Survival analysis of the effect of child spacing on infant mortality among Ekitis, south western Nigeria

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ABSTRACT

Researches are consistent with the view that birth interval is related to infant mortality. Survival chances of infants is jeopardized when births are closely spaced, which most mothers particularly in Ekiti communities are ignorant of. Previous studies in these communities have failed to address the impact of child-spacing on infant mortality, hence, this study. Retrospective information on infant survival were sought from mothers (n=982) who had her most recent child (index child) within the past two years before the survey. The analyses show that majority of the non-first births occurred before 3-years interval. Among the respondents who gave birth to their index child in the last two years before the survey, 54% reported spacing shorter than 3years. While 20.1% of the respondents said their index child was spaced for less than 2years apart. The median birth interval was 33.0 months. Cox-regression model identified that the risk of infant deaths peak for births spaced for less than 24 months and least when births are spaced for between 36 and 59 months. The likelihood of infant deaths among mothers who left an interval of 24-35 months between births is 2.0 ($p<0.05$) times those who left 36-59 months birth intervals. Controlling for confounding variables reduced the strength of the risk and reverse the significance effect of birth intervals 24-35 and 60+ relative to less than 24 months birth interval. However, mothers who spaced births for less than 24 months are 2.9 ($p<0.01$) more likely to experience infant mortality than those who left 36-59 months interval after control of confounding variables. These analyses support previous thinking about shifting the earlier recommended birth interval of at least 24 months to minimum of 36 months.

BACKGROUND

Going by its enormous consequences on health and survival chances of mother and child, the effect of child spacing on infant survival is now attracting more attention from international communities. This is because the effect of short birth spacing can be prevented through family planning programs which most mothers are ignorant of. In a reaction to different views on spacing children for an interval of 3 to 5 years, international agencies such as USAID have begun campaign in this regard. Improving the knowledge on the health consequences and identifying the groups for which the effect of birth spacing is most are necessary in order to provide information that will guide the planners and policy makers. The association between short birth interval and high infant mortality has been revealed at different settings (Miller, 1994; Rustein, 2003, 2005), however, at the study location, few studies on the effects of child spacing on infant mortality have been conducted and they often use descriptive approach but non has made use of multivariate approach to establish the level of relationship between child spacing and infant mortality. Moreover, confounding variables were put under control to see clearly the sole effect of birth spacing on infant mortality. Due to poor record system in the study area, the survey was conducted on household basis and information were sought from mothers who must have given birth to at least two children prior the survey.

Researches at different times have shown that socio-demographic variables such as education, income, work activity e.t.c have influence on child spacing. The study also identified the background characteristics of a woman inhibiting differentials in birth spacing. These characteristics can influence her target for fertility and attainment of such desires is achievable through effective fertility control measures.

STATEMENT OF THE PROBLEM

With an estimated population of 140 million, Nigeria in which Ekiti is a part is Africa's most populous country, and one of the poorest. Like many developing nations, Nigerian's health needs remain substantial. Infant and Maternal Mortality levels are high . In 2008, infant mortality rate was estimated at 75 deaths per 1,000 live births and maternal mortality ratio of 545 per 100,000 live birth (NDHS,2008). Although, the infant and maternal mortality rates are reducing when compared with the previous NDHS survey figures, but the value is still high relative to some contemporary developing nations across the globe.

Previous researches on the analysis of birth interval showed that short birth interval can have tremendous health hazards on mothers and their children: for mothers it can increase the risk of death, trimester bleeding, anemia, premature rupture of membranes, puerperal endometritis and malnutrition. For children it increases the risk of; fetal death, preterm death, low birth weight, small for gestation age, neonatal death, stunting and underweight (Conde-Agudelo, 2002, Rutstein, 2003).

Previous studies conducted at the survey location revealed that many women want longer birth intervals, but are not achieving them. Also, the poor and the rural communities which have more illiterate inhabitants especially are uninformed of the mortality risks of high childbearing frequency, they often realize that spacing is a healthy behavior, but most do not know that infant mortality is associated with short birth intervals. Some of these women are unaware that they can control the pace of births and they lack knowledge on array of options to achieve the longer birth intervals (NDHS, 2008).

RESEARCH QUESTION

In order to establish the linkages between spacing of childbearing and infant mortality, the **following research** questions are proposed:

1. To what extent does the length of the preceding birth interval affect the risks of infant mortality?
2. Do the birth intervals differ across subgroups of the population?
3. Are there certain subgroups for which birth intervals are longer than the other?

RESEARCH JUSTIFICATION

Studying the birth spacing dynamics is of interest for several reasons. First, several inferences are consistent with the view that child spacing is related to cumulative fertility and have impact on maternal and child heath. This has been expressed by competition hypothesis, which states that the birth of each successive child generates competition for scarce resources among sibling in the household, which subsequently leads to a lower quality of care and attention to each child. The family resources may also be stretched to the limit, increasing the probability of children in such households becoming malnourished and hence their survival (Gribble, 1993).

In Nigeria, efforts have been made through government programs and policies to reduce; the total number of children a family bears and frequency of such births and increase age at first marriage. It is worthwhile to evaluate the impact of these programs on people. This research effort is to explore the basis for and extent to which family space their children and also to justify previous findings on relationship between child spacing and infant mortality. Moreover, the research is significant, because spacing of childbearing as a concept is at the heart of reproductive health/family planning, few countries have policies and norms on it (DaVanzo, et al, 2004). Among Ekiti people for instance, there has been little or no research on spacing of childbearing, hence this study.

OBJECTIVES OF THE STUDY

The ***objectives*** to be achieved in the study area are to:

1. determine the effect of child spacing on infant mortality in the study area;
2. to validate the optimum birth spacing theory.
3. identify socio-economic and demographic factors influencing spacing of childbearing in the study area;

LITERATURE REVIEW

Since 1923, the deleterious effect of short birth interval for maternal and child health has always been investigated. The effect of short birth intervals as evident in Adewuyi and Isiugo-Abanihe, 1990, has been demonstrated many times to be one of the most important factors affecting the mortality of infants.

The earliest studies of the effect of the length of birth interval on infant mortality were based on United States registration records. These studies showed that short preceding birth intervals resulted in higher infant mortality rates (Eastman, 1945). He found that only very short birth interval less than 12 months, had any effects on children or mothers. Pre-maturity at National level in England and Wales was also studied by Douglas (1946) using registered births. After standardizing for age, Douglas found that women, who spaced their pregnancies for more than 2, but not more than 6 years apart, are least likely to have premature babies when compared to other possible birth intervals.

Rutstein (2005) using repeated analysis data from DHS from 17countries collected between 1990 and 1997 also examined the relationship between birth intervals and infant and childhood mortality. The results showed that the longer the birth interval the lower the risk or infant mortality, even for intervals of 48 months or more. However, based on his findings, Rutstein recommended that mothers should space births for at least 36 months and concluded that the optimal birth spacing should be between 36 and 59 months.

The research on effects of Birth spacing on infant and childhood mortality, pregnancy outcomes, and maternal mortality and morbidity has been investigated in Matlab, Bangladesh by Davanso et. al (2004). The analysis from the study revealed that compared with intervals of 3-5 years in duration, preceding inter-birth intervals of less than 24 months in duration are associated with significantly higher risks of infant mortality and that the effect still persist even after control for potentially confounding factors.

It has also been generally accepted that a decline in infant and childhood mortality is an important factor in fertility decline. The world Population Plan of Action state “sustained reductions in fertility have generally been preceded by reductions in mortality. Although, this relationship is complex, mortality reduction may be a pre-requisite to a decline in fertility”. The level of infant and childhood mortality may affect the demand for births because of the desire to replace children who have died and the desire to ensure the survival of a certain number of adult children. It may also affect the supply through the duration of post-partum lactational amenorrhea (Adewuyi and Feyisetan, 1987).

DATA COLLECTION AND ANALYSIS

The study was a cross-sectional household and as such a multi-stage area probability sampling technique was used to select the eligible respondents who are mothers. Questionnaire was administered on 982 selected respondents. The data were collected by teams of interviewers which are university degree holders. The training included class presentations, mock interviews, and tests. The reliability and internal consistency of the questions in the questionnaire were assessed through the pretest. The training of the interviewers and translation of the contents of the questionnaire to local language provided grounds for proper understanding, easy interpretation and administration of the questionnaire.

The researcher edits the administered questionnaires for internal consistency and accuracy. Subsequent data entry and analyses were performed using EPI INFO and SPSS software packages. Cox and logistic regression models were employed to correlate the relationship between the dependent and the independent variables.

MEASURING SPACING OF CHILDBEARING

For this study spacing of childbearing was measured as the inter-birth interval. That is the time in months between the delivery of the previous child irrespective of the surviving status of the child and the index child. Women who gave birth in the last two years, preceding the survey were considered for the analysis of child spacing. Extending the interval to two years was necessary because report on infant mortality are always small in proportion to the number of respondents and hence require large number of cases to provide representative information for analysis. Thereafter, a sequential birth history of the index child during arrival and death time was constructed for each woman. The index child must be the most recent delivery by the woman and have not had any other pregnancy since his/her delivery. Selected socio-economic and demographic variables were then considered in relation to surviving status of the index child. This paved way for the analysis of the effect of child spacing on childhood mortality and also provided basis on how socioeconomic and demographic factors influence childbearing. For each child in the study, time (t) starts with a value of zero at birth and is right censored at the first 12 months of life. Meanwhile, a child who is alive and has not reached the age of 12 months as at the time of the study is said to be censored. Also those who are dead or alive after one year are censored. Then, the cases as earlier discussed are those who died between age zero and twelve months.

LIMITATIONS

As with all cross-sectional surveys, the survey was subject to response and recall biases. Self reported data may reflect a perceived desirability of responses rather than actual knowledge or practices, and may be affected by response bias. Response errors are inevitable most especially when personal questions are asked. In Yoruba land as an example, the number of children previously born alive is a taboo or asking a woman the number of dead children. It is believed that children are not supposed to be counted either dead or alive.

Another problem inherent in most retrospective surveys is the heaping of age at death on certain digits (e.g. 6, 12 and 18 months). If the net result of misreporting is the transference of deaths between age segments for which the rates are calculated, mis-reporting of the age at death will bias estimates of the age-patterns of mortality. For instance, an overestimate of infant mortality may result if children dying during the first year are reported as having died at age one or older. Thus, heaping at 12 months can bias the infant mortality estimates. In such cases, heaping would bias infant mortality (${}_1q_0$). Moreover, even when such information are supplied the time at which the event occurred may not be remembered since there have been no proper documentation and keeping of records of vital events. However quality training and intellectual ability of the interviewers with respect to questions that are personal was able to bail them out of such problems. Continuous editing and other techniques were used to reduce and adjust such errors for smooth analysis of the collected data.

Analysis

Table 1.0 shows the percentage distribution of non-first births that occurred in the two years preceding the survey by the number of months since the previous birth and background characteristics of the respondents. The majority of the non-first births in the study area occurred before 2-years interval. Among the respondents who gave birth to the index child in the last two years before the survey, 54% reported spacing shorter than 2years. While 20.1% of the respondents said their index child was spaced for less than 2years apart. The median birth interval is 33.0 months and this ranges from 17.0 months to 36.0 months among women aged 15-19 years and 30-39 years respectively. The reason for low birth interval among teenagers could be a result of their low level of contraceptive use which had been justified in earlier part of this study. Place of residence of a woman does not show a significant difference in birth intervals. A factor responsible for this indifference is the high literacy level in Ekiti State which spread across nooks and cranny of the state irrespective of the location. However, urban women experienced higher median birth interval than their rural counterparts (34.0 vs. 29.0 respectively).

Gender preference, sex of the preceding child and husband's income are not significantly related to child spacing, in these cases p>0.05. The levels of education and monthly income earned by a woman show a direct relationship with birth spacing. This means, the higher the level of education and income earned, the higher the number of months between two consecutive births. The median birth interval is approximately, five months shorter when the previous sibling is dead than when he/she is alive (27.0 months and 33.5 months, respectively). The percentage of women who spaced their children for less than 18 months is higher in rural than urban areas (9.6 and 6.6 percent respectively).

Table 1.0: Percentage Distribution of respondents by birth interval in the last three years preceding the survey according to background characteristics

BACKGROUND CHARACTERISTICS	BIRTH INTERVAL					TOTAL	MEDIAN BIRTH INTERVAL
	0-17	18-23	24-35	36-59	60+		
PLACE OF RESIDENCE $^{n.s}$							
Rural	9.6(23)	11.7(28)	37.2(89)	33.5(80)	7.9(19)	100.0(239)	29.0
Urban	6.6(49)	13.1(97)	32.8(244)	35.9(367)	11.6(86)	100.0(743)	34.3
MARITAL STATUS*							
Married	6.7(65)	12.8(123)	34.0(327)	35.7(344)	10.8(104)	100.0(963)	33.0
Never Married	36.8(7)	10.5(2)	31.6(6)	15.8(3)	5.3(1)	100.0(19)	24.0
LEVELS OF EDUCATION*							
None	17.4(16)	12.0(11)	41.3(38)	25.0(23)	4.3(4)	100.0(92)	25.5
Primary	8.3(20)	14.5(35)	32.6(79)	33.9(82)	10.7(26)	100.0(242)	30.5
Secondary	6.9(30)	13.5(59)	35.3(154)	33.5(146)	10.8(47)	100.0(436)	32.0
Higher	2.8(6)	9.4(20)	29.2(62)	45.3(96)	13.2(28)	100.0(212)	36.0
Religious Affiliations**							
Catholic	5.9(8)	11.8(16)	31.6(43)	40.4(55)	10.3(14)	100.0(136)	36.0
Protestants	6.2(17)	16.8(46)	35.2(96)	29.3(80)	12.5(34)	100.0(273)	30.0
Pentecostal	2.6(6)	8.5(20)	35.5(62)	41.9(98)	11.5(27)	100.0(234)	36.0
Other Christians	8.8(16)	15.5(28)	34.3(62)	32.0(58)	9.4(17)	100.0(181)	29.0
Islam	16.8(23)	9.5(13)	28.5(39)	38.0(52)	7.3(10)	100.0(137)	31.0

Traditional	10.5(2)	10.5(2)	47.4(9)	15.8(3)	15.8(3)	100.0(19)	28.0
Others	0.0(0)	0.0(0)	50.0(1)	50.0(1)	0.0(0)	100.0(2)	n.a
INCOME**							
<₦5000.00	7.4(20)	16.9(46)	36.0(98)	29.0(79)	10.7(29)	100.0(272)	29.5
₦5000.00-₦7,499.00	3.9(7)	14.5(26)	35.8(64)	35.8(64)	10.1(18)	100.0(179)	32.0
₦7,500.00-₦14,999.00	9.7(18)	6.5(12)	28.6(53)	42.7(79)	12.4(23)	100.0(185)	36.0
₦15,000.00-₦19,999.00	1.4(1)	8.6(6)	32.9(23)	42.9(30)	14.3(10)	100.0(70)	36.0
₦20,000.00+	0.9(1)	12.5(14)	33.0(37)	42.9(48)	10.7(12)	100.0(112)	36.0
GENDER PREFERENCE n.s							
Yes	8.5(24)	12.8(36)	31.7(89)	36.7(103)	10.3(29)	100.0(281)	34.0
No	6.9(48)	12.7(89)	34.9(244)	34.9(244)	10.7(75)	100.0(700)	33.0
CONTRACEPTIVE USE**							
Ever Use	5.3(35)	12.6(84)	32.6(217)	38.0(253)	11.4(76)	100.0(665)	35.0
Never Use	11.8(37)	13.1(41)	36.3(114)	29.6(93)	9.2(29)	100.0(314)	28.0
BIRTH ORDER n.s							
2-3	7.0(37)	11.2(59)	33.9(178)	38.3(201)	9.5(50)	100.0(525)	34.0
4-6	7.7(30)	13.6(53)	33.2(130)	33.2(130)	12.3(48)	100.0(391)	33.0
7+	8.9(5)	16.1(9)	41.1(23)	26.8(15)	7.1(4)	100.0(56)	26.0
SEX OF PRECEDING CHILD n.s							
Male	6.5(37)	12.5(71)	33.5(190)	35.4(201)	12.0(68)	100.0(567)	34.0
Female	8.5(35)	13.2(54)	34.6(142)	34.9(143)	8.8(36)	100.0(410)	31.0
SURVIVAL STATUS OF PRECEDING CHILD**							
Living	6.5(59)	12.1(109)	34.4(310)	36.3(327)	10.8(97)	100.0(902)	33.5
Dead	16.9(13)	20.8(16)	28.6(22)	23.4(18)	10.4(8)	100.0(77)	27.0
HUSBAND'S LEVELS OF EDUCATION*							
None	11.4(8)	10.0(7)	47.1(33)	22.9(16)	8.6(6)	100.0(70)	26.0
Primary	12.0(22)	17.9(33)	37.5(69)	26.6(49)	6.0(11)	100.0(184)	27.0
Secondary	4.2(18)	12.7(54)	31.5(134)	40.2(171)	11.3(48)	100.0(425)	36.0
Higher	5.3(15)	10.2(29)	32.2(91)	38.5(109)	13.8(39)	100.0(283)	36.0
HUSBAND'S INCOME n.s							
<N5000.00	2.1(1)	10.4(5)	41.7(20)	35.4(17)	10.4(5)	100.0(48)	34.0
₦5000.00-₦7,499.00	11.8(13)	11.8(13)	34.5(38)	31.8(35)	10.0(11)	100.0(110)	30.0
₦7,500.00-₦14,999.00	8.1(23)	11.6(33)	33.5(95)	36.3(103)	10.6(30)	100.0(284)	34.0
₦15,000.00-₦19,999.00	7.8(10)	14.1(18)	37.5(48)	28.9(37)	11.7(15)	100.0(128)	29.0
N20,000.00-₦29,999.00	5.3(7)	14.4(19)	33.3(44)	32.6(43)	14.4(19)	100.0(132)	33.0
₦30,000+	1.2(2)	8.5(14)	29.3(43)	48.2(79)	12.8(21)	100.0(164)	36.0
CURRENT AGE*							
15-19	53.3(8)	6.7(1)	20.0(3)	13.3(2)	6.7(1)	100.0(15)	17.0
20-24	18.6(16)	24.4(21)	37.2(32)	18.6(16)	1.2(1)	100.0(86)	24.0
25-29	6.2(13)	13.3(28)	41.2(87)	34.1(72)	5.2(11)	100.0(211)	29.0
30-34	4.9(13)	10.6(28)	33.7(89)	40.5(107)	10.2(27)	100.0(264)	36.0
35-39	4.2(9)	10.8(23)	26.8(57)	39.0(83)	19.2(41)	100.0(213)	36.0
40-44	8.3(12)	9.7(14)	35.2(51)	35.9(52)	11.0(16)	100.0(145)	34.0
45-49	2.1(1)	20.8(10)	29.2(14)	31.3(15)	16.7(8)	100.0(45)	34.0
NUTRITIONAL STATUS*							
Underweight(thin)	18.8(24)	19.5(25)	36.7(47)	20.3(26)	4.7(6)	100.0(128)	24.0
Normal	5.3(27)	11.8(60)	32.4(165)	38.5(196)	12.0(61)	100.0(509)	36.0
Overweight	4.3(8)	10.7(20)	35.8(67)	37.4(70)	11.8(22)	100.0(187)	35.0
Obesity	4.8(4)	10.8(9)	31.3(26)	42.2(35)	10.8(9)	100.0(83)	36.0
TOTAL	7.3(72)	12.7(125)	33.9(333)	35.5(347)	10.7(105)	100.0(982)	33.0

Source: Field work 2008 ****Significant at 0.1%*** *****Significant at 1.0%*** ***n.s Not Significant***

SOCIOECONOMIC DIFFERENTIAL IN INFANT MORTALITY

Differentials in infant mortality for the two years preceding the survey by selected background characteristics are presented in table 1.1 below. In the table, infant mortality probabilities appear to be lower in urban than rural areas. The data also shows wide variations in mortality by mothers level of education. Infant mortality ranges from 28 deaths per 1,000 live births among women with higher level of education to 174 deaths per 1,000 live births among women with no formal education. The level of maternal education is inversely related to infant mortality indicators. The pattern is similar to what was obtained in NDHS, 2008. Since education exposes women to information about better nutrition, use of contraception to limit and space births, health care during pregnancy, vaccinations and treatments of childhood diseases.

A child risk of dying is also associated with the father's and mother's income. Infant mortality estimates are lowest for those in the highest income. The risk of death reduced sharply for infant children in the fifth class, but increased for other categories. Higher child mortality for females than males was reported- a pattern that has been observed in communities where strong son's preference is thought to result in relative nutritional and medical neglect of female children (Gupta, 1987).

Infant mortality at all ages tends to be highest among children born to women in the youngest age group. Infant mortality rates also tend to have U-shaped relationship with birth order, with first births and higher order births having elevated mortality rates. In table 5.16, birth order shows the expected U-shaped pattern for infant rates, with rates being higher for first births (151 per 1,000) and births of order seven or higher (583 per 1,000) as compared with second and third-order births.

In table 1.1, infant mortality rates show a sharp decrease as the length of birth interval increases. Also, Rustein, (2003) revealed that births spaced less than 3-years and more than 5 years constitute more child and maternal health risk than births spaced less than 3-years and at most 5 years (optimal birth spacing). This was justified by the present study. Women who spaced their children between 3 and 5 years experienced lower infant mortality than other birth intervals. This is one of the major objective of this study. Further analysis in the next section will ascertain their statistical evidence.

Table 1.1: Infant mortality rates for the three-year period preceding the survey, by background characteristics

Background Characteristics	Infant Mortality $_1q_0$
Residence	
Rural	146
Urban	61
Marital Status	
Married	75
Never-Married	421
Education	
None	174
Primary	103
Secondary	76
Higher	28
Religion	
Catholic	88
Protestants	73
Pentecostal	47
Other Christians	88
Islam	109
Traditional	316
Others	n.a
0-17	236
18-23	104
24-35	87
36-59	43
60+	57
Child preference	
Male	69
Female	98
<20	182
20-29	64
30-39	64
40-49	214
1	101
2-3	56
4-6	93
7+	333
Size at birth	
Small/Very Small	126
Moderate/Large	76
Don't Know	32
Income	
<N5000.00	110
₦5000.00-₦7,499.00	50
₦7,500.00-N14,999.00	49
₦15,000.00-N19,999.00	129
N20,000.00+	18
Husband's Education	
None	143
Primary	130
Secondary	71
Higher	32
TOTAL	**81**

Source: Fieldwork, 2008. [n.a] **Not Applicable**

MULTIVARIATE ANALYSIS

This part of the study examined the relationship between selected socio-demographic variables and child spacing. Also examined are the associations between child spacing and infant mortality in Ekiti-State. Using Logistic model for the analysis of birth spacing, the dependent variable assumed the value of 1, if the respondent has an interval of 36-60 months for the index child under study and 0 if the Interval is less than 24 months, 24-35 months or 61+. The independent variables are; education attainment, place of residence, religious affiliations, income, gender preference, age at first sexual intercourse, contraceptive use and type of union. Moreover, in establishing a relationship between infant mortality and child spacing, Cox-regression model was used.

CHILDBEARING INTERVAL IMPLICATIONS FOR INFANT MORTALITY

It has been emphasized on many occasions in this study the effects of child spacing on survival status of infants. International Health Organizations including WHO have recommended a minimum birth interval of two years for healthy living of the mother and child. However, a new dimension to this view suggested a minimum of three and a maximum of five years birth interval, often referred to as optimal birth spacing. It is one of the objectives of this study to validate the theory and choose which interval will improve the survivorship probability of infant children in Ekiti-State.

Also, analyses of the effects of birth intervals were examined on infant mortality. Results were compared before and after controlling for confounding factors. Thereafter, interactions between intervals and other socio-demographic characteristics were investigated (to see if interval effects vary across subgroups), and compare the magnitudes of effects of short birth intervals to those of other high-risk factors.

Table 1.2 shows the Cox- proportional hazard models for under-five mortality and birth interval. In the table, births occurring after an interval of less than 24 months have higher relative risk 1.7 ($p<0.05$) for infant mortality, when compared with an interval of 36-60 months. Both intervals between 24-35 months and above 60 months also exhibited the same pattern when compared with births spaced for less than 24 months. Adding confounding variables to the model reduced the size of the effect of short intervals but to a relatively small extent. However, increased infant mortality risks were observed to be associated with birth intervals of 24-35 months 2.03 ($p<0.001$) and above 60 months 1.33 ($p<0.05$), relative to birth intervals of three to five years. Controlling for confounding variables reduced the strength of the risk for 24-35 months and increased the strength for above 60 months birth intervals.

In order to facilitate clear understanding and interactive effect between an interval 36-60 months and other low-risk birth intervals, the variable was disaggregated into two groups as seen in Table 1.3. It is obvious that birth intervals of 24-35 months (significant) and above 60months (not significant) have higher relative risk of infant mortality when compared to an interval of 36-60 months. The risk patterns remained the same even when the confounding variables were controlled. Although, non- significant association exists between the interaction of birth interval 24-35 months and above 60 months, but birth intervals 24-35 months have higher relative risks than intervals above 60 months for infant mortality, with and without controlling for confounding factors.

Figure 1.0 was drawn in order to see clearly the survival patterns of infant children. The graph shows the patterns of probabilities of surviving through different age intervals. The graph appears in layers with respect to variable indicators. The graph of an indicator appearing at the top-most layer has higher survival rates than any other indicators. For example, in the figure, women who spaced their children within an interval of 36-59 months survived infant deaths than any other birth interval. This means that least infant mortality was experienced by women who left an interval of 36-59 months between births. Obviously in figure 6.1 clear differentials in infant mortality occur among women who left an interval of 36-59 months and those who left less than 24 months.

Table 1.2: Results of Cox proportional hazard model of the effect of birth spacing on infant mortality without and with control for confounding variables

Birth Intervals (Months)	β	S.E	SIG.	EXP(β)	95.0% C.I for Exp(β)	
					Lower	Upper
Infant Mortality						
<24 (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
24-35	-0.542	0.260	0.037***	0.581	0.349	0.969
36-59	-1.251	0.316	0.000*	0.286	0.154	0.532
60+	-0.968	0.447	0.030***	0.380	0.158	0.913
Controlling For Confounding Variables						
Infant Mortality						
<24 (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
24-35	-0.424	0.332	0.201	0.654	0.341	1.254
36-59	-1.065	0.382	0.005**	0.345	0.163	0.729
60+	-0.635	0.512	0.215	0.530	0.194	1.447

Source: Field work, 2008. *** Significant at 0.1% (P<0.001) **Significant at 1.0%(P<0.01)**

***** Significant at 5% (P<0.001) R.C Reference category.**

Table 1.3: Results of Cox proportional hazard model of the effect of birth spacing on infant mortality without control for confounding variables (*Interaction effects*)

Birth Intervals (Months)	β	S.E	SIG.	EXP(β)	95.0% C.I for Exp(β)	
					Lower	Upper
BIRTH INTERVALS 24-35 & 36-59						
Infant Mortality						
24-35	0.708	0.318	0.026***	2.030	1.089	3.787
36-59 *(Ref.)*	R.C	R.C	R.C	1.000	R.C	R.C
BIRTH INTERVALS 36-59 & 60+						
Infant Mortality						
36-59 *(Ref.)*	R.C	R.C	R.C	1.000	R.C	R.C
60+	0.284	0.483	0.557	1.328	0.515	3.424
Birth Intervals 24-35 & 60+						
Infant Mortality						
24-35 *(Ref.)*	R.C	R.C	R.C	1.000	R.C	R.C
60+	-0.425	0.448	0.343	0.654	0.271	1.574

Source: Field work, 2008. *** Significant at 0.1% (P<0.001)** ****Significant at 1.0%(P<0.01)**

***** Significant at 5% (P<0.05)** **RC Reference category.**

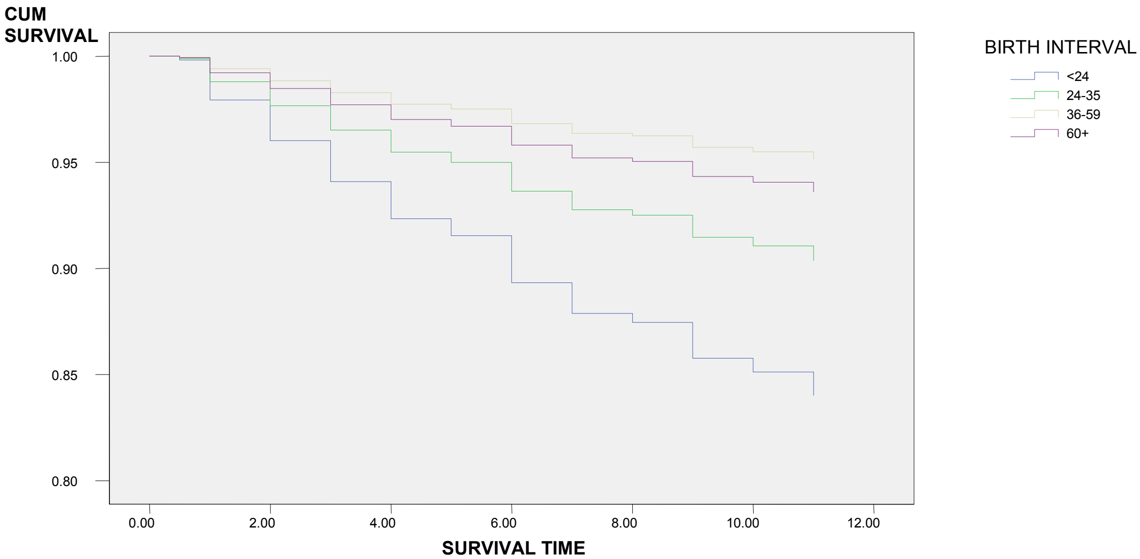
Table 1.4: Results of Cox proportional hazard model of the effect of birth spacing on infant mortality with control for confounding variables (*Interaction effects*)

Birth Intervals (Months)	β	S.E	SIG.	EXP(β)	95.0% C.I for Exp(β)	
					Lower	Upper
Birth Intervals 24-35 & 36- 59						
Infant Mortality						
24-35	0.640	0.362	0.077****	1.896	0.933	3.854
36-59 *(Ref.)*	R.C	R.C	R.C	1.000	R.C	R.C
Birth Intervals 36-59 & 60+						
Infant Mortality						
36-59 *(Ref.)*	R.C	R.C	R.C	1.000	R.C	R.C
60+	0.433	0.532	0.416	1.542	0.543	4.378
Birth Intervals 24-35 & 60+						
Infant Mortality						
24-35 *(Ref.)*	R.C	R.C	R.C	1.000	R.C	R.C
60+	-0.213	0.498	0.069****	0.808	0.305	2.144

Source: Field work, 2008. *** Significant at 0.1% (P<0.001)** ****Significant at 1.0%(P<0.01)**

***** Significant at 5% (P<0.05)** ****** Significant at 10% (P<0.10)** **RC Reference category**

Fig.1.0 Survival Function for birth interval patterns and infant mortality



6.5 SOCIO-DEMOGRAPHIC FACTORS INFLUENCING SPACING OF CHILDBEARING:

This section of the study identified the socio-demographic factors influencing child spacing in the study area. This is done by reclassifying the previous birth interval of the index child into two categories: less than or equal to 23 months and 24 months and above. The essence of the classification was to dichotomize the birth interval as high risk if the interval is ≤ 23 months and low risk if otherwise. This is because results from previous section of this study consistently showed that birth interval of ≤ 23 months are inimical to child survival. Thus, this part of the study also identified socio-demographic factors influencing high risk birth intervals (**HRBI**).

Table 1.5 shows the logistic regression model of socio-demographic factors influencing HRBI. The data revealed that there is no significant relationship between HRBI and place of residence. This means residing in urban does not make a difference in child-spacing. As earlier reported, high literacy level which perpetrated through nooks and cranny of Ekiti communities can explain the insignificancy. Women who ever married have lower odds of HRBI than never-married women (RR=3.7, p<0.01). The result also shows that, the higher the level of education of a woman the lower the risk of having HRBI. For example, women who have no education are 10 times (p<0.001) more likely to have HRBI than their colleagues who have completed their education. Across all religious groups, Muslims are at higher risk of HRBI than any other religious followers. Among the Christians, women who are affiliated with Pentecostal denomination are at lower risk of having HRBI than any other denominations. Specifically, Pentecostal women are 0.58 ($p<0.1$) less likely to have HRBI than Catholic women. Highly educated and elite which dominate Pentecostal sect may be responsible for the difference.

The level of income earned a month also showed significant relationship with HRBI. Women who earned less than N5,000.00 a month (RR=2.1, $p<0.05$) are at higher risk of HRBI than those who earned N20,000.00 and above a month. The influence of income on affordability and accessibility to contraception can be a factor in this regard. As clearly shown in table 1.5 women who have never used contraception to delay childbearing are 1.5 ($p<0.05$) times at risk of HRBI than ever users. As expected, the survival status of the preceding birth also influences HRBI. Women who lost their previous child constituted a greater proportion of HRBI, they are 3.5 ($p<0.001$) times at risk of HRBI than their counterparts with surviving preceding birth. Death of the youngest baby in a family can influence spouses' decision on having another one soon to replace the lost child even though they have decided to halt childbearing.

The relationship between under-nutrition and birth interval is very clear and there is tendency for reduction in HRBI as the Body Mass Index increases. Women whose their nutritional status have been considered as normal are less likely to have HRBI (RR=0.33, $p<0.001$) as compared with under-nutrition women. Among variables considered is work status of a woman. Women empowerment has impetus to influence other variables either singly or jointly to affect birth-spacing. It enhances liberty to self esteem, decision and control over family issues including childbearing. As revealed by this study, women who are not working are approximately 90% ($p<0.01$) at risk of HRBI than women who engaged in one economic activity or the other.

Controlling for education and marital status as shown in table 1.6, it was observed that the significant effects fade away in most of the variables and the relative risks strength reduced considerably across all the classified variables. However, survival of the preceding child, nutritional status, husband's income and work status still retain their usual patterns.

Table 1.5: Results of Logistic Regression Model of the Socio demographic factors Influencing High Risk Child Spacing

Birth Intervals (Months)	β	S.E	SIG.	EXP(β)	95.0% C.I for Exp(β)	
					Lower	Upper
Age						
15-19	1.618	0.629	0.010***	5.045	1.470	17.312
20-24	0.932	0.407	0.022***	2.540	1.145	5.636
25-29	-0.209	0.385	0.587	0.811	0.381	1.725
30-34	-0.481	0.383	0.210	0.618	0.292	1.310
35-39	-0.520	0.393	0.186	0.595	0.275	1.286
40-44	-0.308	0.406	0.448	0.735	0.332	1.628
45-49 (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Place Of Residence						
Rural	0.104	0.183	0.571	1.109	0.775	1.588
Urban (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Levels Of Education						
None	1.089	0.310	0.000*	2.972	1.618	5.459
Primary	0.744	0.260	0.004**	2.104	1.265	3.499
Secondary	0.607	0.241	0.012***	1.835	1.145	2.941
Higher (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Religious Affiliations						
Catholic (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Protestants	0.336	0.267	0.207	1.400	0.830	2.362
Pentecostal	-0.539	0.306	0.079****	0.583	0.320	1.063
Other Christians	0.405	0.284	0.154	1.499	0.859	2.615
Islam	0.509	0.297	0.087****	1.663	0.929	2.978
Traditional	0.219	0.606	0.718	1.244	0.379	4.082
Income						
Less than ₦5,000.00	0.728	0.311	0.019***	2.072	1.125	3.814
₦5,000.00- ₦7,499	0.380	0.338	0.261	1.462	0.754	2.834
₦7,500.00-₦14,999	0.224	0.342	0.511	1.252	0.641	2.445
₦15,000.0-₦19,999	-0.331	0.485	0.496	0.719	0.277	1,.861
₦20,000.00 + (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Work-Status						
Working (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Not Working	0.629	0.203	0.002**	1.876	1.261	2.791
Gender Preference						
Yes	0.109	0.174	0.529	1.116	0.793	1.569
No (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Husband's Levels Of Education						
None	0.393	0.334	0.240	1.481	0.769	2.853
Primary	0.840	0.230	0.000*	2.316	1.476	3.634
Secondary	0.102	0.209	0.624	1.108	0.736	1.668
Higher (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Birth Order						
2-3	-0.490	0.682	0.473	0.613	0.161	2.332
4-6	-0.347	0.691	0.616	0.707	0.181	2.740
7+ (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Sex Of The Preceding Child						
Male (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Female	-0.067	0.186	0.718	0.935	0.649	1.347
Survival Of The Preceding Child						
Living (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Dead	1.238	0.232	0.000*	3.450	2.191	5.433
Current Use Of Contraceptive						
YES (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
NO	0.456	0.164	0.006**	1.577	1.143	2.177
Contraceptive Use						

Ever Use (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Never Use	0.416	0.165	0.012***	1.516	1.097	2.096
Nutritional Status						
Underweight (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Normal	-1.101	0.217	0.000*	0.332	0.217	0.508
Overweight	-1.259	0.274	0.000*	0.284	0.166	0.486
Obesity	-1.206	0.353	0.001**	0.299	0.150	0.598
Husband's Income						
Less than ₦5,000.00	0.279	0.510	0.584	1.321	0.487	3.588
₦5,000.00-₦7,499	1.052	0.346	0.002**	2.863	1.454	5.639
₦7,500.00-₦14,999	0.821	0.302	0.007**	2.272	1.256	4.110
₦15,000.0-₦19,999	0.952	0.339	0.005**	2.590	1.333	5.034
₦20,000.0-₦29,999	0.819	0.342	0.017***	2.269	1.160	4.438
₦30,000.00 + (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Ideal Number Of Children						
1-2 (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
3-4	0.954	0.745	0.201	2.595	0.602	11.183
5-6	1.229	0.749	0.101	3.418	0.787	14.835
7+	1.021	0.795	0.199	2.776	0.584	13.188

Source: Field work, 2008.

Table 1.6: Results of Logistic Regression Model of the Socio-demographic factors Influencing High Risk Child Spacing Controlling for Education and Marital Status

Birth Intervals (Months)	β	S.E	SIG.	EXP(β)	95.0% C.I for Exp(β)	
					Lower	Upper
AGE						
15-19	0.734	1.306	0.574	2.083	0.161	26.963
20-24	0.795	0.545	0.145	2.214	0.761	6.438
25-29	-0.081	0.502	0.872	0.922	0.345	2.466
30-34	-0.331	0.504	0.511	0.718	0.268	1.927
35-39	-0.365	0.512	0.476	0.694	0.258	1.895
40-44	-0.251	0.540	0.642	0.778	0.270	2.241
45-49 (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
PLACE OF RESIDENCE						
Rural	-0.088	0.270	0.745	0.916	0.539	1.556
Urban (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
RELIGIOUS AFFILIATIONS						
Catholic (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Protestants	0.322	0.343	0.347	1.380	0.705	2.700
Pentecostal	-0.555	0.384	0.148	0.574	0.271	1.218
Other Christians	0.334	0.364	0.359	1.397	0.684	2.854
Islam	0.130	0.444	0.770	1.138	0.477	2.716
Traditional	0.930	1.259	0.460	2.536	0.215	29.916
Others	R.C	R.C	R.C	1.000	R.C	R.C
INCOME						
Less than ₦5,000	0.728	0.364	0.046***	2.071	1.015	4.229
₦5,000-₦7,499	0.525	0.383	0.171	1.690	0.797	3.582
₦7,500-₦14,999	0.066	0.390	0.866	1.068	0.497	2.292
₦15,000-₦19,999	-0.323	0.521	0.536	0.724	0.261	2.012
₦20,000 + (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
WORK-STATUS						
Working (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Not Working	0.530	0.277	0.055****	1.700	0.988	2.924
GENDER PREFERENCE						
Yes	0.342	0.226	0.130	1.408	0.904	2.193

No (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
HUSBAND'S LEVELS OF EDUCATION						
None	-19.446	16408.711	0.999	0.000	0.000	0.000
Primary	0.768	0.340	0.024	2.156	1.107	4.201
Secondary	0.235	0.229	0.304	1.265	0.808	1.978
Higher (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
BIRTH ORDER						
2-3	0.041	1.095	0.970	1.042	0.122	8.908
4-6	0.470	1.109	0.672	1.600	0.182	14.065
7+ (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
SEX OF THE PRECEDING CHILD						
Male (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Female	-0.128	0.242	0.597	0.880	0.547	1.415
SURVIVAL OF THE PRECEDING CHILD						
Living (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Dead	1.109	0.354	0.002	3.032	1.514	6.072
CURRENT USE OF CONTRACEPTIVE						
YES (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
NO	0.219	0.212	0.302	1.244	0.822	1.884
CONTRACEPTIVE USE						
Ever Use (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Never Use	0.147	0.239	0.538	1.159	0.725	1.852
NUTRITIONAL STATUS						
Underweight(Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
Normal	-1.257	0.364	0.001	0.284	0.139	0.581
Overweight	-1.415	0.428	0.001	0.243	0.105	0.562
Obesity	-1.398	0.495	0.005	0.247	0.094	0.652
HUSBAND'S INCOME						
Less than ₦5,000	0.388	0.678	0.567	1.474	0.390	5.566
₦5,000-₦7,499	0.823	0.445	0.065	2.276	0.951	5.448
₦7,500-₦14,999	0.823	0.340	0.015	2.276	1.170	4.428
₦15,000-₦19,999	0.959	0.376	0.011	2.608	1.249	5.446
₦20,000-₦29,999	0.656	0.371	0.077	1.928	0.932	3.985
₦30,000+ (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
IDEAL NUMBER OF CHILDREN						
1-2 (Ref.)	R.C	R.C	R.C	1.000	R.C	R.C
3-4	1.467	1.032	0.155	4.338	0.574	32.794
5-6	1.589	1.041	0.127	4.900	0.637	37.667
7+	1.658	1.139	0.145	5.250	0.563	48.954

Source: Field work, 2008. *** Significant at 0.1% (P<0.001) ** Significant at 1.0%(P<0.01)**

***** Significant at 5% (P<0.05) **** Significant at 10%(P<0.10) R.C Reference category**

7.1 DISCUSSION

Researches on child spacing have been conducted at different times in Ekiti-State and other locations in Nigeria. However, the present study revealed socioeconomic factors affecting spacing of childbearing in Ekiti-State. As clearly shown in the result section of this work, the impact of short child spacing are constraints on survival chances children. Women in relatively high income and education equally had short birth spacing. This reveals a serious challenge for the national family planning campaign groups for immediate action in reaching married women in Ekiti-communities.

The data also revealed that more women spaced their recent births for at least 24 months than those who spaced theirs for less than 24 months. The median birth interval in urban locations is greater than rural. The reason for this may not be too far from the fact that urban women are more accessible to family planning programs and are more educated than the rural women.

The mean children ever born (CEB) and child loss are 3.05 and 0.17 respectively. In both cases, mean children ever born and child loss are higher in rural than urban. The higher mean CEB in rural could be accounted for by several factors. For instance, rural women pride themselves with the number of children they have, low level of mobilization on the utilization of family planning, fear of the number of children that will eventually survive and other socio-cultural believes.

A direct association between birth intervals and risk of infant mortality in this study shows that children who are born less than 24 months after the previous birth are more likely to die at infancy than children who are born 36-59 months after the previous birth. It is also important to note that a minimum birth interval of 24 months may not be enough. As discovered through data analysis in this study, infant children born 24-35 months after the previous birth are still at higher risk of dying than children born between 36-60 months after the previous birth. Some of the deaths occurring among infant in Ekiti communities could have been averted if more women had achieved the longer birth intervals they desire. Therefore, extending the minimum recommended birth interval from two years to three years will really make a difference in terms of infant survival in Ekiti-State.

7.2 CONCLUSION

Birth spacing is a well known health intervention strategy for women and under-five children. It can play a significant role in helping Ekiti people achieve maternal and child health Millennium Development Goals. As revealed by this study, longer birth intervals are associated with reduced risk for infant mortality. Through birth spacing, families can reduce the number of children in the household, resulting in less rivalry for food and other resources, and more care and attention from the mother and other care givers to under-five children and infant in particular. In the present study, mothers want birth intervals that are at least 36 months long, despite the fact that majority of births occur less than 36 months after the previous birth. Thus, there is a need to address factors that create the gap between women’s desire and reality.

Therefore, development agencies, ministries of health, community-based organizations, health care provision networks and commercial health care providers, all have potential roles to play in helping to make meaningful birth spacing information and services available to families in Ekiti-State.

FRONTIERS FOR FURTHER RESEARCH

This study has shown that short preceding birth intervals have stronger effects on infant mortality than longer interval. Hence, where data permit, future studies should consider effects of inter-outcome intervals rather than inter-birth interval and allow their effects to vary by type of outcome that began the interval. This will add more to existing knowledge on childbearing practices and infant mortality.

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