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The Stalled Fertility Transition in Bangladesh:

The Effects of Sex and Number Preferences

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ABSTRACT

Over a decade ago, Preston, Muhuri, and Menken found that child survival was higher for the first two boys and first girl in a family, and the latter two authors suggested that "deep-rooted" number and sex preferences were contributing to the late-twentieth-century decline in fertility. Are similar preferences related to today's plateau in fertility? Using the 1996 Matlab Health and Socioeconomic Survey, ICDDR,B Health and Demographic Surveillance System birth records, and the 1994–2007 Bangladesh Demographic and Health Surveys, we examine parity progression for maternal cohorts according to number and sex of their children. The ideal number of children is low—two or three. If mothers' ideal is an even number, they prefer the same number of sons and daughters. However, if they want an odd number, they prefer an additional son. Given available and acceptable fertility control, actual parity progression accords with these ideals. Progression to parity three is *more likely* for those who no sons. Progression to parity four is significantly *less likely* for those who have two sons and a daughter. These complex sex preferences may well contribute to the fertility stall in Bangladesh and other countries. For Bangladesh, changes in traditional valuing of daughters may be essential if fertility is to approach replacement levels.

The Stalled Fertility Transition in Bangladesh: The Effects of Sex and Number Preferences

Jane Menken, M. Nizam Khan, Jill Williams

As the twentieth century drew to a close, there was increasing concern that fertility decline had stalled in some developing countries during the 1990s. John Bongaarts (2006), examining all developing countries that had carried out Demographic and Health Surveys and considering socioeconomic factors that are usually related to fertility decline, found no unusual pattern that would explain the plateau in the seven countries that he had identified as experiencing a stall. He did, however, find that in all but one of these countries, "at the onset of the stall the level of fertility was low relative to the level of development."

Stalled fertility has been studied over the past 20 years, perhaps first by Gendell (1985, 1989), who considered Costa Rica, the Republic of Korea, and Sri Lanka. Studies have been carried out for Thailand (Knodel et al. 1988) and, as followups to Bongaarts's analyses, Kenya (Westoff and Cross 2006), Israel (Nahmias and Stecklov 2004), Egypt (Eltigani 2003), and African countries (Moultrie et al. 2008; Shapiro and Gebreselassie 2007), with various reasons given for faltering fertility decline. Bangladesh was among the countries Bongaarts identified as entering a stall at a time when fertility was low relative to level of development. In this paper we carry out a case study of this single country and propose that its stall in fertility may be related to a specific pattern that we find in preferences for number and sex[1] of children.

INTRODUCTION

Fertility declined dramatically and rapidly in Bangladesh, from a period TFR of well over 6 in the early 1970s to 3.4 in the early 1990s, only 20 years later (Figure 1). It then remained near-static

[1] In this work we use the terms sex and sex composition to signal that what we are measuring in fertility analysis is the biological sex of children born. However, it is important to recognize that the sex composition of families may reflect strong gender preferences—preferences for girls and boys to fulfill particular gendered roles in the family.

until the turn of the century, when it began to decline again. The most recent estimate of the TFR is 2.7 for 2004-2006.

(Figure 1 about here)

Figure 2 shows information from six surveys: the 1996 Matlab Health and Socioeconomic Survey, which covers a rural district, and four Bangladesh Demographic and Health Surveys taken in 1994, 1997, 2000, 2004, and 2007. Period changes in fertility are reflected in the decrease in the mean number of children ever born by age; especially notable is the decline in older women's completed fertility.

(Figure 2 about here)

Bangladesh is unusual in that, even in surveys taken before 1990, desired family size was quite low—under three (cf. Cleland et al. 1994). Muhuri and Preston (1991) and Muhuri and Menken (1997) studied child survival in Matlab for cohorts of children born in 1982–1983. The latter found that girls who had at least one older sister had mortality odds double those of children at lowest mortality risk, and boys who had at least two older brothers had mortality odds fifty percent higher than the lowest-risk children. There was no difference in mortality odds of first-born boys and girls. They interpreted their results as follows:

> In a situation of scarce resources, parents may be forced to allocate what resources they have differentially, and a system of preferential treatment may develop. In this case, resources that affect child survival appear to go to one girl and two boys in the family. …These results also suggest that there was, in Matlab, a deep-rooted set of preferences about children that contradicted notions of desire for large numbers—of either sons or daughters. …
>
> The success of the family planning programme in Bangladesh has been considered surprising, in light of the all-too-prevalent poverty and illiteracy. But the mortality pattern we observe may have been predictive of desires for reduced fertility. (Muhuri and Menken 1997)

The authors questioned whether there was a desire for specific combinations of sons and daughters that affected whether couples went on to have another child—exactly the question we investigate further in this paper.

CITATIONS AND DISCUSSION OF GENDER PREFERENCE TO BE ADDED HERE

Since stopping at three or two children is essential to fertility declining toward replacement level, our hypotheses are related to parity progression—most importantly, to the progression from three to four children and the progression from two to three children.

Consider first the progression from three to four children. If fertility control is either not available or considered unacceptable, then parity progression should be unrelated to the composition of the sibling set because couples may not be able to act on their preferences. We argue that as fertility control becomes more available and acceptable, those who have two boys and a girl will be the most likely to be satisfied with the number and sex composition of their families and, consequently, least likely to have another child. Further, this effect should increase as attitudes toward fertility control become more positive. However, if the preference for sons becomes muted—if the valuing of daughters increases—then those who want three children might be equally satisfied with two girls and a boy. In that case, there should be less of a difference in parity progression between those who have two sons and a daughter and those who have two daughters and one son. In fact, such a decline may be evidence that a change in attitudes towards daughters is taking place.

Considering the progression from two to three children, we argue that the most satisfied parents will be those with one child of each sex and the least satisfied those without a son. Couples who have no sons should have the greatest probability of having another child. This effect should follow the same pattern hypothesized above: as fertility control increases, this preference may increasingly translate to fertility behavior. But, because the desire to have at least one son may be much greater than the desire to have at least two sons, there may not be a decline in this effect of sibling sex composition for a very long time—until parents value sons and daughters nearly equally.

Yet, since nearly a quarter of all couples who have two children have two girls, until and unless a high proportion of parents are satisfied with a completed family consisting of two daughters, in societies with high marriage rates and low infertility, the TFR cannot drop to replacement level.

These arguments lead to the following hypotheses:

H1: The odds of having a fourth birth are least for parents who have two sons and a daughter.

H2: The difference may increase as fertility control becomes more available and accepted and may decrease as the difference in valuing of sons and daughters decreases.

H3: The odds of having a third birth are greatest for parents who have no sons.

H4: As in H2, the difference may increase as fertility control becomes more available and accepted and may decrease as the difference in valuing of sons and daughters decreases. However, it will take longer for this decrease to occur.

We are not the first to consider the combination of number and sex composition important to fertility decline. Two previous studies looked at aspects of the number/sex composition of the sibling set. Bairagi and Datta (2001) concluded that son preference made it unlikely that expected desired fertility would be less than three, even if fertility were under perfect control, but did not document an effect on achieved fertility. Islam, Islam, and Chakraborty (2001) studied birth intervals between the second and third child and between the third and fourth child; their tables include number and sex of *surviving* children as predictors of completing a birth interval within 30 months and of completing a birth interval in 30-60 months. Although they comment on the lower likelihoods of parity progression for certain combinations of surviving children, they did not calculate progression as a function of overall composition of children by sex.

DATA AND METHODS

We use the five public use datasets from the Bangladesh Demographic and Health Surveys (BDHS) that are currently available (for 1994, 1997, 2000, 2004, and 2007), the 1996 Matlab Health and Socioeconomic Survey (MHSS), and the Matlab Demographic Workbook, "an Excel file that houses data for all demographic events occurring in Matlab since 1983" (www.icddrb.org/activity/index.jsp?activityObjectID=2878). The BDHS, like the many other Demographic and Health Surveys, "are nationally-representative household surveys that provide data for a wide range of monitoring and impact evaluation indicators in the areas of population, health, and nutrition" (www.measuredhs.com/aboutsurveys/dhs/start.cfm). The MHSS was carried out by a team of investigators, including Menken and Khan, from ICDDR,B (formerly the International Centre for Diarrhoeal Disease Research, Bangladesh) and several U.S. institutions. ICDDR,B has sponsored the Matlab Health and Demographic Surveillance System since the early 1960s. Households are visited on a regular schedule (biweekly or monthly), and information on vital events is collected close to the time of their occurrence. In addition, there have been special censuses and surveys (of which the MHSS has collected the most extensive socioeconomic and health information). A maternal and child health and family planning program (MCH/FP) was initiated in approximately half the area in 1977, with the remainder of the Matlab area serving as a comparison.

The BDHS asked ever-married women to report their ideal number of sons and their ideal number of daughters. All five surveys contain information on age, age at first marriage, education, religion, residence, and contraceptive use, and fertility histories that give the sex of each child.

We first examine the distributions of ideal numbers of sons and daughters and of combinations of ideal numbers of children by sex for evidence of preferences that differ from simply preferring children of each sex equally or simply preferring one sex over the other.

We then test the hypotheses described above, using logistic regression to predict the odds of progressing from parity three to parity four and of progressing from parity two to parity three. In each case we include a set of characteristics assumed to be related to fertility, including age at survey, age at marriage, and education. For the BHDS analyses, we add urban/rural residence and region of the country, in part as proxies for availability and acceptability of contraception. For the MHSS analysis, as a proxy for availability of contraception, we include residence in the area in which ICDDR,B instituted an intensive maternal and child health and family planning program in the late 1970s, or in the comparison area, which received only standard government services.

Use of age at survey merits some discussion. Older women would, of course, have reached parity two (or any specific parity) longer ago in the past than younger women, who might not have achieved that parity at the time of the survey. We chose this strategy over a specific time-period analysis. Had we selected women who reached parity two in a certain time period and asked whether they had another birth, then we might be capturing a mixture of older women who were slow childbearers and younger women who were rapid childbearers. In that case, the estimated probability of having another child would be higher for young women than older ones—even in a period when fertility actually was falling. In fact, the strategy we chose is conservative, in that if differentials in parity progression by sibling composition were a recent innovation, more likely adopted by younger women, inclusion of the older women would bias our analysis against detecting this effect. The analysis omits women under 20, since few had a second child at the time of the survey and even fewer had a third.

The figures for number and sex composition of children include all children, not just surviving children. We chose to do so for several reasons. First, we are concerned with total fertility, which does not take child survival into account. Second, modeling the effect of a child death on future fertility is difficult in that timing of the death must be taken into account. If, for example, the second child died after the third was born, then almost certainly, unless the second child was known to be quite ill, that death was not a determinant of parity progression. Third, ignoring whether or not children survived is actually conservative, working against our finding the hypothesized effects. Only if there were a much greater mortality rate for boys than girls would the analysis be affected. In fact, until quite recently, just the opposite situation held: Bangladeshi girls had higher mortality rates than boys (The Matlab Demographic Workbook, www.icddrb.org/activity/index.jsp?activityObjectID=2878).

Finally, we do not include individual contraceptive use because the decision to use may be a consequence of the number and sex composition of the sibling set. Instead, we use geographic region as the proxy for access to and acceptability of family planning.

The logit model, where p is the probability of an event (e.g., the probability that a woman of parity three will progress to parity four), is

$$\ln \frac{p}{(1-p)} = c + ß_1X_1 + ß_1X_1 + ß_2X_2 + ß_3X_3 + \ldots\ldots\ldots + ß_kX_k = L\ . \qquad (1)$$

L is referred to as the *log odds*. Then the *odds*, p/(1-p), are the resulting sum exponentiated:

$$\frac{p}{(1-p)} = e^L = \exp(c + c + ß_1X_1 + ß_1X_1 + ß_2X_2 + ß_3X_3 + \ldots\ldots\ldots + ß_kX_k)$$
$$= e^c e^{ß1X1} e^{ß2X2} e^{ß3X3} \ldots\ldots e^{ßkXk}. \qquad (2)$$

If all the predictors are 0–1 variables, then all terms in which X=0 drop out, and the equation above reduces to the product of e^c and terms in which X=1. L reduces to c plus the ß's for which X=1.

When X_i is a dummy variable, than $e^{ßi}$ is referred to as the *relative odds* because, if two people are the same on all characteristics except X_i, then the odds for the person with $X_i=1$ are the same as those for the person with $X_i=0$ multiplied by $e^{ßi}$.

Finally, p is estimated as

$$p = \frac{1}{(1 + e^{-L})} . \qquad (3)$$

RESULTS

IDEAL NUMBERS OF CHILDREN BY SEX

Table 1 shows the ideal number of sons and daughters reported in the 1994 and 2004 BHDS by women who said they wanted at least one child and who gave a numeric response.[2] Results for the other BHDS surveys are similar. Ideal numbers have been quite low in Bangladesh surveys taken over at least the past 30 years (Cleland et al. 1994). In 1994, the mean ideal numbers of sons and daughters were 1.4 and 1.1 respectively. In 2004, there was a slight decline in the ideal number of sons, to 1.3, while the ideal number of daughters remained constant. Overall, women consider a larger number of sons compared with daughters as ideal. In 1994, 36% said the ideal number of sons was two or more while only 11% said the ideal number of daughters was two or more. In 2004, the percent was somewhat lower for sons (30% gave two or more as the ideal number) but nearly identical for daughters (12%).

(Table 1 about here)

More revealing is Table 2, which shows the ideal number of children (columns 2–3) and, by number of children, the number of daughters that women reported as ideal (shaded area). Over the decade, fewer than 12% of women considered four or more children ideal. There was

[2] In 1994, 177 women reported that having no sons and no daughters was ideal and 978 women gave a nonnumeric response. The comparable numbers in 2004 were 1968 and 319. We have inquired of DHS and the survey group in Bangladesh that conducted the BHDS why there is such a large increase in the number reporting having no children was ideal. The number was also quite large in the 2000 BHDS.

a relatively small increase in considering one or two children ideal, from 63% in 1997 to 68% in 2004, a change of only 5 percentage points. Overwhelmingly (98%), women who considered a two-child family ideal preferred a son and a daughter. However, among those who considered two children of the same sex ideal, nearly all wanted two boys rather than two girls (77/5 in 1994; 67/14 in 2004).

(Table 2 about here)

Among those who considered three children ideal, the vast majority (95% in 1994, 90% in 2004) preferred two boys and one girl. Interestingly, when the ideal was either two or four children, the same number of each sex was preferred, but when it was an odd number, one more of boys than of girls was the modal preference. Thus, while some preference for boys exists, it seems to follow the pattern of preferring an equal number of children of each sex or one additional boy.

We next turn to documenting fertility change and asking whether stated ideals are observable in differential parity progression behaviors.

CHANGES IN FERTILITY

As Table 3 shows, nearly all married women aged 30-34 have at least two children, with little change since 1994 in age-specific proportions. Younger women do seem to be reaching parity two at slightly older ages.

(Table 3 about here)

The fertility reduction appears to be occurring at parities above two, as Table 4 shows. The BDHS shows an increasing proportion of ever-married women age 25 or older having three or fewer children. At the same time, the proportion with five or more children has declined dramatically – from 78% of 40-44 year-old women in 1994 to 47% just 10 years later; in the same period the proportion with four or more children declined from 87% to 67% (data not shown).

(Table 4 about here)

The proportions of younger women with three or fewer children are especially high in Matlab, where the family planning program begun in 1978 rapidly affected fertility. In 2007, these proportions were still lower for women aged 20-29 in the BDHS than they had been for Matlab in 1996. Figure 3 records the TFR for the Matlab MCH/FP and the comparison areas and all of Matlab. Prior to 1978, the MCH/FP and comparison areas were similar in their fertility. The MCH/FP area experienced lower fertility from 1978 until the beginning of the 21st century.

(Figure 3 about here)

SOCIAL AND DEMOGRAPHIC CHARACTERISTICS USUALLY RELATED TO FERTILITY

Factors that are usually related to fertility include religion, household socioeconomic status, urban/rural residence, access to and acceptability of family planning, mother’s education, and early marriage, among others. Measures are available in the BDHS and, to a lesser extent, in the MHSS. The predominant religion in Bangladesh is Muslim, but 10–12% of the population is Hindu in Matlab and in the country as a whole, with little change between 1994 and 2007. Approximately 40% of ever-married women lived in households whose assets put them in the top two categories of the BDHS wealth index; we refer to these women as “rich.” In 1994, 85% of ever-married women lived in rural areas, but by 2007 this figure had dropped to 66%. For Matlab, since the entire area is rural, we introduce a variable representing whether the woman resided in the area in which ICDDR,B offered intensive maternal and child health and family planning services (MCH/FP), or in the comparison area. In 1996, 56% of women in the MHSS lived in the area covered by the MCH/FP program.

There has been a profound change in schooling in Bangladesh, as is illustrated by Figure 4. Figure 4A shows that, in the most recent surveys, fewer than 20% of younger women had no schooling, whereas in the earlier surveys almost 80% of older women had never attended school. Similarly, the proportions with at least 5 years of schooling (Figure 4B) have risen dramatically, reaching over 60% for young women in the most recent surveys.

(Figure 4 about here)

Age at marriage has also been increasing, although it remains quite young. Household rosters indicate that in all five BHDS about 30% of 15- to 19-year-olds were married; for the 1996 MHSS the figure was lower, only 14%. Figure 5 shows, for women 25+, the proportion of ever-married women who married before they reached age 15. Again, Matlab stands out in its early shift to postponed marriage.

(Figure 5 about here)

Bangladesh has had a strong family planning program, as is demonstrated by the high proportions of ever-married women who reported ever using contraception. Figure 6 shows the increase in ever-use by age. Especially noteworthy are the high proportions of young married women who report use and the especially early adoption in Matlab. For all ages 20+, the 1996 MHSS proportion ever using exceeds the 1997 BDHS, and for ages 30–44 it equals or exceeds the 2004 BDHS figures.

PARITY PROGRESSION

As described earlier, we use logistic regression to predict the log odds that a woman of parity three would have a fourth birth and that a woman of parity two would have a third birth. Before introducing the sibling composition variables into the models, we first estimated the parity progression equations with age group and several of the factors known to be related to fertility as predictors. These factors include early marriage (<15 or 15–19, with 20+ as the reference category), and religion (Hindu vs. Muslim). For the BHDS, additional variables include the woman's years of schooling (five categories), urban/rural residence, whether or not the family is in the top two categories of the wealth index ("rich"), and district of the country. District dummy variables (Chittagong, Sylhet, Khulna, Rajshahi, and Barisal, with Dhaka serving as the reference district) are introduced as measures of the availability/acceptance of contraception. Barisal and Dhaka are considered more traditional than Khulna and Rajshahi and less traditional than Chittagong and Sylhet (which were one district until after the 1994 BDHS). For Matlab, the entire area is rural; we instead introduce a variable representing whether the woman resided in the area in which ICDDR,B offered intensive maternal and child health and family planning services (MCH/FP), or in the comparison area. Schooling is more limited in Matlab than in the country as a whole, so the education variable has only three categories: 0, 1–4, and 5+ years of schooling. We then added the variables representing the hypothesized relationships between sibling composition and parity progression. In all cases the coefficients and significance of the variables in the first set of equations were nearly identical. For that reason, we present only the final equations.

Demographic and Socioeconomic Factors in Parity Progression

Progression from Parity Three to Parity Four. For each survey, Table 5 presents the final model for predicting whether a woman who had reached parity three would progress to parity four. Consider the constant first; it represents the odds that a woman who had three children and was in the reference category on all predictor variables would progress to parity four. As we expected, this constant declines over time for the BHDS, indicating that women who had reached parity three were increasingly less likely to progress to parity four, thus capturing an overall decline in fertility.

(Table 5 about here)

The remaining rows give the relative odds of progressing to the next parity for a woman with the row characteristics compared to a woman in the reference category. For example, for age, the 40–44 row gives the relative odds for a woman that age compared to a woman age 30–34 (the reference category for age). For the BDHS 1994, the odds are 4.70 for women age 40–44 years, indicating that a woman that age who had three children had nearly five times the odds of a 30–34 year-old who also had three children of progressing to parity four by the time of the survey. Also as expected, the relative odds increase with age—the younger the woman at survey, the less likely she was to have moved from parity three to parity four. The gradient is especially large in Matlab. For women 35 and over, the BHDS relative odds appear to decrease between 1994 and 2004, although, again, we have not performed a strict statistical test of significance. Women who married young (<15 or 15–19) have higher odds of progressing to a fourth birth than those who postponed marriage past age 20. The effect is muted in the MHSS compared to the BDHS, possibly because of the intensive family planning program in that area. In part, both of these effects may be due to the fact that younger women and those who married later had a shorter time between the third birth and survey in which they could have had a fourth birth. However, other results that control for age at third birth and time to survey indicate that the effects of age and age at marriage remain. The education gradient is significant and in the BHDS shows little change over time until the most recent survey, in which it appears somewhat smaller.

The urban-rural relative odds were significant in the BHDS with the exception of 1994 and 2007. They rose to 1.34 in 1997 and then decreased in the subsequent surveys. Districts varied in relative odds, but their ranking seems near invariant over time. Matlab women who did not have access to the MCH/FP program were significantly more likely to progress to parity four than those in the program area.

The relative odds for wealth were significant only in the most recent BDHS. Hindus consistently have much lower odds of progression than Muslims.

Progression from Parity two to Parity three. Similar patterns hold for the progression from parity two to parity three, as shown in Table 6, with some exceptions. For the BDHS, the pattern of age effects does not change systematically over the surveys, nor does the pattern of age at marriage effects. There may be some narrowing of the effects of education. For both progression to parity three and progression to parity two, there are no surprises; the factors usually found to be associated with differential fertility are also significant here.

Table 6 about here

The Effects of Sibling Composition

Progression from Parity three to Parity four. The relative odds of progressing when the first three children include two sons and a daughter are significantly lower in all surveys after 1994. The relative odds are approximately .8 for the BHDS and much lower—.56—for Matlab. There seems little change over time.

Progression from Parity two to Parity three. The relative odds of progressing when there are two children, but no sons, are significantly higher: 1.4 -1.5 in the BHDS after 1994 and 2.0 in the MHSS. The relative odds increased between 1994 and 1996, showed little change in the two subsequent surveys and rose in 2007. For the BHDS 2000, the size of the sibling composition effect is 1.44, about comparable to that of rural residence, which is 1.31. In later BHDS, the sibling composition effect is greater than that of rural residence.

DISCUSSION

We first consider the magnitude of the effect of sibling composition on parity progression by predicting parity progression from the 2000 BDHS equation and from the 1996 MHSS equation. Considering progression from parity three to parity four, we predict the probabilities for

A1. Women who are in the reference category on all predictors, and

A2. Women who differ from A1 in that they have two sons and one daughter.

and then give the relative risk. This exercise is repeated for women who are in the highest category of years of schooling.

This calculation is then carried out for the progression from parity two to parity three for

B1. Women who are in the reference category on all predictors,

B2. Women who differ from B1 in that they have no sons, and

Again there is a second set of estimates for women in the highest category of years of schooling.

Table 7 gives the predicted probabilities. All variables are set at the reference categories with the exceptions noted above. The next-to-last column (bold) shows the predicted progression probability: for the BDHS 2000, it is estimated that women of no schooling and parity three who have no sons or one or three sons have probability 0.42 of progressing to parity four, compared to 0.36 for women who have two sons. Thus they have a 16% higher probability than do women who have two boys and a girl (relative risk of 1.16 shown in the last column). Similarly women of parity two who have at least one son have an estimated probability of .54 of having a third child, while those with no sons have a 16% higher probability, 0.62.

The pattern differs somewhat in the MHSS. The effect of having two sons and one daughter is somewhat larger, so that those who do not have two sons have a 38% higher risk of a fourth child. Progression from parity two to parity three is so high that the effect of having no sons, while significant, raises the risk of having a third child by only 7%.

Panel B has the same calculations for women who have high levels of schooling. The predicted parity progressions are all much lower, reflecting the education effect on fertility. However, the relative risks representing the sibling composition effects are all higher.

We conclude that fertility in Bangladesh can be understood better when the preference for sex distribution of the sibling set is taken into account. The prevailing pattern in Bangladesh is to consider the same number of sons and daughters as ideal. It is when an odd number of children is considered ideal that the preference for sons emerges—with a strong tendency to prefer two sons and a daughter.

These ideals translate to observed fertility patterns. Parity progression from 3 to 4 is lowest for those with two sons and a daughter, and parity progression from 2 to 3 is highest for those with two sons. The effects of sibling composition seem especially high when fertility is already quite low. We conclude that during the 1990s, desire for at least one child of each sex, especially boys, and a preference for two boys and a girl may have inhibited the fall in fertility in Bangladesh.

Part of the stall may, then, be attributable to these preferences. If fertility is to fall to replacement level in Bangladesh, the differential valuing of girls must decline further. Only if families accept daughters in place of the sons earlier generations considered ideal can fertility decline to replacement level.

This first exploration of the effects of sibling composition is a crude one, in that by studying progression among women of different ages, it lumps together the different time periods in which the particular parity was reached, perhaps under quite different family planning patterns. Further work will consider improved models. It will also consider other countries to see whether there is evidence of complex fertility preferences that may be affecting fertility change.

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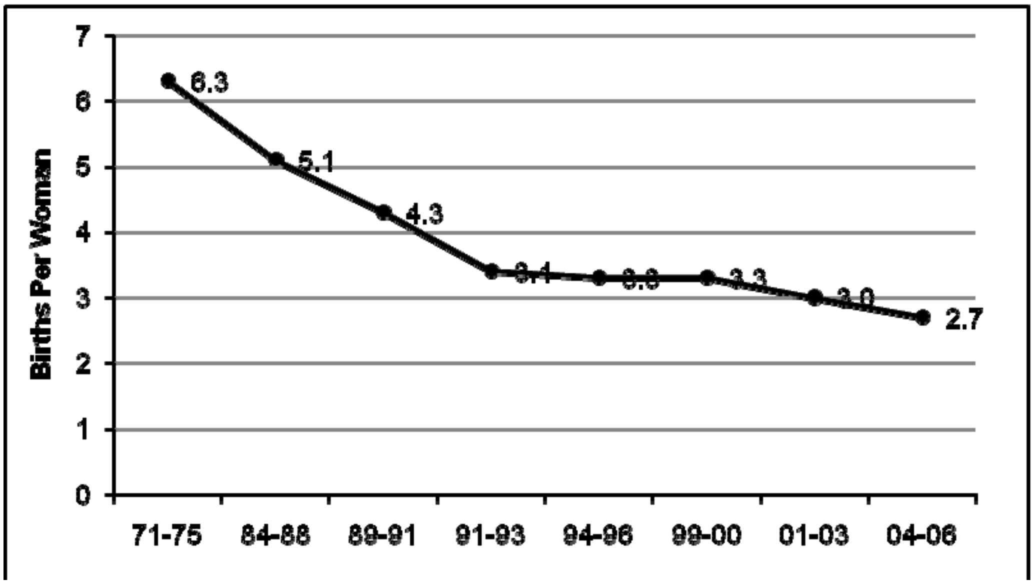
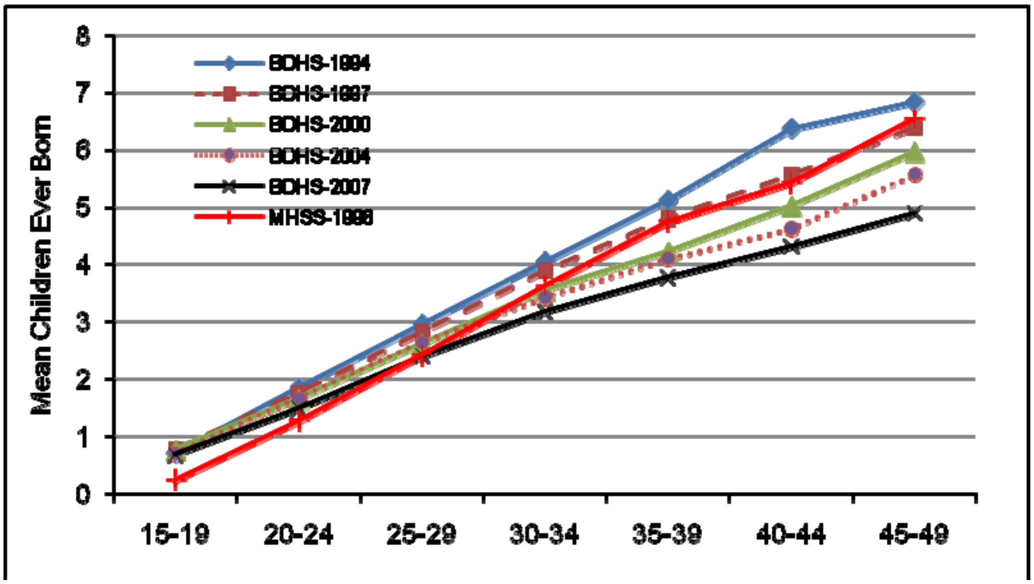
Figure 1: Total Fertility Rate, Bangladesh 1971–2006



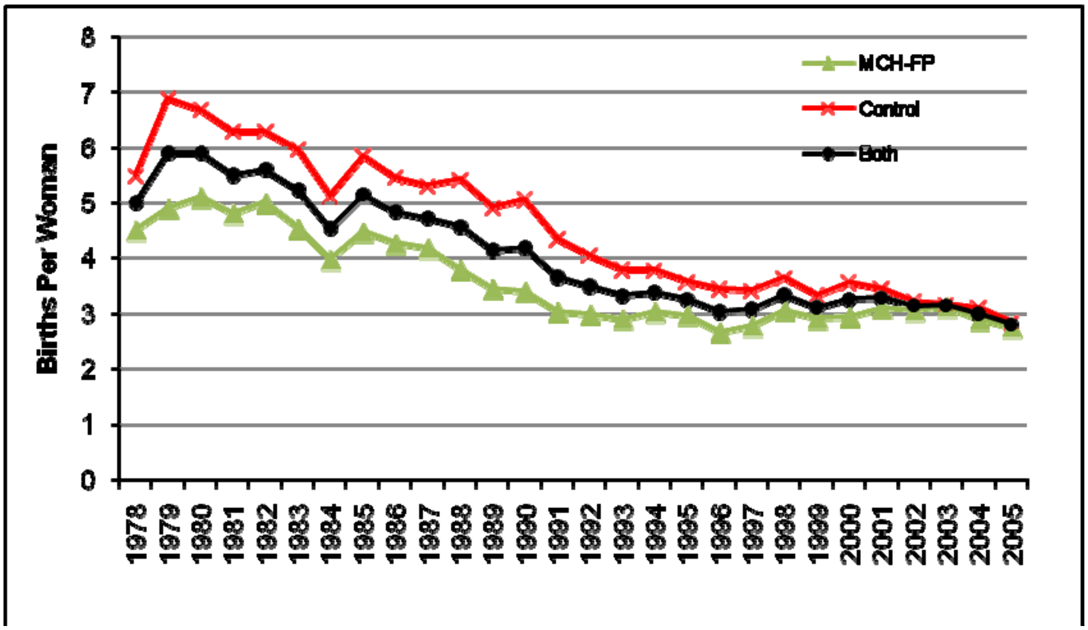
Sources: BDHS (NIPORT et al., 2007)

Figure 2: Mean Children Ever Born to Ever-Married Women by Age, Bangladesh, 1994–2007



Sources: 1994, 1997, 2000, 2004, 2007 BHDS; 1996 MHSS

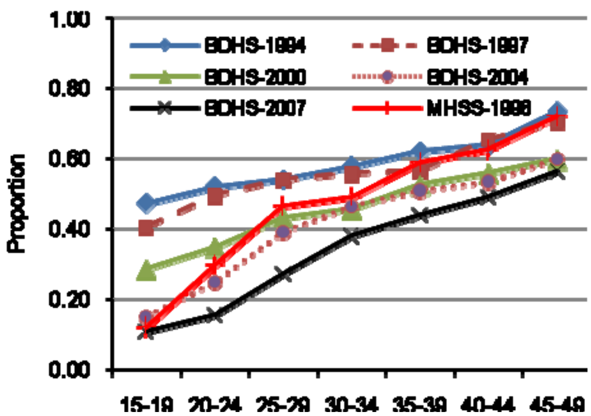
Figure 3. Total Fertility Rate, Matlab 1986–2005



Source: The Matlab Demographic Workbook, http://www.icddrb.org/activity/index.jsp?activityObjectID=2878

Figure 4. Years of Schooling of Ever-Married Women by Age
Bangladesh, 1994–2007

4A. Proportion with No Schooling



4B. Proportion with 5+ Years of Schooling

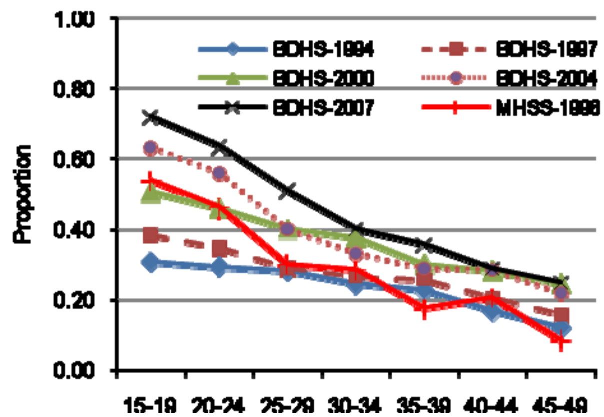


Figure 5. Proportion of Ever-Married Women Married Before Age 15 by Age

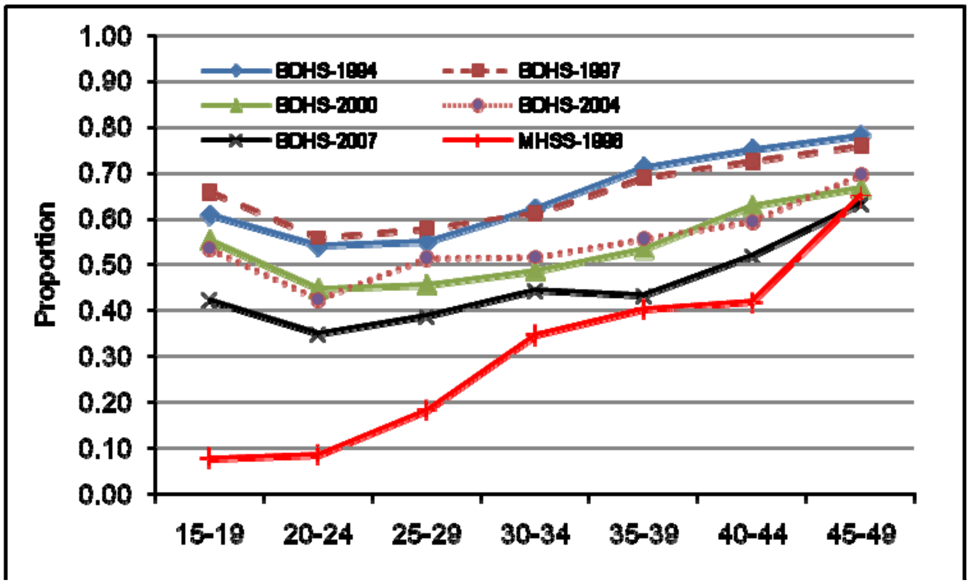


Figure 6. Proportion of Ever-Married Women Who Ever Used Contraception by Age Group

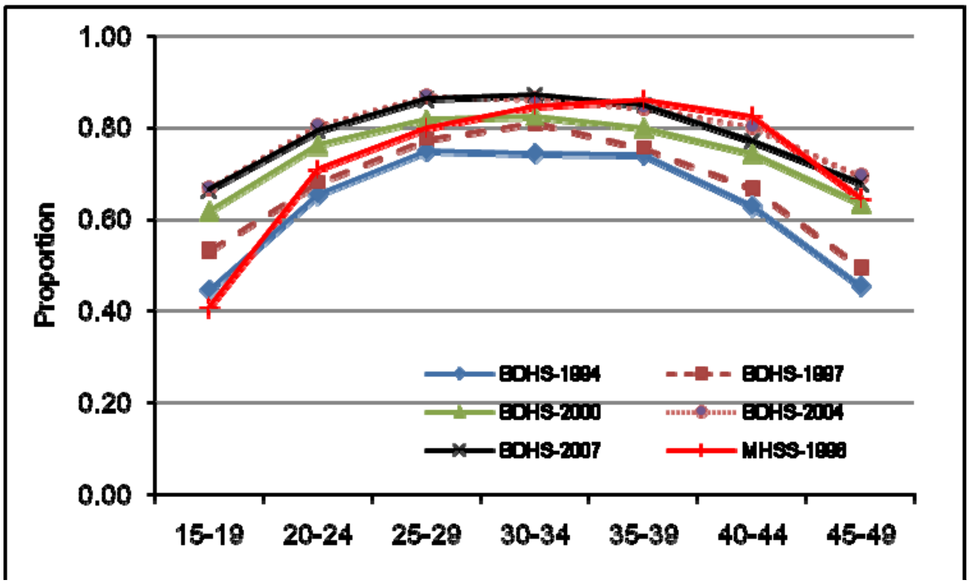


Table 1. Ideal Number of Sons and Daughters Reported by Ever-Married Women in

	Number of Women				Percent of Women			
	1996		2004		1996		2004	
Ideal Number	Sons	Daughters	Sons	Daughters	Sons	Daughters	Sons	Daughters
0	9	159	50	227	0.1%	1.9%	0.5%	2.5%
1	5377	7341	6334	7753	63.5%	86.6%	69.7%	85.3%
2	2892	932	2569	1089	34.1%	11.0%	28.2%	12.0%
3	155	25	119	23	1.8%	0.3%	1.3%	0.3%
4	24	5	15	2	0.3%	0.1%	0.2%	0.0%
5	4	2	6		0.0%	0.0%	0.1%	0.0%
6	2	1	0		0.0%	0.0%	0.0%	0.0%
7+	11	9	1		0.1%	0.1%	0.0%	0.0%
Total	8474	8474	9094	9094	100%	100%	100%	100%
Mean	1.41	1.11	1.31	1.1				

Table 2. Ideal Number of Children and Ideal Number of Daughters, for Ever-married Women aged 15–49 Who Gave a Numeric Response >0, Bangladesh Demographic and Health Survey, 1996 and 2004

Ideal Number of Children	Women		By Ideal Number of Children, Percent Giving Ideal Number of Daughters as					
	Number	Percent	0	1	2	3	4+	Total
	Panel A: Bangladesh Demographic and Health Survey 1994							
1	80	0.9%	95.0%	5.0%	0	0	0	100.0%
2	5278	62.3%	1.5%	98.4%	0.1%	0	0	100.0%
3	2132	25.2%	0.2%	95.0%	4.7%	0	0	100.0%
4	878	10.4%	0.1%	11.5%	88.4%	0	0	100.0%
5	54	0.6%	0	14.8%	64.8%	18.5%	1.9%	100.0%
6+	52	0.6%	0	11.5%	28.8%	28.8%	30.8%	100.0%
Total	8474	100.0%						
	Panel B: Bangladesh Health and Demographic Survey 2004							
1	185	2.0%	80.5%	19.5%	0	0	0	100.0%
2	6081	67.0%	1.1%	98.7%	0.2%	0	0	100.0%
3	1831	20.2%	0.5%	89.9%	9.6%	0	0	100.0%
4	914	10.1%	0.0%	6.8%	92.5%	0.8%	0	100.0%
5	64	0.7%	1.6%	10.9%	67.2%	17.2%	3.1%	100.0%
6	0							
7	1	0.0%	100.0%	0	0	0	0	100.0%
Total	9076	100.0%						

Table 3: Proportion of Ever-Married Women with Two or More Children, by Age, Bangladesh, 1994–2007

	15-19	20-24	25-29	30-34	35-39	40-44	45-49
BDHS-1994	0.13	0.59	0.84	0.91	0.95	0.97	0.98
1997	0.14	0.58	0.81	0.92	0.94	0.95	0.97
2000	0.14	0.54	0.80	0.89	0.92	0.94	0.95
2004	0.12	0.52	0.82	0.90	0.93	0.94	0.96
2007	0.10	0.45	0.77	0.88	0.91	0.94	0.94
MHSS-1996	0.01	0.36	0.79	0.94	0.97	0.96	0.97

Table 4: Proportion of Ever-Married Women with Three or Fewer or Children Bangladesh 1994–2007

	15-19	20-24	25-29	30-34	35-39	40-44	45-49
BDHS-1994	1.00	0.92	0.67	0.41	0.24	0.13	0.10
1997	1.00	0.94	0.70	0.44	0.31	0.21	0.13
2000	1.00	0.96	0.77	0.54	0.38	0.28	0.16
2004	1.00	0.96	0.77	0.56	0.42	0.34	0.21
2007	1.00	0.97	0.81	0.63	0.49	0.37	0.29
MHSS-1996	1.00	0.98	0.83	0.50	0.22	0.16	0.09

Table 5. Relative Odds of Progressing From Parity three to Parity four

Variable	Bangladesh Demographic Survey (BDHS)					MHSS
	1994	1997	2000	2004	2007	1996
Age (ref. 30–34)						
20–24	0.10***	0.09***	0.08***	0.10***	0.12***	0.07***
25–29	0.38***	0.37***	0.35***	0.39***	0.44***	0.27***
35–39	2.24***	1.75***	1.97***	1.85***	1.86***	3.980***
40–44	4.70***	2.94***	3.10***	2.37***	2.83***	7.16***
Age at Marriage (ref. >19)						
<15	4.01***	3.67***	4.32***	5.19***	3.67***	2.62***
15–19	2.14**	1.89**	2.64***	3.13***	2.48***	2.20**
Years of Schooling Completed (ref. 0 years)						
1–4	0.98	0.92	0.81*	0.99	0.91	1.06
5	0.79	0.77	0.63***	0.83	0.64***	
6–9	0.66**	0.51***	0.48***	0.58***	0.54***	
10+	0.25***	0.20***	0.21***	0.25***	0.37***	
5+						0.49***
Residence (ref. Urban for BDHS; MCH/FP area for MHSS)						
Rural	1.08	1.34**	1.25*	1.24**	1.11	
Comparison Area						2.63***
Administrative Division (ref. Dhaka)						
Chittagong	1.55***	1.40**	1.98***	1.97***	1.45***	
Sylhet		1.35*	2.27***	2.19***	2.05***	
Khulna	0.62***	0.57***	0.70**	0.69**	0.48***	
Rajshahi	0.79*	0.70***	1.01	0.64***	0.49***	
Barisal	0.95	1.06	1.09	1.30*	1.00	
Wealth Index (ref. Poor)						
Rich	0.88	0.98	0.84	0.60***	0.62***	
Religion (ref. Muslim)						
Hindu	0.59***	0.51***	0.56***	0.68***	0.68**	0.56*
Sibling Composition of the Three Children						
2 boys + 1 Girl	0.96	0.83*	0.78***	0.85*	0.86*	0.59**
Constant	1.22	1.13	0.72	0.58*	0.81	0.86
N	4736	4270	4557	4771	4275	2094
Log likelihood - original	–2855.86	–2644.6	–2949.21	–3150.06	-2856.08	–1258.45
Log likelihood - model	–2272.05	–2161	–2380.8	–2618.06	-2395.94	–953.46
Pseudo R^2	0.20	0.18	0.19	0.17	0.16	0.24
DF model	18	19	19	19	19	11

* p<.05 ** p<.01 *** p<.001

Table 6. Relative Odds of Progressing From Parity two to Parity three

Variable	Bangladesh Demographic Survey (BDHS)					MHSS
	1994	1997	2000	2004	2007	1996
Age (ref. 30–34)						
20–24	0.09***	0.09***	0.08***	0.13***	0.11***	0.05***
25–29	0.34***	0.38***	0.34***	0.41***	0.45***	0.19***
35–39	1.82***	2.03***	1.53***	1.71***	1.96***	2.10*
40–44	3.07***	3.64***	2.45***	3.06***	2.54***	3.47***
Age at Marriage (ref. >19)						
<15	6.54***	8.53***	6.89***	5.35***	6.74***	3.99***
15–19	3.08***	3.96***	3.17***	3.02***	3.60***	4.34***
Years of Schooling Completed (ref. 0 years)						
1–4	1.02	0.85	0.98	0.80**	0.89	0.80
5	0.81	0.71**	0.73**	0.68***	0.77*	
6–9	0.66***	0.64***	0.56***	0.50***	0.50***	
10+	0.26***	0.28***	0.22***	0.19***	0.35***	
5+						0.36**
Residence (ref. Urban for BDHS; MCH/FP area for MHSS)						
Rural	1.41***	1.18	1.31***	1.16*	1.14	
Comparison Area						2.08**
Administrative Division (ref. Dhaka)						
Chittagong	1.40***	1.88***	1.91***	1.88***	1.66***	
Sylhet		1.81***	1.93***	2.03***	2.74***	
Khulna	0.63***	0.69**	0.66***	0.68***	0.46***	
Rajshahi	0.78**	0.78**	0.80*	0.71***	0.65***	
Barisal	1.00	1.26	1.07	1.14	0.87	
Wealth Index (ref. Poor)						
Rich	0.90	0.83*	0.80**	0.79**	0.74***	
Religion (ref. Muslim)						
Hindu	0.74**	0.69***	0.72***	0.62***	0.60***	0.94
Sibling Composition of the Two Children						
No son	1.17	1.43***	1.44***	1.37***	1.50***	1.87**
Constant	1.49	0.94	1.16	1.19	0.85	5.72***
N	6216	5746	6432	6875	6539	2576
Log likelihood – original	–3411.8	–3273.85	–3881.71	–4234.26	-4218.19	–1373.97
Log likelihood – model	–2628.33	–2528.2	–2921.38	–3313.55	-3236.05	– 989.38
Pseudo-R^2	0.23	0.23	0.25	0.22	0.23	0.28
DF model	18	19	19	19	19	11

* p<.05   ** p<.01   *** p<.001

Table 7. Estimated Probabilities of Parity Progression

Parity	Sibling Composition	Predicted Parity Progression	Relative Risk (A1/A2 or B2/B1)
Panel A: Years of Schooling = 0			
Bangladesh Demographic and Health Survey 2000			
3 to 4	A1: 0,1,3 sons	**0.42**	**1.16**
	A2: 2 sons	**0.36**	
2 to 3	B1: 1,2 sons	**0.54**	
	B2: No sons	**0.62**	**1.16**
Matlab Health and Socioeconomic Survey 1996			
3 to 4	A1: 0,1,3 sons	**0.46**	**1.38**
	A2: 2 sons	**0.34**	
2 to 3	B1: 1,2 sons	**0.85**	
	B2: No sons	**0.91**	**1.07**
Panel B: Years of Schooling = Highest (10+ for BDHS, 5+ for MHSS)			
Bangladesh Demographic and Health Survey 2000			
3 to 4	A1: 0,1,3 sons	**0.13**	**1.24**
	A2: 2 sons	**0.10**	
2 to 3	B1: 1,2 sons	**0.20**	
	B2: No sons	**0.27**	**1.32**
Matlab Health and Socioeconomic Survey 1996			
3 to 4	A1: 0,1,3 sons	**0.30**	**1.50**
	A2: 2 sons	**0.20**	
2 to 3	B1: 1,2 sons	**0.67**	
	B2: No sons	**0.79**	**1.18**