UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

THE EFFECT OF CHILD DEATH ON BIRTH SPACING IN NIGERIA

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DECLARATION

I, **Jude Osayawe Ewemade** hereby declare that this research report is my personal work. It is being submitted to the Faculty of Humanities, School of Social Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the Master of Arts degree in Demography and Population Studies. I hereby declare that this report has not been submitted previously, in part or in full, for any other degree or examination in this or any other university.

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……3rd……..day of September, 2018

DEDICATION

I dedicate the success of this work to the glory of God and to my late father, Architect Friday Omorodion Ewemade.

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I am thankful to the Almighty God who has provided strength and wisdom during the entire duration of my study in this programme. God's favours went beyond my expectation even in the most difficult times.

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Abstract

Background: studies have focused on the effect of short birth spacing on childhood mortality, yet, very little attention has been paid to the possibility of an inverse relationship such that child mortality might also positively or negatively affect birth spacing. In Nigeria, where both fertility and child mortality are high, it is important to examine this inverse relationship as a possible reason for high fertility in the country. Therefore, the objective of this study is to examine the effect of child death on time to birth of the next child.

Data and Methods: Data was drawn from the 2013 Nigerian Demographic Health Survey. A nationally representative survey of women aged 15-49 (reproductive ages) years, men, children, couples and households that collects data on reproductive health, fertility behaviour and birth history of mothers. This study population are live births and the sample size was 188,986 (weighted) live births born to the females (15-49 years) within the five years preceding the survey. A multivariate cox proportional hazard regression model was fitted. The interpretation of results was made using hazard ratios with 95% confidence interval

Results: Controlling for other covariates, the cox regression analysis showed that that the risk of next birth is higher when an index child dies compared to when an index child survives [HR: 2.21, CI: 2.035 – 2.413]. Sub-group analysis by geo-political zones in Nigeria showed that in all the regions there was a higher likelihood of having a next birth following the death of a preceding child. Result showed that the south west region had the highest hazard (HR= 1.79, 95% CI: 1.976 – 3.777) of having a next birth, while the south east region recorded the lowest hazard (HR= 1.49, 95% CI: 1.624 – 2.546).

Conclusion: The findings from this study demonstrate that child death is a major factor that shortens the length of birth intervals in Nigeria. It is therefore important that the government of Nigeria intensifies efforts aimed at reducing infant mortality and encouraging adequate birth spacing. This could be achieved through public awareness on the health importance of adequate birth space to both the mother and the child. This is especially important if significant progress is to be made in achieving a controlled fertility in the country and to achieve the sustainable development goal to improve health of both mother and child in the country by 2030

Keywords: birth spacing, child survival, fertility, maternal and child health.

CHAPTER ONE

INTRODUCTION

Birth spacing defined as the interval between successive births and has been of major concern in demographic research (Conde-Agudelo, Rosas-Bermudez, & Kafury-Goeta, 2007; Rutstein, 2005). This is because it contributes to high birth rate, poor maternal and child outcomes such as low birth weight, preterm birth and maternal mortality (Bener et al., 2012; Khan, Bari, & Latif, 2016). The World Health Organisation (WHO) and other international organisations recommend waiting at least 3-5 years between births to reduce infant and child mortality and also to benefit maternal health (*WHO*, 2007; Upadhyay et al., 2014) Short birth spacing is a direct reflection of the Total Fertility Rate (TFR) in a community(Upadhyay et al., 2014). Nigeria, the focus of this research is a high fertility country with a Total Fertility Rate of 5.7 children/woman (NPC& ICF International, 2014) as compared to other countries in the world. The country remains the most populous country in sub-Saharan Africa, and has a total population of about 180 million and a population growth rate of about 2.61%. The population of the country has significantly increased as compared to the previous years, when it was 95 million in 1990 and 140 million in 2005 respectively (NPC& ICF International, 2014).

A well-spaced birth reduces competition among children for breastfeeding, and available food and other resources in the family(Howell et al, 2016). It also allows the mother time to engage herself in other personal endeavours that will contribute to the household income and also contribute to economic development like taking up employment, business, and furthering of education, if this has not been done.

In recent years, a number of studies have focused on the effect of short birth spacing on childhood mortality highlighting its negative implications on child mortality(Molitoris, 2017; van Soest & Saha, 2018). However, in sub-Saharan Africa and most other developing countries where spacing between births is low(ranges between 28 months in Uganda to 39 months in Zimbabwe) (Casterline & Odden, 2016), very little scholarly attention has been given to the possibility of a reverse causality such that child mortality may also affect birth spacing. Given this gap, this study contributes to the body of knowledge by examining the effects of childhood mortality on fertility (birth spacing). The relationship between birth spacing and child death is complex because of the possibility of reverse causality. While

child death affects fertility through biological and behavioural factors, fertility affects child death through inter-birth effects (Gyimah & Fernando, 2002).

1.2 Problem statement

Adequate birth interval is considered as having a positive influence on the health of mothers and their children (Bener et al., 2012). In Nigeria, regional differences exist in birth spacing among mothers of reproductive ages. There is about a seven-month difference between the birth interval for mothers in the South west region, who have the longest birth interval, and those in the South East region, who have the shortest birth interval (34.7 months and 27.7 months respectively (NPC & ICF, 2014). Furthermore, there is awareness of contraception to space births and reduce the number of children born is high, but the most recent Nigeria Demographic and Health Survey report showed that the level of contraceptive use among currently married women is still low and did not experience a significant increase; 13% in 2003 to 15% in 2013 (NPC & ICF, 2014). Total fertility rate is still 5.7 children per woman; infant (child death) and maternal mortality rates are still relatively high (NPC & ICF, 2014). In Nigeria, the space between births is still relatively short hence its harmful consequences on fertility levels, maternal and child health.

Births interval of less than 24 months increase the risk of certain maternal and child health complications, such as, low birth weight, pre-term birth and maternal mortality(Shelley, 2010). Closely spaced pregnancies, among very young and older women pose serious health risks to mothers and their infants by causing higher risk of pregnancy related complications such as miscarriage or premature labour and birth (Dibaba, 2010). More so, birth interval has been reported to have significant effect on the child's health, physical and mental capabilities (Desta & Teklemariam, 2016). A short birth interval also affects not only the new born but also the index child (Fotso et al, 2013). This is because under nutrition increases with age due to premature weaning of breastfeeding and inadequate alternative feeding practices, often as a result of a younger sibling's birth within a short period of time. Birth interval not only directly affects the chance of infant survival but it also acts as a factor through which other variables indirectly operate on infant mortality (Fotso et al, 2013).

Given these concerns and the continuous need to reduce and eliminate the negative implications of short birth intervals, understanding the implications of child death (a potential predictor) becomes very crucial. This study therefore aims to address the current research gap by studying the effects of child death on birth spacing.

1.3 Research questions

What is the effect of child death on birth spacing among women of reproductive age in Nigeria?

Sub-questions

1. What is the time to next birth among women of reproductive age in Nigeria?
2. Is there an association between child death and birth spacing in Nigeria when selected socio-demographic variables are controlled?
3. Is there any significant difference in the effect of child death on birth spacing across geo-political zones in Nigeria?

1.4 Research objective

To investigate the effect of child death on birth spacing among women of reproductive age in Nigeria.

Sub-objectives

1. To estimate the time to next birth among women of reproductive age in Nigeria.

2. To examine the association between child death and birth spacing in Nigeria when selected socio-demographic variable are controlled.

3. To determine if there is any significant difference in the effect of child death on birth spacing across geo-political zones in Nigeria.

1.3 Justification

Out of the three aspects of childbearing that influence child survival: birth spacing, birth order and maternal age; birth spacing is believed to be the most influential factor (Selemani et al., 2014). This is because pregnancy and child birth are major determinants of women's health and also the health of the child (Babalola & Fatusi, 2009). Child bearing characteristics such as maternal age, birth order, and the interval between births has being known to have an important influence, either positive or negative on reproductive health (Bener et al., 2012; Molitoris, 2017; Moultrie, Sayi, & Timæus, 2012a).

Nigeria is a typical country to study the effect of child death on birth spacing given the high levels of fertility [5.7 births/woman] and high levels of infant mortality [69 deaths /1000 infants] in the country (Morakinyo & Fagbamigbe, 2017; NPC & ICF International, 2014). Adequate birth interval always lead to fewer risky pregnancies such as those of very young or old mothers, it also has a good effect on child health and survival (Lindstrom & Kiros, 2007). To date, majority of the available studies have examined the effect of birth spacing on infant mortality and very few studies have examined the possibility of an inverse relationship whereby child death may influence birth spacing. The Government of Nigeria, in collaboration with relevant stakeholders, has taken major steps to improve the family planning programme in the country. It has adopted programmes such as the Integrated Maternal, Newborn and Child Health (IMNCH) Strategy which was inaugurated in 2007 to guide the country towards achieving the Millennium Development Goals (MDGs) 4 and 5 (to reduce infant mortality and improve maternal health) and also developed guidelines, protocols, curricula, job aids for family planning/childbirth spacing. The government also established a budget line for family planning through the National Strategic Health Development Plan which introduced the provision of free family planning/childbirth spacing commodities policy in 2011. The countries fertility rate has since remained high despite the huge investment in these programs by both local and foreign intervention agencies.

Furthermore, the implementation of these several programs to meet the National Policy on Population for Sustainable Development adopted in 2004, which outlines a multi-sectoral strategy for the challenges posed by rapid population growth. The policy target to achieve a reduction in total fertility rate of at least 0.6 children every five years has failed to meet its target consecutively for the past 15 years. Also, the Sustainable Development Goals (SDGs) which Nigeria is a signatory to, has its third goal aims to ensure healthy lives and promote

wellbeing for all at all ages and its specific target to reduce the global maternal mortality ratio to less than 70 per 100,000 live births and also end preventable deaths of new-borns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births by 2030. Hence, the country has to be proactive and address possible factors that have effects on maternal and child health for this goal to be achieved.

Therefore, the finding of this study would be helpful in reminding local and possibly nationwide policy makers of how fertility and birth spacing situation looks like in the study area and to design appropriate strategies for encouraging greater use of optimal birth spacing and thereby ensuring further declines in fertility and maternal and child mortality. It is also hoped that the result of this research will be an input for health care planners and program managers in designing specific and scientifically sound interventions to address the gap in the utilization of family planning and optimal birth spacing.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Introduction

Birth spacing is important in maternal and child health intervention. Studies have confirmed that advocating for an healthy birth timing and spacing are important interventions to improve infant and maternal health (Bener et al., 2012; Moultrie et al, 2012). Although every birth carries a risk of infant and maternal death or morbidity, some pregnancies are associated with a higher risk than others.

Nigerian women desire on average about 6.5 children, while men desire an average of 8 children. Women's ideal family size is highest in North West Zone (8.4) and lowest in South West Zone (4.5) (NPC & ICF International, 2014). Irrespective of the contraceptive method used in Nigeria, the intervals between births are still relatively short hence its harmful consequences on maternal and child health. The median birth interval in 2013 was 31.7 months, an insignificant increase from 31.4 months recorded in 2008 (NPC & ICF International, 2014).

Some of the previous studies relevant to this topic is discussed in this chapter under appropriate heading.

Child death and determinants of the length of birth spacing

A widely accepted hypothesis inspired and explained by the demographic transition theory holds that high child death contributes to parental desires to have many children. Child mortality affects fertility mainly in two ways: physiological/biological changes and through behavioural/replacement effects. Study show that the physiological effect can be explained by the fact that breastfeeding is interrupted with the death of a child, and consequently, the postpartum infecundable period is shortened (Angeles, 2010; Cain & Cain, 1964; Park, Islam, Chakraborty, & Kantner, 1998). As a result of ineffective use or non-use of contraception, the mother is able to conceive the next child sooner, leading to a shorter birth interval. The association between the death of a child and birth spacing or fertility decisions in literature has been attributed to two strategies of reproductive behaviour: replacement and hoarding(Doepke, 2005; National Research Council, 1998). An insurance (or "hoarding") effect arises from the high tendency of couples in high-mortality settings to anticipate

mortality risks, and also a replacement effect in which parents who experience the death of a child consciously or unconsciously adjust or change their subsequent reproductive preferences and behaviour(Hossain, Phillips, & Legrand, 2007). Research has shown that the death of a child reduces the probability that parents will subsequently adopt a contraceptive method, thereby increasing the likelihood of additional pregnancies (Nobles, Frankenberg, & Thomas, 2015).

Mother's employment status

The effects of women's labour force participation on child spacing is not the same everywhere. A study carried out among countries in sub-Sharan African found a relationship between mothers employment status and birth spacing (Longwe et al, 2013). The findings from the study indicated that having several and/or closely spaced young children might give women less possibilities to have a paying job than would have if they had longer-spaced births. According to this viewpoint, for women under better circumstances, the number of children and the length of birth spacing would not matter, as it is assumed they will have more resources at hand to cater for child care problems. On the other hand, it is also possible that the more highly educated and urban women suffer most, as they tend to have more time demanding jobs and may cluster child bearing into fewer years (De Jong et al, 2017).

Age of mother

Mother's age is considered as one of the major determinants of birth intervals. This is because of its inverse relation to the exposure to the risk of conception. A study revealed that age at marriage and age at first birth are important demographic factors which have strong effects on birth intervals and fertility in general (Feng & Quanhe, 1996). The study further explains that women that marry late often want to bear their first child soon after marriage, in order to compensate for their late start and to ensure that they would have enough time to bear another child. A study done in Ethiopia found that young mothers are more likely to progress to the next birth much earlier than mid aged and older mothers (Yohannes et al, 2011).

Religion

Religion is one of the most important social institutions in Nigeria, with important effects on various aspects of people's lives, attitudes and behaviours due to its social function of upholding and legitimising social norms, values and morality. A study in Nigeria on the effect of religion and ethnicity on women's fertility decision have shown there is significant variation observed in fertility behaviour among women of reproductive age in Nigeria by religion. (Obasohan, 2015).

Religious beliefs is a major determinant to explain the difference in the prevalence and use of contraception among women which in turn affect their fertility behaviours and ability to space births(Obasohan, 2015). The possible reason for this lies in the fact that the religious belief claims that God has placed children in the womb of a woman and that determines the number of birth a woman can have(McQuillan, 2004). Also, a study on the Islamic religion and family planning in Nigeria revealed that Islam as a religion permits polygyny and as such most of these women who practice these religion believed that they can gain much of their husband's attention when they are often pregnant for him (Gwarzo, 2011). Another study explained that some religions, such as Catholicism, have restrictions on contraception based on the belief that it is God's will to bring children into the world (Olaitan, 2011).

Mother's level of education

Although studies did not find a direct significant association between women's education and child spacing, education has a fundamental impact on women's fertility behaviour in many societies. According to a study of women social status and child health in India, women of low socioeconomic status within which education is an indicator, are expected to have first birth at a younger age, yet, timing of subsequent births gets longer with increase in the level of education (Kim, 2010).

Education is a key determinant of fertility behaviour in that it determines decision-making with regard to child bearing and spacing since women of child bearing age have to think of their own education and their children's. Thus, education forms the foundation of knowledge about fertility behaviour by increasing the opportunity cost of childbearing thereby reducing the motivation to have more children. A study focusing on marital fertility found that educated and economically advanced mothers have a higher chance of contributing to household decisions, hence they are able to access and plan births. They also have the resources and knowledge that enables them to access more effective methods of

contraception, thus having a greater influence to determine the duration of birth spacing (Wusu, 2012).

Breastfeeding and contraceptive use

In all countries, almost all women breast feed their new born children. However, breast feeding differs among cultures and individuals both in duration and frequency. Lactation amenorrhea is defined as the postpartum amenorrhea period associated with breastfeeding. Breast feeding practices help determine how long women will remain in amenorrhea without menses and thus less likely to get pregnant after giving birth.

Breastfeeding has been established to be a principal determinants of the length of birth intervals through hormonal suppression of ovulation after birth mainly by delaying resumption of ovulation after birth and thus inhibiting fertility(Saha & van Soest, 2013).

The positive influence of the duration and intensity of breastfeeding on birth intervals has been demonstrated to be strong among less educated, rural and unemployed women(Brown, et.al, 2014). A larger proportion of these women practice breastfeeding intensively and for a longer duration compared with women with more education, urban residence and employed. A study done in Ghana found that birth intervals of women who nursed an average of one to two years and did not practice contraception were, on the average, five to ten months longer than those of women who had foetal or infant deaths and therefore did not nurse (Nketiah-Amponsah et al, 2012). Although the pregnancy rates of the non-nursing women increased much faster than the rates of the nursing women, the rates of the non-nursing women were still fairly low three months after delivery because of the temporary sterility associated with the puerperium and also possibly because of abstinence. A study carried out in two Yoruba communities in Nigeria found out that extended breast-feeding and the associated amenorrhoea and abstinence constitute the only means available to parents in societies not practising modern contraception to achieve desired birth spacing.

In summary, evidence from relevant literatures suggests that socio-demographic variables such as age of the mother, employment status of the mother, educational level of the mother, religion, number of surviving children, death of the index child, duration of breast-feeding, and modern contraception use are factors found to be independent predictors of the length birth spacing.

2.2 Theoretical framework

The child replacement theory provides the necessary theoretical perspective for this study. The study adapts the child replacement theory. The theory has its root in psychology but has been used and explained across various disciplines in different way (demography, economics, medicine). The child replacement theory postulates that child mortality experiences may affect subsequent fertility of couples by exerting a physiological effect, influencing length of birth interval, or a replacement effect, in which couples continue to procreate in an attempt to reach a desired number of surviving offspring (Cain & Cain, 1964). This theory can be further explained in two processes. The first process, best known as the 'replacement effect', refers to couples' deliberate attempts to 'replace' a dead child in order to attain a desired number of surviving children at the end of their reproductive life. This replacement strategy raises subsequent fertility and it's most evident in a context of controlled fertility. However, the most likely situation will be one whereby couple plan for replacement and immediate reaction to a child's death is quick and their attempts to initiate a conception will follow almost immediately after the death of a wanted child. Indeed, a number of strategies can be employed to attempt replacement all of which may affect the length of a birth interval. Among them are earlier resumption of sexual intercourse, and cessation of contraceptive use(Palloni & Rafalimanana, 1999). In societies practicing the use of contraception, replacement strategy will be reflected in delays in use or discontinuation of contraceptive methods.

The second process is called 'insurance (hoarding) effect', this refers to the practice of bearing more children than the desired family size even if none of the children born dies(National Research Council, 1998). This mechanism protects the size of a couple's fertility desire against any future child death, it therefore, insures that the couple attains a desired family size at the end of their reproductive period. This form of anticipatory behaviour can result in increases in fertility when mortality levels increases with certainty. Hoarding is more likely to occur in societies where children are expected to be parents' main plan of old age support, or are meant to enhance reproduction of the lineage, or to reduce the risk of losses of family assets, properties and investments(Palloni & Rafalimanana, 1999).

In line with this theory, this study hypothesis that through the replacement mechanism, child death may have an effect on the length of birth spacing in Nigeria. The mechanism which

may occur through the interplay of both social and demographic factors and also fertility related behaviours of mothers on their reproductive choices

2.3 Conceptual Framework

The conceptual framework for this study was guided by reviewed literature as well as the child replacement theory. As pointed out earlier the child replacement theory articulates that the death of a child may influence the fertility decisions of a woman.

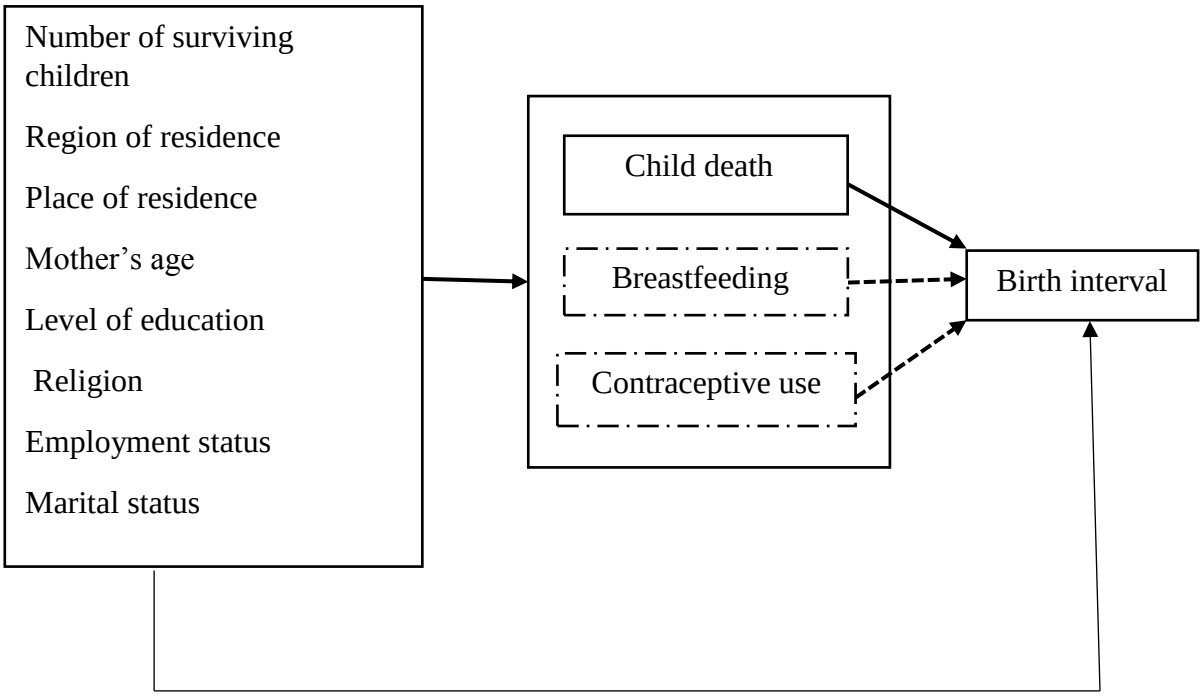

Figure 1: Conceptual framework for the study of the effect of child death on birth spacing in Nigeria (*adapted from child replacement theory by Cain and Cain 1964*).

As highlighted in **figure 1** above, the conceptual framework holds that socio-economic variable (age of mother, mother's level of education, religion, employment status, mother's marital status, place and region or residence) all which are known to either reduce or increase the length of birth interval directly or through intermediate variables such as child survival, breast feeding and the use or non-use of contraception. The mechanism through which

mothers age may be explained directly in the case where the mother marries late and wants to meet her fertility desire before the end of her reproductive circle or indirect in a case where she loses a child at an older age and intend to replace that child before she reaches the end of her reproductive circle. The relationship between mother's education can also affect birth interval by influence of mother's choice to use contraception and in turn influence birth interval, or a direct mechanism through which mother's education may makes her aware of the consequences of a short birth space and in turn influence her decision to space births. The relationship depicted in broken lines in the framework was not covered by the scope of this research. This is because the secondary dataset used for this study did not capture the breastfeeding and contraceptive history of the mothers.

2.4 Hypothesis

Assessing from the frameworks above, the following hypotheses will be tested:

H_0 (Null): Child death does not have an influence on birth spacing in Nigeria.

H_1 (Alternative): Child death has an influence on birth spacing in Nigeria.

Significance level: $\alpha=0.05$

CHAPTER THREE

METHODOLOGY

Introduction

This chapter discusses the methodology used for this study. The study population, study area and the source of data were described. Sample design and Data management was also highlighted. The chapter concludes with data analysis plan and limitation of study.

3.1 Study design

This study is a secondary analysis of nationally representative cross-sectional data from the Nigeria demographic and health survey (NDHS, 2013.

3.2 Data source

The Nigerian Demographic and Health Survey (NDHS) for the year 2013 was the data source for this study. The NDHS is a nationally representative survey of women aged 15-49 (reproductive ages) years, men, children, couples and households. The sampling technique for the survey followed a stratified two-stage cluster sampling procedure. Data were collected on reproductive health issues and birth history by field workers using structured self-administered questionnaires. This study utilizes the children recode component of the NDHS data set. Women were asked questions about their total number of children ever born and surviving as well as detailed reproductive history including sex and date of every live birth, child survival status at time of interview, current age of surviving children and age at death for dead children (NPC&ICF International, 2014).

3.3 Description of study area

The study is set in Nigeria. The country is the most populous country in Africa and the seventh largest in the world after China, India, USA, Indonesia, Pakistan and Brazil. Politically, Nigeria is made up of 36 states and a Federal Capital Territory. The 36 states are grouped into six geo-political zones (regions) namely: North West, North East, North Central, South East, South West and South South region. The level of urbanisation is about 47.8% but is growing at an estimated rate of 4.6% per year. Fertility has remained high with a Total Fertility Rate (TFR) of 5.13 children per 1000 women in 2013 (NPC& ICF International, 2014). This figure marks considerable variations between fertility rates among the regions in the country. Fertility is highest in the North West zone where women have an average of 4.4 children per 1000 women, while fertility is lowest in the South west zone where women have an average of 3.3 children per 1000 women(Mberu & Reed, 2014). About 15% of married women in Nigeria use a method of contraception. The use of contraception also varies by region. It ranges from a low of 3% among married women in the North East region to 38% among married women in the South West region of the country(NPC& ICF International, 2014).

Figure 2: Map showing the six geopolitical regions in Nigeria

(source: NPC & ICF Macro, 2014)**.**

3.4 Study population

The population of interest are women aged 15-49 years who had at least one birth in the past five years prior to the survey.

3.5 Study sample

Analysis was based on the women's birth history, that is the children recode dataset of the 2013 NDHS. This contains data on live births in the last five years before the survey. Therefore, the analytical sample size was 188,986 (n) live births

3.6 Variable description and management

The outcome variable is birth spacing. In this study it is measured as the time to succeeding birth and is defined as time taken to have a succeeding birth. Succeeding birth interval is calculated as the difference in months between the current birth and the following birth, counting twins as one birth.

The independent variables are grouped into two; the main explanatory variable which is child death and the control variables which include number of surviving children, employment status, mother's religion, mother's educational status, age of mother, mother's marital status, place of residence and region of residence. The description of each variable and its categories are presented in the table below.

Table 3.1: Table showing the description and categories of outcome and independent variables

Outcome variable		
Variable	**Definition**	**Coding**
Birth spacing	Time to succeeding birth	Continuous variable in months
Independent variable		
Variable	**Definition**	**Coding**
Child death	The survival status of an index child under the age of 5	1. No 2. .Yes
Level of education	Education level of mother	1. No education 2. Primary 3. Secondary

		4. Tertiary
Number of surviving children	Number of living children born by a woman	1. No child surviving 2. Less than or five children surviving 3. more than five children surviving
Mothers age	Mothers current age.	Continuous variable of mother, ages from age 15 - 45
Mothers marital status	The present marital status of the mother.	1. Never married 2. Married 3. Previously married
Employment status	Employment status of the mother.	1. Employed 2. Unemployed
Religion	Religious group the mother belongs to.	1. Christian 2. Muslim 3. Other religion
Type of place of residence	Geographical location of the mother's place of residence.	1. Urban 2. Rural
Region of residence	Political/administrative area the mother resides	1. North West 2. North East 3. North Central 4. South West 5. South East 6. South South

3.7 Analytical approach

To be able to address the research question in the study, each of the research objectives were addressed.

The **first objective** which was to determine the length of birth spacing among women of reproductive ages in Nigeria was achieved using the Kaplan Meier graph. This method allows the estimation of survival over a specific period of time, for this study it is used to show time taken before the birth of a next child. Also, the log-rank test was used to compare the time to succeeding birth across various explanatory variables.

The **second objective** which was to examine the association between child death and birth spacing in Nigeria when selected socio-demographic variables are controlled was achieved by analysing the effects of the covariates on the dependent variable which is a time variable.

Cox proportional hazards model (i.e. survival analysis) was employed to test this relationship. The cox model is appropriate in analysing time variable and censored observations. Censored cases require special treatment in estimating their exposure time, therefore normal regression procedures cannot be used. To overcome this problem, the survival model accommodates the assumption that censored individuals ae assumed to be at risk of experiencing the event at the mid-point of the interval. Censored cases in this study were cases that were without succeeding births at the time of data collection. Therefore, the time to event of this cases were censored at the date of the survey.

The proportional hazard model adopted in this study was:

$$H(t) = H_0(t)\exp^{(\beta_1\chi_1+\beta_2\chi_2+\ldots.+\beta_k\chi_k)}$$

Where x_1 to x_k are the independent variable.

β is the coefficients.

$H_0(t)$ Is the baseline hazard at time t.

(source: Cox, 1972)

The **third objective** which was to determine if there is any significant difference in the effect of child death on birth spacing across geo-political region in Nigeria was achieved by fitting a separate cox regression model for each region and then compare the hazard ratios across all the geo-political region.

The cox regression model relies on the assumption that the hazard ratio is constant overtime, therefore only predictor variables that did not violate the assumption were utilized for the multivariate analysis. The test for proportional hazard assumption was performed to assess the model assumption. The result of the diagnostic test showed that the model fits reasonably for the data. The diagnostic test result is shown in the appendix section of this report. Weighting of responses using 'survey weights' was also done to correct for sampling error and to ensure that the sample is a true representation of the entire population. Interpretation of results was done using hazard ratios with level of significance set at $p<0.05$.

3.8 Ethical consideration

This study conducted a secondary analysis of an existing dataset. Therefore, no personal information or name of the respondents was identified in the dataset. As a result, anonymity and confidentiality of the study respondents were guaranteed. Besides, ethical permission for the use of the Nigeria Demographic and Health Survey had already been obtained from ICF Macro Inc., USA.

3.9 Study limitations

This study is limited in its inability to determine the timing of occurrence of each of the variables under study such as, the time at which the woman attained an educational level or moved to a particular residence type. Similarly, the study was unable to ascertain if information on birth history of sampled women in the study was affected by recall bias. The study draws on a cross-sectional secondary dataset; as a result, there is tendency for child deaths to be underreported. Omission of deaths can affect levels and patterns of child deaths; so also misreporting of age at death (heaping or avoidance) can distort the age pattern of mortality. Nevertheless, it is not envisaged that the data limitations will pose a serious challenge to this study. This is because the data quality assessment done for the 2013 NDHS data indicated that the surveys yielded a reliable mortality data.

The study is also limited in the absence of some important correlates on the risk of having a next birth in the analysis. The effects of breastfeeding and contraceptive use could not be controlled for because information on them was only available for births that occurred three years preceding he survey. The contraceptive use history between successive births was not available in the dataset and therefore could not be controlled for in the multivariate model. These limitations did not reduce the strength of the result but serves as a research gap for further study to explore on birth spacing.

3.10 Conferences for the dissemination of research findings

S/N	Proposed conferences	Conference dates	Title of paper	Action
1	Annual conference of the Population association of America (PAA) Denver, USA	April 26 – 28, 2018	The effects of child death on birth spacing in Nigeria: how long does it take for mothers to have another baby?	Paper accepted for oral presentation
2	The 4th Asian population association (APA) conference, Shanghai	July 11 - 14, 2018	The effects of child death on birth spacing in Nigeria: how long does it take for mothers to have another baby?	Paper accepted for oral presentation

CHAPTER FOUR

RESULTS

This chapter shows the results of the analysis that was carried out in this study. It begins with the percentage distribution of respondents by selected socio-demographic characteristics. It further goes ahead to show the bivariate and multivariate analysis of the relationship between child death and other selected socio-demographic variables on birth spacing.

4.1 Descriptive profile of births to women in the reproductive ages in Nigeria

The result from **table 4.1** provides a detailed description of the socio-demographic background characteristic of mother's births included in the research. The table showed that about 50% of the total births were born to women with no education, mothers who were employed had 76% of the total births while the unemployed mothers had 24% of the total births. The north east had the highest percentage of births (20%) while the mothers from the south east region had the lowest percentage of total births.

Close to half of live births (48%) have mothers who were not educated experienced a child death while just 6% of the mothers who with completed higher education experienced a child death. The table shows that 66% of child deaths were experienced by mothers who are rural dwellers while 34% of child deaths were experienced by mothers who live in the urban areas.

Table 4.1: Distribution of births by their survival status according to selected demographic and socio-economic characteristics, Nigeria 2013

Characteristic	Survival status of index child				Total	
	Dead		Alive			
Number of surviving children	**n**	**%**	**N**	**%**	**n**	**%**
None surviving	0	0.00	581	2.88	581	0.49

less than or 5 children surviving	61,108	81.53	13,846	68.62	74,954	62.99
more than 5 children surviving	37,701	86.77	5,750	28.50	43,451	36.52
Level of education						
No education	47,345	47.92	13,245	65.64	60,590	50.92
Primary	23,885	24.17	3,984	19.75	27,869	23.42
Secondary	21,793	22.06	2,487	12.33	24,280	20.41
Higher	5,786	5.86	461	2.28	6,247	5.52
Mothers age at child birth						
15-19	1,383	1.40	197	0.98	1,580	1.33
20-24	6,954	7.04	946	4.96	7,900	6.64
25-29	15,561	15.75	2,516	12.47	18,077	15.19
30-34	18,127	18.35	3,169	15.71	21,296	17.90
35-39	20,509	20.76	4,086	20.25	24,595	20.67
40-44	17,762	17.98	4,014	19.89	21,776	18.30
45-49	18,513	18.74	5,249	26.01	23,762	19.97
Mothers marital status						
Never married	874	0.88	109	0.54	983	0.83
Married	91,778	92.88	18,802	93.19	110,580	92.94
Previously married	6,157	6.23	20,177	6.27	118,986	6.24
Employment status						
Unemployed	23,053	23.33	5,157	25.56	28,210	23.71
Employed	75,756	76.67	15,020	74.44	90,776	76.29
Religion						
Christian	42,643	43.16	5,857	29.03	48,500	40.76
Muslims	54,408	55.06	13,923	69.00	68,331	57.43
Others	1,758	1.78	397	1.97	2,155	1.81
Type of place of residence						
Urban	33,890	34.30	4,763	23.61	38,653	32.49
Rural	64,919	65.70	15,414	76.39	80,333	67.51
Region of residence						
North West	14,377	14.55	1,720	8.52	16,097	13.53
North East	19,309	19.54	4,778	23.68	24,087	20.24
North Central	29,570	29.93	9,026	44.73	38,596	32.44
South East	9,614	9.73	1,558	7.72	11,172	9.39
South South	13,275	13.44	1,548	7.67	14,823	12 .46
South West	12,664	12.82	1,547	7.67	14,211	11.94
Total	**98,809**	**100**	**20,177**	**100**	**188,986**	**100**

Source: Computed from NDHS, 2013

4.2 Kaplan-Meier estimates of the time to next birth in months among women of reproductive ages in Nigeria across socio-demographic variables

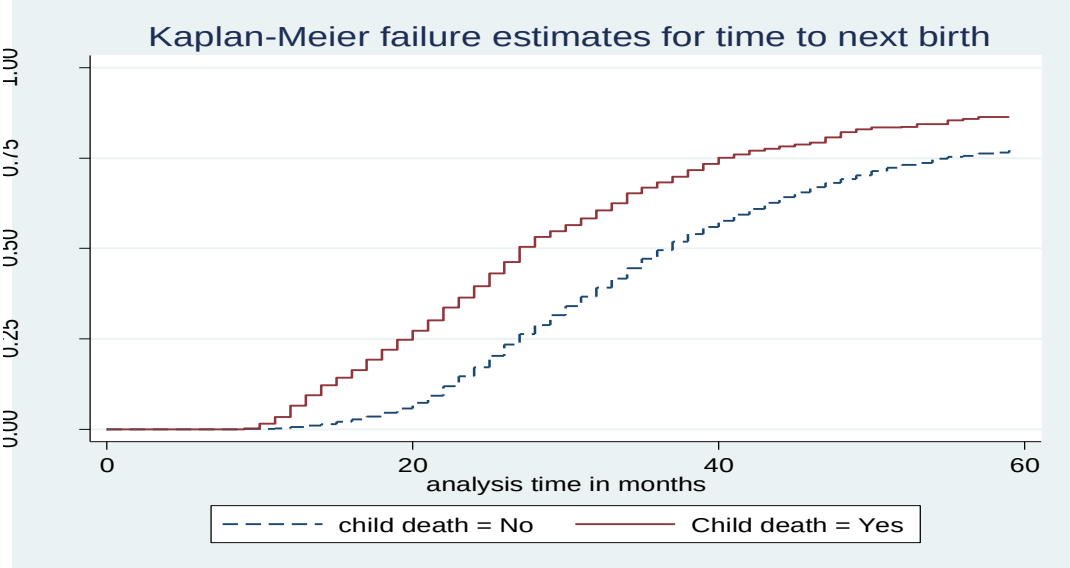

Figure 3: Graph showing the failure estimates for time to next birth in months and child survival status

The Kaplan-Meier graph in **figure 3** shows the estimate of time to next birth and child survival among Nigerian mothers in the reproductive ages. It showed that the median time to next birth in Nigeria when the index child is dead is 27 months while it is 37 months when the index child survives. The graph also shows that in 36 months, 68% of the mother's whose index child died already had a next birth.

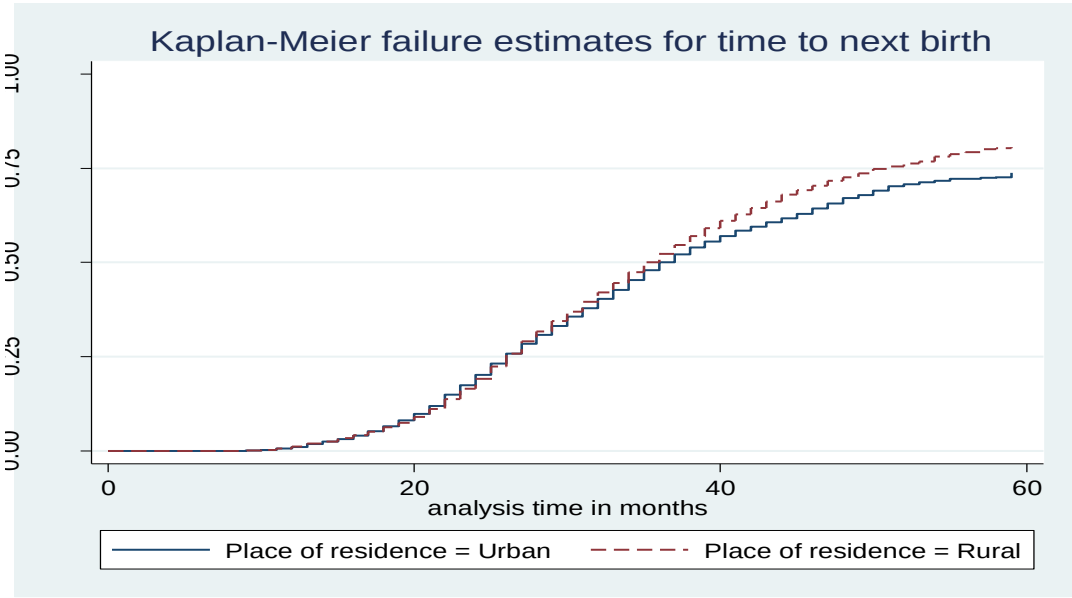

Figure 4: Graph showing the failure estimates for time to next birth in months and place of residence

The Kaplan-Meier graph in **figure 4** shows the failure estimate for time to next birth and place of residence among mothers of reproductive ages in Nigeria. The graph showed that in 36 months, 52% of Mothers who live in rural areas already had a next birth compared to 50% of mothers living in the urban areas.

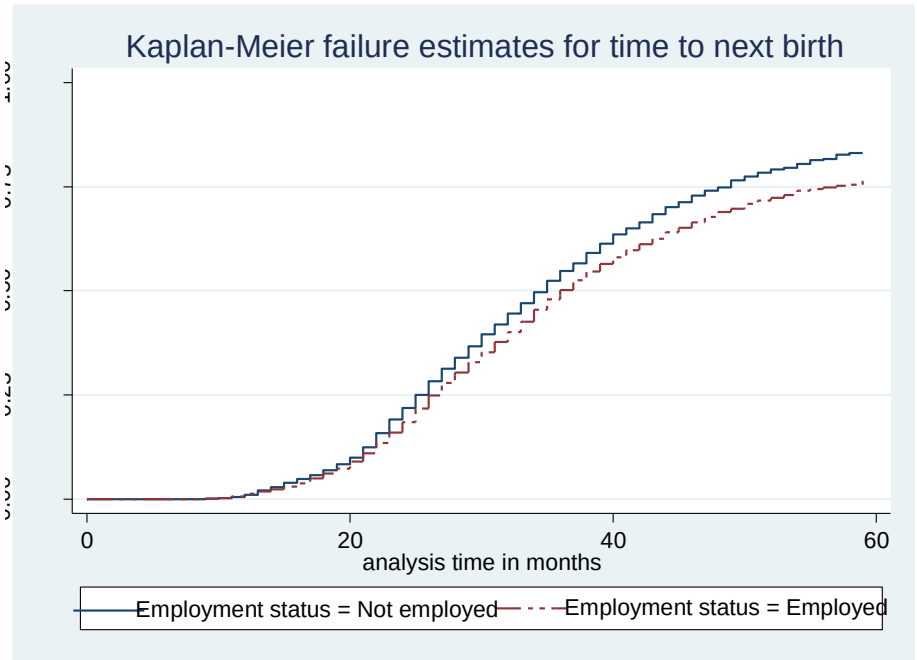

Figure 5: Graph showing the failure estimates for time to next birth in months and employment status

The Kaplan-Meier graph in **figure 5** shows the failure estimates for time to next birth and employment status among mothers in Nigeria. The graph shows that at 36 months, 50% of Employed mothers had next birth compared to 54% of unemployed mothers.

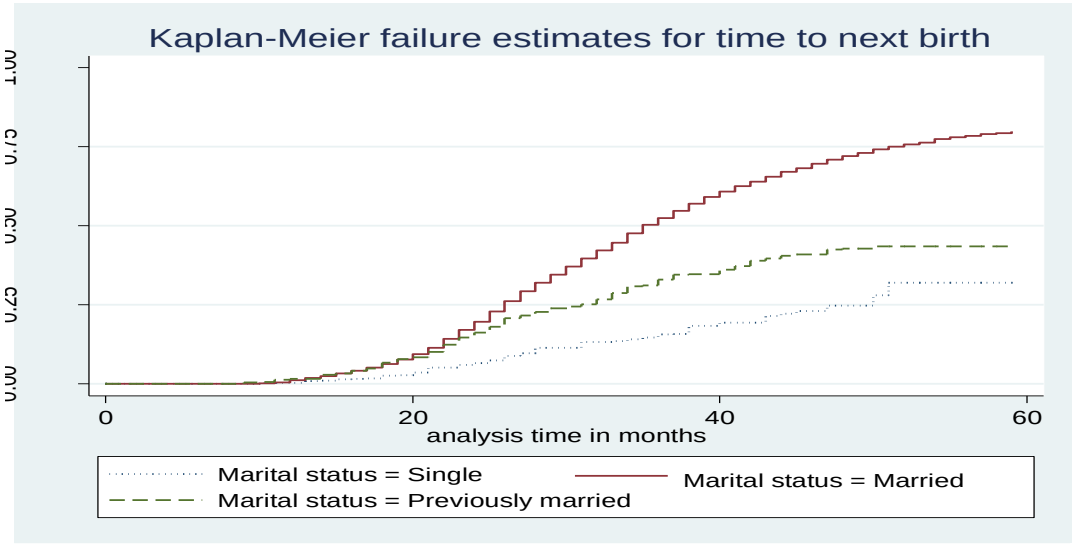

Figure 6: Graph showing the failure estimates for time to next birth in months and mother's marital status

The Kaplan-Meier graph in **figure 6** shows the failure estimates for time to next birth and mother's marital status. The graph shows that there is a statistically significant difference in the time to next birth among women of different marital status in Nigeria. The graph shows that at 36 months, 16% of Mothers who were never married had a next birth compared to 33% of previously married mothers and 52% of the married mothers who already had a next birth at this time.

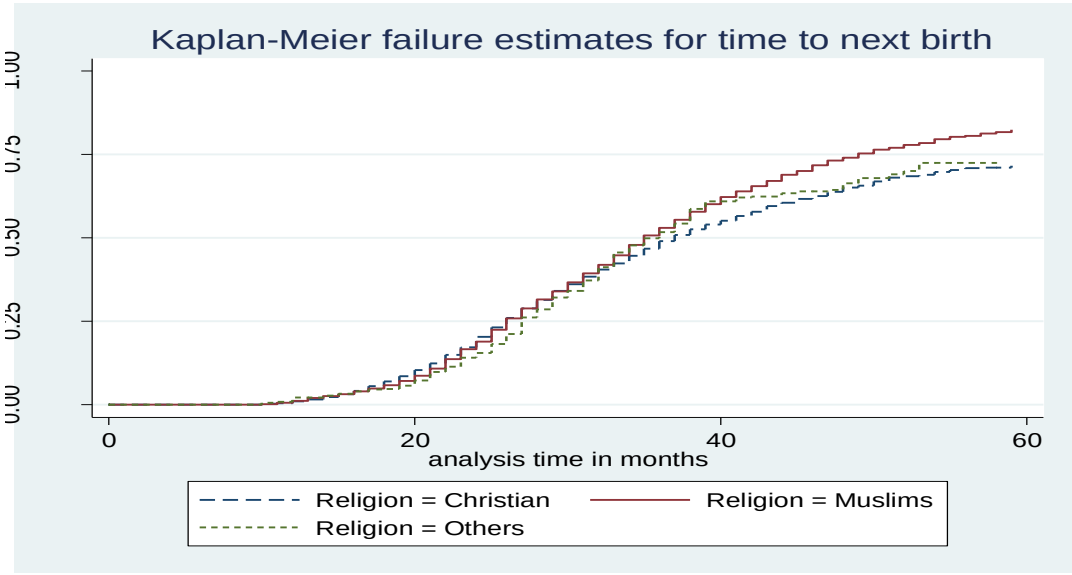

Figure 7: Graph showing the failure estimates for time to next birth in months and mother's religion

The Kaplan-Meier graph shows the failure estimates for mother's religion and time to next birth among mothers in Nigeria show a statistically significant difference in the time to next birth between the different religions. The graph showed that at 36 months, 49 % of the Christian mothers had a next birth, 53% of the Muslim mothers had a next birth and 52% of mothers belonging to other religious sects had a next birth.

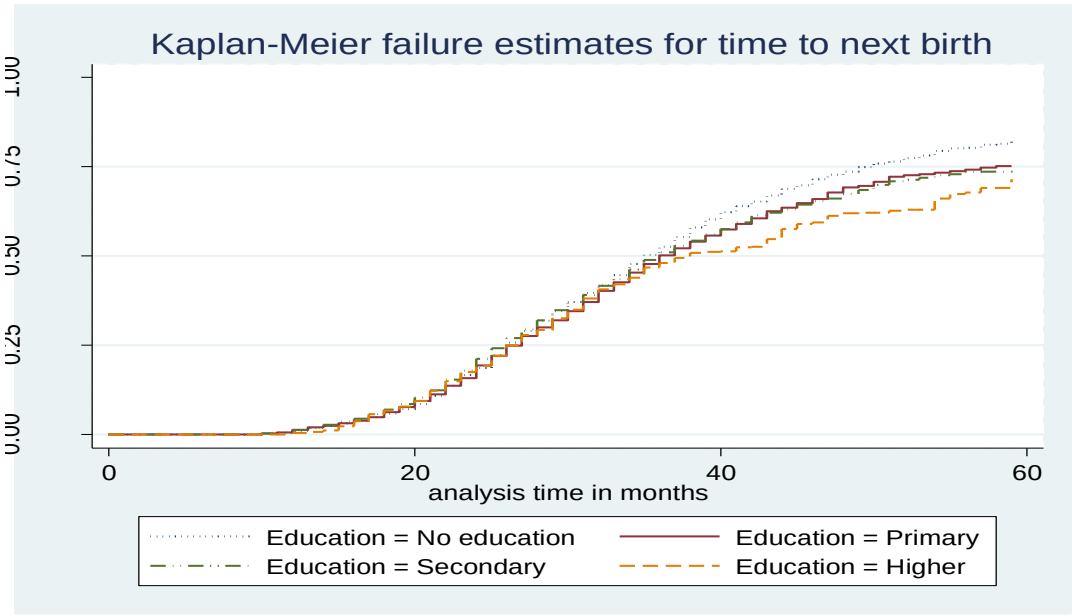

Figure 8: Graph showing the failure estimates for time to next birth in months and mother's educational status

The Kaplan-Meier graph in **figure 8** shows the failure estimates for mother's educational status and time to next birth among mothers of reproductive ages in Nigeria. The graph showed that at 36 months, 48% of mothers with higher education had a next birth, 51% of mothers with secondary education already had a next birth, 50% of mothers with primary education and 52% of mothers with no education already at a next birth at 36 months.

4.2 Bivariate analysis of the effect of child death and selected socio-demographic variables on birth spacing in Nigeria

Result from **Table 4.2** show that at 12 months about 6% of mothers who experienced a child death had already had a next birth when compared to less than 1% of mothers who did not experience a child death and had moved to the next birth during the same period. At 24 months about 39% of mothers who experienced a child death had already had a next birth compared to of 17% mothers whom did not experience a child death and already had the next birth during the same period. At 36 months 68% of mothers who experienced a child death already had a next birth, while only 49% of mothers whom did not experience a child death had a next birth.

The result from the table also showed that the percentage of mothers who had a next birth at 24 months and are unemployed is higher (22%) than mothers who had a next birth at the same period and are employed (18%). Result also showed that the percentage of mothers who had a next birth at 36 months and are unemployed (54%) is higher than the percentage of mothers who are employed (50%) and had a next birth at the same period.

The result from the table indicated that at 24 months the percentage of mothers who had a next birth and are married (20%) is higher than the percentage of mothers who had a next birth and is either single (7%) or was previously married (16%). Result also showed that at 36 months a higher percentage of mothers who are married had already moved to the next birth. The result was statistically significant.

At 36 months a higher percentage of mothers living in the rural area (52%) had already had a next birth when compared to the mothers in the urban areas (50%) during the same period.

The result from the table shows that at 24 months the south east region had the highest percentage of mothers that already had a next birth when compared to other geo-political regions, the north central region had the lowest percentage of mothers that had already had a next birth at this period. At 36 months the south east region had the highest percentage of mothers that already had a next birth when comparing to other regions, while the south west region had the lowest percentage of mothers that already had a next birth at this period.

At 36 months the result showed that mothers with completed higher education (48%) had the lowest percentage of mothers who already had a next birth while mothers with no education (52%) had the highest percentage of mothers that had already had a next birth when comparing to other mothers in the country.

Result from **Table 4.2** show that at 12 months about 6% of mothers who experienced a child death had already had a next birth when compared to less than 1% of mothers who did not experience a child death. At 24 months about 39% of mothers who experienced a child death had already had a next birth compared to of 17% mothers whom did not experience a child death. At 36 months, 68% of mothers who experienced a child death already had a next birth, while only 49% of mothers whom did not experience a child death had a next birth. The result from the table also showed that the percentage of mothers who had a next birth at 24 months and are unemployed is higher (22%) than mothers who had a next birth at the same period and are employed (18%). At 36 months, the result showed that mothers with completed higher education (48%) had the lowest percentage of mothers who already had a next birth while mothers with no education (52%) had the highest percentage of mothers that had already had a next birth when comparing to other mothers in the country.

Table 4.2: Results of log rank test on the bivariate relationship between selected variables and time to succeeding birth among mothers in Nigeria

Predictor variable (time in months)	**Percentage with succeeding at 12 months**	**Percentage with succeeding at 24 months**	**Percentage with succeeding at 36 months**	**p- value**
Child death				
No	0.5	17.1	49.7	0.000
Yes	6.4	39.5	68.2	

Marital status				
Single	0.3	6.6	15.6	0.000
Married	1.1	19.7	52.4	
Previously married	1.6	16.1	32.9	
Place of residence				
Urban	1.0	20.1	50.2	0.000
Rural	1.1	19.0	52.2	
Religion				
Christian	1.0	20.3	48.9	0.000
Muslim	1.1	19.0	52.9	
Others	2.1	15.4	51.7	
Employment status				
Not employed	0.9	21.8	54.7	0.000
Employed	1.2	18.4	50.1	
Education				
No education	1.0	18.6	52.5	0.000
Primary	1.3	19.3	50.2	
Secondary	1,3	21.2	51.0	
Higher	0.5	19.2	48.0	
Region of residence				
North Central	0.7	15.4	49.0	0.000
North East	1.4	21.8	54.8	
North West	1.1	18.5	52.1	
South East	1.6	28.5	60.3	
South South	1.0	21.0	47.4	
South West	0.9	15.9	44.9	
Number of surviving children				
None survive	1.2	8.5	25.3	0.000
Less than or five children surviving	1.0	19.6	52.0	
More than five children surviving	1.3	19.0	50.5	

Source: Computed from NDHS, 2013

4.3 The relationship between child death, selected socio-demographic variables and birth spacing in Nigeria

The left hand panel of **Table 4.3** shows the unadjusted risk ratio from Cox hazard regression of independent variables on the time to next birth of mothers in the reproductive ages in Nigeria. The result indicates that the risk of next birth is higher when an index child died compared to when an index child survives (HR=1.87, 95% CI: 1.73 – 2.02) the relationship was statistically significant.

The results also showed that as a mother gets older they have a lower risk (HR=0.96, 95% CI: 0.95 – 0.96) of having a next birth. The relationship between mother's age and time to next birth was statistically significant.

Mothers who are Muslims had a higher risk of having a next birth when compared to Christian mothers (HR=1.14, 95% CI: 1.03 – 1.25), also mothers who practiced other religions had a higher risk of having a next birth when compared to Christian mothers (HR=1.02, 95% CI: 0.82 – 1.25), and the relationships was statistically significant for Muslim mothers but was not statistically significant for other religions.

The result showed that mothers who are employed have a lower risk of having a next birth when compared to the unemployed mothers (HR=0.85, 95% CI: 0.78 – 0.93). This relationship was also statistically significant.

The mothers who had primary education (HR=0.90, 95% CI: 0.82 – 1.01), secondary (HR=0.93, 95% CI: 0.82 – 1.05) and higher education (HR= 0.82, 95% CI: 0.78 – 0.94) had lower risk of having a next birth when compared to mothers who do not have any formal education. Only the relationship of the higher level of education was statistically significant. Although, the relationship for primary education and time to next birth was not statistically significant.

The results in the right-hand panel of **Table 4.3** showed the **adjusted** risk ratio from Cox proportional hazard regression of independent variables on the time to next birth when controlling for other covariates.

The result indicates that when controlling for other variables, the risk of next birth is higher when an index child died compared to when an index child survives (HR=2.21, 95% CI: 2.01 – 2.41) the relationship was statistically significant.

As a mother's age increases she has a lower risk (HR=0.94, 95% CI: 0.93 – 0.94) of having a next birth after the death of a preceding child. The relationship between mother's age and time to next birth was statistically significant.

The result from the table also showed that when controlling for other covariates, mothers who are Muslims had a higher risk of having a next birth when compared to Christian mothers (HR=1.05, 95% CI: 0.93 – 1.20), also mothers who practiced other religions had a lower risk of having a next birth when compared to Christian mothers (HR=0.94, 95% CI: 0.79 – 1.14), and these relationships were not statistically significant.

Mothers who are employed have a lower risk of having a next birth when compared to the unemployed mothers (HR=0.98, 95% CI: 0.91 – 1.05). This relationship was not statistically significant when controlling for other covariates.

When controlling for other covariates, the mothers who had primary education (HR=1.02, 95% CI: 0.95 – 1.10), secondary (HR=1.10, 95% CI: 1.01 – 1.20) and higher education (HR= 1.17, 95% CI: 1.04 – 1.32) had higher risk of having a next birth when compared to mothers who do not have any formal education. Only the relationships of the secondary and the higher level of education were statistically significant. The relationship for primary education and time to next birth was not statistically significant.

Table 4.3: Results from unadjusted and adjusted Cox proportional hazard model of the of the effects of child death and other variables on the time to next birth

	Unadjusted model			**Adjusted model**		
Predictor variable	**Hazard ratio**	**p-value**	**Confidence interval**	**Hazard ratio**	**p-value**	**Confidence interval**
Child death						
No (ref)	1.000			1.000		
Yes	1.87	0.000	1.73 – 2.02	2.21	0.00	2.03 – 2.41
Marital status						
Single (ref)	1.000			1.000		
Married	3.88	0.00	2.69 – 5.58	5.45	0.00	3.76 – 7.89
Previously married	1.96	0.00	1.33 – 2.88	2.95	0.00	1.99 – 4.36
Mothers age						
15-49	0.96	0.00	0.95 – 0.96	0.94	0.00	0.93 – 0.94
Religion						
Christian	1.000			1.000		
Muslim	1.14	0.00	1.04 – 1.26	1.05	0.68	0.93 – 1.20

Others	1.02	0.85	0.82 – 1.25	0.95	0.39	0.79 – 1.14
Employment status						
Not employed	1.000			1.000		
Employed	0.85	0.00	0.78 – 0.93	0.95	0.68	0.91 – 1.06
Education						
No education (ref)	1.000			1.000		
Primary	0.90	0.07	0.81 – 1.01	1.02	0.50	0.95 – 1.10
Secondary	0.93	0.26	0.82 – 1.05	1.11	0.02	1.01 – 1.20
Higher	0.83	0.00	0.72 – 0.94	1.18	0.00	1.04 – 1.32
Place of residence						
Urban	1.000			1.000		
Rural	1.09	0.19	0.95 – 1.26	1.01	0.98	0.89 – 1.12
Region of residence						
North Central (ref)	1.000			1.000		
North East	1.25	0.02	1.03 – 1.51	1.14	0.15	0.95 – 1.37
North West	1.17	0.03	1.01 – 1.36	1.06	0.43	0.91 – 1.25
South East	1.39	0.00	1.22 – 1.58	1.66	0.00	1.40 – 1.96
South South	0.98	0.67	0.88 – 1.08	1.14	0.05	0.99 – 1.31
South West	0.88	0.11	0.75 – 1.02	1.02	0.87	0.83 – 1.23
Number of surviving children						
None surviving(ref)	1.000			1.000		
Less than or five children surviving	2.67	0.00	1.79 – 3. 96	6.13	0.00	4.10 – 9.16
More than five children surviving	2.61	0.00	1.77 – 3.84	10.69	0.00	7.05 – 16.21

4.4 The relationship between child death and birth spacing in Nigeria across geo-political zones.

The result from **Table 4.4** indicates that after stratifying the cox hazard model by geo-political zones. In all the zones, there was a higher risk of having a next birth when the index child dies. The result showed that the south west region had the highest hazard (HR= 1.79, 95% CI: 1.97 – 3.77) of having a next birth after the death of a child, while the south east region recorded the lowest hazard (HR= 1.49, 95% CI: 1.62 – 2.54) of having a next birth after the death of a child. These results showed that by political zones, there is no major difference in the fertility decision of mothers to have a next birth after the death of a preceding child.

Table 4.4: The geo-political zone differentials of the cox proportional hazard regression on the effects of child death on the time to next birth in Nigeria

Variable	North Central	North East	North West	South East	South South	South West
Child death						
No(ref)	1.000	1.000	1.000	1.000	1.000	1.000
Yes	1.58* (1.80 – 2.89)	1.71* (1.99 - 2.89)	1.63* (1.83 – 2.55)	1.49* (1.62 – 2.54)	1.57* (1.47 – 2.86)	1.79* (1.97 – 3.77)

*p value >0.05

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This study has addressed the three specific objectives. First, it determined the length of birth spacing among women of reproductive age in Nigeria. Second, it examined the association between child death and birth spacing in Nigeria when selected socio-demographic variable are controlled. And lastly, it determined if there was any significant difference in the effect of child death on birth spacing across geo-political zones in Nigeria. The purpose of this chapter is therefore to discuss the findings of this study.

5.2 Discussion of study findings

The aim of this paper was to investigate the effect of child death on birth spacing among women of reproductive age in Nigeria. Birth interval is one of the major determinants of fertility level especially in a populous country. According to NDHS (2013) policy brief, total fertility rate has being stagnant over time in Nigeria, and measures must be put in place to reduce this rate to achieve desired population. Increasing the length of birth spacing will help to achieve this goal as birth interval is one of the major determinants of fertility.

The analysis revealed that the interval for the next birth tends to be shorter due to death of a child. This may be as a result of the couple wanting to make a conscious effort to replace the lost child sooner, which is known as “the child replacement effect” (Setty-Venugopal & Upadhyay 2002). Coital frequency may increase after the death of an index child(Lindstrom & Kiros, 2007). Secondly the death of an infant leads to cessation of breastfeeding which may also increase the chance of pregnancy(Brown et. al, 2014) The emotional desire to replace a deceased infant, the resumption of sexual activities following the termination of breastfeeding, may contribute to a rise in the risk of having a next birth sooner following an infant's death(Lindstrom & Kiros, 2007).

The probability of having a next birth after a child death was compared across geo-political regions of Nigeria, the result showed a slight difference in the hazard of having a next birth among the six regions but they all had higher hazards of time to next birth after the death of a

child. This result indicates that although Nigeria is a multi-ethnic and multi-cultural country, fertility decisions and behaviour of mothers towards replacement and reproduction is similar across the country. This trend was found to be surprising because fertility rates are nit uniform across the country, further research can be carried out to explain the factors responsible for this trend.

Mother's education was one of the most important measures that showed statistical significance in the increase in birth space. The effect of education on birth interval is also in line with the findings from studies in several countries which showed that mothers with no education were less likely to space births than mothers with education (Grundy & Kravdal, 2014; Khan et al., 2016; Wusu, 2012). This might be due to the fact that educated women are more likely to use contraception to prolong their birth spacing and may have the knowledge regarding the negative effect of short birth intervals as well as benefits of small family size. When other covariates were adjusted for, women with higher education had a higher hazard of having a next birth when compared with women with no education (Oni & McCarthy, 1986; Solanke, 2017). An hypothesis to explain this could be that more educated mothers in our study may have married later in life and subsequently hurried to establish a family(Basu, 2002). Another possible hypothesis could be that more educated mothers may wish to compress childbearing into fewer years and participate in other non-childbearing activities, but further quantitative and qualitative research would be required to investigate this claim(Wusu, 2012). In contrast to our findings, a study using the DHS data from 35 countries suggested that expanding education opportunities for women motivated longer birth intervals (Setty-Venugopal and Upadhyay 2002).

Statistically significant association was also observed between the length of birth interval and age of mother. In line with other studies , this study revealed that mothers who belonged to the younger age group were more likely to have short birth interval as compared to those who are in the older ages(de Weger, Hukkelhoven, Serroyen, te Velde, & Smits, 2011; Wineberg & McCarthy, 1989). This can be partly explained by the notion that younger mothers (15 – 19) are less likely to have exposure to health care information about family planning and optimal birth spacing than older mothers. Similarly, the Nigerian Demographic and Health Survey of 2008 and 2013 showed that the space between births increased as the age increases, such that the lowest and highest intervals were among mothers of younger age groups (15 – 19years) and mothers of older age groups (40 – 49 years), respectively. This longer birth interval with

increase in maternal age may be attributed to the decreasing fecundity and fecundability associated with age, as a result of ovarian and hormonal dysfunction (Bhattacharya et al. 1995; Mturi 1997).

This study is limited in its inability to determine the timing of occurrence of each of the variables under study such as, the time at which the woman attained an educational level or moved to a particular residence type. Similarly, the study was unable to ascertain if information on birth history of sampled women in the study was affected by recall bias. The study draws on a cross-sectional secondary dataset; as a result, there is tendency for child deaths to be underreported. Omission of deaths can affect levels and patterns of child deaths; so also misreporting of age at death (heaping or avoidance) can distort the age pattern of mortality. Nevertheless, it is not envisaged that the data limitations will pose a serious challenge to the findings in this study. This is because the data quality assessment done for the 2013 NDHS data indicated that the surveys yielded a reliable mortality data (NPC & ICF, 2014b). The contraceptive use history between successive births was not available in the dataset and therefore could not be controlled for in the multivariate model. These limitations did not reduce the strength of the result but serves as a research gap for further study to explore.

5.3 Conclusion and recommendation

In conclusion, child death showed to be a positive factor that reduces the length of birth spacing across geo-political regions in Nigeria. This hinders the reduction in the country's effort towards fertility.

Therefore, interventions related to child mortality should be stronger nationwide to keep birth interval longer. Post-partum counselling which may include family planning counselling and programs designed for bereaved mothers who experienced a child death is important in addressing short birth intervals and their consequences. Strategies to ensure the education of females to higher levels should be encouraged. Education for women and girls should include reproductive health education that would emphasize the importance of spacing births and advocate the use and need of contraception, family planning and exclusive breastfeeding.

These measures are important in reducing the length of birth space and the negative effect on the health of the mother and the child

Given that this study was unable to test the effect of breastfeeding history and contraceptive use after the death of a child, further research could explore this relationship using longitudinal data collected over period of time or a mixed method approach this would give the opportunity to capture expansive information on the subject matter and also to determine the direction of causality. Further research can also look into studying the effect of siblings outcomes on child death and birth spacing. Awareness of this relationship may be critical for policy intervention and programmes on birth spacing.

APPENDIX

Test of proportional-hazards assumption

Time: Time

	rho	chi2	df	Prob>chi2
0b.child_d~h	.	.	1	.
1.child_deth	-0.14703	1134.92	1	0.0000
1b.num_surv	.	.	1	.
2.num_surv	0.03703	81.07	1	0.0000
3.num_surv	0.02930	43.20	1	0.0000
1b.marital~t	.	.	1	.
2.maritals~t	-0.00910	3.00	1	0.0833
3.maritals~t	-0.04379	70.08	1	0.0000
0b.v714	.	.	1	.
1.v714	0.04394	150.89	1	0.0000
1b.religion	.	.	1	.
2.religion	-0.04246	157.90	1	0.0000
3.religion	-0.00426	1.14	1	0.2867
1b.v025	.	.	1	.
2.v025	0.04214	184.26	1	0.0000
1b.v101	.	.	1	.
2.v101	0.02054	58.13	1	0.0000
3.v101	0.04497	192.31	1	0.0000
4.v101	-0.03384	90.69	1	0.0000
5.v101	-0.04285	114.36	1	0.0000
6.v101	-0.03531	100.03	1	0.0000
0b.v106	.	.	1	.
1.v106	-0.03807	102.44	1	0.0000
2.v106	-0.04311	87.97	1	0.0000
3.v106	-0.10318	463.67	1	0.0000
v012	-0.04988	99.28	1	0.0000
global test		2040.31	18	0.0000

note: robust variance-covariance matrix used.

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