Challenges of Reducing Under-Five Mortality: an Analysis of Contributing Factors from the Nigerian Context

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ESTHER OLUWAFEYIKEMI ADERINWALE

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Dr. John Cameron (Supervisor)

Prof. Arjun S. Bedi (reader)

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Inquiries:

DEDICATION

This project is dedicated to the ancient of days, the One who was, who is and is to come whose grace saw me through this phase of my life.

Also to my wonderful parents: Mr. & Mrs. Aderinwale whose love, care, support and prayers kept me going. I love you.

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List of Acronyms

FMoH	Federal Ministry of Health
MDG	Millennium Development Goal
NDHS	Nigeria Demographic Health and Survey
NHIS	National Health Insurance Scheme
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
WHO	World Health Organization
U5MR	Under-Five Mortality

Abstract

In a bid to deepen understandings about underlying causes of the uneven success in reducing global child mortality rates by 2015 (MDG 4), this research analyses the situation in Nigeria, a country that ranks second highest in global child mortality ratings. Using the proximate framework for child survival developed by Mosley and Chen (1984) and extant literature, this study identified factors influencing child survival at global and national levels. An empirical investigation was subsequently conducted using the third and fourth rounds of the Nigeria Demographic and Health Survey (NDHS) in years 2003 and 2008 to identify factors that determine the likelihood of child mortality in the country. Hence, the empirical strategy adopted was a Probit estimation technique. The results of which suggested that bio-demographic factors and environmental characteristics of the household are primary factors driving child mortality in Nigeria.

Taking it a step further, the study delved deeper into a critical analysis of particular bio-demographic factors and environmental characteristics that significantly impacted child mortality. An identified key factor was birth spacing which was then analysed from biomedical and cultural perspectives to provide a holistic examination of Nigeria's child mortality situation. This contextual approach revealed various complexities underlying birth spacing across different cultural settings and ethnicities within Nigeria.

This study is indicative of the importance of understanding the local contexts and pathways through which main causes of child mortality operate in high child mortality countries like Nigeria. It also highlights the need for more research that investigates structural causes intensifying the spate of child mortality especially as these causes are quite resistant to Quick-fix policies tailored to achieve the global priority of reducing child mortality.

Relevance to Development Studies

In light of the huge commitment from supranational, national and sub-national levels towards ensuring the survival of every child through early childhood, this study analyses the situation in Nigeria- a country that significantly constitutes a clog in the wheel of achieving balanced global survival and development of children. This study sought for a contextual understanding of the Nigerian child mortality situation and found that understanding the pathways through which determinants of child mortality operate across different settings is crucial to reduce under-five mortality. Moreover, an understanding of the Nigerian context can provide a roadmap for identifying similar factors in other contexts, to foster the tailoring of preventive and curative policies that consider local complexities in the drive to ensure global development.

Keywords

Chapter 1
Introduction

The health status of children, while important in itself not only for ethical or posterity reasons, is also a widely important factor to consider in the evaluation of a country's social development. Its significance is highlighted by its designation as an overall measure of a society's socioeconomic condition and the quality of life of its citizens (UNDP 2007). Furthermore, one can infer that "the quality of the lives of children provides a good sign of a community's prospect for the future" (Kent 1991:1). This indicates why children's health and promotion of their survival has been a globally publicized priority, gaining prominence at regional, national and international levels over the last two decades. For instance, 3 out of the 8 Millennium Development Goals adopted by the United Nations and its member countries are targeted at saving and improving the lives of children (WHO 2002:4).

The UNICEF report on levels and trends of child mortality (2012) suggested that there has been a marked improvement in worldwide child survival, as mortality rates especially in children under the age of five years have declined greatly compared to what they were in the 1990s. However, it was found that success rates had been inconsistent and unequal across and within regions of the world (UNICEF 2012a:1). Hence, the report ironically described the "story of child survival over the last two decades as one of significant progress and unfinished business" (ibid). This being said, a regional decomposition of the global burden of deaths among children aged below five revealed that the concentration of mortality is found in Sub-Saharan Africa and South Asia (UNICEF 2012b:8) (See figure 1).

Figure 1 Breakdown of the concentration of the global burden of under-five mortality

Source: UNICEFa, 2012
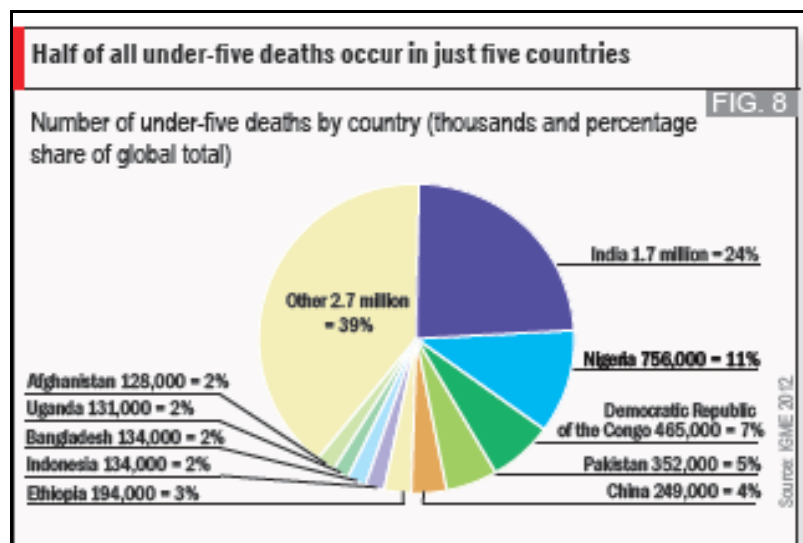
The increasing gaps between South Asia, Sub-Saharan Africa and the rest of the world further emphasize the inequities that subsist in child survival. Apart from poor nutrition and vaccine preventable deaths (that arises from diseases

such as malaria, pneumonia among others) which is often regarded as the underlying cause of death among children under five years (Black et al. 2010: 1985), other contributory factors to the increasing gaps identified at the national/subregional level is conflict or violence and political fragility (UNICEF 2012b:12) as in the Democratic Republic of Congo. These inequalities continue to pose a clog in the wheel of balanced global development in ensuring the survival of about two-thirds of children aged less than five years in the world by 2015 (Millennium Development Goal 4).

This paper is motivated by the heterogeneity in child mortality rates that exists across and within Sub- Saharan Africa and particularly in Nigeria. The choice of this country is deeply rooted in not just its enormous contribution as the second largest contributor to under-five mortality rates in the world (see figure 1) but also in its extremely low average annual rate of reduction towards achieving the 2015 MDG target (as shown in table 1) despite its relative strength[1].

Table 1 Country progress towards MDG 4

Country or territory	Under- five mortality rate (per 1000)			Average annual rate of reduction (%)	Summary assessment of progress
	1990	2000	2008		
India	116	94	69	2.9	Insufficient progress
Nigeria	230	207	186	1.2	Insufficient progress
Democratic Republic of Congo	199	199	199	0.0	No progress
Pakistan	130	108	89	2.1	Insufficient progress
China	46	36	21	4.4	On track
Ethiopia	210	148	109	3.6	Insufficient progress
Indonesia	86	56	41	4.1	On track

[1]Nigeria is regarded the Giant of Africa (2nd fastest growing African economy) and from the list of countries in Figure 1, it is the only non-conflict African country with such staggering under-five mortality figure and has comparatively low population (relative to India and China). Hence, there is a need to understand the determinants and/or factors contributing to the slow rate of progress in ensuring child survival in a relatively "stable" country.

Bangladesh	149	91	54	5.6	On track
Uganda	186	156	135	1.8	Insufficient progress
Afghanistan	260	257	257	0.1	No progress

"on track" indicates that the under-five mortality rate for 2008 is less than 40 per 1,000 or that it is 40 or more with an average annual rate of reduction of 4% or higher for 1990–2008;

"insufficient progress" indicates that the under-five mortality rate for 2008 is 40 or more with an average annual rate of reduction of 1%–3.9% for 1990–2008;

"no progress" indicates that the under-five mortality rate for 2008 is 40 or more with an average annual rate of reduction of less than 1% for 1990–2008.

Adapted from WHO and UNICEF 2010

In order to understand factors driving the high rates of under-five mortality in Nigeria, this paper attempts to analyze findings from the third and fourth rounds of the Demographic and Health Surveys conducted in Nigeria in years 2003 and 2008. Using information on the individual mortality outcomes of children born 0-59 months preceding the surveys, this study will examine factors associated with the likelihood of child mortality in Nigeria. Previous studies on determinants of under-five mortality in Nigeria found that regional disparities, education, poor health care utilization (Adebowale et al. 2012, Antai 2011, Kayode et al. 2012) and place of residence (Antai et al. 2010) were significantly associated with the likelihood of under-five mortality. Nevertheless, beyond what these studies have shown, this study aims to use the econometric results as a guide to delve into a critical analysis of the pathways through which the identified key factors influence the odds of under-five mortality in the Nigerian context, thus providing a holistic analysis of the child mortality situation in Nigeria.

To begin with, under-five mortality is situated in the existing literature on the subject, using the Mosley and Chen's proximate framework but particularly identifying fundamental issues in the Nigerian context that contribute to dismal under -five mortality rates. Then an empirical framework surrounding this child health outcome was developed based on findings. Thereafter, the data sets used in this study was discussed alongside its limitations. Later, the empirical scrutiny of the determinants and/or factors that have contributed to, or are responsible for the high rates of child mortality in Nigeria was conducted.

Furthermore, based on the econometric results and in a bid for a clearer and contextual understanding of pathways through which identified factors (precisely birth spacing) influence, the penultimate chapter examines the relationship between birth spacing and the likelihood of under-five mortality from a bio-medical and behavioral/cultural perspective. Conducting such contextual pathways is important, since it would aid developing tailor made strategies and prioritizing effective interventions towards increasing the survival chances of Nigerian children. Moreover, since child mortality is the end result of (disease) processes and (biological, social and cultural) interactions it is important to analyze contextual pathways of other determinants in high mortality settings. This is an avenue for further research towards achieving MDG 4 within a practical time frame.

The remainder of this paper is organized as follows: Chapter 2 presents a review of the determinants of child mortality initially from a global perspective and subsequently with particular attention to Nigeria, by reviewing the situation

of child health and the key health issues prevalent in the country. Chapter 3 entails data and empirical analysis, alongside a report of findings. Based on the determinants of mortality identified in the previous chapter, I delved into a critical analysis (from a bio-medical and behavioral/cultural perspective) of the relationship between birth spacing (an identified key determinant) and the likelihood of under-five mortality in chapter 4. Chapter 5 synthesizes all the findings and presents a conclusion based on insights gained from the analysis.

Chapter 2

Under- Five Mortality: The Barometer of Child Well-Being &Health

Under-five mortality also known as U5MR is defined as the probability of dying between birth and the fifth year birthday. It is expressed as the number of deaths in the age range 0 to 5 per 1000 live births, if subject to current mortality rates (Hill et al., 2012:1). Among the indicators of child health status (infant mortality, neo-natal mortality), U5MR is a reliable indicator for statistical analysis since it is mostly free from non-sampling errors[2] inherent in other indicators. Moreover, it reflects not only child mortality levels but also reflects the position of the health and socioeconomic condition of the broader population because it is often referred to as the outcome of diverse inputs that include: "the nutritional status and the health knowledge of mothers; the level of immunization and oral rehydration therapy; the availability of maternal and child health services (including prenatal care); income and food availability in the family; the availability of safe drinking water and basic sanitation; and the overall safety of the child's environment, among other factors" (UNICEF 2008).

The growth and development of a child is subject to the interplay of the living conditions of the family and the resources as well as services available in the surrounding community. This interaction produces biological risk factors that act on the child's health in form of illness and diseases, of which death is the most extreme outcome. Hence, mortality in children especially in developing countries is associated with a broad range of bio-demographic, health and related social factors (Uddin et al. 2009:271). These factors include maternal and child health care services, environmental health factors and socio-economic factors.

2.1 Determinants of Under-Five Mortality

The proximate framework for child survival developed by Mosley and Chen (1984) (see figure 2) further asserts the pathway through which socioeconomic factors influence mortality through biological mechanisms called proximate determinants. I would like to state that some factors have been examined much more thoroughly than others therefore the following review is intended to guide the choice of variables for this analysis, to avoid a selective bias while also ensuring that relevant contextual factors are not dismissed.

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[2]Non-sampling errors like misreporting of age at death, this usually arise when mothers cannot recall precise information (age) about the dead child which in extreme cases cause transfer (s) of death (heaping) from one childhood mortality category to another such as from one month (neo-natal mortality) to one year (infant mortality).Such heaping at one year does not affect U5MR estimates.

Figure 2 Operation of the five groups of proximate determinants on the health dynamics of a population
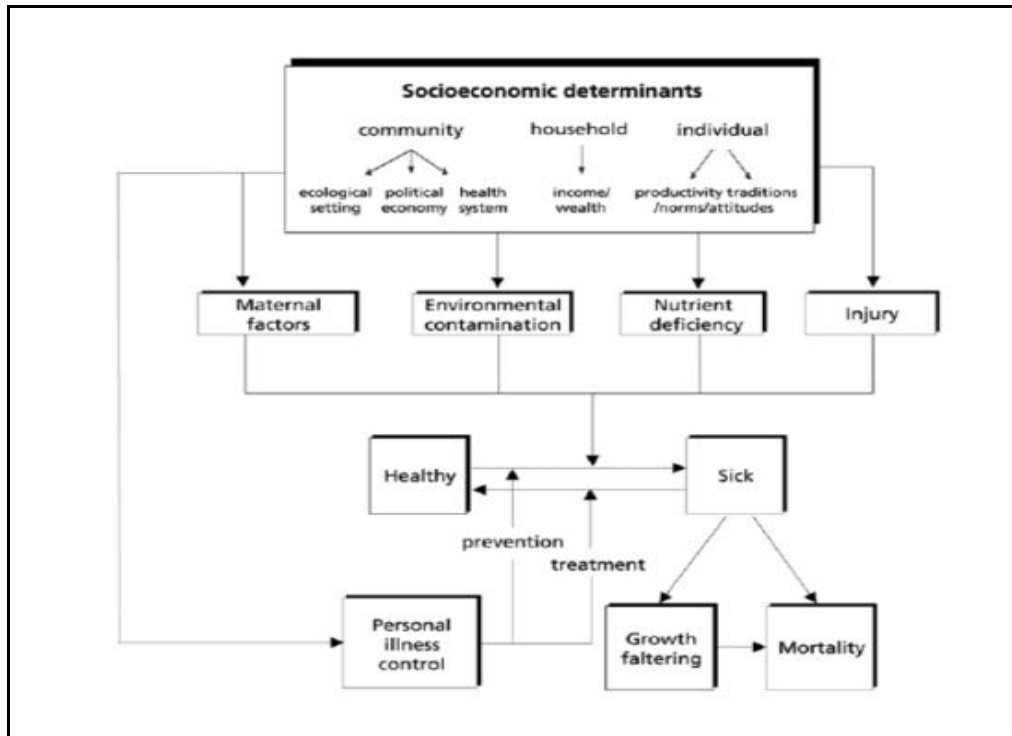
Source: Mosley and Chen (1984)

Following the analytical thinking presented in the Mosley and Chen framework as well as previous literature on factors associated with child mortality, I classified the determinants of child mortality as bio-demographic determinants, behavioural attributes of the mother, environmental characteristics of the household and socio-economic determinants. However, it is imperative to state beforehand that most of the determinants influence mortality through a synergy of social, biological, cultural and behavioural elements thus making the classifications interconnected.

Bio-demographic determinants of child mortality

In their cross-country analysis of levels and trends of childhood mortality, Bicego and Ahmad classified "sex of child, multiplicity of births (if twin, triplet or quadruplet), order of birth, age of mother at first birth and length of preceding birth interval as bio-demographic determinants of child mortality" (Bicego and Ahmad, 1996:15). Also, low birth weight has been identified in literature as a key biological determinant of child mortality (Claeson, 2000:1195).

The weight of a baby at birth is a key indicator of the mother's nutritional status and health prior to and during pregnancy. Claeson et al.'s report on the stalling rates of child mortality in India, designated low birth weight (LBW) as a key predictor of malnutrition and an important determinant of child growth, morbidity and survival (ibid:1195). Furthermore, evidence from previous studies (Chandra, 1999; Iyasu et al., 1992; Paneth, 1995) showed that there is increased susceptibility to diseases, higher likelihood of mortality, low resistance to infections and poor cognitive function amongst children born with low birth weights. Moreover, (Emmanuel I., 1993, cited in Li et al., 2003) argues that "under-nutrition and/or growth disturbances during developmental stages in utero can

cause permanent changes that predispose individuals to develop health problems later in life"(Li et al., 2003:164). It becomes evident that low birth weight is not only a disadvantage to infants but also spans across all life stages up to adulthood (see figure 6 in Appendix B). Therefore, it is expected that children who are born with low birth weights will have poor health outcomes.

Pregnancy and delivery complications are heightened for multi-fetal pregnancies and multiple births-twins, triplets and quadruplets- which often result in increased likelihood of mortality. Hong (2006) found that for this category of children especially in developing countries there are higher probabilities of birth defects, complications and more frequently infections which are worsened by underutilization of health facilities on the part of the mothers (since they mostly deliver outside health facilities) and poor health care system at the institutional level. Other mediating factors that account for the high odds of mortality amongst multiple birth as compared to singletons include low birth weight and/or preterm births (Ozumba and Okafor, 2004), competition for mother's time (Bicego and Ahmad, 1996:17) among others.

A typical U-shaped relationship between child mortality and mother's age at birth as well as the birth order of the child has been identified in literature. The factors that jointly produce this effect have been theorized based on biological, economic and/or behavioral orientation (Elliot 1992; Magnus et al. 1985; Whitworth and Stephenson 2002). Owing to immature development of the reproductive system of "too young" mothers (teenagers and young adolescents), their poor health seeking behavior usually as a result of financial constraints and immaturity, "slowing down" of the reproductive system of "too old" mothers which causes pregnancy and/or delivery complications, poor health conditions peculiar to old age- hypertension, diabetes and waning attitudes towards childcare (especially after so many children), children born to "too young" or "too old" mothers face greater risks of poor health and heightened odds of dying. Sullivan et al (1994, cited in Balk 2003) added that "older women have higher likelihoods of delivering a genetically impaired infant later in life" (ibid: 2) who may not survive early childhood.

Similarly, children born in quick succession especially those born below the UNICEF and WHO recommended birth interval of 24months are greatly exposed to the risk of childhood mortality. There are various mechanisms identified in literature that accounts for the association between short birth interval and increased child mortality (see figure 4). One of the widely explored mechanisms is the maternal depletion hypothesis; it implies that delivering children in quick succession which often results in short periods of lactation (for the older of the pair) diminishes the mother's nutritional status and places a strain on her reproductive health which might compromise her ability to optimally support fetal growth thus increasing the odds of adverse perinatal outcomes (king 2003, cited in Conde-Aguelo et al. 2012:96). The nutritional content of the breast milk for both the preceding child and the new birth is depleted hence exposing the children to adverse childhood mortality outcomes (ibid).

Other plausible explanations for the aforementioned association are presented in the penultimate chapter. The importance of adequate birth spacing in a bid to lower the risks of child mortality cannot be overemphasized. This is portrayed in the findings of Rutstein's (2005) cross- country analyses of the demographic and health surveys for 17countries in a bid to examine the birth interval,

infant and child mortality and nutritional status nexus. He quantified gains in child mortality if mis-timed and under-spaced births were prevented:

> For the year 2003, if women in developing countries (excluding China) would not have had any births at intervals less than 24 months; they could have averted almost 2 million deaths in that year to children under age 5years. An additional almost 1 million deaths in that year would have been averted if mothers had spaced at least 36 months between births. The deaths that would have been averted account for about 35% of all deaths to children less than 5years of age in 2003 (ibid: 23).

The findings from Rutstein (2005) validate the consensus that of the three aspects of child bearing that affects child survival outcomes: birth interval, maternal age and birth order; birth interval is the most important.

Behavioural attributes of the mother and child mortality

The primary gatekeepers of a child's health are the parents (Case and Paxson 2002:164) especially the mother since her choices and health-seeking behaviour (particularly during pregnancy) is directly correlated with not just the pregnancy outcomes but also the survival chances of the child. Thus, it becomes imperative that to have a healthy child who will survive early childhood and beyond, the parents must make right choices and quality decisions.

Studies (Anderson and Bergstrom 1997; Mosley and Chen 1984; Ozaltin et al. 2010) have shown that on the mother's part, right choices and quality decisions include her health and nutritional content; seeking prenatal care from skilled practitioners[3] , exclusive breastfeeding and safe complementary feeding, adequate care during sickness amongst others. In the words of Sullivan (2013) "as a mother's nutrition goes so does her child's". To buttress this, Black et al. (2008) in their study on the effects and consequences of under-nutrition on children aged under five years points out that "maternal under-nutrition (reflected in her short stature and low body mass index BMI) is highly associated with adverse child health outcomes- intrauterine growth restriction, stunting and severe wasting (in extreme cases)" (ibid:243). A plausible explanation for this association offered by Ozaltin et al. 2010 is that:

> the intergenerational transmission from the mother's environmental milieu during her own childhood (and also fetal life) to her offspring's growth and survival may be plausible in explaining the relationship between maternal stature and child mortality and under-nutrition (ibid:1515).

Another key area to ensure the healthy growth and development of a child is optimal feeding; which starts from early initiation and exclusive breastfeeding

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[3] A skilled health professional as described by WHO is "an accredited health worker—such as a midwife, doctor, or nurse—who has undergone proficiency training in the skills needed to manage pregnancies, childbirth and the immediate post-partum period. In addition, such an individual must be capable of identifying, managing and referring pregnancy (delivery) complications (if the need arises)" (WHO, 2008). Traditional birth attendants either trained or untrained, (TBA) are excluded from this category.

of the child for the first 6months before safe complementary foods[4] are introduced together with breastfeeding up to two years (UNICEF 2008). Consequently, the child's immune system is developed against infection, resulting in lower incidences of morbidity and mortality. According to UNICEF (2008), "Breastfeeding does not only boost infants' immune systems; it also protects them from chronic conditions later in life such as obesity and diabetes. Suboptimal breastfeeding still accounts for an estimated 1.4 million deaths in children aged less than five years annually" (ibid).

Health seeking behaviour that includes seeking antenatal care from a skilled professional, receiving tetanus toxoid during pregnancy, giving birth in an health facility[5], seeking prompt medical attention when the child is sick are other ways in which the behaviour of the mother can influence the survival outcome of her child.

Environmental characteristics of the household and child mortality

Within the field of public health and particularly in connection with the survival of children especially those under five years, much emphasis has been placed on the improvement of the environment in which the child lives. The justification for this can be seen in the underlying cause(s) of the identified top killer diseases of children aged under five years- Acute respiratory infection (from indoor air pollution); diarrhoea (mostly from poor water, sanitation and hygiene) and malaria (from inadequate environmental management and vector control) (Pruss-Ustun et al. 2008:2).

While most studies (Balk 2003; Woldemicael 2000) have argued that the environment starts to have a bearing on child survival when children are aged two and above because they seem to have direct contact with the floor and water (while crawling, learning to walk and playing) at these ages, the World Bank publication on environmental health and child survival (2008) presents an evidence of the critical role of the environment on the lifecycle of a child from the womb all through the developmental stages(see further details in figure 7 in Appendix B). For instance, Watson-Jones et al. (2007 cited in World Bank 2008) found that "anaemia in pregnant women which is associated with increased risks of preterm delivery is often caused by a combination of malaria, hookworm infections (which often arise from inadequate environmental management) and dietary deficiencies (World Bank 2008a:25)". In the same way, poor environmental conditions have been found to have proximate effects on "permanent growth faltering, lowered immunity and increased mortality" (World Bank 2008b)which often expose children to chronic diseases as well as poor cognitive function in later years (as shown in figure 7) .

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[4]See http://www.who.int/mediacentre/factsheets/fs342/en/ for the optimal recommendation by WHO and UNICEF

[5]However, some studies (Ettarh and Kimani, 2011; Odimegwu et al., 2011) have found that delivery in health facilities especially in developing countries may not influence the chances of survival since the pregnancies are already at heightened risks of complication before seeking medical assistance. This finding still bears an undertone of poor health-seeking characteristics on the mother's part.

Overall, maintaining good hygiene and sanitary levels, proper vector control as well as having access to safe water is crucial to every aspect of a child's life (UNICEF 2008).

Socioeconomic determinants of child mortality

Going back to the Mosley and Chen framework presented in figure 2, socioeconomic determinants of child mortality operates through "the more basic proximate determinants- environmental contamination, nutrient deficiency, maternal factors and injury- to influence the risk of mortality" (Mosley and Chen 1984:34). Indeed, education which often serves as a proxy for skills and exposure and strongly correlates with occupation and household assets (ibid) has consistently been observed in literature to strongly influence the survival chances of a child (Agha 2000; McMurray 2000). Better educated parents have been associated with lower risks of child mortality (Bbaale and Buyinza 2012; Hobcraft 1993). This finding is explained by the fact that educated parents especially mothers are often more enlightened and as a result they have better behavioural attributes- maintain higher level of hygiene, have good health-seeking behaviour and adopt better child-care practices (Mosley and Chen 1984: 35; Bbaale and Buyina 2012:138). Apart from the better behavioural attributes often linked with higher educational attainment, other studies associate education with better employment opportunities which often implies additional source of income to cater for the child (Gakiodu et al. 2010).

However, there are passionate debates in literature on the relationship between mother's employment and child survival. One strand of the argument is that mother's employment denote less time for child care which may increase the likelihood that the child will die while the other strand posits that there is more money to hire a "skilled and attentive care-giver" (Mosley and Chen 1984:35) who will offer childcare and enhance chances of child survival. Using multiple regression technique to examine the relationship between child care strategies, women's employment and nutritional status on randomly sampled households in Nicaragua, Lamontagne et.al (1998) found that "children of employed mothers (56%) fared better in anthropometric measures (weight for height) than those whose mothers were unemployed". The authors noted that "even though maternal care time may decrease significantly when mothers work away from home, when the time of substitute caregivers is included in the total care time, no significant difference in total child-care time remained" (ibid:404).

Similarly, there are conflicting findings on the relationship between polygamy and child survival, however two main schools of thought have emerged in estimating the link between both factors (Gyimah 2009). While a school of thought opined that polygamy increases the likelihood of death amongst children aged under-five years owing to overcrowded houses which often increases the risk of infectious diseases (Defo 1996), low resource per child (Gyimah 2009), poor overall well-being of the child owing to continued jealousy and rivalry amongst co-wives (Wagner and Riegner 2011); the other posits that polygamy enhances the chances of child survival. This view is premised on the fact that there is an increase in the number of care-givers (co-wives, older siblings) in the household that could care for the younger children and likely reduce the odds of under-five mortality. Moreover, some authors (Amankwa 1997; Aryee 1975) argued that polygamy could be a natural means of birth control due to the usual suspension of conjugal duties (aided by the availability of substitute wives) after

delivery, and the consequent longer breastfeeding periods and birth intervals between children. To this effect, Aryee (1972) has found evidences of long post-partum abstinence in polygamous unions (Aryee 1975:295).

In the same vein, the relationship between child mortality and household composition is quite unclear (Kaldewei and Pitterle 2011). This ambiguity stems from the different effects- beneficial and harmful identified in the association. On the beneficial side, a large household size may mean that there is an increase in the number of caregivers-elderly or unmarried single women-living in the household that could care for younger children (which may invariably reduce the likelihood of child mortality). Whereas on the harmful side, a large household may also mean higher prolificacy which implies fierce competition among household members for finite resources, the younger ones (those of higher order) are more vulnerable in such competitions and deprivation or lack of care heightens the risks of mortality.

As I have stated earlier that good health seeking behaviors promotes good health (which reduces the likelihood of mortality), it has been observed across different settings that high user-fees and out-of-pocket health expenditure has constituted a bottleneck in the (full) utilization of healthcare especially among the poor (who need it the most) (Boyer et al. 2009; Mwabu et al. 1995; Van der Geest et al. 2000). Thus, improving access to health care (through complete removal of user fees, health insurance coverage among others) is expected to motivate individuals to seek prompt medical attention as at when due. In addition, there should be a reduction in incidences of major outbreaks that could result in fatalities since the monetary burden of seeking routine health maintenance services would be alleviated.

Another socio-economic determinant of child mortality is the mother's autonomy over her (reproductive and physiological) health. The importance of mother's decision making power over her health becomes clear from the WHO framework on reproductive health which implies that reproductive health enables the ability to "decide if, when and how often to have children" (World Health Organization, n.d.). Within this premise, it is expected that the health of the children would be positively influenced since they are adequately planned and timed. Also, it is expected that after having the children women who can decide on their own health can adequately make right decisions in the face of emergencies or complications.

Traditionally, urban-rural as well as regional differentials in child mortality has been analyzed in the context of inequalities – in infrastructural development, poverty levels, housing structure, non-functional systems that tends to favor urban areas and regions over one another (Antai 2011:1; Defo 1996: 409;Mosley and Chen 1985). However, with the alarming rise of urban slums emerging evidence in analyzing the aforementioned differentials revealed that there is marginal or no variation between the rural and urban areas as well as across regions[6]. Furthermore, regional variations may be as a result of differences in cultural

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[6] For instance, Manda (1999) found that children in rural Malawi were more likely to survive than their counterparts in the urban area owing to overcrowding and poor sanitation prevalent in urban areas (ibid:310).In the same way, after controlling for socio-economic and environmental variables the author found that regional differences in child mortality in Malawi was very minimal.

practices (Caldwell 1990; Defo 1996:405), that affects behavioral patterns like breastfeeding patterns, beliefs about diseases and food taboos[7] during pregnancies which affects health seeking behavior and patterns(Fabrega 1972, cited in Balk 2003:4); bio-demographic variables (Manda 1999:310) for instance, early marriages resulting in births to "too young" mothers or late marriages resulting in births to "too old" mothers and short birth spacing arising from gender preferences(Fayehun 2011: 80) thus, increasing the risks of child mortality.

By juxtaposing the previewed literature with the Mosley and Chen framework, it becomes more glaring that child mortality in most cases does not occur in isolation rather it is the end result of (disease) processes and (biological, social and cultural) interactions.

2.2 Child Mortality in Nigeria: The Situation and Fundamental Issues

Background

Nigeria, often regarded as the giant of Africa is classified by the World Bank as a lower middle income country with a population of about 170 million and a life expectancy at birth of about 52years[8] . As described in the UNICEF country profile for 2012, about a quarter of the population is children aged less than five years. In terms of its resources, Nigeria is richly blessed with human and natural (mineral and agricultural) resources. Within the continent, Nigeria is Africa's largest crude oil producer and at the global level, it is the tenth largest crude oil producer[9] .

However, amidst these plentiful resources (or wealth) in the country not only is the survival of a child in the first five years not guaranteed (as seen in figure 1) but also the pace of curbing the situation is extremely low (as seen in table1). According to a publication by the Federal Ministry of Health in Nigeria, the expected run-rate to achieve the 2015 MDG target from 2011 to 2015 should be an annual reduction of 10% as opposed to the current rate of 1.2% (FMoH 2011:24). It is evident that there is a need to identify not just the factors or determinants that are associated with the likelihood of child mortality in the country but the pathways of influence as well if greater progress is to be made towards reducing the high mortality rates by 2015.

The situation

According to a 2002 publication on the position of child survival in the country carried out by Futures group, they found out that similar to other countries, nu-

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[7]For instance, Ogunjuyigbe(2008) found that "most restricted foods (food taboo) during pregnancy and lactation are common sources of essential nutrients for pregnant (lactating) women thus depriving the children supply of adequate nutrients/ immunity they require early in life" (ibid:392). These food taboos vary across cultures for example in Nigeria among the Igbos, "it is believed that periwinkle and banga soup (rich sources of protein) prolong labour during child delivery" (Onifade 2006: 45).

[8]See http://data.worldbank.org/country/nigeria

[9]See http://www.revenuewatch.org/countries/africa/nigeria/overview

tritional deficiencies and other identified top killer diseases- malaria, diarrhoea, acute respiratory infection (ARI) and other vaccine preventable diseases for children aged less than five years are also prevalent in Nigeria. Besides, Nigeria has its share in the burden of HIV/AIDS on child mortality seen in other African countries (Policy project 2002:3).

However, poor contraceptive use, the nature of the country's health care system and quality of its services continues to aggravate the situation of under-five mortality. The state of the Nigerian health care system reflects in the poor ranking of its performance across the 8 indicators used by WHO in year 2000 to rate the UN member states[10] . Overall, the Nigerian health care system emerged as 187 among the 191 member states, a position that is negatively correlated with its economic standing.

Furthermore, "the unmet need for family planning (15% for spacing, 5% for limiting births) and low contraceptive prevalence rate (15%)"(FMoH 2011:34) increases the proportion of mis-timed and under-spaced pregnancies in the country hence increasing the odds of mortality.

Fundamental issues

In light of the foregoing narratives, a combination of low contraceptive use and the deplorable healthcare system constitute background issues aggravating the child mortality situation in Nigeria. The contraceptive use as well as the unmet need[11] (for spacing and limiting) is low in Nigeria, I present the level of contraceptive use in table 2 as compared to selected African countries.

Table 2 Level of contraceptive use in selected African countries

Country	Unmet need for spacing	Unmet need for limiting	Contraceptive prevalence rate
Nigeria	12	5	15
Uganda	25	16	24
Lesotho	11	20	37
Malawi	17	10	33
Ethiopia	20	14	15
Democratic Republic of Congo	19	5	21

World Bank 2010

As aforementioned, the other compounding factor threatening child survival in the country is its deplorable health care system. In understanding this, I referred to the proximate determinants of child mortality (see figure 2).As stated by the authors, socio-economic determinants of child mortality can operate through three levels of proximate variables: individual-level, household level and community level (Mosley and Chen 1984: 34). At the community level, they

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[10]See http://www.who.int/whr/2000/en/whr00_en.pdf

[11] Full definitions of the contraceptive terms are in the appendix.

elaborated that "the health care system of a population can influence mortality in four major ways- institutionalized actions, cost subsidies, public information/education/motivation and technology" (ibid :38). With the aid of previous studies I will briefly highlight these channels in the Nigerian context before embarking on the empirical journey.

Institutionalized actions

There is a political and fiscal decentralization of the Nigerian health system across the three tiers of government- federal, state and local government (Ogbebo 2013) which constitute a bottleneck to the smooth functioning of the sector. This is buttressed in the report on the analysis of the barriers to immunization coverage conducted by the International Vaccine Access Centre (IVAC) in 2012 which states that there is a "disconnect of responsibility and authority across all tiers of government" (Chizoba et al. 2012) that hinders the success of routine immunization in the country. Another contributing factor to the poor performance of health system is the very low budgetary allocation to health as shown in figure 3 below.

Figure 3 Government spending on health in Nigeria[12]
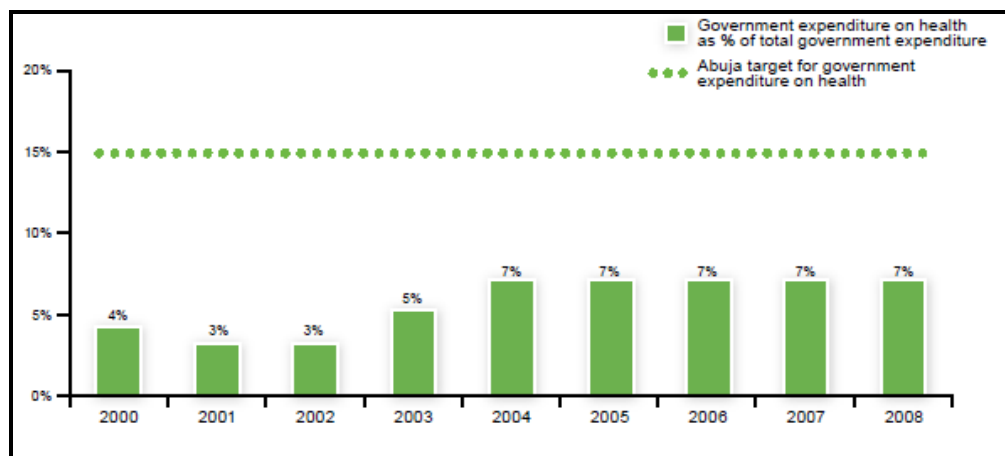
Source: FMoH 2011

As figure 3 shows, over a period of eight years (year 2001 to 2008) the proportion of government spending on health increased marginally from 4% to 7%. Indeed this poor financing has led, according to policy project (2002), to short-lived success of health interventions in the country. An example of this is in the case of routine child immunization. The study added that huge successes recorded in child immunization was in the late 1980s and early 1990s when the intervention was donor-funded but when "donor funding was withdrawn, coverage rates plummeted" (Policy project 2002: 12). Poor funding also manifests in lack of basic infrastructure, equipment and the characteristic out of drug syndrome in the Nigeria health system (Obansa and Omirinsan 2013: 223).

Cost subsidies

The bulk of health funding is borne by households through out-of-pocket payment for healthcare (FMoH 2011). In a bid to alleviate the burden of health

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[12] The budgetary allocation on health also falls short of the 15% budgetary allocation on health agreed by African leaders in Abuja 2001 (FMoH 2011:64).

costs on households so as to ensure full utilization of healthcare services by the majority, the National Health Insurance Scheme was established in 1999 but was not implemented until 2005 (NHIS 2012). The scheme has so far enrolled employees in the formal sector excluding those in the informal sector despite the fact that the vast majority that require health service the most are in the informal sector. However, in the long run it is expected that as the scheme expands and more households have access to it there should be considerable reductions in the high rates of child mortality in the country.

Motivation

Other identified plagues in the Nigerian health system includes poor remuneration and motivation of the health workforce(Enabulele 2013); inefficient allocation of staff and poor working conditions (FMoH 2004) which results in a massive brain drain (Lambo 2004) altogether reflecting in the poor quality of service delivered.

Technology

As stated by Mosley and Chen (1984: 40), medical technology improves the effectiveness and efficacy with which proximate determinants can be manipulated by the health system. In the Nigerian context, there is a need for an integrated medical system that would incorporate adequate surveillance system to track, monitor and control disease outbreaks (Osain 2011:470). The federal ministry of health (2004) also identified that there is a very poor and non-functional referral system across all types of health facilities in the country (FMoH 2004). It is imperative that there is a functional referral system across health facilities so as to address complications and emergencies effectively. I have personally observed that other African countries whose economies are not as buoyant as Nigeria's like Kenya, Burkina Faso have functional health surveillance systems to monitor causes of mortality especially among children under- five years in a bid to prioritize interventions. For studies like this, data and information from surveillance system would have been more appropriate as cause-specific deaths would be easily identified.

The preceding section gives a clearer picture of the numerous issues the Nigerian healthcare system is fraught with and a foresight into understanding that ceteris paribus if all the factors associated with child mortality were held constant in the face of the poor system and poor contraceptive use, high child mortality rates will persist in the country. The empirical journey of this study starts off in the subsequent section with an explanation of the empirical strategy adopted.

2.3 Empirical Specification

This section outlines a framework to subject our expectations of the influence of proximate determinants of child mortality to empirical scrutiny. Let D, a dichotomous variable, denote the occurrence of the death of a child aged less than five years in the five years preceding the Demographic and Health surveys this work is focusing on that is, NDHS for years 2003 and 2008. Following the analytical thinking presented in the Mosley- Chen framework (in figure 2) as well as identified factors in the previewed literature, D may be treated as a function of variables capturing the overall behavioural characteristics of the mother especially her

health seeking behaviour (XB), bio-demographic attributes peculiar to the index child (XC), environmental characteristics of the household (XE) as well as the household's socio-economic characteristics considering the socio-economic characteristics of the husband and that of the mother (XS) and a vector of additional explanatory variables (XA). Thus, under-five mortality may be represented as

$$D = X_B \beta_B + X_C \beta_C + X_E \beta_E + X_S \beta_S + X_A \beta_A + \varepsilon, \qquad (1)$$

The βs are the coefficients that would be estimated in the empirical analysis and ε is the error term that is unobservable factors which may influence under-five mortality. Based on the assumption that ε follows a normal distribution, this equation will be estimated using a probit model. This specification is estimated separately for NDHS 2003 and 2008.

In detail, D captures the probability that a child aged less than five years will die in the five years preceding the round of the demographic and health survey in year 2003 and 2008. Bio-demographic attributes considered include

- The preceding birth interval between the index child and the previous birth

- The birth order of the child which gives the position of the child be it the first born, second born or of higher order

- Whether the child is a singleton or part of multiple births

- The sex of the child whether male or female

- The size of the child at birth used as a proxy for low birth weight (LBW)[13]

- The age of the mother at first birth.

The overall behavioral characteristics of the mother including her health seeking behavior is captured by whether she received prenatal care from a skilled healthcare practitioner during pregnancy, if she received tetanus toxoid during the pregnancy, where she delivered the child (in an healthcare facility or in the house) and when the child was weaned. The mother's nutritional position was also captured using her height and body mass index (BMI) as a proxy. The household's environmental characteristics include whether the household has access to improved source of drinking water, if there is a flush toilet and the type of flooring material in the household. Socio-economic characteristics were subdivided into husband's socioeconomic characteristics mainly his educational status, mother's socioeconomic characteristics include her educational status, na-

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[13]According to a global analysis of estimates of Low birth weight (LBW) conducted jointly by WHO and UNICEF in 2004, birth weight information for most of the births in Nigeria were unavailable (WHO &UNICEF 2004). This is not surprising since most births are delivered outside of health facilities hence they are not weighed. Even when they are weighed, the measurements have been reported to be "inaccurate or poorly recorded" (WHO and UNICEF 2004:3). Owing to this paucity of information and measurement bias, most studies (Chukwu, 2008) that have conducted analysis on birth weight have demonstrated that the use of the "size of baby at birth" as reported by the mothers is a good proxy for birth weight. However, there may still be possibilities of recall bias.

ture of her employment (if she works all year round or seasonally), her autonomy over her own health status[14] and her religion. The overall household socioeconomic characteristics include the size of the household; the economic position of the household was captured by its wealth status, the place of residence (whether rural or urban). Other variables included in the specification include the nature of the marital union (be it monogamous or polygamous), region of residence and if the household has a health insurance cover (although this question was introduced in the fourth round of the DHS hence it was only included in the 2008 specification).

2.4 Definition of Variables

Table 3 below presents a description of how the variables were included in the model as well as expectations of the relationship between the variable on the probability of the occurrence of under-five mortality. The regression analysis is based on cross-sectional data to identify factors associated with under-five mortality in Nigeria.

Table 3 Variable description

Variable	Expected effect on under five mortality	Description
Bio- Demographic Determinants		
Preceding Birth interval	**Too short birth interval increases likelihood of under-five mortality**	**Two dummy variable: (i) "Less than 24 months" takes on value 1 if the preceding birth interval is within this range and 0 otherwise; (ii) "more than 48months" takes the value 1 if the preceding birth interval is more than 48months. Reference category is "between 24-48 months"**
Child's sex	**A male child is more likely to die in comparison with a female child**	**Dummy variable with the value 1 if the child is female and 0 if male**
Multiple delivery	**Children of multiple births have an increased likelihood of death as compared to singletons**	**Dummy variable with the value 1 if the child is part of a multiple delivery and 0 if otherwise**
Birth order	**Birth order has a U-shaped relationship with the likelihood of under-five mortality**	**Two dummy variables: (i) "second born" takes on the value 1 if the child is the second born and 0 otherwise; (ii) "birth order three and higher" takes on the value 1 if the child is of birth order 4 or higher and 0 otherwise. Reference category is first born**
Age of mother at birth	**Age of mother has a U-shaped relationship with the likelihood of under-five mortality**	**Two dummy variables: (i) "More than 25 years" takes on the value 1 if the mother was between 25years and 34years of age when she gave birth to the first child and 0 otherwise; (ii) "More than 35years" takes on**

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[14] Owing to the identified poor use of contraceptive in the country, my interpretation of the mother's autonomy on her health is beyond her physiological health but also includes her reproductive health within the framework of the WHO stated in section 2.1.

		the value 1 the mother was more than 35years of age when she gave birth to the first child and 0 if otherwise. Reference category is less than 25years
*Birth Size	Small sized children are more likely to die	Dummy variable with the value 1 if the child has a small size at birth and 0 if otherwise
Behavioral Attributes		
Weaning the child	Increased likelihood of death if child is weaned early or not breastfed	Two dummy variable: (i) "less than 6 months" takes on value 1 if the duration of breastfeed-ing is less than 6 months and 0 otherwise; (ii) "more than 6months" takes the value 1 if the duration of breastfeeding is more than 6months. Reference category is "never breastfed"
Prenatal care	Maternal care during pregnancy decreases the likelihood of early childhood mortality	Dummy variable with the value 1 if mother received any form of skilled prenatal care and 0 if otherwise
Tetanus Toxoid	Receiving tetanus toxoid dur-ing pregnancy reduces the likelihood of neonatal deaths due to neonatal tetanus	Dummy variable with the value 1 if mother received tetanus toxoid vaccination during the pregnancy of specific child and 0 if otherwise
Facility Birth	It is expected that children born in health facilities should have lower odds of mortality	Dummy variable with the value of 1 if delivery takes place in a health facility (public/private) and 0 if otherwise
Environmental Characteristics		
Flooring	Natural and rudimentary floor-ing material increases risk of exposure to diseases and may induce mortality	Dummy variable with the value 1 if a household have access to an improved flooring mate-rial and 0 if it does not
Improved sanitation	Unimproved toilet facilities exposes children to diseases which may induce mortality	Dummy variable with the value 1 if a household have access to improved toilet facilities and 0 if it does not
Improved Water	Unimproved drinking water source increases the risk of exposure to diseases and may induce under-five mortality	Dummy variable with the value 1 if a household have access to an improved source of drinking water and 0 if it does not
Socio-economic Determinants		
Father's Education	An inverse relationship be-tween the education of the fa-ther and the likelihood of child-hood mortality	The reference category was: no education
Mother's Education	Higher level of maternal educa-tion decreases the likelihood of child mortality	The reference category was: no education
Mother can make her own health decision	Ability of the mother to make her own (reproductive and physiological) health decision should decrease the likelihood of death	Dummy variable with the value 1 if mother has autonomy over her health decisions and 0 if otherwise
Mother working all year round	My expectation here is unclear going by the identified debate in the previewed literature	Dummy variable with the value of 1 if mother is working all year round and 0 if otherwise
Household Size	My expectation is similar to the above-mentioned	Total number of household members
Polygamy	My expectation is also similar to the fore-going	Dummy variable with the value 1 if the mother is in a polyga-mous union and 0 if otherwise

Religion : Catholic, Islam, Protestant and Traditional	It is also unclear since different religions has different practices that can influence the outcome differently	Four dummy variables were constructed for the widely practiced religions in the country taking a value of 1 if it was a specific religion and zero if otherwise
Wealth Index	Children of poor households have increased likelihood of mortality	The wealth quintile was re-grouped into low (lowest and second quintiles), middle and high (fourth and highest quintiles)
Rural	Children in rural areas are more likely to die	Dummy variable with the value 1 if the household is located in a rural area and 0 otherwise
Region of residence	Decreased risk of death in southern zones(South east, South south and South west) as compared with the northern zones(North central, North east and North west)	Six dummy variables for each of the six regions taking a value of 1 if it was the region and zero if otherwise. In the regression, reference category was North West since it has highest rate of mortality
Health Insurance	A decreased likelihood of mortality since insurance covers the monetary burden of seeking adequate health care	Dummy variable with the value 1 if a household has health insurance coverage and 0 if otherwise

Most of the independent variables (*), used in this study relied on mothers' recall, which may have introduced some measurement error because it is based on personal perceptions. Therefore, the possibility of recall bias must be considered in the interpretation of these results.

Chapter 3

Data and Empirical Analysis

3.1 The Data

The empirical analysis in this study is based on data from the third and fourth rounds of the Demographic and Health Surveys (DHS) conducted in Nigeria in 2003 and 2008. Among other things, the nationally representative surveys collected detailed birth histories of mothers aged 15-49 years, health-related information including utilization of health services, breastfeeding practices, their socio-economic characteristics and other household characteristics. The information on the survival status of the child included questions on the date of birth of the child, the current survival status (that is, if the child was dead or alive as at the date of interview) and the age at death (if dead).

My analysis is restricted to children in the age group 0-5 years and the focus is on individual mortality outcomes of children born 0-59 months preceding the surveys in the two rounds. An attempt was made to reach the highest possible precision when restricting the sample hence; the sample was created using day of birth and day of interview to ensure that the sample size corresponds to actual live births that took place in Nigeria between November 1998 to September 2003 and between January 2004 to November 2008.

Of the 5438 live births that took place between November 1998 to September 2003, 722 children died (about 13.3% of the births) and of the 27259 children born between January 2004 and October 2008, 3015 children died (about 11.1% of the births).

Following the outline in Owen O'Donnell et al 2008 (see Appendix C), the estimate of under-five mortality rates[15] for these samples are 187.8 deaths per 1000 live births (standard error is 8.9per 1000) and 156.5 deaths per 1000 live births (standard error is 3.3 per 1000) for the 2003 and 2008 rounds respectively. These under-five mortality rates are quite similar to those presented in the final publication of the NDHS for both rounds- See figure 8 in Appendix E.

The 2008 NDHS significantly expanded in content and size hence, the difference in the sample size. Nonetheless, the representative nature of the survey makes it an ideal choice in analyzing the determinants of child mortality in Nigeria. Both DHS surveys employed the use of multi-stage cluster sampling procedure. The final reports of both surveys contain a detailed information about the sampling procedure adopted in carrying out the survey (NPC and ICF Macro, 2003; NPC and ICF Macro, 2008).

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[15] The DHS estimates are different from the UNICEF-IGME estimates presented in Table 1 owing to different estimation techniques. While the DHS estimates are generated using robust direct methods the UNICEF-IGME estimates were generated from standard indirect techniques.

Limitation of the Data

A limitation of this data is its retrospective nature since it is based on the mother's recall ability. It is likely that for several reasons there may be an underreporting of the incidence of child mortality. This can arise if mothers are unwilling to talk about their dead children because their culture forbids them to talk about the dead or because it triggers sad memories. However, the final report of the DHS for both surveys acknowledged the possibility of underreporting but from their data quality assessment they assert that "there has been no severe underreporting in the rates of child mortality in the survey" (NPC and ICF Macro, 2003; NPC and ICF Macro, 2008:118). Another reason could be that details such as the age at death may not be remembered vividly (since it is in the past). Thus there may be issues of death transfers (heaping) from one mortality age category[16] to another but since I am considering deaths in the first five years of life my estimates would be unaffected by heaping. In sum, these factors suggest that the estimates should be treated with a possibility of recall bias.

3.2 Descriptive Statistics

Table 4 provides information on the percentage of live births and dead children aged less than five years that died in the five years preceding the survey in years 2003 and 2008 by the North and South geopolitical zones in Nigeria[17]

Table 4 Proportions of children aged less than five years by mortality outcome in the North- South geopolitical zone in Nigeria (%)

Region	Live birth rates		Under five mortality rates	
	2003	2008	2003	2008
North	3915 (72)	18757(68.8)	560 (77.6)	2253(74.7)
South	1523(28)	8502(31.2)	162 (22.4)	762(25.3)
Total	5438(100)	27259(100)	722(100)	3015(100)

Note: Information about the death of a child is based on mother's recall and proportion is defined in terms of percentage of women who reported that they had a dead child aged less than five years within five years preceding the survey.

Source: Computed from NDHS 2003 & 2008

The incidence of under- five mortality is higher in the Northern zones(which includes North West, North Central and North East) than in the southern zones (which includes South East, South West and South South). In the 2003 survey, the Northern zones account for about 77.6% of the national burden of under-five mortality while the southern zones accounts for about 22.4%. Overall, about 13.3% of the total live births in the five years preceding the 2003 DHS survey died. Similarly, the northern zones accounted for about 74.7% of the national burden of under-five mortality while the southern zone accounted for about 25.3% in the 2008 survey. Altogether, about 11.1% of the total live births in the country in the five years preceding the 2008 DHS survey died.

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[16] The age categories for children under five years include- neonatal mortality (within the first month of life), infant mortality (before the first birthday) and under-five mortality (0-5) years.

[17]See Map 1 in Appendix F showing the six geopolitical zones in Nigeria

Table 5 presents the descriptive statistics of the independent variables in this analysis. Some of the main features of these data are discussed below

Table 5 Descriptive statistics of selected variables from NDHS 2003 & 2008

	2003		2008	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
Preceding Birth Interval (Less than 24months)	0.19	0.39	0.18	0.39
Preceding Birth Interval (More than 48months)	0.14	0.35	0.16	0.35
Age of mother (More than 25years)	0.48	0.49	0.49	0.50
Age of mother (More than 35years)	0.23	0.42	0.25	0.43
Birth Order (Second Born)	0.16	0.36	0.18	0.38
Third born and higher	0.64	0.48	0.64	0.48
Multiple Births	0.06	0.32	0.05	0.29
Female	0.49	0.50	0.49	0.49
Birth size	0.84	0.37	0.84	0.36
Mother's Height (cm)	158.24	6.32	157.69	7.22
Nutritional status of mother	0.97	0.28	0.92	0.27
Less than 6month	0.16	0.36	0.14	0.46
More than 6month	0.78	0.41	0.77	0.47
Prenatal	0.34	0.47	0.43	0.73
Facility birth	0.34	0.48	0.31	0.35
Tetanus Toxoid	0.36	0.48	0.33	0.42
Flooring material	0.59	0.49	0.50	0.50
Improved Water	0.72	0.45	0.68	0.47
Improved sanitation	0.12	0.32	0.47	0.50
Polygamy	0.35	0.48	0.33	0.47

Household size	7.24	3.74	7.02	3.62
Mother Education	0.77	0.89	0.81	0.93
Catholic	0.10	0.31	0.08	0.28
Protestant	0.27	0.44	0.32	0.47
Islam	0.60	0.49	0.57	0.49
Father Education	1.10	1.19	1.18	1.39
Rural	0.65	0.48	0.74	0.44
Mother works all year round	0.68	0.46	0.72	0.77
Mother can make own health decision	0.22	0.42	0.37	0.48
North Central	0.17	0.37	0.18	0.38
North West	0.31	0.46	0.28	0.45
South South	0.09	0.29	0.11	0.32
South West	0.10	0.30	0.11	0.32
South East	0.08	0.28	0.08	0.27
Middle	0.19	0.39	0.19	0.39
Rich	0.35	0.48	0.29	0.46
Health Insurance			0.06	0.63

Note: The number of observations ranges from 3509 to 5438 for year 2003 and from 17644 to 27259 for year 2008.

In both surveys, the children were mostly females and singletons. In the 2003 survey, about half of the children were from mothers with no or primary education (74.9%). About a third of the mothers were in polygamous unions and (68%) worked all year round. Only 22% of the mothers in the 2003 survey have autonomy over their health decisions and about one-third received one or more tetanus toxoid injection during pregnancy. 34% of the mothers received prenatal care from a skilled healthcare professional with only one- third of the deliveries occurring in a healthcare facility, a finding also reported in NDHS 2003. On average, children in the 2003 sample come from households that are in the poor wealth quintile. Majority of the households have moderate environmental conditions: access to improved water source (72%), rudimentary/finished floor material (59%) but only 12% of the households have improved toilet facility.

Conversely in the 2008 survey, about 37% of the mothers have autonomy over their health decisions. About 43% of the mothers received prenatal care from a skilled healthcare professional and only 31% of the deliveries took place in a healthcare facility. Half of the children were from households in the poor wealth quintile and the average environmental conditions of the households ranged from access to improved water source (68%), rudimentary/finished floor material (50%) and 47% have improved toilet facility. About 6% of the households are covered by a health insurance scheme.

3.3 Under- Five Mortality and Selected Characteristics

As a preview to the econometric work, Table 6 shows the bivariate relationship that is, an association between the likelihood of death (U5Mr) and some selected characteristics for the two cross-sections.

Table 6 Under- five mortality and selected variables

Variable	2003			2008		
	Dead=0	Dead=1	P-value	Dead=0	Dead=1	P-value
Birth interval (Less than 24months)	0.17	0.26	0.010	0.19	0.29	0.007
Birth interval (Between 24 – 48months)	0.48	0.43	0.004	0.49	0.43	0.000
Birth interval (More than 48months)	0.15	0.08	0.001	0.15	0.09	0.032
Female	0.50	0.47	0.329	0.49	0.45	0.058
Multiple births	0.05	0.14	0.000	0.04	0.13	0.000
Birth order (Second born)	0.17	0.13	0.012	0.18	0.15	0.005
Third born and higher	0.63	0.66	0.260	0.64	0.67	0.007
Mother's age (Between 25-34)	0.50	0.44	0.003	0.15	0.09	0.019
Mother's age (Greater than 35)	0.23	0.28	0.002	0.25	0.28	0.061
Birth size	0.15	0.21	0.087	0.15	0.20	0.055
Weaning the child (less than 6months)	0.13	0.32	0.008	0.12	0.30	0.002
Weaning the child (more than 6months)	0.84	0.43	0.022	0.82	0.40	0.011
Facility Birth	0.36	0.23	0.121	0.32	0.24	0.029
Tetanus Toxoid	0.38	0.17	0.000	0.38	0.16	0.091
Mothers nutritional status	0.91	0.91	0.231	0.92	0.92	0.375
Prenatal	0.33	0.48	0.014	0.41	0.67	0.044
Improved water	0.73	0.69	0.031	0.72	0.68	0.015
Improved sanitation (toilet)	0.13	0.06	0.000	0.48	0.46	0.056
Floor	0.61	0.48	0.088	0.72	0.71	0.387

Notes: The P-value column of the table reports p-value for a two-tail t-test. The null hypothesis is equality of means. In the 2003 survey, the number of observations when dead=1 ranges from 301 to 722 and the number of observations when dead =0 ranges from 3066 to 4716. In the 2008 survey, the number of observations when dead=1 ranges from 1234 to 3015 and the number of observations when dead =0 ranges from 16410 to 24244.

In both surveys, the numbers show that child mortality occurs more in households with poor environmental conditions. Precisely the 2003 survey reveals that the mean number of households with access to safe drinking water in which under-five mortality occurs is 0.69 as compared to 0.73 where such events do not occur. The mean number of households with flush toilet and improved flooring material where incidence of child mortality occurs is 0.06 and 0.48 respectively as opposed to 0.13 and 0.61 where a child under five years did not die. The behavioral characteristics of mothers have a bearing on the mortality outcome of their children. Particularly in the 2008 survey, women who failed to receive tetanus toxoid during pregnancy and gave birth in their homes as opposed to a health facility were more likely to have an incidence of child mortality than mothers who did otherwise. However, the place of delivery does not have a bearing on the survival status of the child in the 2003 survey. This confirms studies that find that delivery in health facilities especially in developing countries may not influence the chances of survival since the pregnancies are already at heightened risks of complication before seeking medical assistance (Ettarh and Kimani, 2012; Mandy, 1999; Odimegwu et al., 2011).

The nutritional status of the mother does not appear to have a bearing on the likelihood of child mortality. Besides, mothers who weaned their children earlier than 6 months had higher likelihood of child mortality. Older mothers (over age 35) are more likely to experience child mortality as compared to those younger than 35years. While the birth order and sex of the child appears not to have a bearing on child mortality in the 2003 survey, small sized children were more likely to die. The length of the birth spacing differs for the two categories of children. Children born within and over the UNICEF and WHO recommended birth spacing period (that is, at least 24 months) were more likely to survive.

3.4 Probit Regression Estimates

Marginal effects based on several probit specifications of the child mortality equation are presented in Table 7 and 8. Table 7 presents estimates based on the third round of the Demographic and Health Survey (DHS) conducted in Nigeria in year 2003 and table 8 are estimates based on the fourth round of the DHS conducted in year 2008. The probit regression was fitted with under-five mortality as the outcome variable. This was related to the independent variables in four different specifications for both surveys and presented in tables 7 and 8 in the spirit of a sensitivity analysis. Specification 4 forms the final model. The description of results was based on the significant variables. Negative and significant marginal coefficients will mean that the variable reduces the likelihood of under-five mortality while positive and significant marginal coefficients indicate that the variable increases the likelihood of under-five mortality.

Factors associated with under-five mortality in NDHS 2003 survey

In the 2003 NDHS survey (Table 7), the significant determinants of under-five mortality are:

- Bio-demographic attributes of the index child – birth spacing, age of mother, multiplicity of births and birth order.

- Behavioral characteristics of the mother- tetanus toxoid injection and when the child was weaned.
- Environmental characteristics of the household- Access to an improved toilet facility and flooring material.
- Socio-economic characteristics of the household- household size and polygamy.

Table 7 Probability of the incidence of Under-five mortality – Probit estimates
(Standard errors)

Variable	Model 1	Model 2	Model 3	Model 4
Less than 24 months	0.07* (0.014)	0.03* (0.014)	0.03* (0.013)	0.02* (0.015)
More than 48months	-0.05* (0.012)	-0.02* (0.010)	-0.02* (0.010)	-0.02* (0.010)
More than 25years	-0.01* (0.012)	0.00 (0.011)	0.01 (0.011)	0.03* (0.014)
More than 35years	0.03* (0.017)	0.05* (0.017)	0.05* (0.018)	0.09* (0.025)
Multiple Births	0.08* (0.011)	0.03* (0.009)	0.03* (0.009)	0.03* (0.012)
Female	-0.12 (0.009)	-0.004 (0.008)	-0.01 (0.008)	-0.01 (0.009)
Second born	-0.04* (0.014)	-0.04* (0.009)	-0.04* (0.009)	-0.04* (0.011)
Third born and higher	0.03* (0.015)	0.03* (0.014)	0.03* (0.014)	0.04* (0.019)
Birth size	0.08* (0.014)	0.02* (0.018)	0.02* (0.012)	0.00 (0.012)
Mother's Height		-0.00 (0.000)	-0.00 (0.00)	-0.00 (0.00)
Mother's nutritional status		-0.002 (0.014)	-0.003 (0.014)	-0.00 (0.018)
Weaning: less 6mths		-0.08* (0.008)	-0.08* (0.008)	-0.07* (0.009)
More than 6mths		-0.04* (0.035)	-0.04* (0.036)	-0.04* (0.051)
Tetanus toxoid		-0.02* (0.012)	-0.02* (0.012)	-0.02* (0.014)
Facility birth		-0.004 (0.010)	-0.00 (0.010)	0.01 (0.013)
Prenatal care		0.02 (0.013)	0.02 (0.013)	0.01 (0.016)
Toilet			-0.03* (0.010)	-0.02* (0.013)
Water			0.01 (0.009)	0.01 (0.011)

Floor				-0.005 (0.009)	-0.01* (0.012)
Catholic					0.04 (0.047)
Protestant					0.03 (0.04)
Islam					0.02 (0.33)
Household size					-0.01* (0.002)
Polygamy					0.02* (0.012)
Father Education					-0.01 (0.007)
Rural					0.002 (0.012)
Mother working all year					-0.02 (0.011)
Mother can make own health decisions					-0.01 (0.010)
Mother education					-0.00 (0.008)
North Central					-0.01 (0.014)
North East					-0.02 (0.012)
South East					-0.04* (0.015)
South South					0.03* (0.013)
South West					-0.02 (0.015)
Middle					-0.01 (0.014)
Rich					0.02 (0.02)
N	5438	3548	2167	2167

Note: the standard errors in parenthesis are heteroscedasctic consistent. P-value is statistically significant at at least; *10% significance level.

Reference categories.

a. Specification 1: Bio-demographic variables alone

b. Specification 2: specification 1 and behavioral attributes

c. Specification 3: specification 2 and environmental determinants.

d. Specification 4: specification 3 and Socio-economic determinants. Specification 4 is the final model

Factors associated with under-five mortality in NDHS 2008 survey

In the 2008 NDHS survey (Table 8), the significant determinants of under-five mortality are:

- Bio-demographic attributes of the index child – Birth spacing, age of mother, multiplicity of births, the sex of the child and birth order.

- Behavioral characteristics of the mother- If the mother received prenatal care from a skilled professional and when the child was weaned.

- Environmental characteristics of the household- Access to safe water and flooring material.

- Socio-economic characteristics of the household- Household size, education of the father, place and region of residence, if the household have an health insurance cover, the nature of the mother's work (if all year round as opposed to working seasonally).

Table 8 Probability of the incidence of Under-five mortality – Probit estimates (Standard errors)

Variable	Model 1	Model 2	Model 3	Model 4
Less than 24 months	0.08* (0.006)	0.04* (0.005)	0.04* (0.006)	0.04* (0.006)
More than 48months	-0.04* (0.005)	-0.02* (0.004)	-0.02* (0.004)	-0.02* (0.005)
More than 25years	-0.02* (0.005)	-0.001 (0.004)	-0.00 (0.005)	0.00 (0.005)
More than 35years	0.010 (0.006)	0.03* (0.005)	0.03* (0.006)	0.03* (0.008)
Multiple Births	0.08* (0.005)	0.03* (0.004)	0.03* (0.004)	0.03* (0.005)
Female	-0.02* (0.004)	-0.01* (0.003)	-0.01* (0.003)	-0.01* (0.004)
Second born	-0.02* (0.006)	-0.01 (0.006)	-0.01* (0.005)	-0.02* (0.06)
Third born and higher	-0.01* (0.006)	-0.01 (0.006)	-0.00 (0.007)	-0.00 (0.007)
Birth size	0.03* (0.006)	0.01 (0.004)	0.01 (0.006)	0.01 (0.005)
Mother's Height		-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
Mother's nutritional status		0.03 (0.006)	0.03 (0.006)	0.01 (0.006)
Weaning: less 6mths		-0.06* (0.003)	-0.06* (0.003)	-0.05* (0.003)
More than 6mths		-0.03* (0.014)	-0.03* (0.014)	-0.03* (0.019)
Tetanus toxoid		-0.01* (0.004)	-0.01* (0.004)	-0.00 (0.005)
Facility birth		-0.01* (0.004)	-0.01 (0.004)	0.01 (0.005)
Prenatal care		-0.01* (0.002)	-0.01* (0.002)	-0.01* (0.003)
Toilet			0.00 (0.00)	0.00 (0.00)
Water			-0.004 (0.003)	-0.02* (0.001)
Floor			-0.00	-0.001*

			(0.001)	(0.004)
Catholic				0.01
				(0.013)
Protestant				0.00
				(0.012)
Islam				-0.01
				(0.011)
Household size				-0.01*
				(0.007)
Polygamy				0.00
				(0.00)
Father Education				-0.02*
				(0.002)
Rural				0.02*
				(0.005)
Mother working all year				0.02*
				(0.002)
Mother can make own health decisions				-0.00
				(0.004)
Mother education				-0.00
				(0.003)
North Central				-0.01*
				(0.005)
North East				-0.00
				(0.005)
South East				-0.01*
				(0.007)
South South				-0.02*
				(0.005)
South West				-0.03
				(0.005)
Middle				0.01
				(0.006)
Rich				0.01
				(0.007)
Health Insurance				-0.01*
				(0.004)
N	27259	17644	11413	11413

Note: the standard errors in parenthesis are heteroscedasctic consistent. P-value is statistically significant at at least; *10% significance level.

Reference categories.

a. Specification 1: Bio-demographic variables alone

b. Specification 2: specification 1 and behavioral attributes

c. Specification 3: specification 2 and environmental determinants.

d. Specification 4: specification 3 and Socio-economic determinants. Specification 4 is the final model.

Bio- Demographic Attributes

Birth spacing

Consistent with the bivariate analysis presented in Table 6, birth spacing that is the length of interval between births has a significant influence on under-five mortality in both surveys. In the 2003 survey, birth intervals that are less than 24 months (as compared to intervals between 24 to 48 months) remained consistently significant across the 4 specifications. Its positive sign configuration implies that children born with a preceding birth interval of less than 24 months (too short interval) have a higher likelihood of dying in their early childhood

days as opposed to those born within a preceding interval that range between 24-48 months. Also, there is a statistically significant effect of birth intervals that are more than 48 months on under-five mortality (Table 7, see specifications 1–4). In the 2003 survey, relative to children with the UNICEF and WHO recommended birth space (more than 24 months), children born after an interval of 48 months had about two percentage point reduction in their likelihood of dying within the first five years of birth.

Likewise in the 2008 survey, there was a large and statistically significant effect for both dummies of birth spacing on the likelihood of under-five mortality (Table 8, see specifications 1–4). In the 2008 survey, relative to children whose birth spacing is in the UNICEF and WHO recommended interval, children born with a "too short" birth interval and those whose interval is greater than 48 months had about two and four percentage point reduction respectively in their likelihood of dying within the first five years of birth.

Overall, the regression results suggest that children whose birth interval ranged from 24 months and above were less likely to die. This finding is consistent with Rutsein (2005) presented in chapter two and Singh and Tripathi (2013) who found that long birth intervals lower the risk of the odds of child mortality. Plausible explanations for this finding will be discussed in the penultimate chapter.

Multiplicity of Births

Compared to singletons, children of multiple births face increased risks of dying in their first five years of birth. This was significant across the four specifications for both surveys. I found that in comparison with singletons, children of multiple are about three percentage points more likely to die. As discussed in the literature review, this could be because multiple births are at higher risks of pregnancy and delivery complications as well as birth defects. Thus, in the face of poor health care like that of Nigeria their chances of survival become threatened. This finding buttresses Hong's (2006) argument that high-risk pregnancies contribute to higher level of child mortality in developing countries (ibid: 631).

Sex of the Child

The gender of the child is negatively linked with the incidence of child mortality which implies that female children are less likely to die as compared to their male counterparts.In the 2008 survey, female children were about two percentage points less likely to die while the effect was not significant in the 2003 survey. Previous studies had also identified sex differentials in the survival chances in the early childhood phase (Bicego and Ahmad 1996:15; United Nations 2011). These differentials have been hypothesized to result from complexities in the interplay of biological and behavioural factors that influence mortality through different stages of life (United Nations 2011).

Birth Order

Consistent with expectations, it was observed that the U-shaped relationship between birth order and child mortality, where children of higher birth orders have increased risks of childhood mortality. This result persists for the dummy that captures third order births and higher across all specifications in the 2003 survey (Table 7, see specifications 1–4). It suggests that children in a higher rank (from third-born children) are about four percentage point likely to die. Children of higher order face increased likelihood of mortality for several reasons. Since

parental resources (in terms of time, energy and material resources) for each of their children decreases as the number of children increases, it is possible that later births start off their life facing sibling rivalry and competition of their parent's finite resources. Studies such as (Boerma and Bicego, 1992) have shown that sibling rivalry for resources can impact the nutritional status of the index child, incidence of morbidity and higher fatalities from illnesses and accidents (Whitworth and Stephenson 2002:2108). It is also possible that communicable diseases for example chicken pox and measles spread more easily within a household since there are quite a number of young children in the household. In such circumstances, the younger ones may face heightened risks of mortality because they are usually more susceptible to these diseases.

Age of the Mother

As discussed in chapter 2, age of the mother is expected to have a U-shaped relationship with under-five mortality for the several reasons outlined in chapter 2.1.Consistent with this expectation, in both surveys, children born to mothers aged more than 35 years had about three and nine percentage points increased likelihood of death within the first five years of life.

Birth size

The size of the child at birth is positively linked with its survival status. Small sized children are more likely to die than their big-sized counterparts. This suggests a successful use of birth size as proxy for low birth weight (LBW). In detail, the variable was significant across specifications 1-3 in the 2003 survey but the effect became insignificant in the fourth specification as socioeconomic factors tend to undermine the effect of the size of the child. While, in the 2008 survey it had a significant effect only in the first specification and the effect became insignificant as behavioral characteristics of the mother leaned towards trumping the effect of the variable.

Behavioral Characteristics of the Mother

Weaning of the Child

The duration of breastfeeding proved to be very important in influencing the survival status of a child through early childhood. I found that children that were weaned early (less than 6months) are less likely to die as compared to children who were not breastfed, and for those that were weaned later there was a lesser likelihood of death. The results in the 2003 survey indicate that the effect of delaying the weaning of a child by one month (for early-weaners) reduces the probability that the child will die by seven to eight percentage points. While for children weaned later than six months in the 2003 survey are about four percentage points less likely to die.

Similarly, in the 2008 survey children that were weaned early were about five percentage points less likely to die as compared to those who were not breastfed. And for those children that were weaned later than six months, the magnitude of the effect was quite steady across all specifications and indicates that children weaned later than six months were about four percentage points less likely to die. These results are in consonance with previous findings from Bolivia (Aguirre, 1995) and provide evidence that longer duration of breastfeeding reduces the risks of mortality. These results also match the effect reported in Duijts et al (2010) work on Netherlands, that is prolonged breastfeeding reduces morbidity

and attendant mortality risks in children. It implies that promoting strategies that support exclusive breastfeeding could be a way forward in ensuring child survival.

Tetanus Toxoid Injection

Receiving tetanus toxoid injection during pregnancy is negatively linked to child mortality and its magnitude remained consistent across all specifications of the 2003 survey (table 7, specification 2-4). The estimated effect reflects the correlation between adequate care during pregnancy and health outcomes of both mother and child. The result indicates that receiving one more dose of tetanus toxoid injection reduces the likelihood of mortality by two percentage points.

Prenatal Care

In the 2008 survey, children whose mothers received prenatal care from a skilled professional are less likely to die than those whose mothers did not. This finding is not surprising since receiving prenatal care does not only educate mothers about healthy practices but also counsel them on improving their lifestyles so as to prevent diseases and infections that could endanger their health and that of the baby. Also, the skilled professional can easily detect complications and risks to pregnancy (Halim et al 2011: 244).

Environmental Characteristics of the Household

As discussed earlier, the environmental settings of the households have a bearing on the survival of the child since poor environment exposes children to conditions that pose threats to their survival. My finding in both surveys indicates than children whose houses have improved flooring material (for example cement or tiles) were less likely to die as compared to their counterparts in household with unimproved/natural flooring material. This may be because clay or dirt flooring material may act as a conduit for transmitting infectious diseases to the child.

Also, previous studies (UNDP 2006, Rai et al 2010) found that access to safe drinking water is important in reducing incidence and/or spread of water borne diseases (a leading killer of children aged under five years) consequently reducing the risks of child mortality. The findings from the 2008 survey was consistent with the aforementioned as children born in households that have access to an improved source of drinking water were about two percentage points less likely to die as compared with children whose households do not have access to safe drinking water. The importance of safe drinking water to children especially the newly weaned ones cannot be over emphasized. Exposure to unsafe water at such tender ages (newly weaned) worsens the survival chances of children.

The risk of childhood morbidity and mortality heightens in households with unimproved toilet facilities (for example pit latrine, open pit, buckets). Major health hazards that arise from the use of such toilet facilities have a bearing on the survival chances of children aged less than five years. This is evident in the results from the 2003 survey. Children whose households have access to improved toilet facilities (such as Flush toilet, ventilated improved pit (VIP) were about two percentage points less likely to die as opposed to those who do not have access to improved toilet facilities.

Socio-economic Characteristics

Household size

The overall effect of household size on child mortality reflects the tension between the two effects (discussed in chapter 2) and the results from both surveys reveals that the beneficial effect of having an increased number of caregivers appears to dominate. As a result, children from large households in both surveys are less likely to die.

Polygamy

As discussed in the literature review, that the influence of polygamy on childhood mortality has fuelled passionate debate over the years. My findings (in the 2003 survey) suggest that, contrary to the school of thought that polygamy enhances the survival chances of children in such union, polygamy in the Nigerian context actually increases the likelihood of mortality among children in their early childhood by two percentage points.

Father's education

Consistent with expectations, the education of the mother was negatively linked with child mortality but the effect was not significant. Similar results have been observed (Ettarh and Kimani 2012; Manda 1999) in other Sub-Saharan African countries. However, the father's education was not only negatively linked with mortality its effect was also significant in the 2008 survey.The result suggests that a one-year increase in the father's education is associated with a two percentage point decrease in child mortality. This effect is not surprising since the education of the father is strongly correlated with his occupation and income which consequentially influence his tastes, attitude and preference for consumption goods as well as child care services. As discussed by Mosley and Chen (1984), the effect of father's education has more bearing on child survival especially when more educated fathers marry less educated mothers. This is the case in my sample as about 58% of the fathers have at least primary school education as opposed to 48% of the women with at least primary school education.

Mother's working status

The nature of the mother's work was positively linked with child mortality. The results indicates that children whose mothers worked all year round are about two percentage points more likely to die as opposed to those whose mothers worked seasonally or occasionally. This finding tends to support the argument that child care time is a substitute for the mother's time in the labor market. This could be an avenue for future research in the Nigerian context.

Place and Region of residence

As discussed earlier in the literature review, the findings on the place of residence shares the view that urban areas are more favored in terms of infrastructural development and other socio-economic factor that enhances the survival of a child in his early childhood. The results in the 2008 survey showed that a child in the rural area was about two percentage points more likely to die than their counterparts in the urban area. My findings on regional differences were similar to those of Manda (1999) discussed in section 2.1. Most of the regional variations have been accounted for by the environmental and other socio-economic variables hence the variations were quite modest. This finding validates the notion in the country that regional differences in child mortality are driven by so-

cio-economic factors (Antai 2011:1). Thus, efforts should be geared towards addressing the underlying socio-economic differentials.

Health Insurance Coverage

Consistent with earlier discussion in chapter 2 on health insurance cover, my findings suggest that children whose households have a health insurance cover were about two percentage points less likely to die as compared with their counterparts whose households do not have health insurance coverage. The large effect of this variable despite its low mean (only 6% of the households have a health insurance cover) supports the idea that lowering monetary burden of healthcare utilization is the conduit through which health insurance influences health outcomes. Therefore, strategies that promote the wide scope of the NHIS beyond the formal sector to the informal sector are expected to alleviate the child mortality burden in the country.

The overall emerging story from the regression result suggests that bio-demographic factors and environmental characteristics are dominant contributing factors to the likelihood of child mortality in Nigeria. This is because all the variables capturing these characteristics included in the regression analysis were at least significant in either or both of the surveys. This finding is in consonance with the identified determinants in the Mosley and Chen framework adopted in this study. Health insurance cover was also significant regardless of its small mean. As outlined in the introduction, this study seeks to transcend identifying contributing factors to synthesizing possible contextual pathways through which identified dominant determinants of under-five mortality exert influence so as to design and prioritize interventions for effective results. Hence, with the aid of the findings from the 2008 survey[18], the penultimate chapter presents a critical analysis of the relationship between an identified key variable (birth spacing) and the likelihood of child mortality in the Nigerian context from a biomedical perspective and a cultural outlook.

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[18] I did not persist with the 2003 survey owing to its small sample size.

Chapter 4

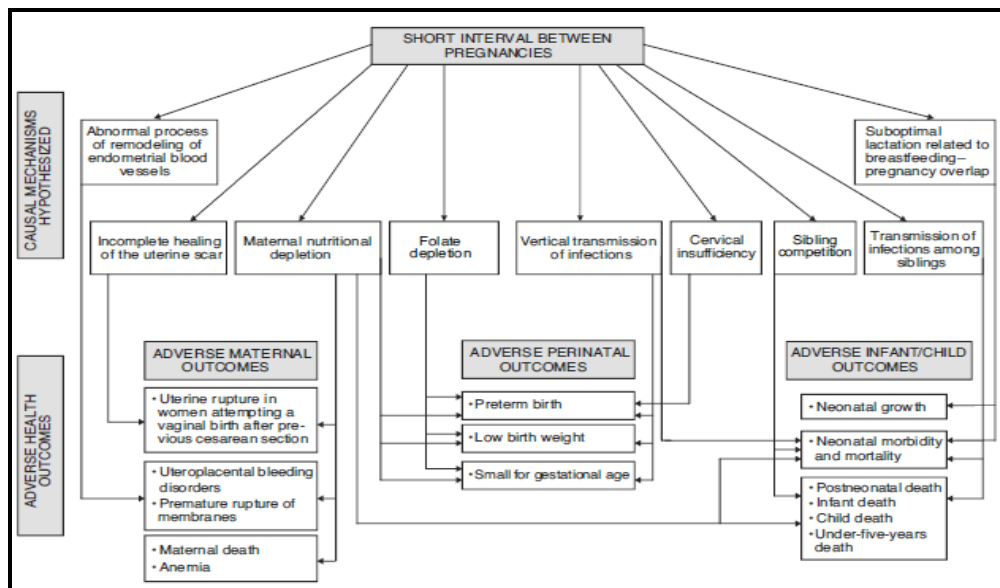## Birth Spacing and Under-five Mortality

In a bid for a holistic analysis of the situation of child mortality in Nigeria, I chose birth spacing as the key variable to analyze contextually. This choice was motivated by several reasons. First, findings from the empirical analysis reconfirm the importance of child bearing patterns on child survival. Second, the gains of birth spacing quantified by Rutstein (2005) presented earlier in chapter 2 indicate that the association between birth spacing and child mortality is worth exploring because adequately planned and timed births have higher chances of survival. Third, of the bio-demographic variables that affect child survival considered in this study, birth spacing appears to have relatively more underlying complexities. Lastly and most importantly, the association between birth spacing and child mortality lends itself to a thorough analysis from various perspectives which offer contextual insights towards curbing the child mortality situation in the country.

Based on the foregoing, the subsequent discussion on the relationship between birth spacing and child mortality will start off from the biomedical perspective and then proceed into the cultural outlook where I identified two contrasting yet interesting standpoints in viewing the relationship.

4.1 Birth Spacing and Child Mortality: A Biomedical Perspective

Evidence from systematic reviews and meta-analyses of biomedical literature revealed that short birth intervals are significantly associated with increased risk of adverse perinatal outcomes such as preterm birth, low birth-weight, and small for gestational age (Conde- Agudelo et al., 2012); thus significantly increasing the risks of early neonatal, infant mortality and under-five years mortality (Rutstein 2008). The aforementioned association in the biomedical literature has mostly been estimated based on hypotheses that draw on medical/ biological orientations (see figure 4).

Figure 4 Hypothetical causal mechanisms identified in literature

SHORT INTERVAL BETWEEN PREGNANCIES

CAUSAL MECHANISMS HYPOTHESIZED

- Abnormal process of remodeling of endometrial blood vessels
- Suboptimal lactation related to breastfeeding–pregnancy overlap
- Incomplete healing of the uterine scar
- Maternal nutritional depletion
- Folate depletion
- Vertical transmission of infections
- Cervical insufficiency
- Sibling competition
- Transmission of infections among siblings

ADVERSE HEALTH OUTCOMES

ADVERSE MATERNAL OUTCOMES
- Uterine rupture in women attempting a vaginal birth after previous cesarean section
- Uteroplacental bleeding disorders
- Premature rupture of membranes
- Maternal death
- Anemia

ADVERSE PERINATAL OUTCOMES
- Preterm birth
- Low birth weight
- Small for gestational age

ADVERSE INFANT/CHILD OUTCOMES
- Neonatal growth
- Neonatal morbidity and mortality
- Postneonatal death
- Infant death
- Child death
- Under-five-years death

Source: Conde-Aguelo et al. 2012

Apart from the maternal depletion hypothesis discussed in chapter 2.1, other plausible biomedical mechanisms through which short birth spacing increases the likelihood of child mortality include those hypotheses (in figure 4) that have been identified to be correlated with high risks of low birth weight, prematurity and inadequate lactation. Since, the negative consequences of short birth intervals is not exclusive to newborns or infants alone as they have been reported to be significantly associated with increased risks of stunting and under-nutrition in children aged less than five years (Rutstein 2008). All these contribute to chronic diseases and health complications in the course of a child's growth[19] which ultimately threatens the child's survival chances. For instance, "children born too small (low birth weight) or too early (prematurity) who narrowly survives the neonatal stage may still have chronic or respiratory and immunologic problems that weaken them later in life" (Haaga 1991: 37), thus increasing the odds of mortality.

As I stated earlier, the link between short birth spacing and child mortality can be also be viewed from a behavioral/ cultural perspective beyond biomedical orientations. This is owing to the background knowledge the cultural outlook often provides to understanding and then offers insights that could help address the situation (odds of child mortality). Besides, the underlying factors on the decision to have a child are mostly rooted in the complex interplay of social, cultural, behavioral and economic factors all of which work through proximate determinants which influences the outcome (mortality).Within these premises, I explored an analytical narrative (where I found two contrasting yet interesting view points) to aid my contextual understanding of the relationship between birth spacing and under-five mortality.

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[19] From the previous discussions in chapter 2, it is evident that health complications that arise as a result of poor nutrition extend beyond early childhood through an individual's life cycle. See figure 6 in Appendix B for a lifecycle framework of nutrition and adverse outcomes asides from mortality (which is often a primary outcome) that can arise all through life stages.

4.2 Birth Spacing and Child Mortality: A Cultural Outlook

To begin with, an identified key area where societal and cultural factors may influence birth spacing is in cultural perceptions and values placed on the sex of a child (Fayehun et al. 2011:80). This finding holds true in developing countries like Nigeria, where societal norms, beliefs and values tend to shape attitudes on reproduction. For instance, societies where sons are revered are characterized with high fertility, short birth intervals and its attendant risks. In the words of Arkutu (1995), 'women continue to bear children (in such societies), in anticipation of the "desired children" even in conditions that threatens their lives' (ibid: 17).

A study conducted in Nigeria on patterns of birth spacing across the five predominant ethnic groups in the country based on data from NDHS 2008 reported that one of the ethnic groups (the Igbos) had an exceptionally shorter birth interval as compared to other ethnic groups especially if the preceding child was female which implies the urgency in having the "preferred male son". This finding about Igbo people complemented Nnadi's (2012) that, "the premium[20] placed on the male child is higher among this tribe than others". The author further stressed that '... a five year old male is valued more than a full grown woman in Igbo land' (Nnadi 2012:135) since the value placed on the male child defies his birth order, he remains the head regardless of his age and birth rank.

Taking a cue from the findings of the aforementioned study, I delved into looking at the relationship between birth spacing and child mortality from an ethnic group level[21] . As a preview, I present a bivariate relationship of ethnicity and child mortality in Table 9,

Table 9 Under-five mortality and ethnic groups' variables

Variable	2008		
	Dead=0	Dead=1	P-value
Birth interval (Less than 24months)	0.19	0.29	0.007
Birth interval (Between 24 – 48months)	0.49	0.43	0.000
Birth interval (More than 48months)	0.15	0.09	0.032
Igbo	0.13	0.11	0.005
Hausa-Fulani	0.39	0.47	0.000
Yoruba	0.11	0.06	0.09
Northern Minorities	0.07	0.07	0.526
Southern Minorities	0.03	0.02	0.308

Notes: The P-value column of the table reports p-value for a two-tail t-test. The null hypothesis is equality of means.

The numbers show that child mortality is higher amongst the Hausa- Fulani and the Igbos. The mean incidence of mortality for the two ethnic groups is 0.47

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[20]The premium placed on sons is vivid from the "names given to the second and third order births that are females (for instance Nwanyibunwa which means "a girl is nonetheless a child") as the names express the regrets, disappointment and/or sorrows the parents have since they do not have their revered son yet" (Nnadi 2012:136).

[21]See map 2 in Appendix E for a map of Nigeria showing a distribution of the ethnic groups.

and 0.11 respectively which is comparatively higher than the means for other ethnic groups. Studies such as Brockerhoff and Hewett (1998) have shown that the children from the Hausa-Fulani ethnic group have higher likelihoods of mortality as compared to their counterparts from other ethnic groups. This observed disadvantage has been attributed to "accumulation of disease assaults and nutritional deficiencies over time resulting from the harsh epidemiological environment of Hausa land and other parts of northern Nigeria" (ibid: 23). This buttresses the discussion of our regression results in the preceding chapter that environmental characteristic of the household is one of the dominant determinants of child mortality in Nigeria. Hence, there is a need to address poor environmental conditions that pose a threat to the odds of child survival in the country.

Continuity & Change in cultural norms, traditions and the birth spacing - child mortality nexus

The subsequent discussion focuses on the contrasting yet interesting standpoints I identified in viewing the link between short birth spacing and child mortality. I begin with the Igbo ethnic group (continuity) and then the Hausa-Fulani ethnic group (change).

Male child syndrome, short birth spacing and child mortality amongst Igbo people in Nigeria

According to Nwokocha (2007: 224), the societal norms, beliefs and values which shape attitudes on reproduction amongst the Igbos are peculiar. The peculiarities are upheld by the social organization whose structures have deeply rooted patriarchal ties than other tribes in Nigeria. Despite several years of western influence, the society still upholds its strong cultural traditions, beliefs and norms. One of such is the preference for male sons (locally referred to as male child syndrome); Isiugo- Abanihe (1993) highlights the situation in the tribe more vividly:

> "A man who died without a son lived a worthless life; he is inherited by his brothers and is soon forgotten since his branch of the family tree has ended…also, in traditional Igbo society, the status of a man is assessed in part by the number of his sons, a man with many sons is viewed as a wealthy or an accomplished man; his neighbors cautiously avoid confrontations or litigation with him; he is assured a befitting burial at death.

> For a woman, the birth of a male child is of paramount importance as well because it establishes her firmly in the family. She is said to have "taken root" or 'established a solid foundation' when the first son arrives. Since the birth of a son ensures marital security, given the prevailing high child mortality, just a son is not enough. The desire to ensure that at least one survives his father encourages prolific child-bearing" (Isiugo- Abanihe 1993:6).

The above insight implies that the importance attached to male children among Igbo people defies gender boundaries- both husband and wives desire male children for their culturally perceived significance. For a clearer understanding of the complexities among this ethnic group, some personal interview excerpts from Nwokocha (2007) are presented in Box 1(Appendix D). The illustrations from the interviews lend credence to the fact that the society still upholds its strong cultural traditions, beliefs and norms especially male child syndrome which has persisted despite changing times- education, modernization and greater awareness. This reflects a continuity of cultural values, norms and traditions.

The women continue to bear the brunt (as described by Mrs. Eunice in Box 1)[22] since marital security[23] is assured in giving birth to at least a son. The quest for sons (in a bid for marital security) serves as a justification for high fertility especially when the male children are not 'born early'. Consequently, when women feel less secure in their marriages for instance, if there are increasing rates of polygamy (especially in their immediate environment), if their husbands are migrating more (increased male migration)[24] and worse still if divorces becomes rampant[25], they tend to decrease their child spacing more in a bid to give birth to at least a son to secure their marital relationships in the short run and ensure inheritance rights on the long run.

According to Nwokocha (2007), "this pronatalist -propelled tradition has been implicated in the relegation of family planning practices, short interval pregnancies, abortion and adverse pregnancy outcomes in general" (ibid: 223). The situation becomes worse in the face of the deplorable healthcare system in the country (with its characteristic non-functionality and poor referral system to handle pregnancy/delivery complications and emergencies). Based on the foregoing discussion, it can be surmised that culture and birth spacing are likely to influence child mortality as shown in the analytical framework presented in figure 5.

[22]This is corroborated by Nnadi (2012) who states that "in Nigeria, specifically amongst the Igbos, as a matter of culture the lack of a male issue in a marriage sometimes leads to divorce, separation or the husband taking several wives until one of the wives is able to produce a male child" (Nnadi 2012: 137)

[23] It is imperative to state that marital security amongst the Igbos surpasses sharing a man with other women but mainly borders on inheritance issues. The girl-child and women are denied rights to inheritance rights thus when the husband dies (without a male child), his assets are inherited by his kinsmen. The kinsmen (except on few occasions) dispossess the wife and daughter- (s) of their husband (father)'s property.

[24]Male migration also heightens women's insecurities owing to the fear of being abandoned while their husbands take new wives in their new station. In Lesotho, it was found that "there is a strong linkage between male migrants and proliferation of illegitimate children" (Modo 2011: 447). These socio-demographic indicators –divorce, migration put additional pressures on the women in social, economic and psychological terms.

[25] In their work on the demand for sons in the United States, Dahl and Moretti (2004) found that there were subtle preferences (not as extreme as Asia) for sons than daughters. They observed that "parents of girls are more likely to be divorced than parents of boys….also, in the event of a divorce, fathers were more likely to live with their sons; possibly because they fight harder to obtain custody of sons than daughters" (ibid:35)

Figure 5 Conceptual framework for studying child mortality from a cultural perspective (continuity)
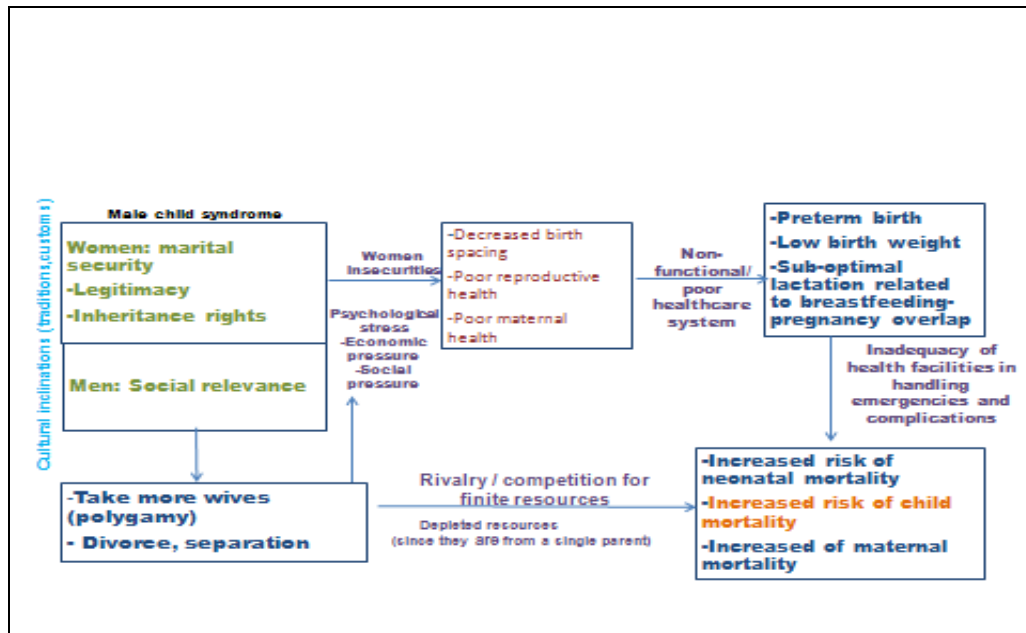
This framework uniquely synthesized channels through which cultural norms and traditions (male-child syndrome) subject women to insecurities which they try to overcome by giving birth to more children in quick succession (short/decreased birth spacing) compounded by inadequate or poor health systems in the country (as highlighted in section 2.2) thus worsening child mortality situation in Nigeria.

Unlike Asia (as reported by Scrimshaw 1978, cited in Mosley and Chen 1984:36) where "infanticide is the last resort to achieve desired child preference and/or composition", Igbo women continue to "try their luck" in a bid to get their marital security (a male child).

Short Birth Spacing- High Child Mortality Nexus among the Hausa-Fulani

"A woman should not go to her husband while she has a child she is suckling. If she does, the child gets thin, he dries up, he won't get strong and he won't be healthy. If she goes after a year, the child won't get strong: but if she goes after two years it is nothing, he is already strong before that, it does not matter if she conceives again after two years. If she only sleeps with her husband and does not become pregnant, it will not hurt her child, it will not spoil her milk. But if another child comes in, her milk will make the first one ill" – Smith (1954:148).

The aforementioned illustration is an excerpt from the famous book 'Baba of Karo[26]' which suggests that the Hausa- Fulanis have a (local) consciousness of

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[26]This book is a full-scale autobiography of an old Hausa woman, which reveals and evaluates the changes that have taken place in the wider political and economic framework of Hausa life from the pre-colonial times to the post-colonial time (Smith 1954:7).

the ills of short birth spacing and their awareness pre-dates the 'ideal birth spacing' recommendation of the WHO and UNICEF.

Traditionally, the Hausa- Fulanis have engaged in different local methods to ensure adequate spacing among their children in a bid to avoid "Tamowa" (a child illness believed to arise as a result of having sexual intercourse during breastfeeding) (Akinfeleye et al. 1994). These methods ranged from mothers delivering in their natal home and returning to their marital home after weaning the child (ibid), using local herbs, charms and/or concoctions to prevent pregnancies if mothers/ fathers could not abstain (Renne 1997) and if (all) preventive methods failed and pregnancy occurred during the weaning period, the women resorted to abortions (Madauci et al., 1968; cited in Renne 1997), as "abortion was considered the lesser of two evils" (Renne 1997). This practice was also strengthened by societal reproductive norms and values[27] as well as religious inclinations[28].

The Hausa- Fulanis are notable for their religious steadfastness and passion for Islam; they do not only uphold the doctrine and teachings of the Quran but they also hold Islamic teachers and scholars in high esteem as they are the revered gate keepers on reproductive and sexual health issues. Within these premises, they mostly adhered to the practice of "two years of breastfeeding and served as a basis for abortion" (Renne 1997).

However, unlike the Igbo values, traditions and norms that proved resilient to changing times (education and modernization) the Hausa-Fulani value system changed over time albeit in a unique way. With the spread of education and enlightenment, recent interpretations of the Quran have argued that a long duration of breastfeeding (natural spacing tool) was not mandatory but optional (Waines, 1995; cited in Renne 1997). Furthermore, Islamic scholars in Islamic schools are tutoring their students (married women) otherwise; as shown in an interview excerpt extracted from the study conducted by Renne in order to understand the changing patterns of child spacing in a Northern town in 1997:

> "The teachers used to say in Islamiyya that too much breastfeeding blocks the brain of the child. That is why they are telling parents to wean the child when he is one year or eight months old" (Renne 1997:9).

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[27] In the society, women that gave birth in quick succession were given names for instance: "Women who have short birth intervals are described as *GindinGyada* (Groundnut's root), *Aimaka* (One who is never tired of nursing a baby), and *Karya* (One who is never tired of having sex)" (Akinfeleye and Omideyi, 1994).

[28]Renne (1997: 6) showed some Quran passages to support the doctrine on the length of breastfeeding:

"Mothers should breast feed their children two full years, provided they want to complete the nursing. The family head must support women and clothe them properly. Yet no person is charged with more than he can cope with. No mother should be made to suffer because of her child, nor family head because of his child" (Sura II: 233).

So for the Hausa-Fulanis, it seems like their change in religious beliefs is fostering child mortality since they are tending not to believe in long breast feeding periods and are more likely to become pregnant sooner. Also, medically, it is said that a lactating woman has lower chances of getting pregnant.

This confirms that outcomes (child mortality) differ across cultural settings hence should be addressed contextually if positive results are desired.

Chapter 5

Conclusion

Motivated by the situation of child mortality in Nigeria, where high rates of child mortality and slow rate of annual reduction makes achieving the 2015 MDG target appear bleak (as shown in Figure 1 and Table 1), I analyzed determinants driving under-five mortality in Nigeria using the third and fourth rounds of the Demographic and Health Surveys conducted in the country in years 2003 and 2008. Individual cross-sections of the datasets were analyzed using Probit estimation technique to identify factors associated with the likelihood of under-five mortality in the country.

My results indicated that bio-demographic characteristics of the index child and environmental characteristics of the household are the dominant determinants of child mortality in Nigeria, corroborating Mutunga's findings (2007) on Kenya. In relation to environmental characteristics, it is noteworthy that ensuring the improvement of household characteristics- access to safe water, improved toilet and flooring material will significantly contribute to child survival. Another significant finding was that households with health insurance cover were less likely to experience child mortality. However as discussed earlier in chapter 2, the scope of the NHIS is limited to the formal sector (in the dataset, only about 6% of the households had the cover); thus, efforts should be geared towards extending coverage to the informal sector (where the majority of households operate).

This study further explored the link between birth spacing (an identified key variable) and the incidence of child mortality. This was motivated by the empirical findings of the study as well as the underlying complexity of birth spacing in the Nigerian context. Moreover, understanding the pathway through which adequate birth spacing might improve child health outcomes is essential for effective evidence-based interventions to address child mortality and alleviate Nigeria's worsening U5Mr condition caused by short-lived interventions owing to the deplorable state of the health system (see section 2.2).

The contribution of this paper to literature includes constructing a conceptual framework that provides background knowledge and a basis for generating and supporting hypothesis from the cultural perspective (see figure 5) by analyzing linkages between birth spacing dynamics and child mortality in a patriarchal society, where son preference is resistant to changing times. It also helps to identify variant influences of culture on birth spacing by juxtaposing norms and values of two cultural settings (Igbos and Hausa-Fulanis where cultural continuity tends to uphold cultural norms and reinforce short birth spacing and where cultural change drives shorter birth spacing respectively) and showcasing how outcomes (child mortality) differ across cultural settings and require contextual considerations if positive results are to be realized.

In conclusion, given the deplorable state of the Nigerian healthcare system and poor contraceptive use in the country (shown in chapter 2) improving health services and contraception availability may seem the quick- fix approach towards reducing child mortality, but it should be noted that socio-cultural factors like birth spacing are more resistant to change as the chances of policy regulating structural and social attitudes are quite slim. Hence, this finding implies that in examining factors that drive child mortality, researchers should consider birth spacing but it should be borne in mind that it is a cultural phenomenon which is not amenable to quick-fix policy changes.

Furthermore as an area of further research, an analysis of contextual pathways through which other dominant determinants of child mortality exert influence is essential so as to aid prioritization and implementation of effective interventions in Nigeria.

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Appendices

Appendix A Definitions

Contraceptive prevalence rate: It is an indicator used in measuring the proportion of women in the reproductive age bracket (15-49) years using any form of contraception at a given point in time. It reflects the extent of people's conscious efforts towards controlling their fertility (United Nations, 2012).

Unmet need for Limiting: This is a measure of women within the reproductive age bracket (15-49) years that desire no additional children and are not currently using a contraceptive method (Bertrand et al. 1994: 138).

Unmet need for Spacing : This is a measure of women within the reproductive age bracket (15-49)years who desire to postpone their next birth by a specified length of time and are not currently using a contraceptive method (ibid).
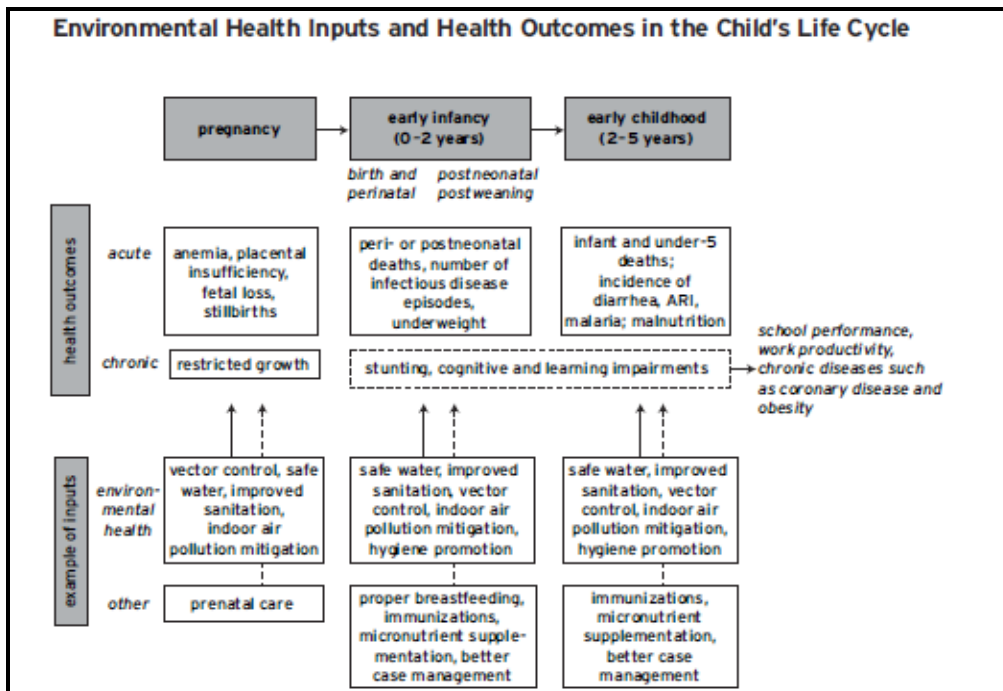
Appendix B Life cycle framework

Figure 6

Nutrition throughout the life cycle framework
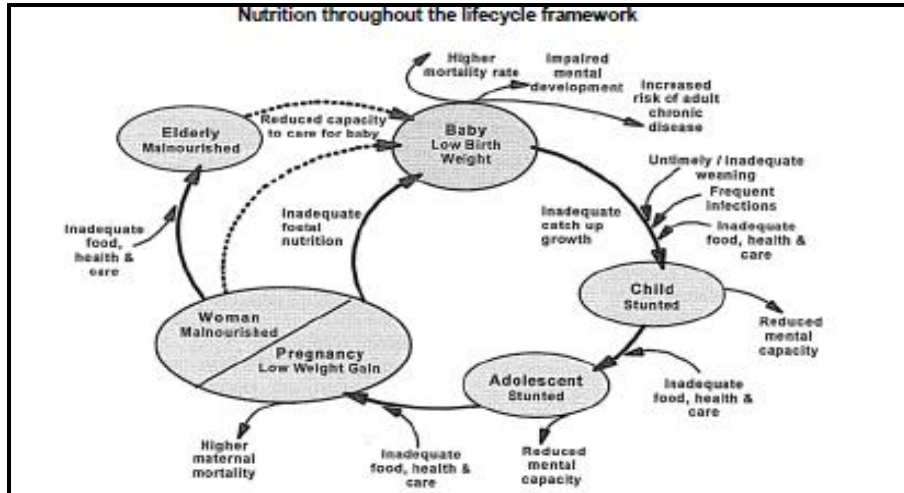
Source: Commission on the Nutrition Challenges of the 21st century (2000) Final report of the ACC/SCN

Figure 7

Environmental Health inputs and Health Outcomes in the Child's life cycle

Source: World Bank 2008

Appendix C Outline for computing mortality rates

Computing child mortality rates from household survey data

Outline for computing child mortality rates using household survey data as presented by O'Donnell et al (2008).

Preparing the data: Demographic and Health Survey

The DHS uses a century month code (CMC) for some of its date variables. A CMC is the number of the month since the start of the century. For example, January 1900 is CMC 1; January 1901 is CMC 13. The variables needed for direct mortality estimation in DHS are

```
V008: date of interview (CMC)
B3: date of birth (CMC)
B7: age at death (month imputed)
B5: whether the child is still alive
```

The age at interview variable, `hypage`, can be calculated for children alive and children dead in Stata as follows:

```
gen hypage=(v008-b3)/12
```

Then, we can generate the surviving time (in years), `timeyears`, for each child in the survey and an indicator of whether the child is `dead`

```
gen timeyears=.
replace timeyears=hypage
replace timeyears=b7/12 if b5==0
gen dead=(b5==0)
```

Computing mortality rates and standard errors

The IMR and U5MR are computed using a life table, produced using the command `ltable`. The command below selects only those children born in the previous 10 years, including those born exactly 10 years ago. Stata allows one to specify the interval width, which can vary through the life table.[1] In the case below, a fixed half-yearly interval is used.

```
ltable timeyears dead if hypageyrs <=10 , int(.5) gr
```

Stata produces a life table along the lines of table 3.1. The lack of decimals in the intervals makes interpretation somewhat difficult—the first row refers to the first half-year of life, the second row to the second half-year of life, and so on. There were 5,316 children born during the previous 10 years, of whom 114 died during the first six months of life, and 194 were "lost" or censored—that is, they were born within six months of the interview date and were therefore not fully exposed to the risk of death. The assumption made in the life table is that these 194 children were exposed for only half of the interval—in this case three months rather than six. The total number of children exposed during the first six months is thus 5,316 less half of 194, or 5,219. The survival rate for the first six months is therefore (5,316 – 114) divided by 5,219, or 0.9782. The survival rate for each of the subsequent half-years is computed in the same way, and from these the cumulative survival function (labeled simply "survival" in table 3.1) is formed. The IMR is the complement of the cumulative survival function at the end of the first year—that is, 1 – 0.9752, or equivalently 24.8 per 1,000 live births. The U5MR is equal to 1 – 0.9642, or 35.8

Appendix D Personal Interview excerpt

Personal interviews excerpts held by Nwokocha (2007) are presented in Box 1below

Box 1

Male Child Syndrome

Interview 1, Mr. Ikenna:

"I would rather marry as many as ten wives instead of living and dying without at least a male child. My people living and dead will never support a man who was unable to raise a male child that will replace him. What can a daughter offer in terms of tradition and what custom will she practice? She is only a "marketable commodity" and cannot be said to have a culture until she is married. If you go round this community, what I have told you, other reasonable men also will. It is an attitude that has transcended from generation to generation and I would not be a party to any change in that direction; I thank God I have five sons".

Interview 2, Mrs. Eunice:

"When a marriage ends up abruptly, it is usually the woman that suffers more. For one, it is not easy for her to establish another relationship that will culminate into marriage. In our society, once a woman is divorced, the notion is that she is responsible for the situation, because it is the 'man world' and even when it is glaring that her husband is responsible for the problem, she is surprisingly blamed. Women who more frequently experience dissolution of marriage are those who do not have sons; that is why most of all struggle to have them at all cost, we want to be counted among women achievers".

Adapted from Nwokocha, 2007:227

"These views were unanimously confirmed by the male FGD participants that have at least one son. The implication of the above is that the value of males over females has continued to be resilient to changing times" (Nwokocha 2007:227).

Appendix E   Mortality rates presented in the final publication of the NDHS

Figure 8

Mortality rates as presented in the Final publication of the NDHS
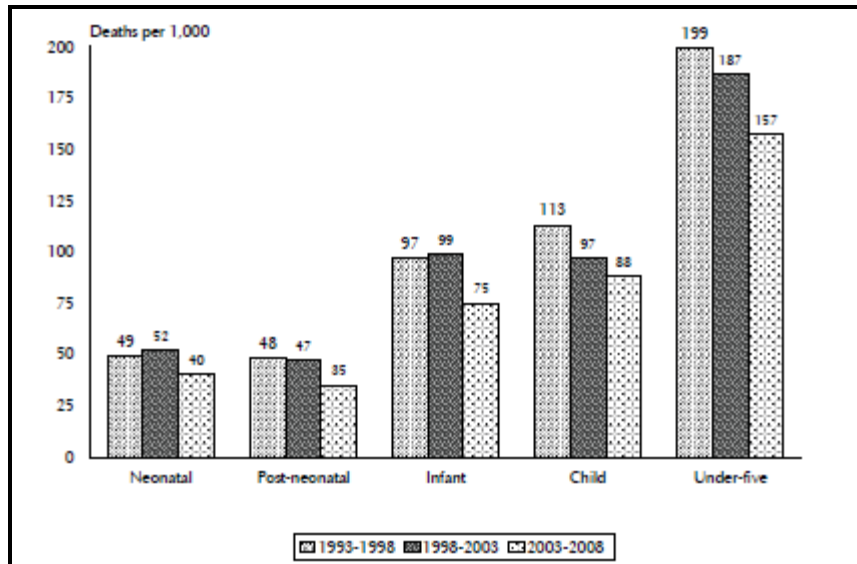
Source: NDHS final publication 2008

Appendix F Maps of Nigeria showing the geopolitical zones and ethnic groups

Map 1 Map of Nigeria showing the six geopolitical zones

Map 2Map of Nigeria 2 showing the distribution and location of the major ethnic groups

Map legend:
- Hausa-Fulani
- Yoruba
- Igbo
- Southern Minorities
- Northern Minorities