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Existing Gap between Preferred and Actual Birth Intervals in Bangladesh: Relation to Fertility and Child Health

Analysis from the Bangladesh Demographic and Health Survey 2011

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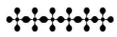
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Existing Gap between Preferred and Actual Birth Intervals in Bangladesh: Relation to Fertility and Child Health

Analysis from the Bangladesh Demographic and Health Survey 2011

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Conflict of Interest

The authors declare that they do not have any conflict of interest in connection with this paper.

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Executive Summary

The measurement of birth interval preferences is as challenging as measuring unintended fertility. However, this is an important predictor because differences in a country's fertility levels can be attributed to the differences in the length of the reproductive life of women and differences in the length of time between births when women are exposed to the risk of conception. Analysis of those factors influencing the span and those affecting the spacing of fertility has proven useful, since in many cases they appear to vary quite substantially across populations. Only a few studies were found in the public domain so far in Bangladesh on birth interval dynamics creating a scope for this paper.

This paper intended to look into the existing gap between actual and preferred birth intervals in Bangladesh. The paper also examined the degree to which the interval varies in different geographical locations – namely urban and rural. For this the respondents who already had a live birth and observed the time interval to the second birth were considered. The survival probability of the preceding birth interval (time) and different explanatory variables were examined in this process. The 2011 Bangladesh Demographic and Health Survey dataset was utilized for this paper.

The secondary analysis found that the overall length for actual birth intervals in urban and rural areas are 64.87 months and 57.57 months, respectively. These lengths are significantly higher than the mean lengths of the previous intervals (41.54 in urban areas and 39.53 in rural areas). However, for intervals less than 24 months the difference between actual and preferred birth interval is not significant. That means there is a group of people in both urban and rural areas who prefer to have more children within a short interval. Based on the secondary analysis, the interval of the preceding birth to conception is strongly associated with neonatal mortality as well as under-five mortality, even after controlling for a host of potentially confounding factors. The highest child mortality (10% urban vs. 15% rural) is prevalent in the minimum birth interval of 6-11 months. The mortality rate has been found to be the least during first birth (3%) in both urban and rural settings. In terms of mothers, education and its relation with the intervals, it was found that more than 80% of women in urban and rural areas with secondary or higher level of education prefer up to two children. On the other hand, 21% of urban and 29% of rural women with no degree attainment preferred having three to four children. In the case of actual birth intervals, mothers with primary or higher education have fewer children than mothers with no education. The paper also looked into the nutritional outcome of the children and found that there is little change in the under-nutrition status of children if the preferred birth interval prevails. However, birth interval might influence children's under-nutrition through its association with preterm births and low birth weight.

This study recommends a new policy framework to meet the unmet needs of the family planning and reproductive health issues; hence, decreasing the difference between these two areas. As a short birth interval and the preceding short interval causes many health risks for a woman and her newborn child, understanding how many women in the two different settings actually preferred short intervals is important for policy makers. New programmatic approaches could come out from this such as designing programs around couple communication towards preferred family size and optimal birth spacing to achieve a couple's fertility intentions. As it has been observed with many health outcomes, the educational level of the mother affects the preferred birth interval. Therefore, this could influence policies on minimum level of compulsory education for girls. As husbands are reported to be involved in the decision to have a desired number of children, interventional strategies should be taken on fertility issues targeted towards husbands in urban and rural areas.

LIST OF ABBREVIATIONS

ABI	Actual Birth Interval
AFT	Accelerated Failure Time
BDHS	Bangladesh Demographic and Health Survey
DHS	Demographic and Health Survey
NCHS	National Center for Health Statistics
P-L	Product Limit Method
PBI	Preferred Birth Interval
SD	Standard Deviation
WHO	World Health Organization

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1. Introduction

Given the importance of birth interval as one of the cornerstones of both policymakers' and scientists' arguments for family planning, it is somewhat surprising that so few measures have been taken to quantify the relationship between birth interval and health outcomes. Understanding the mechanisms by which birth interval might improve maternal and child health also falls under this gap. A birth interval is defined as the length of time between two successive live births. This also indicates the pace of childbearing. Information on birth interval provides understanding on the birth-spacing patterns that have far-reaching impact on both fertility and child mortality. Children born within closer intervals have long been associated with an increased risk of adverse health outcomes, including infant and child mortality. Research has shown that a short inter-pregnancy interval (less than two years) is an independent risk factor for pre-term delivery and neonatal death¹. Furthermore, short birth intervals may lead to maternal depletion syndrome; breast milk diminution and competition between siblings close in age in terms of basic needs like food and other resources.²

In Bangladesh, the median birth interval is 18 months shorter when the previous sibling has died than when the previous sibling is still alive (31 months and 49 months, respectively). The percentage of births occurring within a very short interval (less than 18 months) is almost eight times higher for children whose previous sibling died than for children whose previous sibling survived (23% and 3%, respectively).³

Differences in a country's fertility levels can be attributed to the differences in the length of the reproductive life of women and differences in the length of time between births when women are exposed to the risk of conception. Analysis of those factors influencing the span and those affecting the spacing of fertility has proven useful, since in many cases they appear to vary quite substantially across populations⁴. Few studies have been conducted so far in Bangladesh on birth interval dynamics; those that have deal with small-scale datasets and do not represent the country as a whole. Zenger et al. studied siblings' neonatal mortality risks and birth spacing in Bangladesh⁵ while Nitai et al. studied the differential patterns of birth interval in Bangladesh⁶.

Various socio-economic factors such as the mother's place of residence, education, and employment status or occupation have also been correlated with birth spacing, although the mechanisms by which these background variables influence birth spacing is less clear. In some settings, maternal education is associated with shorter spacing; in Korea, for example, one study reported that better-educated women had shorter second birth intervals than those less-educated⁷. Diversity of birth intervals has also been reported among urban and rural populations. A shorter interval has been observed in the rural areas of 51 countries.⁸ The effect of maternal employment on spacing for some settings appears to be associated with shorter spacing. In this case the nature of work is perhaps more important—employment in the formal and modern sector have been found to be related to longer spacing⁹.

With such context, this paper aims to identify the gap between actual and preferred birth interval in urban and rural settings of Bangladesh. This paper also looks into the relationship between birth intervals and child health, fertility variation, and the association with other proximal factors for understanding the mechanisms by which these indicators affect the intervals.

2. Data Source and Methodology

Data Source

The dataset from the Bangladesh Demographic and Health Survey (BDHS) 2011 was used for this paper. This nationally representative sample survey has been conducted for the past 20 years in Bangladesh. For each of these surveys the DHS has collected extensive information on fertility, fertility preferences, child mortality, and maternal and child health indicators from women of reproductive age (15-49 years). This gave the authors of this paper the liberty to look into different aspects of the hypothesis and create a scope for trend analysis.

Methodology

The paper's hypothesis was to look into the existing gap between actual and preferred birth intervals in Bangladesh and to examine the degree to which the interval varies in urban and rural areas. For analysis, the paper only considered the respondents who already had a live birth and an observable time interval to the second birth.

To test this hypothesis, the authors evaluated the survival probability of the preceding birth interval (time) and different explanatory variables. They also tried to find significant associations by using the product limit (P-L) method, also known as the Kaplan-Meier method. This method issued to estimate time-to-event models in the presence of censored cases. It is based on estimating conditional probabilities at each time point when an event occurs and taking the P-L of those probabilities to estimate the survival rate at each point in time. As a target sample, the authors considered the last birth of the women (with parity two or more) living in the rural and urban areas of Bangladesh for the last five years to calculate the actual birth interval.

3. Operational Definitions and Data Analysis

Operational Definitions

The operational definitions that have been followed for the variables are as follows:

Selection of the Actual Birth Interval and Computation of its Length: The study considered only the last birth to measure the birth interval. In addition, only birth intervals of currently married women have been included to control for any differential preference by marital status. Because the birth intervals include open (i.e., censored cases) and closed intervals (i.e., failures), the distribution of the actual length of these birth intervals has been evaluated with Kaplan-Meier life table techniques. The technique has made it possible to accurately identify fertility trends over time and to assess the impact of various socioeconomic fertility differentials as well.

Selection of the Preferred Birth Interval and Computation of its Length: For this paper, only the birth intervals that ended with or were expected to end with a wanted birth have been used. For closed intervals, if the birth closing the interval was wanted, then the preferred interval is equal to the actual interval; if the birth closing the interval was wanted later, the preferred interval equals the actual interval plus the additional time the woman reports that she would have wanted to wait. For open intervals, if the woman wanted a birth now or soon, the

preferred and actual birth intervals are the same; if she wanted a birth later, the preferred interval equals the actual interval plus the desired waiting time till the next birth.

Preferred Length of Next Birth Interval: The preferred birth interval among the women who wanted another child adds to the length of time that elapsed since the birth of the last child (or to the time since marriage for women with no births). The estimated preferred length of next birth interval is being used for this paper. Because sub-fecund women can be expected to contribute to longer open intervals than they would have preferred, the calculation has been limited to women classified as fecund as well as to those who want another child.

Preferred Length of Last Birth Interval: For this paper, the preferred length of last birth interval was measured by focusing on the woman's report of whether her last birth was planned. The length of the interval for the woman who wanted the pregnancy can be considered a measure of preference, although as with the measure of the preferred next interval, it does not reflect if the woman wanted to become pregnant sooner than she did.

Child Nutritional Status: As an outcome indicator, this paper investigated the potential effect of actual birth interval and preferred birth interval on under-nutrition of children in urban and rural Bangladesh. The anthropometric measures of the young children were collected from the BDHS dataset. These measures, which provide good summaries of children's nutritional status¹⁰, are height-for-age, weight-for-height, and weight-for-age. Following the references of the World Health Organization (WHO), these measures are already standardized using the distribution of the U.S. National Center for Health Statistics (NCHS) reference population. Three indicators of malnutrition and under nutrition are commonly constructed from these measures:

- **stunting** - a condition reflecting chronic malnutrition manifested by low height-for-age;
- **wasting** - a condition reflecting acute or recent malnutrition manifested by low weight-for-height; and
- **underweight** - a condition reflecting chronic and/or acute malnutrition manifested by low weight-for-age.

In this paper, a child was classified as "stunted" if s/he was below minus two standard deviations (-2 SD) from the reference median in terms of height-for-age, as "wasted" if below -2 SD from the reference median in terms of weight-for-height, and "underweight" if low weight-for-age by the same criterion.

Data Analysis

The first phase of the analysis consisted of a univariate analysis, followed by the P-L method of the survival function [Kaplan and Meier, 1958]. The obtained P-L method is as follows:

$$\hat{S}(t_i) = \prod_{j=1}^i \left(1 - \frac{d_j}{n_j}\right)$$

Where,

S (t_i) = Survival Probability

d_j = The number of failures in the j-th time

n_j = Total number of observations in the j-th time

This technique is appropriate for analyzing birth intervals because all intervals –closed and/or open - can be included here, thereby helping to avoid the bias towards short intervals.

The P-L method was also used to estimate the proportion of women not having another child subsequent to her most recent live birth. The estimate for median birth intervals was obtained using the P-L estimate for the survival function, taking censoring into account. The advantage of using the P-L method is that censoring is factored in when estimating survival functions. In the final stage, the authors used an accelerated failure time (AFT) regression model by using Weibull, Lognormal and log-logistic distribution. R-programming was used for further analysis. The AFT model of the survival function is as follows:

$$S(t|X) = S_0(t \exp(\beta X))$$

Where

$S_0(t)$ = Baseline Survival Function (only depend on time)

$S(t|X)$ = Survival Function with covariate X

And β is the coefficient

4. Results

Birth Interval and Socio-Demographic Characteristics of Women

The overall length for actual birth interval of urban and rural areas is 64.87 months and 57.57 months, respectively, which is significantly higher than the mean length of the previous interval (41.54 in urban areas and 39.53 in rural areas, table 1). In both areas, 2.7% of children opening the first interval died before conception or live birth of the next child. The mean age of women in both geographical areas was around 30 years while the average number of surviving children was found to be 2.1 and 2.4 in urban and rural areas, respectively.

Table 1: Birth Interval and Socio-Demographic Information of the Women

Variable	Effect	
	Urban (n=6196)	Rural (n=11646)
<i>Birth interval characteristics</i>		
Actual length	Mean = 64.87 Median = 51	Mean = 57.57 Median = 45
Child opening the first interval died before conception of next child/ live birth	2.7%	2.7%
Length of previous interval	Mean = 41.54 Median = 36	Mean = 39.53 Median = 35
<i>Women's demographic characteristics</i>		
Mean age in years	31.13	30.60
Average number of surviving children	2.1	2.4
<i>Women's fertility preferences</i>		
Desire for more children	36% (1877)	64% (3334)
Discussion of desired family size with husband	86.1% (5334)	84.8% (9878)

Thirty-six percent of women in the urban areas desired more children after their last live childbirth. In rural areas, more than twice the number of women (64%) desired more children. Comparatively, the mean number of women having discussed desired family size with their husband is slightly higher in the urban areas (86%) than the rural areas (85%).

Both urban and rural Bangladeshi women who had their last childbirth within the last five years have limited access to mass media. This group of women has access to TV, radio, and newspaper less than once a week. Among the urban population, the educational status of women averaged above primary level while in rural areas, primary level education was more common. No significant difference in educational status was found among women and their husbands for both geographical areas.

Table 2: Mass Media Exposure of the Women

Number of mass media she is exposed to every week				
	Urban		Rural	
TV	Mode > once/week	Mean < once/week	Mode = None	Mean < once/week
Radio	Mode = None	Mean < once/week	Mode = None	Mean < once/week
Newspaper	Mode = None	Mean < once/week	Mode = None	Mean < once/week
<i>Woman's educational level</i>	Mode = Secondary	Mean > Primary	Mode = Secondary	Mean = Primary
<i>Husband's educational level</i>	Mode = Secondary	Mean > Primary	Mode = None	Mean = Primary

Differences between Actual and Preferred Length of Birth Intervals

For birth intervals more than 24 months, the median length of actual birth interval is 70.45 months in the urban areas (figure 1). For their rural counterparts the corresponding median is 60.03 months. However, the median preferred birth interval is 73.42 months and 62.01 months in urban and rural areas, respectively.

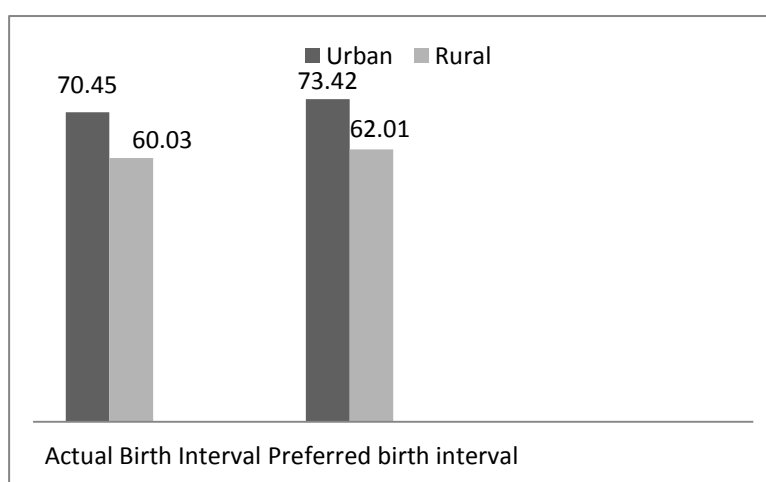


Figure 1: Median length in months of actual and preferred birth interval that are more than 24 months.

The difference between the actual and preferred birth intervals was 2.97 in urban areas and 1.98 in rural areas. Among the birth intervals less than 24 months, the median length of actual birth interval does not show much difference between the geographical locations (20.05 months in urban vs. 20.21 months in rural) ($P=0.154$). The same lack of differentiation is evident with the median preferred length (20.09 months vs. 20.24 months). The overall difference between actual and preferred birth interval is 0.04 in urban areas and 0.03 in rural areas ($P=0.263$).

Mother's Educational Status and Actual Number of Children

Thirteen percent of rural, illiterate women and 8% of urban illiterate women have 3-4 children. The proportion of women having more than six children among the illiterate population was low (2% in rural vs. 3% in urban areas, figure 2a). Completing primary education has some positive influence on having fewer children, with 13% of urban women, and 14% of rural women in this group having 1-2 children (figure 2b). The proportion of women with a secondary education having up to 2 children is even higher (27% urban vs. 23% rural, figure 2c). On the contrary, 12% of urban women and 3% of rural women with a higher degree have up to 2 children ($P=.000$) (figure 2d).

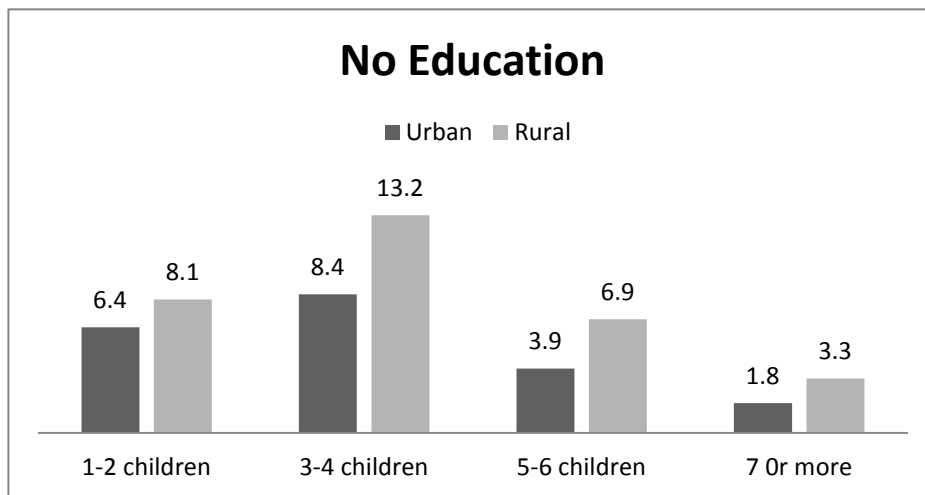


Figure 2.a: Number of children of mothers with no education.

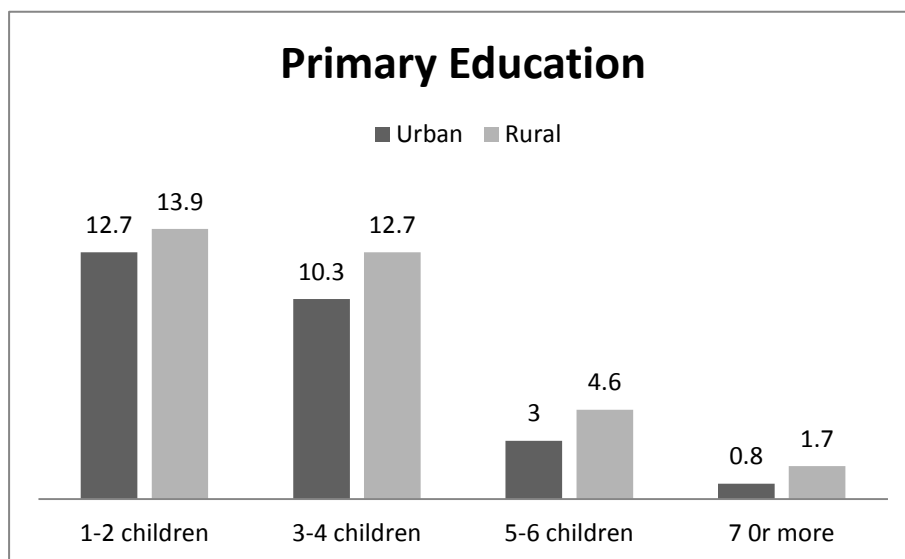


Figure 2.b: Number of children of mothers who receive primary education.

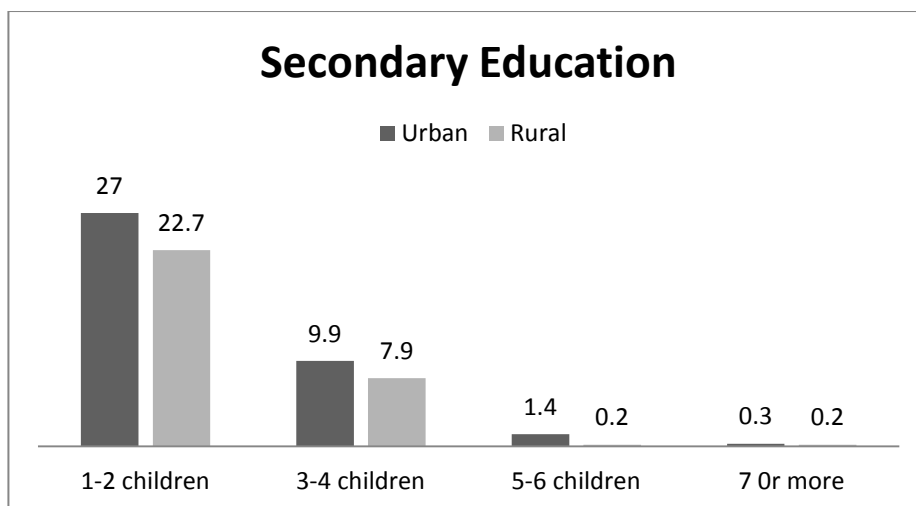


Figure 2.c: Number of children of mothers who receive secondary education.

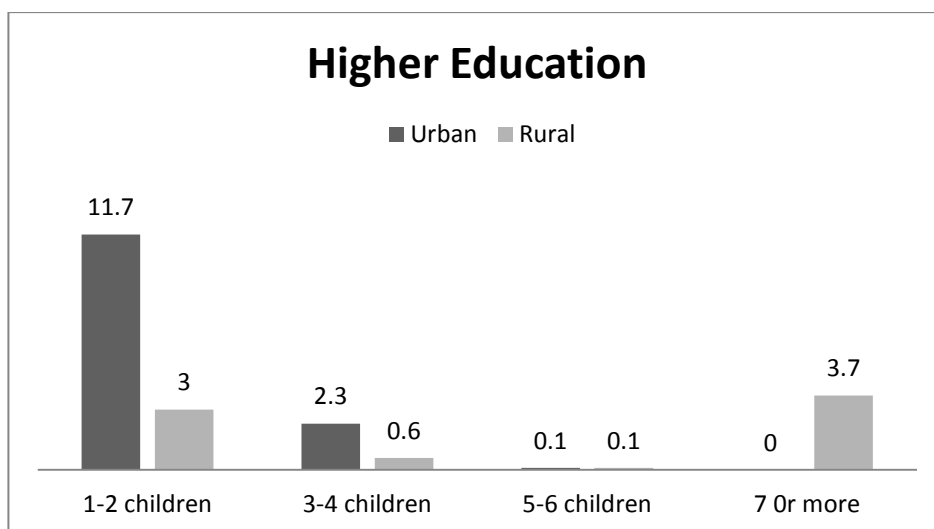


Figure 2.d: Number of children of mothers who receive higher education.

Mother's Educational Status and Preferred Number of Children

In terms of the relationship between mothers' educational status and preferred number of children, no particular trend was observed. In urban Bangladesh, around 78% of illiterate women preferred up to two children, compared to 70% of their rural counterparts. Twenty-one percent of illiterate urban women and 29% of rural women with no degree preferred having three to four children (figure 3a). More than 80% of urban women with a primary education want up to two children; this is the same case for 75% of rural women (figure 3b). In both geographical locations, women with secondary or higher education mostly prefer up to two children. In both areas, more than 80% of women who have a higher degree prefer one to two children.

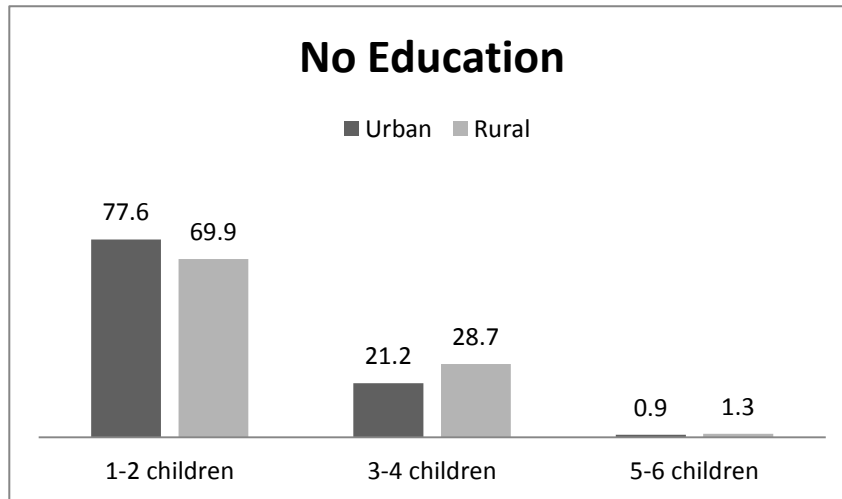


Figure 3.a: Preferred number of children of mothers with no education.

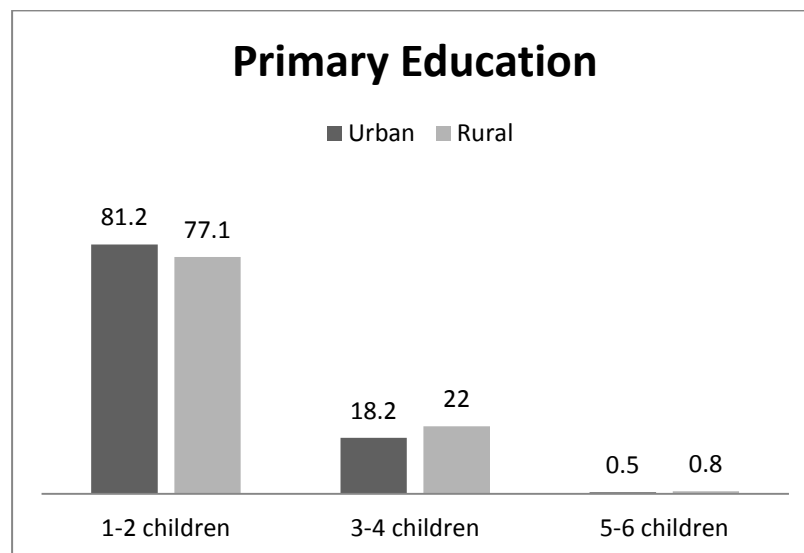


Figure 3.b: Preferred number of children of mothers who receive primary education.

In both geographical locations, women with secondary or higher education mostly prefer up to two children (figures 3c and 3d). In both areas, more than 80% of women who have a higher degree prefer one to two children.

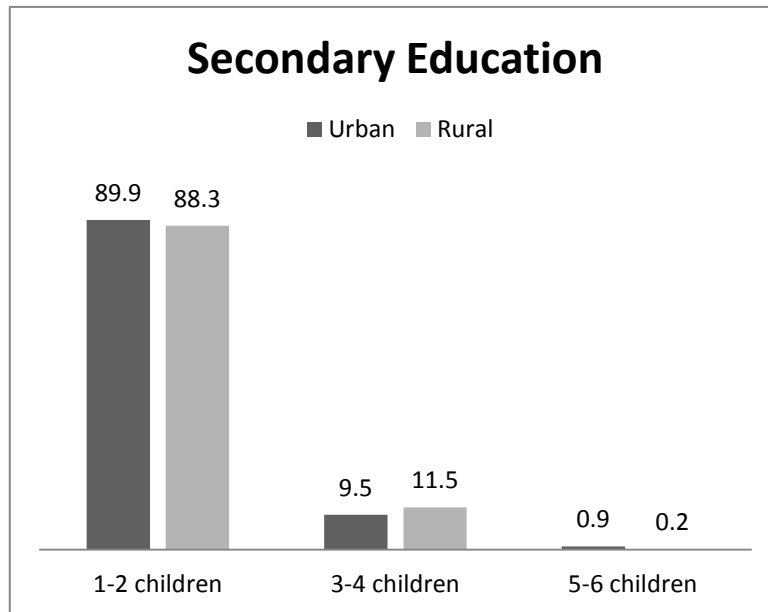


Figure 3.c: Preferred number of children of mothers who receive secondary education.

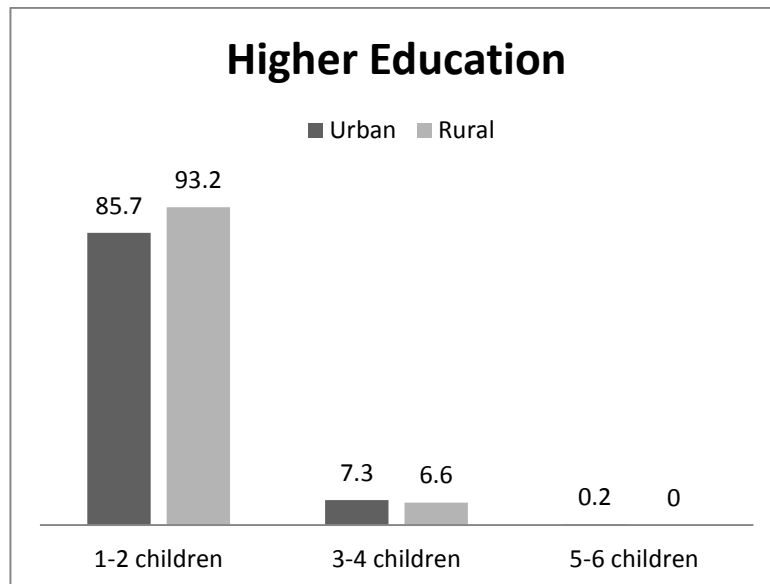


Figure 3.d: Preferred number of children of mothers who receive higher education.

Child Mortality Rates by Birth Intervals

In the last five years, considering the last birth only, child mortality is similar in both geographical locations (3% urban vs. 4% rural) ($P = 0.215$). Child mortality is higher where birth intervals are less than 24 months and gradually decrease as the interval increases over 24 months and so on. Child mortality is the highest (10% urban vs. 15% rural) when mothers have the minimum birth interval of 6-11 months. The mortality rate has been found to be the least during first birth (3%) in both urban and rural areas.

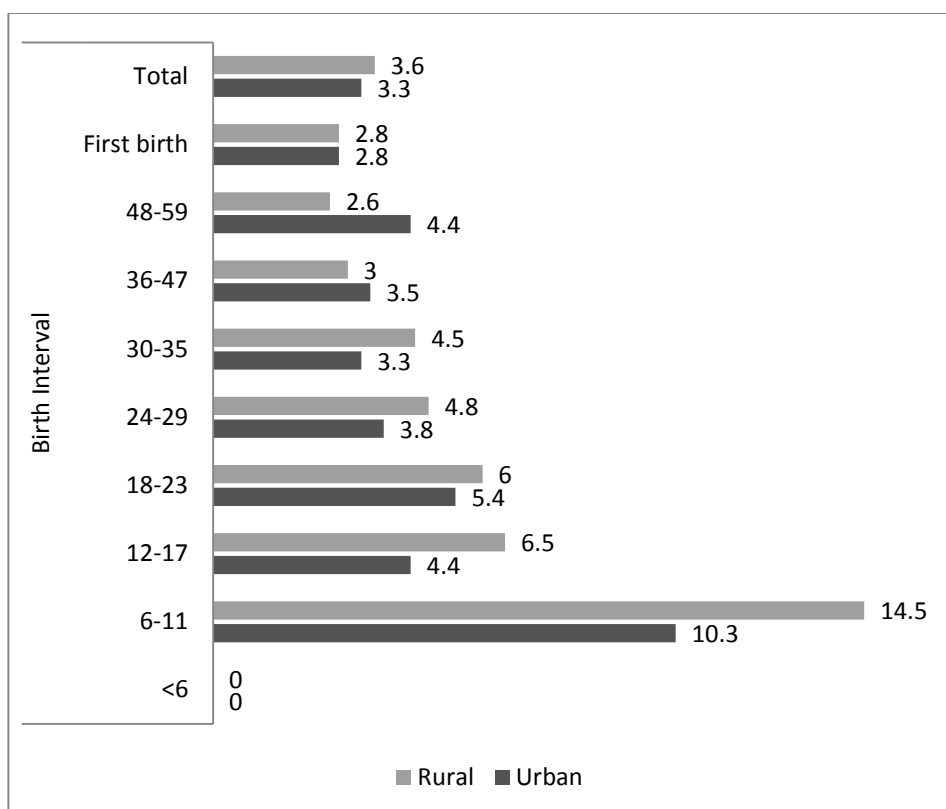


Figure 4: Child mortality rate by birth intervals.

Relationship Between Birth Interval and Mother's Occupation

Almost 13% of urban working women and more than 80% of urban housewives reported a birth interval of less than or equal to seven months (table 3). In rural areas, only 4% of working women and more than 95% of housewives reported the same interval between births. Around 80% of urban and 91% of rural homemakers had an 8-12 month birth interval. The birth interval was higher among housewives (83% urban vs. 90% rural) having a 13-18 months birth interval. In the case of working women, almost one in six urban and one in 10 rural women had a 19-24 month birth interval. The corresponding proportion having more than a 24 month interval was 19% for urban and 11% for rural working women.

Table 3: Birth Interval and Mother's Occupation

Birth Interval (months)	Working		Housewife	
	Urban	Rural	Urban	Rural
7-	12.6%(19)	4.3%(13)	87.4%(132)	95.7%(291)
8-12	19.4%(32)	8.8%(29)	80.6%(133)	91.2%(299)
13-18	16.6%(51)	10.0%(67)	83.4%(256)	90.0%(601)
19-24	18.2%(83)	10.4%(109)	81.8%(372)	89.6%(942)
>24	19.1%(980)	10.7%(991)	80.9%(4138)	89.3%(8304)
Total	18.8%(1165)	10.4%(1209)	81.2%(5031)	89.6%(10347)

Correlating Actual and Preferred Birth Interval with Child Health

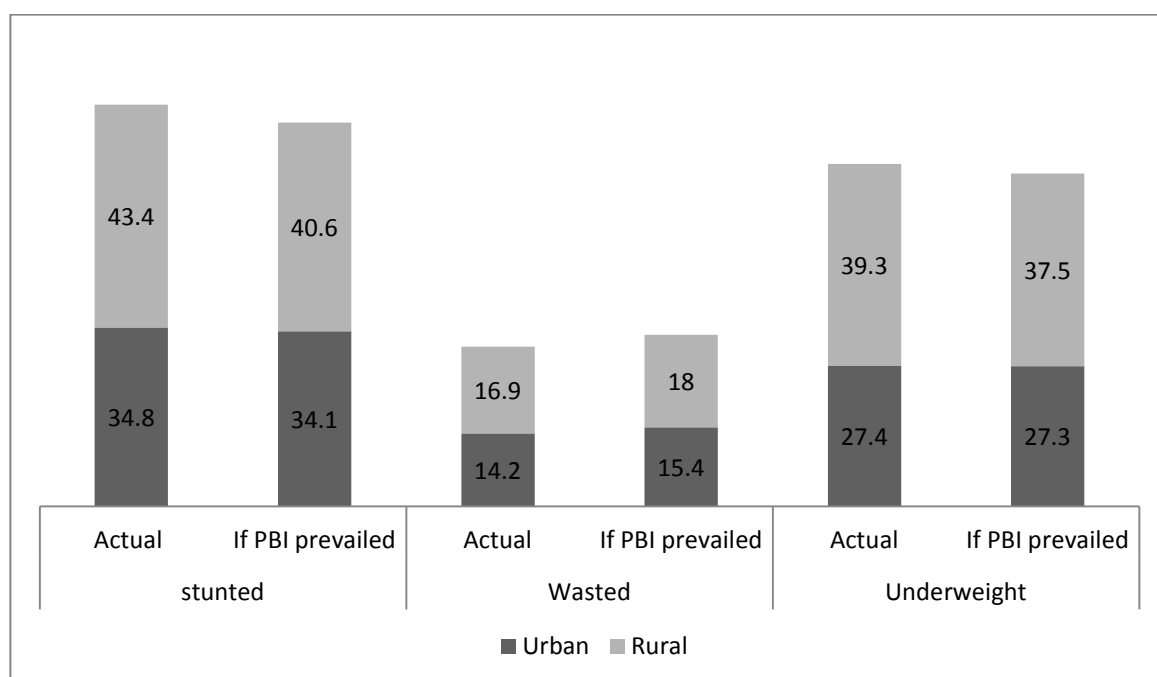


Figure 5: Correlating actual and preferred birth interval with child health.

In the urban areas, the proportion of children stunted in relation to actual birth intervals was 35% with the proportion shifting insignificantly among the preferred birth interval (34%) decreasing by only 0.7% (figure 5). In the rural areas, the corresponding proportion for stunting was about 3%. In the wasting category, the differences amounted to only 1% between the actual and the preferred intervals (when succeeded) with the scenario nearly the same in the rural areas ($P=0.197$). In both areas, the proportion of underweight children was unchanged if the preferred birth interval prevailed. In the urban areas, the proportion of underweight children is 27% in cases of actual intervals and the preferred interval prevailed. In the rural areas, the underweight proportion is 39% for actual birth intervals, while in rural areas the proportion decreases to 2% when the preferred interval is succeeded.

5. Discussion

In the BDHS 2011, the median birth interval in Bangladesh is reported to be 47 months³. The previous birth interval for urban and rural areas is found to be 41.54 and 39.53 months, respectively³. Nevertheless, for the last birth, the actual birth intervals in urban Bangladesh are found to be 64.87 and 57.57 in rural areas. This reveals the fact that in the case of last birth, the birth intervals increased significantly in both areas. More than 80% of couples in urban and rural areas reported discussing preferred family size, hence they become more aware that they can control the timing of their offspring's births to achieve smaller family size.

The gap or difference between actual and preferred birth intervals is more in the urban areas than the rural areas when the median birth interval is more than 24 months. This creates an opportunity for policies as well as programs concentrating on reducing the levels of fertility and child mortality.

For intervals less than 24 months the difference between actual and preferred birth interval is insignificant. That means there is a group of women in both urban and rural areas who prefer to have

more children within a short interval. This should be another place to concentrate on because women with short birth intervals have a significantly higher risk of preeclampsia, high blood pressure, and premature rupture of membranes compared to those with an interval of more than 24 months.¹¹

The interval of the preceding birth to conception is strongly associated with neonatal mortality as well as under-five mortality, even after controlling for a host of potentially confounding factors.¹² In the last five years, child mortality has been found to be higher when the birth interval is less than 24 months. This proportion gradually decreases when the interval is 24 months and over. The highest child mortality (10% urban vs. 15% rural) is prevalent in the minimum birth interval of 6-11 months. The mortality rate has been found to be the least during first birth (3%) in both urban and rural settings.

Although there is little change in the under-nutrition status of children if the preferred birth interval prevails, birth interval might influence children's under-nutrition through its association with preterm births and low birth weight. The mother may not have recovered her nutritional status if a pregnancy occurs soon after the previous birth, which may lead to preterm birth and low birth weight.¹³

Women's higher education level is usually linked to better health awareness and longer birth intervals.¹⁴ In this paper, it was found that more than 80% of women in urban and rural areas with secondary or higher level of education prefer up to two children. On the other hand, 21% of urban and 29% of rural women with no degree attainment preferred having three to four children. In the case of actual birth interval, mothers with primary or higher education have fewer children than mothers with no education.

The stresses of work outside the home usually motivate employed women to postpone pregnancy and adopt a longer birth interval.² Among working class women, 19% of urban and 11% of rural women prefer to have a birth interval of more than 24 months.

6. Limitations of the Paper

This paper tried to establish the existing gap between the actual and preferred birth intervals among the urban and rural population of the country using proper technique and methodologies, however there are a few limitations. First, selection bias is a concern because the estimation is based on the last birth of the woman for the last five years only to calculate the actual birth interval. A second concern is that the BDHS questionnaire does not allow respondents to give negative responses regarding spacing preferences so that women who might have preferred shorter intervals than what they actually had were, in a sense, "forced" to report that they were satisfied with their interval lengths. Therefore, the estimated preferred birth intervals may be upwardly biased.

7. Policy and Program Implications

As a short birth interval and the preceding short interval causes many health risks for a woman and her newborn child, understanding how many women in the two different settings actually preferred short intervals is important for policy makers. Apart from preference of short interval, the number of couples discussing their desired number of children is also a challenge in health and family planning education. New programmatic approaches could come out from this such as designing programs like a behavior change communication campaign for couple communication towards preferred family size and optimal birth spacing to achieve a couple's fertility intentions. As it has been observed with many health outcomes, the educational level of the mother affects the preferred birth interval. Therefore, this could influence policies on minimum level of compulsory education for girls. As husbands are reported to be involved in the decision to have a desired number of children, interventional strategies should be taken on fertility issues; targeted towards husbands in urban and rural areas.^{15,16} Involving men along with

women in promoting family planning communication and information dissemination could have an impact in fertility regulation. This can enhance their shared decision-making on issues like family size and reproduction. Quality family planning services should be made available to the community through public and private organizations and non-governmental organizations. Moreover, information, education and communication for promoting family planning methods should be strengthened. ¹⁷

8. Conclusion

This paper began by asking if there is a gap between the actual and preferred birth intervals in Bangladesh. Although 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 Bangladesh³, the gap was found to be very little when the actual and preferred birth intervals are less than 24 months. This implies that the perception of appropriate birth interval and its benefits is yet to be understood by the mothers having birth intervals of less than 24 months in both urban and rural areas. Robust programmatic approaches are needed to bring changes among them. Almost twice as many women in the rural areas want more children than in the urban areas. Therefore, an effort should be given in the rural areas to ameliorate the situation. The authors tried to address the issue of whether mother's education and occupation is a potentially endogenous variable. It was found that there are some differences in birth interval when these two variables vary. There are significant differences observed among the urban and rural data of the last childbirth for the last five years. A new policy framework emphasizing couple communication and male engagement should come out to meet the unmet needs of the family planning and reproductive health issues, hence, decreasing the difference between these two areas.

9. References

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