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Determinants of Birth Spacing and Effect of Birth Spacing on Fertility in Bangladesh

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Abstract

For the last few decades, demographers have directed considerable attention towards the study of human fertility through the analysis of birth interval data. This study examines the covariates of birth intervals and the effect of increased birth intervals on current fertility level in Bangladesh. Using the data of BDHS 2007, Cox Proportional Hazards model is used to determine the covariates of birth intervals. Mother's age at first birth, previous birth interval, mother's education and working status, mass media exposure appeared as the significant determinants of birth intervals. To estimate the tempo effect of birth interval on current fertility of Bangladesh, Bongaarts and Feeney method (1998) has been used. The tempo adjusted TFR was found to be 3.85, while the conventional TFR was 2.73 for the year 2005-06. This demonstrates that an increased effort to widen the spacing of births can effectively reduce the level of fertility in the future.

I. Introduction

'Birth Spacing' refers to the time interval from one child's birth date until the next child's birth date. It is one of the important indicators of fertility scenario of a country. There may be very personal reasons why time is needed between pregnancies. Analysis of those factors influencing the birth cycles and those affecting the spacing of fertility has proven useful effects, since in many cases they appear to vary quite substantially across populations (Rodriguez et al. [1], 1984). Planning enough time between pregnancies increases the chance of a good outcome for the mother and each of her babies. If a parent has experienced a miscarriage or loss of a child, they may need time to grieve, evaluate their risks and work through their fears and anxieties before considering a future pregnancy (Maitra and Pal[2], 2004). A couple or their child may have a medical condition which needs to be managed before they are able to begin or continue childrearing. Also, a woman may be in her later reproductive years and be feeling the need to have her pregnancies spaced closer together in order to achieve the family size she desires. A planned pregnancy is more likely to have a good outcome for both mother and baby (Scrimshaw[3], 1996).

Birth intervals are generally long in Bangladesh, with a median interval of 44 months (BDHS Report[4], 2007). Lengthy breastfeeding and a long period of postpartum amenorrhea are likely to contribute to the relatively high percentage of births occurring after an interval of 24 months or more in Bangladesh. A comparison with earlier BDHS surveys shows that the median birth interval has increased markedly, rising from 35 months in 1993-1994 to 39 months in 2004 and 44 months in 2007. Between 1991 and 2007, the median birth interval increased by 26 percent (BDHS Report[4], 2007).

Bangladesh has achieved a remarkable demographic transition over the last two decades. The total fertility rate declined from about 6.3 in the early 1970s to 3.3 in the mid 1990s (BDHS Report[5], 2004). There was an initial rapid decline in fertility of nearly two children per women up to the early 1990s. Fertility then turned around 3.3 births per woman for most of the 1990s. This was followed by another noteworthy decline in fertility during the current decade. The 2007 BDHS data, show further decline in fertility to 2.7 (BDHS Report[4], 2007). The recent fertility decline in Bangladesh might have association with the changes in birth spacing.

Thus, the objective of this study is to analysis the determinant of birth spacing in Bangladesh and examine the tempo effect of birth spacing on fertility.

II. Data, Variables and Methodology

Secondary data extracted from the Bangladesh Demographic and Health Survey conducted in 2007 under the authority of the National Institute for Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare has been used for this study. BDHS 2007 covered a nationally representative sample of 10,996 married women of reproductive age.

Dependent variable: From birth history data birth intervals are computed by subtracting date of marriage or date of birth of previous child from date of birth of index child. In this study up to fifth order births have been considered as it covers most of the range of fertility experience in Bangladeshi women.

Independent variable: The important factors of demographic, socio-economic and healthcare facilities have been identified as explanatory variables on the basis of chi-square test and from the previous studies. They are mother's age, mother's age at first birth, previous birth interval, gender preference, region, place of residence (urban/rural), contraception status, mother's education and employment status, wealth index, religion, exposure status to mass media. Dropping variables technique has been used to choose independent variables in the study.

III. Analysis Procedure

As the dependent variable is birth interval, clearly, throughout an interval women may either have a birth or be right censored at the time of the survey. Thus, censored cases require special treatment in estimating exposure time, so, ordinary regression procedures are not appropriate. Therefore, a continuous time event history analysis technique, in particular, the general proportional hazards (Cox[6], 1972) model is used to determine the covariates on the timing of birth intervals. The Cox proportional hazards regression model is the most frequently used regression model in survival analysis because this model is semi-parametric and can be used for both censored and uncensored data.

Estimating Tempo Effect and Adjusted TFR: To estimate the quantum and tempo of fertility in Bangladesh and to determine the influence of birth spacing on current fertility, we applied Bongaarts and Feeney (Bongaarts and Feeney[7], 1998) method in this study. The adjustment formula for Total Fertility Rate at order 'i' is given by

$$TFR^*_i = TFR_i / (1-r_i)$$

Where, r_i is the rate of change in mean age of childbearing at ith birth order.

To obtain a rate of change in mean age of childbearing (MAC) at each order for calendar year y, average the values for years y-1 and y to obtain a value for the beginning of year y, and the values for years y and y+1 to obtain a value for the end of year y and subtract the former from the latter. This reduces to,

$$r_i (t)=0.5 * (MAC_i (y+1) - MAC_i (y-1))$$

The adjustment made to TFR_i depends solely on the timing changes during the year in which TFR_i is measured, and it is independent of timing changes before or after this year. Summing over all birth orders gives the adjusted TFR_{adj}

$$TFR_{adj} = \Sigma\ TFR^*_i$$

IV. Results

Table 1 presents the proportional hazard model estimate of relative risk of covariates of birth interval in Bangladesh. Considering all births up to fifth birth order, the overall subsequent birth intervals are computed. Our findings suggest that previous reproductive experience has a significant influence on the pace of child bearing and length of prior birth intervals is strongly related to the lengths of subsequent intervals. Women with more than 37 months previous birth intervals have 41 percent higher birth intervals than that of women with previous birth intervals less than or equals to 12 months.

Table. 1. Proportional Hazards model estimates of relative risk of the overall subsequent birth interval.

Demographic and socio-economic characteristics	Coefficient β	S.E. (β)	Odds ratio and 95% CI
Mother's age at first birth			
≤15 (ref)			
16-20	-0.014	0.017	0.986 (0.953, 1.020)
21-25	-0.155***	0.028	0.857 (0.811, 0.905)
26-30	-0.327***	0.069	0.721 (0.630, 0.826)
31-35	-0.581	0.244	0.560 (0.347, 0.902)
≥36	-1.372**	0.578	0.254 (0.082, 0.787)
Previous birth interval			
≤12 (ref)			
13-24	-0.092	0.026	0.912 (0.867, 0.960)
25-36	-0.189**	0.026	0.828 (0.786, 0.871)
≥37	-0.525*	0.026	0.592 (0.563, 0.622)
Gender Preference			
No (ref)			
Yes	0.48**	0.19	1.049 (1.011, 1.088)
Division			
Barishal (ref)			
Chittagong	0.201*	0.027	1.223 (1.159, 1.290)
Dhaka	0.034	0.027	1.035 (0.981, 1.091)
Khulna	-0.226**	0.030	0.798 (0.753, 0.846)
Rajshahi	-0.176*	0.028	0.839 (0.794, 0.886)
Sylhet	0.336***	0.029	1.400 (1.322, 1.482)
Place of residence			
Urban (ref)			

Rural	0.051***	0.018	1.052 (1.016, 1.090)
Mother's Education			
No education (ref)			
Primary	-0.090*	0.018	0.914 (0.883, 0.946)
Secondary	-0.326*	0.023	0.722 (0.690, 0.755)
Higher	-0.511***	0.048	0.600 (0.546, 0.658)
Mother's working status			
Not employed (ref)			
Employed	-0.118***	0.017	0.889 (0.861, 0.919)
Wealth Index			
Very poor (ref)			
Poor	-0.030	0.024	0.970 (0.926, 1.017)
Middle	-0.046*	0.025	0.955 (0.910, 1.002)
Rich	-0.062**	0.027	0.940 (0.892, 0.991)
Very rich	-0.120***	0.031	0.887 (0.835, 0.942)
Ever use of contraception			
Never used (ref)			
Used only folkloric	0.432*	0.123	1.540 (1.210, 1.960)
Used traditional methods	0.214*	0.040	1.238 (1.145, 1.339)
Used modern method	0.132***	0.022	1.141 (1.093, 1.191)
Religion			
Islam (ref)			
Hinduism	-0.163***	0.028	0.850 (0.804, 0.898)
Buddhism	-0.147	0.146	0.863 (0.648, 1.149)
Christianity	-0.019	0.163	0.981 (0.713, 1.351)
Others	-0.197	0.303	0.822 (0.454, 1.487)
Mass media exposure			
Not exposed (ref)			
Less than once a week	-0.064**	0.028	0.938 (0.887, 0.992)
At least once a week	-0.148***	0.023	0.863 (0.825, 0.902)
Very often exposed	-0.152***	0.022	0.859 (0.822, 0.897)

Model Chi-square: 2496.428 with Degrees of Freedom: 33
Note: Reference category is denoted by (ref).
***p<0.01, **p<0.05, *p<0.1

Mothers having first birth on age 21 to 25 have 14 percent increased birth intervals than that of reference category (having birth on or before reaching 15). Mothers having first birth after 36 years have 74 percent larger interval than mothers having first birth before age 15. The possible reason is- risk of child mortality and maternal health of mothers. This finding is similar to the previous study (Rodriguez et al.[1], 1984).

Contraception status is found to be a significant differential on determining length of birth intervals. One of the interesting findings of this study is that, the birth interval of any order are likely to be higher among those women who ever used any contraceptive method, compared to those who never used of any contraceptive method. Though it is an unexpected and particular result but it may occur due to the fact that those women who are ever users are young newly married and want to keep their family size small. Since at young age they are more fertile so birth interval may be shorter. On the other hand vast majority of the never user are adolescent and their marriage to first birth interval is naturally higher due to adolescent subfecundity. Our result is consistent with previous study in Bangladesh (Kamal et al.[8], 2007).

Regional effect on birth interval was also present in birth intervals. All the division was found to be significant differential on birth intervals, except Dhaka. Place of residence was found to be significant differential for overall birth interval and the result suggest that urban women have longer birth interval than rural women. The reason may be the lack of educational facilities, working status and for lack of consciousness.

It is hard to establish religion as a proved determinant of fertility transition now-a-days, but in context of Bangladesh there is a tendency of shorter birth interval among Muslim Bangladeshi women than that of Non-Muslim women. We found that Hindus have 14 percent, Buddhists have 13 percent longer birth interval than that of Muslim women. Almost similar result was observed while studying the Dutch family reconstructions from the period 1820–1885 where Catholics and Orthodox Protestants had shorter birth intervals than Liberal Protestants (Bavel and Kok[9], 2004).

The length of birth interval increases with level of education of respondents. An imaging result- higher educated woman have 40 percent larger birth interval than that of illiterate women, while secondary educated mothers have 37 percent larger birth intervals than that of illiterate women. Working status also found to be important differential of length of birth interval. Employed women found to have 11 percent larger birth interval than that of non-employed women. Similar results were obtained in previous study (Lappegård and Rønsen[10], 2004).

Mass media exposure also found to be an important differential of length of birth interval. Often exposed women are found to have 1.14 times larger birth interval than that of non-exposed women. Similar outcome was found in previous studies too, mass media exposure was stated as a determinant of fertility decline when studying the reason of fertility decline in Ghana (Parr[11], 2001).

Estimation of Tempo Effect and Adjusted TFR: To estimate the quantum and tempo of fertility in Bangladesh, we applied Bongaarts and Feeney method in this study. The application of the Bongaarts-Feeney method requires the TFR and the mean age at childbearing (MAC) to be specified by birth order. Since the number of women having 5 or more children is found to be small in 'BDHS 2007', hence we limit the analysis up to fifth birth order.

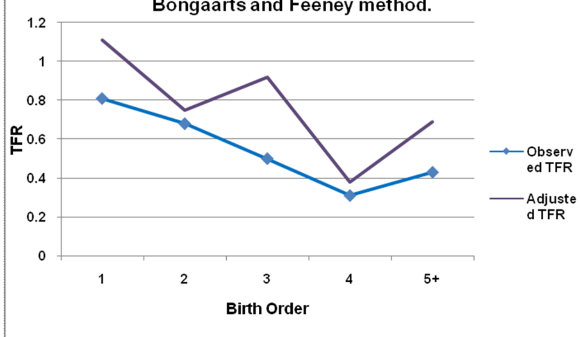
To compute the tempo adjusted TFR, the births occurs in the previous 36 months of BDHS 2007 survey are classified into 3 groups. In our notation year 1 contains those births, which occurred 25 to 36 months prior to the survey; year 2 contains those births, which occurred 13 to 24 months prior to survey and year 3 contains births occurred in last 12 months prior to survey. The estimated TFR for year 1, year 2 and year 3 are 2.83, 2.73 and 2.65 respectively. The adjusted TFR is calculated for year 2, using the mean age of childbearing of year 1 and year 3. The adjusted TFR and mean age of childbearing for year 1 and 3 are summarized in following table.

Table. 2. Adjusted TFR for BDHS 2007, using Bongaarts and Feeney method

Birth Order	Year 1 (2004-05) MAC_i	Year 2 (2005-06) TFR_i	Year 3 (2006-07) MAC_i	Year 2 (2005-06) Adjusted TFR_i
1	19.56	0.81	20.10	1.11
2	23.48	0.68	23.69	0.75
3	26.12	0.50	27.04	0.92
4	28.62	0.31	29.03	0.38
5+	32.64	0.43	33.40	0.69
		2.73		**3.85**

Our results suggest that if we adjust tempo effect then there is a rise in level of fertility during the recent past after controlling for a slight increase in the parity specific mean age at birth. For year 2 (2005-06) the conventional estimate of TFR is 2.73, while the tempo adjusted TFR is 3.85. Adjusted TFR represent the quantum effect free from the timing changes over time. Thus the tempo effect is found to be 1.12. The observed and adjusted TFR are presented graphically in following figure.

Figure 1: Adjusted TFR for BDHS 2007, using Bongaarts and Feeney method.



Our result is similar to that of previous study (Islam, et al.[12], 2003). Using BDHS data for three periods, adjusted TFR was found to be higher than that of conventional TFR.

Bongaarts-Feeney method just gives us an idea about how timing of births, i.e., birth spacing affect the total fertility rates. Our tempo effect was found to be 1.12, which means if the effect of timing of birth was absent, the tempo adjusted TFR was 3.85. For increases in length of birth intervals, the conventional TFR is reduced by 1.12 births per women in year 2 (2005-06).

V. Conclusion

Fertility control is often considered as parity-specific stopping behavior. Deliberate spacing, whether parity-specific or not, could in principle have been an important strategy of parents to curb the growth of their family, at least temporarily. This kind of behavior is of great interest, since it indicates that couples were mentally prepared to – and able to communicate about – rational interference with procreation. This study is conducted to analyze covariates of birth spacing and to examine the effect of birth spacing on current fertility in Bangladesh.

Multivariate analysis using Cox's model is conducted to specify the significant determinant of birth spacing. The results indicate that; mother's age at first birth, previous birth interval, mother's education status and employment status, exposure status to mass media have significant impact on length of birth interval. Among other variables; contraception status, place of residence (urban/rural), gender preference also showed significant impact on birth spacing.

Educated women always have longer birth interval than non-educated women and employed women have longer birth interval than that of non-working women. Being involved in economic activity is a real option and can therefore impact upon their reproductive life- this is also proved in previous studies (Beguy[13], 2009). Government of Bangladesh should take necessary steps to increase the proportion of educated women. Working opportunity should be increased too for women, else women will not have interest to be higher educated when there is no appropriate jobs available for them.

Age at first birth is an important determinant of fertility. This study revealed that, mothers having first birth before reaching 20 years of age, have high number of parity in their reproductive life span; while mothers having first birth at higher age usually having higher birth interval. This fact should be taken on account for fertility program of government. Clearly, some socio-cultural activities, family traditions also need to be changed. From our findings we can suggest women to marry at later age. Or government can take necessary steps to resist women to marry before a certain age, say 20 years. Additional attention should be given to newlywed couples and implementing reproduces health programs among the adolescents. Also mothers should be encouraged to breastfeed their child.

Rural mothers still have larger birth interval than that of their urban counterparts (odds ratio 1.052) which indicates the lack of development in fertility behavior among the rural families; still they are not aware of high parity progression. Fortunately, mass media is a significant determinant of birth spacing as like as the previous studies (Parr[11], 2001). The result indicates, mothers who are often exposed to mass media have 14 percent increased birth interval than that of non-exposed mothers. So mass media can play significant role to drive the rural people to widen the birth intervals. Moreover, the media massages helped to create awareness to create small family norms. For messages helped in creating awareness in early message, spacing or son preference. Messages could be transmitted through movies or drama related program of radio or television. However, regional effect is also present, multivariate analysis showed that- all the division was found to be significant differential on birth intervals, except Dhaka. Lack of education, social and religious belief may be the possible reason behind this.

The length of birth interval plays significant role on fertility level of a country, which was first identified in 1964. Bongaarts and Feeney method gives us an idea about how timing of births, i.e., birth spacing affect the total fertility rates, which was invented in 1998. In this study the application of Bongaarts and Feeney method reveals that increased birth interval made a decrement of 1.12 births. The conventional TFR was 2.74 while Time adjusted TFR was 3.85. Clearly, an increased effort to widen the birth spacing of births can significantly play an important role to reduce the level of fertility in the future.

Though fertility is started to decline in Bangladesh, it is still a major problem for Bangladesh to achieve the targeted level of socio-economic development. Despite of all progress, we still have to keep in mind, we need long road to go for achieving developed Bangladesh. Fertility should always be barrier of progress if we can't stop its increasing trends. Without a rapid reduction in current fertility trends, it would be difficult to achieve replacement level fertility in near future.

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