FERTILITY DECLINE IN BANGLADESH: UNDERSTANDING DEMOGRAPHIC COMPONENTS AND SOCIOECONOMIC CORRELATES

ABSTARCT

This paper aimed to quantify the contribution of demographic components in fertility decline of Bangladesh using the 1993-1994 and 2007 Bangladesh Demographic Health Survey. It also investigated the factors affecting fertility. To understand the contribution of demographic components, we applied decomposition technique developed by Kitagawa. The TFR decreased by 0.7 births per woman during 1993 to 2007. The lion's share is attributed to change in marital fertility. Marital change contributed a little in fertility decline in the study period. The multivariate regression analyses identified several variables as important determinants of fertility such as women's education, place of residence, inter-spousal communication on family planning, toilet facility, child mortality, contraceptive use and age at first marriage. Programs should aim to raise females' age at first marriage, to enhance women's education and opportunities for their jobs. Efforts should be made to strengthen family planning program that needs for extra cutback to reduce fertility at replacement level.

1. INTRODUCTION

In recent decades, the world has witnessed a rapid pace of fertility decline in the majority of the developing countries. Overall, the total fertility rate (TFR) of the developing world dropped from 6.0 births per woman in the late 1960s to 2.9 birth per woman in 2000-2005 (United Nations, 2007; Bongaarts, 2008). Declines were most rapid in Asia, North Africa, and Latin America regions, where social and economic development has also been relatively rapid. Sub-Saharan Africa also experienced significant declines despite its lagging development (Bongaarts, 2003). The emphasis on social development gained acceptance as a growing body of empirical research substantiated the view that public action in fertility decline had much to contribute both to better living conditions and to reducing population growth (Dreze and Murthi, 2001).

Bangladesh is one of the most cited countries which achieved remarkable progress in fertility decline in the last three and a half decades. The TFR declined dramatically from a high level of 6.3 births in the mid-1970s to 3.3 births in the early of 1990s. The TFR was almost static at 3.3 births per woman during the entire 1990s and then again started to decrease in the beginning of 2000s. After a decade long stagnation, the TFR came down to 2.7 births per woman in 2007. Attention has been drawn to such success in achieving rapid fertility decline in Bangladesh, allegedly by placing more emphasis on vigorous family planning programs than on social development (Dreze and Murthi, 2001; Caldwell et al., 1994), although some authors argued that the social development and modernization process significantly reduce fertility in developing countries (Kouame and Schellekens, 2002; Kocher, 1974).

Bangladesh is predominantly an agricultural country. The economy of the country is characterized by resource scarcity and subsistence-level of economics. The increasing population pressure on the land is continually decreasing land-man ratio. As a result, the homeless population is being increased gradually, migrating from rural to urban areas and engaging themselves in different professions for better livelihood. According to United Nations (UN) Human Development Indicator (HDI), Between 1980 and 2010, life expectancy at birth of Bangladeshi people has increased by almost 19 years, mean years of schooling increased by about 3 years, expected years of schooling increased by almost 4 years, GNI per capita increased by 150% from 635 in 1980 to 1587 in 2010 (United Nations, 2010). Besides, the national head count index of poverty measured by the upper poverty line declined from 56.6% in 1991-1992 to 40.0% in 2005. However, the poverty has been estimated at 38.0% in 2008. During 1991 to 2005, urban poverty reduced at a faster rate than rural poverty (Alam, 2010).

Despite pervasive poverty and underdevelopment, Bangladesh has achieved a considerable decline in fertility (Barkat-e-Khuda and Hossain, 1996). Indeed, Bangladesh represents an apparent anomaly for its decline in fertility, despite the absence of the conditions believed to be necessary for such reproductive changes. Bangladesh is the only country among the world's twenty poorest countries where such a rapid decline in fertility has occurred (Barkat-e-Khuda and Hossain, 1996). Thus, interest in the topic is now rising among demographers and policy makers to drive up understanding the mechanisms of such a rapid decline of fertility in Bangladesh. This study aims to fill in this gap. The main objective of the study is to examine to what extent the demographic components contributed in fertility decline in Bangladesh during the period 1993 to 2007. It also aims to investigate the socioeconomic factors associated with fertility transition in Bangladesh for the same period. The expectation is that the findings of the study would hopefully explain the nature of fertility transition and also identify the socio-demographic factors associated with this among women of Bangladesh.

2. DATA AND METHODS

2.1 *Data*

Data used in this study have been taken from Bangladesh Demographic Health Surveys (BDHSs) conducted during 1993 to 2007. The BDHSs are nationally representative surveys which followed multistage cluster sampling procedure to collect information from ever married women as well as men from all the administrative regions of the country. The surveys obtained detailed information on fertility levels, marriage, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutritional status of women and young children, childhood mortality and causes of death of children under five, maternal and child health, awareness and behavior regarding HIV/AIDS, and other sexually transmitted infections (STIs) etc. The surveys were conducted under the authority of the National Institute for Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare by Technical assistance provided by ORC Macro through the MEASURE DHS program. Financial support for the survey was provided by the U.S. Agency for International Development (USAID), Bangladesh. The details of the surveys are provided in the BDHSs reports.

2.2 *Variables used in the study*

The dependent variable of the study is the number of children ever born to per woman in her entire reproductive age. We hypothesize that fertility is affected by a set of socioeconomic and proximate factors. The socioeconomic factors included in the study are: women's education, place of residence,

religion, working status of women, inter-spousal communication on family planning and wealth index. The development factors are: toilet facility, electricity connection in the households and media exposure. The proximate determinants are: age at marriage and current use of any contraceptive method.

2.3 *Methods*

In the first section of the study we decomposed fertility into two components: change in the proportion married and change in the marital structure using the technique developed by Kitagawa (1955) and later adapted by Retherford and Rele (1989) to understand the contribution of demographic components in the decline of TFR. The original technique was composed of three components, namely: proportion of married, marital fertility and non-marital fertility. Since, in Bangladesh, offspring procreation occurs within only marital union and illegitimate births are rare, we restricted the formula only on two components as mentioned above. According to the technique, the change in TFR from period t_1 to t_2 can be decomposed by using the formula:

$$\Delta TFR = 5\sum_{i=1}^{7} F_i \Delta P_i + 5\sum_{i=1}^{7} P_i \Delta F$$

where, the symbol Δ denotes changes and F_i and P_i indicate the average values over the study period. In the above mentioned equation, the first components of the right hand side indicates the contribution of the change in TFR due to change in marital structure (MS) and the second component indicates the changes in TFR due to change in marital fertility (MF). Each of the components has been broken down into seven categories by conventional 5-year age group.

The second section of the study used multivariate analysis to identify factors affecting fertility of women, followed by bivariate analysis on 1993-1994 and 2007 BDHSs data. The unit of analysis of this section is the number of children ever born to per woman. In this section, the analyses were restricted to de jure residents only. The bivariate analysis used in the study was one-way analysis of variance (ANOVA) to examine the association between different socioeconomic factors and fertility. Besides, due to the nature of independent variable as count data, we used negative binomial Poisson regression analysis as the multivariate treatment to examine the net effect of various socioeconomic factors on fertility. The Poisson model is superior to ordinary least squares(OLS) or other linear models in this instance because the distribution of a count variable, such as children ever born (CEB), is one that is heavily skewed with a long right tail (Zhang, 2008). Thus, it is the suitable procedure to estimate CEB also because it is a positive integer. The Poisson regression model for the analyses of cumulative fertility can be written as:

$$P(Y = y) = \frac{e^{-\lambda}\lambda^{y}}{y!}.$$

Here, the incidence rate of birth λ is influenced by a set of explanatory variables X_i s and

$$\lambda = \exp(b_0 + \sum b_i X_i),$$

where b_0 is the constant term and b_i 's are the effect coefficients. The results of the Poisson regression analyses have been presented by effect coefficients (b_i), standard error (SE) as well as incidence rate ratio (IRR) with 95% Wald confidence interval (WCI). All the statistical techniques were performed by SPSS v17.

3. RESULTS

3.1 *Change in socioeconomic, developmental and proximate determinants*

Table 1 shows the background characteristics of women as well as change of socioeconomic, developmental and proximate determinants of the respondents in the first and the most recent BDHSs. Women's education showed a progressive change over the past one and a half decade. The percentage of women with no formal education has decreased from 58.2% in 1993-1994 to 32.1% in 2007. Additionally, the percentage of women with higher education has increased about four folds from 2.1% in 1993-1994 to 7.8% in 2007. The residence in urban areas has also increased dramatically more than three folds from 11.5% to 37.8%. The proportion of Non-Muslim women decreased relatively 2.5% in this time. A significant change has occurred in the working status of women. The proportion of working women has been almost doubled in the period 1993-1994 to 2007. Surprisingly, inter-spousal communication decreased by 23.6%. The percentage of women who never discussed on family planning has increased from 31.7% in 1993-1994 to 55.3% in 2007. In 1993-1994, one in ten women used flush toilet facility, which has increased at three out of ten in 2007. Similarly, a significant shift has been occurred in the electricity connection in the household (HH). In 1993-1994, the consumption rate of electricity was only 19.6%, whereas, this rate has increased at 52.5% in 2007. A slightly less than one-third of the women had access to electronic media such as television (TV) or radio in 1993-1994, while in 2007, this proportion was more than one out of two. Data shows that development has also occurred in the reduction of child mortality. For instance, in 1993-1994, 37.7% of the women had had experience of at least one child death, whereas this rate decreased at 23.8% in 2007. The prevalence of ever use of any contraceptive method increased from 63.5% to 79.5%. Besides, the data reveal that the prevalence of

child marriage –marriage before age 18, did not change much within the last one and a half decade. For instance, in 1993-1994, the prevalence of child marriage was 87.9%, which decreased at 80.4% in 2007.

3.2 *Trends in age specific fertility rates (ASFRs) and TFRs and change in ASFRs and TFRs during 1993-1994 to 2007*

Table 2 shows the ASFRs, TFRs and change in ASFRs and TFRs for the period 1993-1994 to 2007. Data revealed that, the TFR has declined by 21.4% from 3.4 births per woman in 1993-1994 to 2.7 births in 2007. The TFR was static at 3.3 births per woman during the entire 1990s. As compared to 1993-1994, the ASFRs have decreased in all age cohorts in 2007. A close inspection to the table suggests that until 2004, the ASFRs did not change much in the young women aged 15-24. Besides, the ASFRs among women were either static or in a decreasing trend among women aged thirty five or above. The young women aged 20-24 had higher fertility throughout the study period. The ASFRs decreased consistently among women aged 20-24, the prime reproductive age of Bangladeshi women and among those aged 30-34. On the other side, the ASFRs fluctuated among women aged 15-19 and 25-29.The young women aged 15-24 contributed more than half (53.3%) in the TFR in 2007, while this proportion was 48.9% in 1993-1994. Specifically, the adolescents added more than one-fourth births in the TFR. The last column of the table apparently shows that the ASFRs decreased with the increase of five-year age cohort. The contribution of young women aged 15-24 in the decline of fertility for the study period was very little as against of the elder women. Further the data show that, the decline of ASFRs was more pronounced among the women aged 35-49.

3.3 *Proportion of married women for the period 1993-2007*

Table 3 represents the proportion of age specific currently married women of Bangladesh for the period 1993-2007. Overall, the proportion of currently married women of reproductive ages declined by only 1.8%; from 0.794 in 1993-1994 to 0.780 in 2007. The proportion of currently married women decreased by 4.4% among the teenagers and 2.5% in the women aged 20-24. Currently married women increased slightly in the age groups 30-34 and 35-39. Further, the proportion of currently married women decreased by 2.1%, from 0.874 to 0.856; and 2.4%, from 0.824 and 0.804 in the women aged 40-44 and 45-49 years respectively during the same period. The lesser decline in currently married women may have little contribution in the overall lessening of TFR.

3.4 *Decomposition of TFR*

This section of the study is devoted to identify the relative contribution to the decline of TFR in Bangladesh due to change in marriage pattern and marital fertility rates. Table 4 presents the results of the decomposition of change in TFR. Overall, only 0.73 births were reduced in the last one and a half decade. The lion part of the fertility decline is attributed to the change in marital fertility as it accounted for 0.67 of the 0.73 births reduction, or roughly 91.8%. The change in marital structure accounted for only 8.2% of the decline over the period of one and a half decade.

3.5 *Differentials of fertility by socioeconomic, development and proximate factors*

Table 5 shows the differentials of mean number of children ever born to women by different socioeconomic, developmental and proximate factors for two time points 1993-1994 and 2007. During this period, the mean number children ever born to per ever married women decreased by 0.68 births, from 3.46 births per woman in 1993-1994 to 2.78 births per woman in 2007. The decreasing of births was highest among those who never discussed on family planning with their husbands. To examine the association between cumulative fertility and various socioeconomic and demographic factors we applied ANOVA on data. The findings showed that, working status of women was not associated with MNCEB in 1993-1993; however, it was strongly associated with the dependent variable for 2007 data. The association between MNCEB and other variables selected for analyses in this study were highly statistically significant.

The both survey data indicate that women's education was inversely associated with MNCEB. As expected, rural women had higher fertility than their urban counterparts. The Muslim women had higher fertility than the non-Muslim women. Although, non-working women had on an average, 0.05 births more in 1993-1994, however, the 2007 BDHS data showed that the working women had on average 0.10 births more. The MNCEB was more among women who never discussed on family planning than those who ever discussed on the issue with their husbands. The developmental factors included in the study showed that, the women who used flush toilet, had electricity connection in the households and who had access to electronic media had lower fertility than women who had no those facilities. As expected, the women who had had experience of child mortality had higher fertility than were those who had had no experience of child death. Higher fertility were also associated with the ever use of any contraceptive

method and who were married-off as a child than those who never used any family planning method and those who got marriage at age 18 or above.

3.6 *Determinants of fertility in Bangladesh in 1993-1994 and 2007*

The results of the multivariate analyses obtained through negative binomial regression analyses have been presented in Table 6 and Table 7. The findings show that of the socioeconomic factors included in analyses, place of residence had no significant effect on fertility in 1993-1994, although it showed to have net impact on fertility of 2007 BDHS data after controlling over other factors. Of the developmental factors, access to electronic media appeared to have no significant net effect of fertility. The proximate determinants had statistically significant relationship with fertility of Bangladeshi women.

Women's education was inversely associated with fertility. The effect of this variable was more sharpened in the most recent 2007 data than it was in 1993-1994. For instance, as compared to women with no formal education, the odds of fertility among women with higher education was 34.5% lesser in 1993-1994, whereas it was 46.5% lesser in 2007. For these two data sets, almost a similar pattern of difference of odds of fertility was observed among women with primary and secondary education. The odds of fertility in the non-Muslim women as compared to their Muslim sisters were significantly 3.4% and 8.9% lower in 1993-1994 and 2007 respectively. In 2007, the rural women had 6.0% increased fertility than their urban counterparts. Although working women than non-working women had significantly lower fertility in 1993-1994, the estimated odds showed a reverse picture in 2007 between working and non-working women.

Findings from the both survey data show that inter-spousal communication on family planning had negative effect on fertility. The more was communication the lesser was fertility. For instance, as compared to women who discussed on family planning with their husbands, the women who discussed the issue once or twice and who discussed the issue often, had 8.1% and 10.7% respectively decreased fertility in 2007. Similar findings were also obtained for 1993-1994. The developmental factors such as better toilet facility had negative association with fertility. However, although another developmental factor namely electricity connection in household had statistically negative association with fertility in 1993-1994, it appeared have no more significant effect on fertility in 2007.

Child mortality, as expected, had the most single significant positive effect on fertility for both survey data. For instance, as compared to women who never had had experience of child death, the women who had had experience of at least one child death had 2.15 times and 1.85 increased fertility in 1993-1994 and 2007 respectively. Findings revealed that the women, who ever had used any contraceptive method, had significantly increased risk of fertility than those who never used any contraceptive method. Besides, the women who got marriage at age 18 or above had decreased fertility than women who were married-off at their child ages. However, the risk of having higher or lesser fertility was somewhat lower in 2007 as compared to that of 1993-1994.

4. DISCUSSION AND CONCLUSION

This paper examines the patterns and determinants of fertility in Bangladesh for the period 1993-1994 to 2007. It also examined the relative contribution of demographic components in fertility decline from 1993-1994 to 2007. The observed TFR was 3.44 births per woman in 1993-1994 which decreased at 2.71 births in 2003, indicating a decline of 0.73 births over almost one and a half decade. Although there was a consistent increase of CPR, however, the TFR did not decrease in the expected pace and magnitude as those were during the 1980s. Despite, the findings clearly revealed that the fertility decline was faster among older women and fluctuated in the younger women. The decomposition analysis revealed that, in fertility decline during the period 1993-1994 to 2007, the lion part was attributed to marital fertility. The change of marital structure contributed only a little. This is supported by the fact that, the females' mean age at first marriage increased by only 1.2 years from 14.3 years in 1993-1994 to 15.5 years in 2007. Our study further shows that, four out of five women got marriage before they reach at age 18 years –the legal females' age at first marriage in Bangladesh. In 1993-1994, almost nine out of ten were married-off at their child ages. Relatively, only 7.5% child marriage reduced during the last fourteen years. Thus, females' lower age at marriage is a crucial predictor for stagnation as well as slower rate of fertility reduction in Bangladesh.

The TFR remained static during the entire 1990s. Bongaarts and Watkinsons (1996) argue that, uneven development, variations in institutional and cultural contexts within a country can affect the extent of channels of social interaction among communities are thus likely to have an independent influence on the pace of fertility transitions. Caldwell (1997) suggests that, a socioeconomic change in every fertility transition is a precursor that brings fertility in people's economic calculus; then, the cultural and ideological debates on the status and roles of women within family and society. Our findings are

consistent with these arguments that Bangladesh has been shifted from the least developed country to a low developed one which made more favourable situation in further decline of fertility.

The multivariate analysis namely negative binomial Poisson regression analyses applied in this study has identified several variables as important determinants of fertility transition in Bangladesh. The estimated incidental odds ratios suggest that proximate factors were stronger predictors than the socioeconomic factors in fertility decline of Bangladesh. Of the developmental factors included in the study, child mortality showed the strongest predictive power in fertility transition as well as reduction. The other variables under developmental factors had comparatively little but significant effect on fertility. Of the socioeconomic variables included for analyses, women's education appeared as the most single significant determinants of fertility. The effect of this variable was somewhat stronger for 2007 than it was in 1993-1994.

Indeed, the powerful effect of education on reproductive behaviour is undisputed (Barkat-e-Khuda and Hossain, 1996). There are several plausible reasons why women with some education usually display a lower fertility rate than the women with no formal education. One reason why education may operate through these channels is that schooling makes the woman able to read and write, increases her knowledge about the outside world, and provides her with certain practical and theoretical skills that enhances her productivity (Toor, 2007). Conceptually, in addition to the effects of women's education, there may be a 'spill-over' from other people's education through, for example, social learning. Uneducated women who live in societies where a large proportion are literate, or where the average educational level is high, may have a fertility different from that of educated women. Also the better-educated may be influenced by the educational distribution in the community. In aggregate, education has, on the whole, a substantial reducing effect; fertility will decline more sharply in response to an increase in women's education than as suggested by the estimates of individual level effects (Toor, 2007). An important finding is that, the effect of education on fertility was somewhat stronger in 2007 than it was in 1993-1994. This may be partly attributed to substantial increase of female education in the most recent decades. A large empirical literature documents the beneficial effects of parents' education in improving the quality of children (Caldwell 1994; Mensch, Lentzner, and Preston 1985). Lam and Duryea (1999) emphasized on the mechanism that, if education reduces the unit price of quality of a child, then parents will reduce fertility and increase investments in child quality. Educational attainment alters parent's perceptions of the advantages of small families, brings changes in the status of women, changes the social and economic aspirations, and affects both attitude towards contraception and ability to

understand and make use of particular methods (Hakim, 1999), which in turn may produce a depressing effect on fertility.

The urban-rural differential in fertility is one of the most widely studied areas in fertility. It is generally expected that, in societies undergoing socio-economic, cultural, and demographic changes, fertility will be lower in urban than in rural areas due to the impact of a host of factors (Hakim, 1999). In the last one and a half decade, fertility declined with same pace and magnitude in both the rural and urban settings. The bivariate analyses showed significant association between fertility and place of residence, with fertility being higher among rural than urban residents. However, the variable showed to have no more significant effect for 2007 data, although it had a net effect in 1993-1994 when other socio-demographic variables were controlled. The possible reasons behind diminishing the effect of rural and urban areas on fertility may be the rapid expansion of urban areas, increased rate of population migration from rural to urban areas, shifts in agricultural structure, economic development, influence of modernization process among rural people and many other socioeconomic changes. However, this changing direction of the relationship between urbanization and fertility is due to the difference in approaches or to a real trend needs to be examined.

Unlike other aspects of differential fertility (by ethnicity, education, income, occupation, and rural/urban), religious affiliation is sometimes argued to have both direct and indirect effects on fertility. Its direct effects might operate through doctrines that impose restrictions on contraceptive use, abortion, pre-marital sex and out-of-wedlock childbearing. Our findings suggest that religion is an important determinant of fertility. Consistent with many other studies, our analyses showed that Muslims tend to have more children than their non-Muslim counterparts (Westoff and Frejka, 2007; Dharmalingam and Morgan, 2004; Morgan et al., 2002; Knodel et al. 1999). Muslims tend to desire more children and are less likely to use contraception (Morgan et al., 2002). Religion is also sometimes argued to have an indirect effect through doctrines that emphasize traditional gender and family values that are conducive to high fertility. Although this pattern is not context-specific (Dharmalingam and Morgan, 2004), there does not seem to be conclusive 'grand' explanations for Muslim's higher fertility vis-a-vis non-Muslims. A number of demographers advocated context-specific explanations (Jeffery and Jeffery, 1997; Knodel et al. 1999; Obermeyer, 1992).

The effect of working status of fertility for two data sets is controversial. Findings showed that, working women had lower fertility in 1993-1994, while fertility was found to be significantly higher in

this subgroup of women in 2007. It is argued that, although a negative association between female work and fertility has been found in several developed countries, the relationship has not always been clear and inverse in the case of developing countries (Shah, 1986). Consistent with many other studies (Hakim, 1999; Shah, 1999; Syed, 1978), our findings indicate that women's work has not been found to have a consistent negative influence on fertility. In the context of the position of women in the Bangladeshi society, sex segregation and supremacy of males over females are common. Women are still weaker subjugated in this society. Unless women have prestigious jobs in formal sectors, their work outside the home generally is not highly valued. Thus, it is usually assumed that working women in prestigious formal sectors, as a privileged group, would have lower fertility than their non-working counterparts. However, in Bangladesh, practically only a small proportion of women are engaged in formal sectors and others are engaged in the informal sectors like ready-made garment factories and other non-government organizations. Besides, the women with higher education maintain lives as housewives unless they get suitable high-status occupation. These women, in fact, enjoy higher autonomy in their households and decision-making process than those engaged in low-paid jobs. Thus, it is assumed that inclusion of the women in working status would have higher fertility than their non-working counterparts.

There is nothing new in the suggestion that women in many countries do not have the last word in determining their own fertility; the role of husbands in reproductive decision-making is producing a growing amount of research (Voas, 2003). The role of husband-wife communication as an important variable in fertility dynamics dates back to the 1950s (Acharya and Surrender, 1996). Our findings reflect that, the existence of inter-spousal communication has a definite declining effect on fertility. Women who discussed family planning with their husband had a smaller mean number of children ever born as compared to those who did not talk. Inter-spousal communication can help improve relations between the couples and help to converge their ideas and attitudes on important household decisions, of which fertility is the most important. Inter-spousal family planning communication is an effective strategy to minimize differences of opinion between husbands and wives regarding family planning method choice and other reproductive preferences (Islam et al., 2010). In fact, the frequent communication improves understanding between couples about family size they both desire and inspires them to adopt effective family planning method, resulting in lower fertility among them as compared to those who never discuss on the issue. The study of Ramakumar and Gopal (1972) revealed that along the socioeconomic scale, couples in a higher position communicate more with each other than others. They concluded with the hope that it should be possible to demonstrate that communication between husband and wife on matters relating to family planning is a factor that influences fertility.

To improve understanding of the effect of modernization process on fertility decline, we included two variables as development indicators in this study. The use of flush toilet has increased from 10%-31% and electricity connection in households has been expanded from 20% to 53% during the period 1993-1994 to 2007. These two indicators indicate substantial modernization in Bangladesh in the last one and a half decade. The impact of the variable, electricity connection in households was not clear. This is because, the variable appeared as a statistically strong significant predictor that showed negative effect on fertility in 1993-1994, however it appeared to have no more significant effect in 2007. Besides, the variable toilet facility showed to have significant negative effect on fertility. More specifically, the women with no better toilet facility had 7%-9% increased fertility than those who had improved toiled facility. Studies showed that, Asia and Latin America have proved that the impact of the various aspects of rural development on reproductive behavior is dependent on such socio-economic changes (Kouame and Schellekens, 2002). These studies revealed that, with increased incomes and improved living conditions resulting from rural development programs, parents can envision a better future for themselves and their children. This entails both increased investment in the education, health and nutrition of the children, thus increasing their cost, and an aspiration for well-being among parents that leads them to desire more goods. Competition between those two objectives leads parents to take up attitudes and behaviours that favour small families. Meanwhile, rural development programs cause diversification of activities, one effect of which is the reduced economic value of children. The conjunction of all those factors causes the demand for children, and eventually fertility, to decline.

Consistent with many earlier studies (Hossain et al., 2005; Fitaw et al., 2004; Lindstorm and Kiros, 2001; Saksena et al., 1984; Park et al., 1979), our findings showed that child mortality had significant positive effect on fertility. Research has determined that the death of a child reduces the probability that parents will subsequently adopt a contraceptive method, thereby increasing the likelihood of additional pregnancies (Hossain et al., 2005). The effect of infant and child mortality on fertility operates through both physiological mechanisms and volitional behaviors. The physiological effect relates to the impact of an index child's death on breastfeeding and the return of menstruation. The inhibiting effects of breastfeeding on fecundity, particularly during the first twelve months after a birth, are well established. In the absence of breastfeeding the postpartum amenorrheic period is about two months (Lloyd and Ivanov 1988). Prolonged breastfeeding can extend the amenorrheic period for up to 19 months or more (Berhanu and Hogan 1998; Bongaarts and Potter 1983). Even after the return of menstruation breastfeeding can continue to depress a woman's fecundity. The death of a breastfeeding infant

prematurely ends lactation, and thereby shortens the length of the postpartum amenorrheic period. In non-contracepting populations the early return of menstruation contributes to a higher risk of conception, and thus a shorter than normal birth interval. Parents may also intentionally try to replace a deceased child as soon as possible with a subsequent birth. Known as the replacement effect, this conscious effort to compensate for infant or child mortality by shortening the time to a next birth is generally believed to occur in populations where mortality has begun to decline, and contraceptive use is common (Park et al. 1998; Lloyd and Ivanov 1988; Nur 1985).

The lion's part of fertility decline that had occurred in Bangladesh is attributed to the effective population policy and success of the government as well as non-government organizations efforts to fulfill the demand of quality of family planning services. Due to an effective family planning program, the ever use of CPR has increased more than five folds from 14% in 1975 to 83.0% in 2007. The current contraceptive use rate has increased more than seven folds from 7.7% in 1975 to 55.8% in 2007. The multivariate analyses applied in the study showed positive effect on fertility. This may be explained by the way that, many of the currently married women start to use contraceptive method after they have achieved children as their desired size. Despite this, the 2007 BDHS suggests that the unwanted fertility accounted 0.8 births in the TFR 2.7 births per woman. Overall, 17% of currently married women in Bangladesh have an unmet need for family planning services, 7% for spacing and 11% for limiting births. The total demand for family planning in Bangladesh is 73%. 77% of family planning demand is satisfied. Unmet need has increased from 11% of currently married women in 2004 to 17% in 2007. The apparent increase in unmet need may reflect problems with the supply of family planning services and/or an increase in demand for family planning (NIPORT et al., 2009). It is expected that if unmet need of contraception could be met, then replacement level of fertility, 2.1 births per woman would be achieved very soon.

Just as for fertility levels, Asian countries cover a wide spectrum in terms of marriage patterns, specifically in female ages at marriage and the universality of marriage (Jones, 2007). In South Asia, including Bangladesh, marriage remains near universal and women marry at a very young age. The proportion of the female population that remains single and never marries impacts fertility levels in a society like Bangladesh, where childbearing outside of marriage is uncommon. Marriage in Bangladesh marks the point in a woman's life when childbearing becomes socially acceptable. Age at first marriage has a major effect on childbearing because women who marry early have, on average, a longer period of exposure to the risk of becoming pregnant and a greater number of lifetime births. The findings of our

study are in a quite good agreement with this hypothesis. The both bivariate and multivariate analyses revealed that females later age at marriage had negative effect on fertility. There has been a slow but steady increase over the past 25 years in the age at which Bangladeshi women first marry, from a median age of 14.1 years for women in their late forties to 16.4 years for those in their early twenties (NIPORT et al., 2009). A comparison of the 2007 BDHS with previous surveys shows that median age at first marriage has been increasing over time. The median age at marriage among women age 20-49 has increased by one year over the past decade, from 14.2 years in 1996-1997 to the current figure of 15.3 years. A large proportion of marriages still take place before the legal age. The 2007 BDHS found that 66% of the women age 20-24 were married before age 18. However, the median age at marriage among men age 25-54 has not changed since 2004 (NIPORT et al., 2009). Thus, lower age at first marriage of women is one of the crucial factors of fertility decline in Bangladesh.

There are several limitations with regard to interpreting the results of this study. Due to the cross sectional design of the study and all the variables analyzed in the regression model, it can only provide evidence of a statistical association between those variables and children ever born and cannot show a cause-effect relationship. The other limitation of the study is the underreporting of the number of children ever born, particularly among the older women. It is likely that women tend to omit some of the children they have given birth to, particularly those living in other households and those who have died, with the result that the proportion children omitted tends to increase with the age of the mother. Another error in the reported number of children ever born arises from the inclusion of stillbirths or late fetal deaths among live born children (United Nations, 1983). Despite these, the strength of the study is that, it used nationally representative BDHS data, which are generally employed in estimating fertility in the developing countries like Bangladesh, where sample vital registration is hardly followed and are not reliable.

Finally, despite dramatic increase of the use of contraceptive prevalence rate, Bangladesh has not yet achieved the replacement level of fertility. The country showed speedy decline in fertility when it has unfavourable situation in terms of economic status. In more favourable situation the pace and magnitude of fertility decline is slow. Many factors are attributed to this phenomenon. Among these factors, women's education, place of residence, inter-spousal communication on family planning, toilet facility, child mortality, contraceptive use and age at first marriage. Despite legal restrictions against marrying at a younger age, child marriage is more common in Bangladesh. Therefore, programmess should be undertaken to reduce the incidence of child marriage through creating awareness regarding the marriage

law and the disadvantages of marriage at early ages. Programs that focus on reduction of infant and child mortality could also be considered, which would help to reduce fertility. Since, environmental or developmental factor such as toilet facility is interrelated to infant and child mortality, efforts should be made to improve hygienic environment to reduce child mortality and thereby fertility. Despite substantial development in women's education in recent decades, there is still room to improve the status of women's education. Opportunities should be created for better jobs in the formal sectors for educated women not only for fertility reduction, also to contribute to overall development of the country. On behalf of the government, more emphasis should be given on family planning program to inspire couples to adopt sterilization focusing on those who already have achieved fertility as their desired size. In this regard, programs should focus to enhance inter-spousal communication on family planning.

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Table 1: Percentage distribution of ever married women and relative change of their background characteristics, Bangladesh, 1993-1994 and 2007

Background characteristics	1993-1994		2007		% change (1993-1994 to 2007)
Socioeconomic characteristics	N	%	N	%	
Women's education					
No education	5529	58.2	3525	32.1	26.1
Primary	2542	26.8	3268	29.7	2.9
Secondary	1228	12.9	3345	30.4	17.5
Higher	197	2.1	855	7.8	5.7
Place of residence					
Urban	1096	11.5	4151	37.8	26.3
Rural	8399	88.5	6845	62.2	26.3
Religion					
Islam	8332	87.8	9924	90.3	2.5
Others	1163	12.2	1071	9.7	2.5
Working status					
Not working	7971	84.0	7759	70.6	13.4
Working	1517	16.0	3233	29.4	13.4
Discussed FP with husband					
Never	2805	31.7	5603	55.3	23.6
Once or twice	3387	38.3	3538	34.9	3.4
More often	2645	29.9	998	9.8	20.1
Developmental factors:					
Toilet facility					
Flush	963	10.2	3104	30.8	20.6
Other	8516	89.8	6983	69.2	20.6
Electricity connection in HH					
No	7623	80.4	4788	47.5	32.9
Yes	1856	19.6	5300	52.5	32.9
Electronic media exposure					
No	6594	69.6	5101	50.6	19.0
Yes	2886	30.4	4984	49.4	19.0
Experience of child death					
No	5912	62.3	8375	76.2	13.9
Yes	3583	37.7	2621	23.8	13.9
Proximate determinants:					
Ever used any contraceptive method					
No	3463	36.5	2258	20.5	16.0
Yes	6032	63.5	8738	79.5	16.0
Age at first marriage					
<18	8349	87.9	8842	80.4	7.5
18+	1146	12.1	2154	19.6	7.5
Total	9,495	100.0			

Table 2: ASFRs, TFRs, relative contribution in TFR of age cohort of women and change in ASFRs and TFRs during 1992-2007

Age group	Survey year					Relative contribution to the TFR					FC[a]
	1993-1994	1996-1997	1999-2000	2004	2007	1993-1994	1996-1997	1999-2000	2004	2007	1993-2007
15-19	140	147	144	135	126	20.4	22.5	21.8	22.3	23.3	10.7
20-24	196	192	188	192	173	28.5	29.4	28.4	31.7	32.0	11.7
25-29	158	150	165	135	127	23.0	23.0	25.0	22.3	23.5	19.6
30-34	105	96	99	83	70	15.3	14.7	15.0	13.7	13.0	33.3
35-39	56	44	44	41	34	8.1	6.7	6.7	6.8	6.3	39.3
40-44	19	18	18	16	10	2.8	2.8	2.7	2.6	1.9	47.4
45-49	14	6	3	3	1	2.0	0.9	0.5	0.5	0.2	92.9
TFR	3.4	3.3	3.3	3.0	2.7	100.0	100.0	100.0	100.0	100.0	21.4

Sources: BDHS 1993-1994, BDHS 1996-97, BDHS 1999-2000, BDHS 2004; and BDHS 2007
Note: [a] Change in ASFRs and TFRs.

Table 3: Proportion of age specific currently married women of Bangladesh, 1993-2007

Age group	Proportion of currently married women (PCMW)					% change in PCMW during 1993-2007
	1993-1994	1996-1997	1999-2000	2004	2007	
15-19	0.477	0.483	0.466	0.460	0.456	-4.40
20-24	0.846	0.793	0.778	0.817	0.825	-2.48
25-29	0.929	0.919	0.911	0.921	0.921	-0.86
30-34	0.927	0.920	0.939	0.927	0.928	0.11
35-39	0.900	0.913	0.877	0.894	0.914	1.56
40-44	0.874	0.860	0.842	0.844	0.856	-2.06
45-49	0.824	0.790	0.823	0.816	0.804	-2.43
Total	0.794	0.776	0.762	0.770	0.780	-1.76

Table 4: Decomposition of change in TFR during 1993-1994 to 2007, Bangladesh

Changes	Change in fertility	% contribution to change
Change in TFR due to:		
Change in marital structure	-0.06	8.22
Change in marital fertility	-0.67	91.78
Total change in TFR	-0.73	100.00

Table 5: Mean number of children ever born (MNCEB) by background characteristics of women, 1993-1994 and 2007, Bangladesh

Background characteristics	1993-1994		2007		Change (1993-1994 to 2007)
	MNCEB ±SD	*F*-statistic	MNCEB ±SD	*F*-statistic	
Women's education		155.56***		740.82***	
No education	3.84±2.71		3.80±2.23		0.04
Primary	3.33±2.53		2.99±1.98		0.34
Secondary	2.33±1.98		1.88±1.49		0.45
Higher	1.62±1.37		1.49±1.13		0.11
Place of residence		25.14***		82.12***	
Urban	3.09±2.34		2.55±1.89		0.54
Rural	3.51±2.65		2.91±2.15		0.60
Religion		9.90***		29.23***	
Islam	3.49±2.66		2.81±2.08		0.78
Others	3.23±2.30		2.45±1.84		0.78
Working status		0.45		5.86**	
Not working	3.47±2.67		2.75±2.12		0.72
Working	3.42±2.33		2.85±1.93		0.57
Discussed FP with husband		127.86***		78.78***	
Never	4.05±2.96		3.00±2.23		1.05
Once or twice	3.42±2.54		2.60±1.80		0.82
More often	2.94±2.17		2.26±1.65		0.68
Developmental factors:					
Toilet facility		33.37***		131.08***	
Flush	3.00±2.36		2.53±1.87		0.47
Other	3.51±2.64		3.03±2.14		0.48
Electricity connection in HH		31.10***		125.73***	
No	3.54±2.65		3.12±2.20		0.42
Yes	3.16±2.47		2.66±1.92		0.50
Electronic media exposure		66.17***		129.64***	
No	3.61±2.64		3.11±2.15		0.50
Yes	3.13±2.53		2.64±1.96		0.49
Experience of child death		4557.66***		4544.61***	
No	2.30±1.89		2.15±1.62		0.15
Yes	5.37±2.52		4.77±2.06		0.60
Proximate determinants:					
Ever used any contraceptive method		113.33***		130.78***	
No	3.08±2.89		2.34±2.41		0.74
Yes	3.68±2.42		2.89±1.95		0.79
Age at first marriage		471.92***		538.08***	
<17	3.67±2.63		3.00±2.10		0.67
18+	1.92±1.91		1.87±1.64		0.05
Total	3.46±2.62		2.78±2.06		0.68

Table 6: Results of Poisson regression analysis showing the regression coefficient with Standard Error (SE), incidence rate risk (IRR) and 95% Wald Confidence Interval (CI) of CEB on education of women in Bangladesh, 1993-1994

Characteristics	β	SE	IRR [Exp(β)]	95% WCI	
				Lower	Upper
Women's education (*ref*: no education)					
Primary	-0.060	0.0138	0.942***	0.917	0.968
Secondary	-0.270	0.0230	0.763***	0.729	0.798
Higher	-0.428	0.0638	0.652***	0.575	0.739
Religion (*ref*: Islam)					
Others	-0.034	0.0184	0.966*	0.932	1.002
Working status (*ref*: not working)					
Working	-0.058	0.0169	0.944***	0.913	0.975
Discussed FP with husband (*ref*: never)					
Once or twice	-0.141	0.0143	0.869***	0.845	0.893
More often	-0.230	0.0164	0.795***	0.770	0.821
Toilet facility (*ref*: flush)					
Other	0.066	0.0252	1.069**	1.017	1.123
Electricity connection in HH (*ref*: no)					
Yes	0.049	0.0181	1.050**	1.013	1.088
Experience of child death (*ref*: no)					
Yes	0.766	0.0123	2.152***	2.101	2.205
Ever used any contraceptive method (*ref*: no)					
Yes	0.277	0.0140	1.319***	1.283	1.356
Age at first marriage (*ref*: <18)					
18+	-0.369	0.0249	0.692***	0.659	0.726
Intercept	0.958	0.0293	2.605***	2.460	2.759

Table 7: Results of Poisson regression analysis showing the regression coefficient with Standard Error (SE), incidence rate risk (IRR) and 95% Wald Confidence Interval (CI) of CEB on education of women in Bangladesh, 2007

Characteristics	β	SE	IRR [Exp(β)]	95% WCI	
				Lower	Upper
Women's education (*ref*: no education)					
Primary	-0.189	0.0145	0.828***	0.805	0.852
Secondary	-0.520	0.0177	0.594***	0.574	0.615
Higher	-0.625	0.0346	0.535***	0.500	0.573
Place of residence (*ref*: urban)					
Rural	0.058	0.0142	1.060***	1.031	1.090
Religion (*ref*: Islam)					
Others	-0.093	0.0218	0.911***	0.873	0.951
Working status (*ref*: not working)					
Working	0.054	0.0136	1.055***	1.027	1.084
Discussed FP with husband (*ref*: never)					
Once or twice	-0.084	0.0138	0.919***	0.895	0.944
More often	-0.113	0.0236	0.893***	0.853	0.935
Toilet facility (*ref*: flush)					
Other	0.085	0.0157	1.089***	1.056	1.123
Experience of child death (*ref*: no)					
Yes	0.613	0.0131	1.845***	1.798	1.893
Ever used any contraceptive method (*ref*: no)					
Yes	0.312	0.0180	1.367***	1.319	1.416
Age at first marriage (*ref*: <18)					
18+	-0.172	0.0197	0.842***	0.810	0.875
Intercept	0.945	0.0237	2.572***	2.455	2.694