival. This phenomenon can be explained based on the fact that as family size increases, intra-familiar competition for foods and other essential services require for child survival also increases. Parental attention might also decrease with increase in household size.

Proper health attention for mothers during and after pregnancy also was shown to be important in the survival of child till his or her fifth birthday. The study showed that children from mothers who visited the clinic for postnatal attention within the first 2 months of birth had better chances than children whose mothers did not visit the clinic for postnatal attention. Studies have shown that these services reduced Under five mortality (Becher et al, 2004). It also supports the NDHS 2008 report that postnatal care helps prevent complications after childbirth. It is common knowledge that children whose mothers are in the habit of seeking medical attention will allow their children to have the privileged of receiving proper and necessary immunization and treatment of preventable diseases which includes polio, DPT, Hepatis B, HPV, Rotavirus e.t.c.

Similarly, it was revealed that child mortality was higher in homes using biomass fuel materials like charcoal, wood crop residue, dung, straw and lignite, compared with children from homes using non- biomass fuel like electricity, LPG, biogas and kerosene. This is in agreement with Ezzati M et al, (2002) who concluded that Exposure to indoor air pollution (IAP) from the combustion of solid fuels is an important cause of mortality in developing countries

However, the association of good flooring conditions with high U5M is inconsistent with previous UNICEF (2001) report. This might be due to the fact that mothers with good flooring

conditions are probably more educated and report childhood illness and mortality better than mothers who are not so educated and with poorer flooring conditions.

5.2 LIMITATION OF STUDY

The reliability of mortality estimates depends on the sampling variability of the estimates and on non-sampling errors. Non sampling errors depend on the completeness with which child death are recalled and reported, and the accuracy of the date of birth information for living children, and the age at death information for deceased children provided by the mother.

Typically, the most serious source of non-sampling errors in a survey like this that collects retrospective information on births and death is the underreporting of births and deaths for children who were not living at the time of the survey. Several DHS studies show evidence of downward bias in reporting child death (Jacoby & Wang, 2003). For example, mothers may be reluctant to talk about their dead children either because it brings back sad memories or because their culture discourages mention of the dead. Even if a respondent is willing to talk about a dead child, she may forget events that happened in the more distant past, particularly if a child was alive only for a short time.

5.3 CONCLUSION AND RECOMMENDATION

This study has shown that region of residence.bio demographic and environmental factors and other socio demographic factors are important determinant of Under-five Survival in Nigeria. Therefore, there is a need to focus on improving child survival particularly in the Northern region. In addition, educating mothers on the danger of several births to reduce household size, awareness on the danger of using biomass materials for cooking, improving housing conditions and the importance of postnatal visits for checkups should be encouraged.

It will make a great difference and it would be of great benefit if proper considerations are given to improve child survival in Nigeria. It is a cause worth pursuing.

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APPENDIX 1

Child Survival Indicators in Nigeria: Current Situation

Total population (000)	158,423
Crude birth rate (CBR) (per 1,000)	41.7
Infant mortality rate (IMR) (per 1,000)	88
Under-5 mortality rate (U5MR) (per 1,000)	143
Neonatal mortality rate (per 1,000)	40
Low birth weight Incidence (%)	12
Antenatal visit for woman (4 or more visits, %)	45
Early initiation of breastfeeding (within 1 hour of birth, %)	38
Use of improved drinking water sources (%)	58
Use of improved sanitation facilities (%)	31

(Sources: UNICEF 2012 Nigeria Country Profile: Maternal, Newborn & Child Survival