The Demography of Zimbabwe: Some Research Findings

University of Zimbabwe Demographic Unit

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Chapter 6

Birth intervals and their relationship with infant mortality in Zimbabwe

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Introduction

The decline of mortality and fertility expected as a result of increased fertility regulation has been the subject of considerable debate (Bongaarts, 1981, 1987; Potter, 1988; Trussell, 1984). Changes in reproductive patterns can influence child health and survival through a number of different mechanisms, most notably through changes in birth order, birth interval and maternal age at child-bearing. Short intervals between births can lead to a number of health problems:

- lack of maternal recuperation
- lack of maternal preparation for birth
- premature birth
- low birth weight.

These factors are associated with an increased risk of death or the inability to take adequate care of the newborn baby due to poor physical health. The findings of many studies on birth intervals indicate that infant mortality can be reduced if live birth spacing of more than three years can be accomplished (through family planning and maternal child health care).

The deleterious effects of short birth intervals on infant mortality have been known for several decades. Birth intervals are shorter for women whose last child died than for those whose last child survived (Janowitz et al., 1981). This may be attributed to the truncation of lactation and early return of ovulation and fecundability (Knodel, 1968; Adlaka, 1974; Brass et al., 1973) or it may be due to attempts by the parents to replace the dead child (Preston, 1978).

The greater the age at first marriage, the shorter the birth interval due to reduction of the reproductive impairments associated with early marriages and compensation for the loss of earlier reproductive life through child-bearing at relatively shorter intervals (Ahmed, 1982).

Education of women may affect the length of birth intervals in two ways. Firstly, birth intervals may lengthen through the effect of education on the demand for children. Educated women are hypothesized to desire fewer children and would, therefore, be expected to have longer birth intervals. Secondly, birth intervals may shorten because of the increased fecundability associated with reduced breast-feeding durations (Cochrane, 1989). A reduction in the intensity and duration of breast-feeding causes a reduction in the period of post-partum amenorrhoea, during which women are insusceptible to conception. Educated women, who are likely to be formally employed, are likely to breast-feed for short durations. Education is expected, therefore, to positively affect delayed conception and to negatively affect post-partum amenorrhoea. Depending on social norms and values, both educated and non-educated women may have short birth intervals.

Women's work status can affect birth intervals, firstly through reducing the demand for children. When women's work is incompatible with child-bearing and rearing, fewer children may be desired, women wait longer to conceive and thus have longer birth intervals. Secondly, women's work status can affect birth intervals through reducing the breast-feeding duration, which is associated with short birth intervals. Thirdly, women's work status, affects birth intervals through the ability of employed women to pay for child-care services (especially in developing countries where such services are inexpensive) that free them from the pressure of many children interfering with their work. In these situations, birth intervals may be short.

One of the proximate determinants of birth interval is contraception which is used for preventing births, for spacing and limiting purposes and for health reasons. The effective use of contraception is hypothesized to lengthen birth intervals.

Place of residence, age at first marriage, maternal education, miscarriages, parity, sex of child, birth order, marital status and abortion can also influence the length of birth intervals.

This paper attempts to highlight the association between birth intervals and infant mortality in Zimbabwe. The relationships between birth intervals and socio-economic, environmental and demographic factors are also examined.

Objectives

The specific objectives of the study are:

- to examine the differentials within birth intervals in Zimbabwe by selected background variables;
- to investigate the relationship between birth intervals and infant mortality in Zimbabwe;
- to examine the role of birth intervals in the promotion of child health and in the limitation of infant mortality.

Data source

The data source for this study is the Zimbabwe Demographic and Health Survey

(CSO, 1989) which was designed to provide current information on fertility; child mortality levels and trends; contraceptive knowledge, approval and use, as basic indicators of maternal and child health, for policy makers and planners. The sample consists of a total of 4 201 women aged 15–49 years interviewed between September 1988 and January 1989. The survey provides data on birth histories which form the basis for intensive analysis in this study.

Limitations

The availability and quality of data limits many studies on birth intervals. The data used in this study consists of reproductive histories elicited from mothers aged 15–49 years. As is common in retrospective surveys, this data is subject to inaccuracies in the dates of events and in age statements. Retrospective studies also have problems with the accuracy of recall of distant events. Other limitations in the study of the effect of birth intervals on infant mortality are "spuriousness" and "simultaneity" (Gray, 1981). With spurious relations, birth order and mother's age are both related to the length of the corresponding birth interval and simultaneously exert their own effects on the mortality risks of infants and children. With simultaneity, biases can occur, for example when couples attempt to replace a lost index child. (The term "index child" refers to the observed child.) The resulting short birth interval is the consequence, not the cause, of the survival status of the index child.

In some studies it is impossible to assess whether the child under observation was conceived before or after the birth interval under consideration. This is particularly evident with some of the retrospective surveys. To overcome this problem it is important to relate each birth or pregnancy interval to two children or two pregnancies, one preceding and the other succeeding the interval under consideration. It is necessary to determine whether the observed or index child is from the first (preceding) or second (succeeding) pregnancy with respect to a given interval. This is important for two reasons: firstly, the length of a birth interval may have different effects on the health of the preceding and succeeding child; secondly, the fate of the preceding child may in itself determine the length of the subsequent birth interval.

There is a further problem with the effect of infant deaths on birth intervals. It has been shown in a number of societies that birth interval tends to be shorter following a child death than when the child survives (Knodel, 1968; Jain, 1969; Cantrelle and Leridon, 1971; Preston, 1978). This shortening of the interval is in part a biological effect due to the curtailment of lactation and hence of post-partum amenorrhoea and in part, in some societies, a voluntary compensation whereby parents try to replace the lost child as soon as possible (Preston, 1978). Failure to control for the fate of the preceding child can confound the analysis of the relationship between birth interval and child mortality, since a short interval may be either a cause or a consequence of a child's health.

Events defining the interval will also affect the interpretation of study results. If the interval is defined by two full-term births, then conceptions leading to an abortion will be omitted and this may affect the length of the interval.

The main limitation of using the Zimbabwe Demographic and Health Survey (CSO, 1989) to analyze birth intervals is that this data does not include information on miscarriages and abortions. The influence of miscarriages on birth intervals is more complex than may be obvious. This has been found by comparing the mean birth intervals of women who have had a miscarriage between two live births with those of women who had two successive live births. The nature of birth intervals is better understood if account is taken of miscarriage and its temporary infertility.

There is no control for the effects of other variables in many studies of birth intervals. The interval between births is closely linked to the age of the mother and to the number of children she has borne. A young woman, for example, of high parity must of necessity have had closely spaced births, whereas an older woman with lower parity may well have had long intervals between her children. Unfortunately many studies have not controlled for maternal age and parity in the analysis of birth intervals. The works of Henry (1961), Wolfers (1968) and Sheps et al. (1973), in particular, have enumerated the difficulties of obtaining and analyzing information on birth interval. A reading of these articles suggests that great prudence be used in interpreting the "means of birth intervals".

Multiple regression analysis is used in this study to determine the independent effect of these variables on birth intervals.

Use of concepts

The term "birth interval" is often used without clear definition of its meaning. There are several definitions of this term. Omran (1984) described five different types of birth intervals:

Interbirth interval: This is the interval between two successive or consecutive births including live or stillbirths. This disregards an intervening pregnancy ending in abortion or foetal loss.

Interconception interval: This is the interval between the onset of one pregnancy and the onset of a subsequent one. It is also known as "onset to onset interpregnancy interval".

Interlive birth interval: This is the interval between two successive live births. It disregards intervening pregnancies which do not end in a live birth.

Interpregnancy interval: This is the end of a pregnancy (whether the outcome was a live birth, stillbirth or foetal loss) and the onset of a subsequent pregnancy, usually measured as the date of the last menstrual period. It is also known as "end to onset interpregnancy interval" or "pregnancy spacing".

Pregnancy interval: This marks the period between the end of one pregnancy and the end of a subsequent pregnancy (regardless of their outcome). It is also known as "end to end interpregnancy interval".

Miller (1989) defines birth interval as the sum of conception interval (time between previous birth and conception of index child) and length of gestation. Henin (1968), in his study of the Baggara in Sudan, computed the mean birth interval by determining the age difference of mothers from time of first live birth to last live birth. He divided this summation by the number of live births (-1.0 for each woman) to arrive at the mean interval. Other concepts used in this study are:

First birth interval: Rindfuss et al. (1978) defined first birth interval as the interval between marriage and the birth of the first child.

Succeeding birth interval: Interval between date of birth for the index child and date of birth for the next child.

Preceding birth interval: Interval between date of birth for the index child and date of birth for the child born before it.

Index child: This refers to the observed child.

Short birth interval: Interval which is less than 24 months.

Long birth interval: Interval which is more than 25 months.

Infant mortality: This is the proportion of children born who died before reaching the age of one year.

Child mortality: This is the proportion of those children alive at first birthday who died before reaching the age of five years.

This study analyzes the first birth interval and interbirth interval and their relationship to infant mortality. These are the only types of birth intervals which can be analyzed using the Zimbabwe Demographic and Health Survey data because insufficient data is available for the use of other types of birth intervals.

Framework for analysis

This study analyzes socio-economic, demographic and environmental factors affecting birth intervals. The effect of these factors on birth interval is examined using multiple regression analysis. Figure 6.1 shows the framework used for analysing factors affecting birth intervals, and reproductive factors affecting infant mortality respectively.

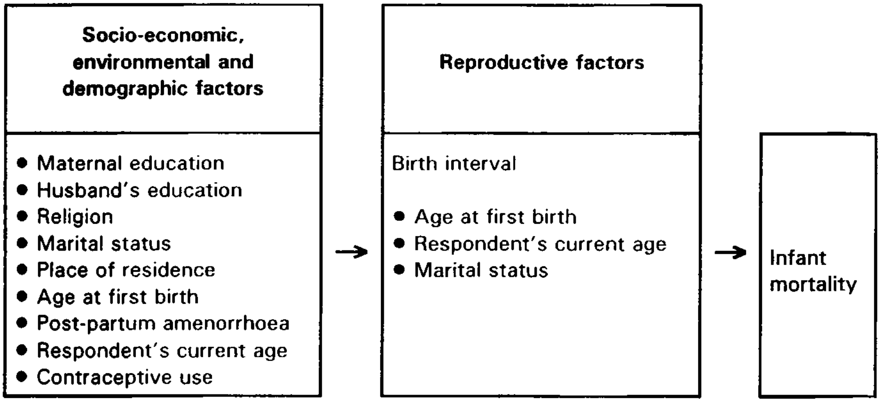

Figure 6.1: Framework for analyzing birth intervals

Birth interval differentials

Only women with at least two children are included in the analysis. This avoids possible bias if women with one child are included since there are no interlive birth intervals. The preceding birth interval is used in the analysis because most evidence on the effects of birth intervals on the probability of child survival focuses on preceding birth interval (Winikoff, 1983).

The mean birth interval

The mean preceding birth interval for Zimbabwean women is 46 months; 63.5% of the women reported that their preceding birth interval is longer than two years and only 36.5% of women have intervals less than two years. Birth intervals longer than two years carry the least risk of infant mortality. The mean preceding birth interval shows that most women in the country prefer intervals which are longer than two years.

Traditional practices of prolonged breast-feeding have helped to maintain such reasonable birth intervals in the country. Breast-feeding is almost universal in Zimbabwe with an average duration of 19 months (CSO, 1989). Breast-feeding prolongs the period of post-partum amenorrhoea and suppresses ovulation, thus producing the effect of temporary infecundity or subfecundity (Weeks, 1989). This extends the period of insusceptibility to pregnancy and lengthens intervals between births.

The median birth interval is 36 months. This means that half of the women analyzed have birth intervals of less than 36 months and the other half have intervals of more than 36 months. Table 6.1 shows the percentage distribution of women by birth interval length.

Table 6.1: Percentage distribution of women by birth interval

Birth interval (months)	Percentage distribution of women	Number of women
0-24	36.5	886
25-48	29.0	704
> 49	34.5	838
Total	100.0	2 428

The mean succeeding birth interval is 45 months. This reflects a difference of only one month from the mean preceding birth interval.

The relationship between birth intervals and background characteristics

The mean birth intervals are important in providing a general picture of birth intervals in the country. It is, however, important to consider birth intervals by background characteristics to determine whether there are differentials in birth intervals among Zimbabwean women.

Age

Analysis has shown that younger women have more closely spaced births than older women. Using five-year age group data, women under 34 years of age represent the highest proportion of short birth intervals (intervals which are less than two years). For 35–49 age group most women have long birth intervals. Table 6.2 shows the distribution of women by short (under 24 months) and by long (over 24 months) birth intervals controlling for age. (Five-year age groups have been divided into two broad groups: 15–34 years referring to younger women and 35–49 years referring to older women.)

Table 6.2: Percentage distribution of women by birth interval and by age of woman

Birth interval (months)	Age group 15-34 years	Age group 35-49 years	Total	Number of women
0-24	83	17	100	705
> 25	44	56	100	1 260

Table 6.2 clearly shows that with regard to age, younger women have shorter birth intervals than older women; 83% of the younger women and 17% of older women have short birth intervals. Over half of the older women (56%) have long birth intervals and 44% of younger women have long birth intervals. This shows that, generally, younger women have shorter birth intervals than older women. The bivariate analysis of short birth interval by current age of respondent also shows that younger women space their children more closely than older women do.

Short birth intervals among younger women might be due to modernization as this can lead to a decrease in the length of the breast-feeding period. It can also lead to less regard for post-partum sexual abstinence, particularly among younger women, with or without compensatory adoption of contraceptive practices. This increases the risk of pregnancy thereby shortening birth intervals.

For young, modern women, sexual relations are no longer simply a means of child-bearing but a way of maintaining a successful marital relationship (Sala-Diakanda et al., 1981). This increases exposure to pregnancy. Short birth intervals, therefore, also occur among women who have received some education and are removed from situations in which traditional norms and sanctions impose restraints on sexual behaviour.

Education of women

The bivariate analysis of birth intervals by education shows marked differences in the birth intervals of women in different educational categories. Educated women have shorter birth intervals than women who are less educated. The difference between birth intervals of women with no education and those with primary education is noticeably smaller than that between women with primary and those with secondary education (Table 6.3).

Table 6.3: Percentage distribution of women by birth interval by education

Birth interval (months)	No education and primary education	Secondary and higher education
0-24	30	60
25-45	16	17
> 46	54	23
Total percent	100	100
Number of women	1 694	271

Education provides women with work opportunities outside the home which may be incompatible with long durations of breast-feeding. Increased education thus implies reductions in birth intervals if contraception is not practised as a replacement. As duration of breast-feeding generally declines with education, this could indirectly lead to a decline in birth intervals among educated women. The education variable reflects a number of other dimensions. In particular there is a very strong cohort factor affecting level of education. Older birth cohorts have had fewer educational opportunities and consequently differences between education groups may mirror differentials related to age or birth cohort rather than education per se.

Education of husbands

Women with educated husbands have shorter birth intervals than women with less educated husbands (Table 6.4). Women whose husbands have little education constitute the lowest percentage of women with short birth intervals. Educated women tend to marry educated men and this may explain why women with educated husbands have short birth intervals. The analysis of birth intervals shows that educated women have shorter birth intervals than less educated ones.

Table 6.4: Percentage distribution of women by birth interval by husband's education

Birth interval (months)	No education and primary education	Secondary and higher education
0-24	30	59
25-48	27	22
> 49	43	19
Total percent	100	100
Number of women	1 636	577

Literacy

The extension of education since independence in 1980 has resulted in improved literacy rates among Zimbabwean women. The analysis of birth intervals by literacy shows that most women who cannot read have long birth intervals while most who can read have short birth intervals (Table 6.5).

Literate women have short birth intervals yet they are able to utilize printed family planning information. Those who listen to radio daily also have shorter birth intervals than those who do not, yet information on family planning is disseminated by radio. One reason for this situation may be that cultural practices such as breast-feeding and sexual abstinence which help to lengthen birth intervals are not utilized much by modernized, educated women.

Table 6.5: Percentage distribution of women by birth interval by literacy

Birth interval (months)	Literate	Illiterate
0-24	40	26
25-48	30	27
> 49	30	47
Total percent	100	100
Number of women	1 817	611

Education of women/age

Educated women have been shown to have shorter birth intervals than uneducated ones. However, age may be the significant factor. If younger, educated women have short birth intervals it could be due to age rather than education. Controlling for age helps to determine more clearly the effect of education on birth interval.

This study found that most educated women in all age groups have shorter birth intervals than less educated women. However short birth intervals are more common among younger educated women (74%) than among older educated women (38%) (Table 6.6).

Table 6.6: Percentage distribution of women by birth interval by education controlling for age

	15–34 years	
Birth interval (months)	No education and primary education	Secondary and higher education
0-24	47	74
25-48	36	23
> 49	17	3
Total percent	100	100
Number of women	1 174	250

35–49 years		
Birth interval (months)	No education and primary education	Secondary and higher education
0-24	11	38
25-48	22	32
> 49	67	30
Total percent	100	100
Number of women	902	95

Place of residence

The analysis of birth intervals by place of residence shows the same trend for both rural and urban areas (Table 6.7). Over 50% of women in both areas have long birth intervals: 74% of urban and 69% of rural women. Slightly more than 25% of women in both areas have short birth intervals. The long birth intervals are probably due to cultural props supporting long durations of breast-feeding. It is generally believed that it is pathogenic for a pregnant woman to breast-feed an infant. Thus, traditional mechanisms of contraception passed from generation to generation are practised to facilitate long durations of breast-feeding, hence the long birth intervals. Mhloyi (1987) observed in some parts of Zimbabwe that some pregnancies are aborted if they begin when infants are nursing.

Long birth intervals in both rural and urban areas (mostly in rural areas) are also due to sexual abstinence beliefs and taboos. In Zimbabwe, abstinence is practised not as a spacing mechanism per se, but because of a variety of such beliefs. According to Mhloyi (1987), after giving birth, a woman is expected to be given enough time for her back to heal before she engages in sex. This practice helps to maintain long birth intervals in both rural and urban areas.

Table 6.7: Percentage of women by birth interval by place of residence

Birth interval (months)	Urban	Rural
0-24	26	31
25-48	54	56
> 49	20	13
Total percent	100	100
Number of women	542	1 407

Region/province

The Zimbabwe Demographic and Health Survey (CSO. 1989) has treated Harare and Bulawayo as separate provinces to give a total of nine provinces in Zimbabwe. The analysis of birth interval by province shows that Bulawayo has the highest proportion of women with short birth intervals followed by Harare (including Chitungwiza), Mashonaland Central and Midlands respectively. Bulawayo, Harare and Chitungwiza are the large urban areas of Zimbabwe. Most women staying in large urban areas are more educated than those in small urban areas which might explain the high proportion of women with short birth intervals in these areas. Table 6.8 shows birth interval differentials by province.

Table 6.8: Percentage distribution of women by birth interval by province

Birth interval/ Region	0-24 months	25-45 months	> 46 months	Total	Number of women
Manicaland	29	14	57**	100	287
Mashonaland Central	40	20	40	100	149
Mashonaland East	31	19	50**	100	278
Mashonaland West	33	13	54**	100	265
Matebeleland North	33	27	40	100	73
Matebeleland South	36	18	46	100	83
Midlands	38	13	49	100	293
Masvingo	33	16	51**	100	252
Harare/ Chitungwiza	49*	18	33	100	162
Bulawayo	51*	23	26	100	123

* High percentages of women with short birth intervals
** High percentages of women with long birth intervals

Harare and Chitungwiza are within Mashonaland East but when they are separated from the province, as was done for the Zimbabwe Demographic and Health Survey or ZDHS (CSO, 1989), Mashonaland East has a low proportion of women with short birth intervals. Bulawayo is within Matebeleland North but it was separated for the purpose of ZDHS. The rest of the province demonstrates a smaller percentage of women with short birth intervals than Bulawayo. While in Matebeleland North 33% of women have short birth intervals, in Bulawayo more than half (51%) the women have short birth intervals. In all the provinces except Bulawayo, over 50% of the women have birth intervals longer than two years (long birth intervals).

Ethnicity

The analysis of birth interval by ethnicity (Table 6.9) shows that whites have a higher percentage of women with short birth intervals than blacks and "others". "Others" refers to coloureds, Asians and other racial groups. Before independence in 1980 there were disparities in the education systems available to whites, Asians, coloureds and blacks in Zimbabwe. Whites and Asians had better opportunities in education than blacks. As previously indicated, educated women have shorter birth intervals than non-educated women, therefore white women have shorter birth intervals than blacks. Cultural factors affecting blacks (such as sexual abstinence when a woman is nursing) do not necessarily operate in western cultural behaviour, contributing further to short birth intervals among white women.

Table 6.9: Percentage distribution of women by birth interval by ethnicity

Birth interval (months)	Black	White	Others
0-24	36	78	42
25-48	29	18	25
> 49	35	4	33
Total percent	100	100	100
Number of women	2 383	33	12

Religion

Religion is important in analyzing social systems and as a differentiator of social processes because it is the most common, although not the only, manifestation of value orientations. This is confirmed by Durkheim's study (1915) of the interrelationships between religious systems and social order, and by Weber's (1947) comparative studies of religious values and socio-economic systems. Table 6.10 shows birth interval differentials by religion.

Table 6.10: Percentage of women by birth interval by religion

Birth interval (months)	Traditional	Spiritual	Christian	Others	No religion
0-24	35	34	36	45	37
25-45	17	16	17	23	11
> 46	48	50	47	32	52
Total percent	100	100	100	100	100
Number of women	193	384	1 298	60	27

For all religious groups, the "others" category has the highest percentage of women with short birth intervals (45% have intervals under two years). The "others" category includes Hindus, Jews and Muslims. Jews are less likely to have a high percent of women with short birth intervals according to Goldscheider (1971).

According to Nag (1966), there is a custom among both the Hindus and Muslims of West Bengal in India of abstaining from marital relations for about six months when a mother is nursing. However, this is not strictly followed by the majority in Bengal. In most cases, sexual relations resume within two to three months of birth. Hence post-partum sexual abstinence is not expected to lengthen birth intervals. If this is also the case for the Hindus and Muslims in Zimbabwe, it may explain why the "others" category has the highest percentage of women with short birth intervals in Zimbabwe. However, the practice of the Hindus and Muslims in Bengal may be influenced by strong cultural rather than religious factors and therefore may not be representative of all Hindus and Muslims. It is difficult to measure the degree of religious affiliation and this poses problems when the influence of religion on the length of birth intervals is analyzed. Over half of the women in all religious groups in Table 6.10 have long birth intervals.

Marital status

As shown in Table 6.11, the highest percentage (74%) of women with short birth intervals are in the never-married category. Never-married women are usually young and educated. According to the 1982 Census (CSO, 1985) 94.41% of never-married women aged 15 years and above were in the 15–34 years age range while 5.59% were in the 35 years and above age range. The census data also shows young women aged 15–19 years to have the highest literacy rate (72%) and the literacy rate to decline as age increases. Young and educated women have shorter birth intervals than older or less educated women.

Over half (54%) of divorced women have short birth intervals. The 1982 Census (CSO, 1985) shows 54.37% of divorced women aged 15 years and above to be in the 15–34 years age range. Since most divorcees are younger women, they may hold values that differ from those of older women because they are more susceptible to social change. These differences can lead to conflict between the younger generation and their in-laws which, in turn, can lead to divorce. A possible explanation for the high percentage of divorcees having short birth intervals is that most divorcees are younger women and younger women have short birth intervals.

Married and widowed women have the highest proportion of those with long birth intervals. Married women tend to plan their families and this may be why they have longer birth intervals. Table 6.11 shows that married and widowed women have long birth intervals while divorced and never-married women have short birth intervals.

Table 6.11: Percentage distribution of women by birth interval by marital status

Birth intervals (months)	Never married	Married	Widowed	Divorced
0-24	74	35	24	54
25-48	13	29	33	30
> 49	13	36	43	16
Total percent	100	100	100	100
Number of women	31	2 102	96	199

Age at first marriage

The analysis of birth intervals by age at first marriage shows that women who marry at a relatively late age have the highest proportion of short birth intervals. In most cases these women are educated. This, together with the fact that women who marry late may want to utilize their reduced child-bearing time, accounts for the short birth intervals.

Analysis of age-at-first-birth data shows a small proportion of women who gave birth to their first child at a relatively late age to have short birth intervals (less than 24 months). Most women who were less than 20 years of age when they gave birth to their first child had short birth intervals, while most women who gave birth to their first child at a relatively late age had long birth intervals.

Parity progression ratio

The analysis of birth intervals leads to an interest in the proportion of women who move from one stage of the number of children ever born to the next — the parity progression ratio. This is important because birth intervals change by parity and the number of women who move to the next parity will make it possible to estimate the proportion of women with certain kinds of birth intervals.

This study has shown that the number of women moving from one stage of the number of children ever born to another decreases with parity. In other words, as parity progresses, the number of women with such a parity decreases. This analysis is based on women with two or more children and for the parity progression ratio the same procedure is used. Table 6.12 shows the parity progression ratio by total number of children ever born.

Table 6.12: Parity progression ratio by children ever born

Parity	Parity progression ratio	Number of women
2	0.97	2 356
3	0.80	1 953
4	0.63	1 540
5	0.47	1 142
6	0.35	838
7	0.24	582
8	0.16	397
9	0.11	255
> 10	0.11	262

Table 6.12 shows that the number of women who move from one stage to another decrease as the total number of children ever born increases. Of all the women who had ever given birth, 97% had two children, 80% had three children, 63% had four children, and so on.

Proximate determinants of birth intervals

The duration of susceptibility to pregnancy, which determines birth intervals, is influenced by a number of factors. Amenorrhoea, breast-feeding, use of contraception and fertility preferences are key birth interval determinants.

Abortions and miscarriages are other important determinants of birth interval but the ZDHS (CSO, 1989) does not provide data for these. The effect on birth intervals of the use of contraception, post-partum amenorrhoea and fertility preferences are examined in the following section. Breast-feeding affects birth intervals through its influence on the length of amenorrhoea.

Use of contraception

The most influential determinant of birth interval is effective contraceptive use. It helps to prevent pregnancy and therefore prevents infant and maternal deaths due to short birth intervals. In Zimbabwe the most widely known contraception method is the pill (CSO, 1989). Withdrawal is the most frequently recognised traditional method.

Contraception is generally used in Zimbabwe for child spacing. This practice maintains the long birth interval tendency that exists in the country. Zimbabwe is recorded as having the highest prevalence of contraceptive use in sub-Saharan Africa (CSO, 1989).

Post-partum amenorrhoea

By influencing the length of the post-partum period when women are naturally infecund and insusceptible to pregnancy, amenorrhoea plays an important role in determining the length of birth intervals. The traditional practice of sexual abstinence while breast-feeding also contributes to longer birth intervals. In Zimbabwe the median duration of post-partum sexual abstinence is 4.3 months and the median duration of post-partum amenorrhoea is 12.6 months (CSO, 1989). This extended period of post-partum amenorrhoea explains the long period of protection from subsequent pregnancy.

Bivariate analysis has shown that the duration of the amenorrhoea period is related to the length of birth intervals. Women who have long periods of amenorrhoea have long birth intervals and vice versa. The period of post-partum amenorrhoea is also related to the duration and intensity of breast-feeding. In Zimbabwe the long duration of breast-feeding is associated with an extended period of amenorrhoea.

Table 6.13 shows the proportion of respondents insusceptible to pregnancy because of post-partum amenorrhoea or post-partum sexual abstinence or both.

Table 6.13: Proportion insusceptible to pregnancy because of post-partum amenorrhoea or post-partum sexual abstinence

Months since birth	Still breast-feeding	Still amenorrhoeic	Still abstaining	Still insusceptible*
< 2	95.0	88.7	82.9	91.2
2-3	94.9	78.8	56.8	87.3
4-5	91.8	70.9	31.8	75.5
6-7	92.2	73.5	27.5	77.5
8-9	89.4	61.5	10.6	62.5
10-11	89.8	50.9	13.9	55.6
12-13	87.6	49.6	7.1	51.3
14-15	81.7	43.5	9.2	48.9
16-17	73.4	30.3	7.3	34.9
18-19	52.1	18.8	6.3	22.9
20-21	33.3	13.1	1.0	14.1
22-23	16.1	2.7	7.1	9.8
24-25	11.4	0.8	3.8	4.5
26-27	6.5	0.0	5.8	5.8
28-29	3.9	0.8	0.8	1.6
30-31	2.8	0.0	2.8	2.8
32-33	1.7	0.0	3.4	3.4
34-35	0.0	0.0	0.0	0.0
Total	49.7	30.9	14.3	34.6

Source: CSO, 1989

* Amenorrhoeic, abstaining or both

Fertility preferences

The general expectation is that birth intervals decrease in duration as the desired family size increase in number. However, in reality, women who prefer large families tend to have longer birth intervals than those who prefer small families. The women who prefer large families tend to be less educated. Cultural factors which help maintain long birth intervals operate more among non-educated women thus, promoting long birth intervals (Table 6.14).

A problem encountered when analyzing desired number of children in relation to birth interval is that women who prefer fewer children are usually younger women who may not have completed child-bearing. They may have more children than they desire and they may also use contraception after a certain parity so that their birth intervals are similar to those of the older cohorts.

Table 6.14: Percentage distribution of women by birth interval by desired number of children

Parity/ Birth interval (months)	1	2	3	4	5	6	7
0-24	38	70	70	52	44	23	19
25-48	38	17	16	29	33	31	24
> 49	24	13	14	19	23	46	57
Total percent	100	100	100	100	100	100	100
Number of women	13	113	99	602	23	1 046	267

First birth interval

First birth interval is defined as the interval from first marital union to first birth. According to Rindfuss et al. (1978), the use of this term is problematic because premarital births may occur before the first marital union. It is clear that marital status does not adequately define susceptibility to pregnancy in such cases. The mean first birth interval for Zimbabwean women is 18 months. Table 6.15 shows the percentage distribution of women by first birth interval.

Table 6.15: Percentage distribution of women by first birth interval

Birth interval (months)	Percentage distribution of women	Number of women
0-24	82	1 608
25-48	12	242
> 49	6	116
Total	100	1 966

Over half of Zimbabwean women (53%) give birth to their first child within one year of marriage. This study has also found that 2.2% of women give birth to their first child before marriage and 26.9% are pregnant before marriage, which shortens some first birth intervals to less than 9 months. However, 73% of women become pregnant after marriage.

These results show that Zimbabwean women tend to become pregnant as soon as possible after marriage. This might be due to cultural expectations that require newly married women to bear children for their lineages as soon as possible or risk the subsequent disrespect of in-laws. Having given birth, women are expected to breast-feed their children for a long time, hence the mean birth interval is over three years.

First birth interval/place of residence

Over 80% of women in both urban and rural areas have first birth intervals of less than two years (Table 6.16). Social expectations of pregnancy soon after marriage are influential in both rural and urban areas. Only about 15% of women in both rural and urban areas have first birth intervals longer than 25 months.

Table 6.16 Percentage distribution of women by first birth interval by place of residence

Birth interval (months)	Urban	Rural
0-24	84	81
25-48	11	13
> 49	5	6
Total percent	100	100
Number of women	581	1 384

Multivariate analysis

Correlation analysis is used in this study to measure the relationship between birth intervals and background characteristics. Multiple regression analysis is also used to measure the background characteristics that are significantly associated with birth intervals. The stepwise method of multiple regression is used because it lists the independent variables (in this case the background characteristics) in descending order of their predictive power on birth intervals.

Correlation

Using the matrix zero order correlations between the independent variables and the dependent variable, the results indicate that maternal education, current age of respondent, marital status, contraceptive use, age at first birth, place of residence and post-partum amenorrhoea are the independent variables most related to birth intervals. Current age of respondent has the highest correlation with birth interval which is a positive correlation.

The correlation coefficients show primary education to have a very low positive correlation with birth interval (0.114) and secondary education to have a negative correlation with birth interval (-0.315). This means that birth intervals decrease as education levels increase. This confirms the results of the bivariate analysis where non-educated women were found to have longer birth intervals than educated women.

Age at first birth has a low negative correlation (-0.184) with birth interval. As age of women at first birth increases, birth intervals decrease. However the correlation coefficients are low.

Urban place of residence has a low negative correlation (-0.188) with birth interval. Birth intervals decrease as urbanization increases.

In terms of marital status, the results indicate never-married status to have a negative correlation (-0.209) with birth interval. As the proportion of never-married women increases, birth interval length decreases. Currently married status has a low positive correlation (0.192) with birth interval. This shows that married women have longer birth intervals than never-married women. The correlation between current marital status and birth interval is very low.

The correlation coefficient of contraception use shows traditional contraception to have a low positive correlation (0.179) and modern contraception to have a very low negative correlation (-0.054) with birth interval. With traditional contraception, birth intervals increase and with modern contraception birth intervals decrease slightly.

Post-partum amenorrhoea has a low positive correlation with birth interval (0.131). Birth intervals increase as the period of amenorrhoea increases.

Of all the variables which relate to birth interval, current age of respondent is the most highly correlated. It has a positive relationship with birth interval, meaning that the birth intervals increase with the current age of respondents.

Multiple regression

The stepwise multiple regression analysis demonstrates the importance of the following predictors:

Current age of respondent: has a beta weight of 0.694780 and is statistically significant with a t-test of significance of 52.9. As indicated by the matrix of zero order correlations, birth interval length increases with an increase in age. The adjusted coefficient of determination R^2 is 0.48255 and this means that 48.3% of the total variation in birth interval length is explained by current age of respondent.

Postpartum amenorrhoea: has a beta weight of 0.332822 and is statistically significant with a t-test of significance of 27.4. The two predictors, current age and postpartum amenorrhoea, explain 58.6% of the variation in birth intervals.

Since current age accounts for 48.3% of the variation, post-partum amenorrhoea accounts for the remaining 10.3% of the variation in birth intervals.

Age of respondent at first birth: has a beta weight of -0.337738 and is statistically significant with a t-test of -32.9. The adjusted multiple coefficient of determination, R^{2}, is 0.69586. This indicates that 69.6% of the variation in birth intervals is accounted for by the combination of the separate influences of the three predictors, current age, amenorrhoea and age at first birth. The R^2 is statistically significant. The addition of age of respondent adds 11% to the percentage of the explained variance in the birth interval.

Currently married status: has a beta weight of 0.090984. The variable is statistically significant and the t-test of significance is 8.9. The adjusted multiple coefficient of determination, R^{2}, for the combination of the four predictors is 70.4% (0.70356). The variable of currently married status accounts for 0.8% of the variation in birth intervals.

Urban place of residence: has a beta weight of -0.080441. It is statistically significant with a t-test of significance of -8.0. The adjusted R^2 for the five variables is 71% and only 0.6% of the variation in birth interval is accounted for by urban place of residence.

Use of modern contraception: has a beta weight of 0.069895 and is statistically significant with a t-test of significance of 6.9. The adjusted R^2 for the six predictors is 71.4%. The variation in modern use of contraception accounts for 0.4% of the variation in birth interval.

Use of traditional contraception: has a beta weight of 0.058816. The t-test of significance is 4.8. The adjusted R^2 is 71.6%. This variable contributes 0.2% of the variation in birth interval.

Never-married status: has a beta weight of 0.38623. It is statistically significant and the t-test of significance is 3.4. The adjusted R^2 of the eight predictors is 71.7%. The contribution of this variable to the variation in birth intervals is 0.1%.

Secondary education of the woman: has a t-test of significance of -2.1 and so is statistically significant. It has a beta weight of -0.22522. The adjusted R^2 is 0.71755 which means that 71.8% of the variation in birth interval is accounted for by the variations of these nine predictors. The variation of women's secondary education accounts for 0.1%. Education is negatively related to birth interval; the higher the educational level, the shorter the birth interval.

The sizes of the beta weights (b_i) in the final regression model indicate the relative importance of each independent variable. The larger the absolute value of beta weight, the more important the contribution of the independent variable.

The beta weights show that much of the variation in birth interval is caused by the variation in current age of woman. Variables such as primary education and religion are statistically insignificant and therefore have been left out of the regression model. The model which is most useful in predicting birth interval when using the standardised beta weights is as follows:

$$Y = .833X_1 + .310X_2 + -.330X_3 + .096X_4 + -.088X_5 + .109X_6 + .060X_7 + .041X_8 + -.023X_9$$

where Y is the birth interval and X_1 to X_9 are the independent variables. The numerical values are the beta coefficients.

The birth interval and infant mortality relationship

The chance of an infant dying increases with factors such as malnutrition, infectious diseases and lack of health care. If death rates among infants in Zimbabwe are to be substantially reduced, then the conditions which increase the risk of death must be alleviated. One way to prevent infant deaths may be to encourage long birth intervals. The importance of birth spacing and its potential for improving infant survival are the subjects of this paper.

In this study, most infant deaths were found to occur in both rural and urban areas at 0–7 months of age. A possible reason why rural areas experience higher infant mortality rates than urban areas is the differentials in the provision of health services between the two areas. There are more health centres in urban areas, and they are better equipped and more accessible than rural health centres. In addition, urban women tend to be more educated than rural women and have access to health care information. Short birth intervals, however, substantially increase children's chances of dying in both rural and urban areas.

Although birth interval, together with maternal age and birth order, has a major influence on child survival, there was until recently very little information on birth intervals in many developing countries. When there is a short birth interval between two children, they both have a greater chance of dying than do children with a longer birth interval between them. Birth intervals of less than two years are strongly and consistently associated with high mortality rates. The increase in deaths associated with short birth intervals is usually greatest during the first year of life. This is explained by Table 6.17.

This study found that most infants who died before reaching the age of one year had been born after short birth intervals (intervals less than two years). The analysis of birth intervals by infant deaths, controlling for place of residence, shows that in urban areas, 51% of infants who died under three months of age were born after intervals of less than 12 months. In rural areas, the figure is 57%. This demonstrates a high mortality rate for infants born after short birth intervals in both rural and urban areas, although it is slightly higher for children of rural women. The effect of birth interval on infant mortality is strongest during the first five months of life.

Table 6.17: Infant and child mortality for 1978–1988 by preceding birth interval

Preceding birth interval (months)	Infant mortality (1q0)	Childhood mortality (4q1)	Under-five mortality (5q0)
0-24	78.9	53.5	128.2
25-48	47.9	23.4	70.2
> 49	42.8	25.1	66.8

Source: CSO, 1989

The analysis of the distribution of infant deaths by birth interval, controlling for education, shows that infant deaths associated with short birth intervals are greater among children of non-educated women than among those of educated women. Infant deaths due to short birth intervals decline with increasing level of maternal education, in both rural and urban areas. As the level of education increases, diet improvement and the prevention of disease through immunization and hygiene also increase, thereby reducing the risk of dying due to the effects of short birth intervals. The important point, however, is that short birth intervals are a threat to the health of all children.

Table 6.18 shows that more non-educated women experienced infant deaths after short birth intervals than did educated women.

Table 6.18: Percentage distribution of women who experienced infant deaths after short birth intervals by education

Education	Experienced infant death	Did not experience infant death	Total percent	Number of women
No education	79	21	100	487
Primary	53	47	100	1 589
Secondary +	41	59	100	352

Although short birth intervals are more hazardous to infants of non-educated mothers than to those of educated ones, it is important to realise that short birth intervals are a threat to the survival of all infants irrespective of maternal education.

The percentage distribution of women who reported death of their children by age in months shows that more children die under the age of 12 months than at subsequent ages (Table 6.19).

Table 6.19 Percentage distribution of women who reported child death by age at death

Reported age at death (months)	Percentage distribution of women	Number of women
0-12	27	578
13-26	23	505
27-38	19	409
39-48	17	378
49-60	14	305
Total	100	2 175

Summary and conclusions

A number of factors affect death of children under the age of 12 months. This study has used multiple regression analysis to find out how birth interval, among other reproductive factors, is related to infant mortality.

For many years, studies have shown that infants born after very short birth intervals have a higher risk of infant deaths than infants born after long birth intervals. To find out whether birth interval is a significant predictor of infant mortality and whether its effect remains when other reproductive factors are taken into account, stepwise multiple regression method has been used. Four factors have been used as independent variables in this analysis: birth interval, age at first birth, current age of respondent and marital status.

Several conclusions can be drawn with respect to the birth interval pattern in Zimbabwe. First of all, the length of birth interval has been shown to be largely a function of a woman's current age. This study has shown that short birth intervals are common among young women regardless of residence or education.

The directions of the changes in birth intervals are closely related to the current process of urbanization. There is less regard for prolonged breast-feeding and post-partum sexual abstinence particularly among younger women and in urban areas. These changes are accompanied by the phenomenon of short birth intervals. Given the continuing process of urbanization, the potential increase in shorter birth intervals can only be counteracted by a compensating increase in effective use of contraception.

The study has also shown that child spacing occurs mainly through largely unconscious biological mechanisms affecting the postpartum non-susceptible period.

The bivariate analysis suggest that short birth intervals are associated with high rates of infant mortality. Multivariate analysis has, however, shown that there is no correlation between birth interval and infant mortality and that birth interval is not even statistically significant as a predictor of infant mortality. It is however necessary to have more information than is currently available in order to assess the direction of the relationship between birth interval and infant mortality in Zimbabwe.

Recommendations

Birth spacing makes an important contribution to the promotion of health and welfare. Fathers and policy makers need to be educated on the importance of lengthening birth intervals to improve maternal and child health.

Several factors make birth interval a feasible and important component of child survival programmes. In most societies birth spacing is not a new idea; traditional methods include withdrawal, abstinence and prolonged breast-feeding. While it is best to make a range of effective contraceptive methods accessible to all, couples should also be encouraged to use whatever means they can to postpone their next pregnancy for a few years. Birth spacing is a step towards child survival and improved health that couples can take on their own, whether they are rich or poor and whether they live in a city or in a village. Birth spacing complements other child survival activities, such as immunization or oral rehydration for diarrhoeal diseases. When health workers are talking to mothers about the health benefits of immunization, oral rehydration and breast-feeding, they can also discuss the benefits of good birth spacing.

Further research should be done to improve methods of analyzing birth intervals. Finally much should also be done to quantify the relationship between birth intervals and infant mortality in Zimbabwe.

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