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Trends and Determinants of Adolescent Childbearing in Bangladesh

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Abstract

Using four sets of Bangladesh Demographic and Health Survey data collected during 1993/94, 1996/97, 1999/00, and 2004, the paper examines the trends and determinants of adolescent childbearing in Bangladesh, and identifies area-level variation in explaining differentials in adolescent first birth. Discrete-time multilevel hazard modeling is used to estimate the hazard of first birth before age 20 after controlling the effects of other individual and household factors. The results suggest that the overall probability of first birth before age 20 among Bangladeshi women remained static or even increased slightly over time. There was a significant area level variation in teenage first birth in 1993/94 and 1996/97. However, over time the effect of area is decreasing. At the individual level, women's education, especially higher education, has the strongest effect in delaying first birth during adolescence. Age at marriage has a strong association with age at first birth: a one-year increase in age at marriage decreases the chance of teenage first birth by 10% or more. Frequent media exposure has a significant delaying effect, and the effect is more distinct in the most recent year. These findings reinforce our understanding that the government should continue its efforts to promote female education, especially higher education. Policies should also be directed to delay age at marriage, which may in turn delay the timing of first birth.

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1. Introduction

Because of its far-reaching individual and social consequences, adolescent childbearing remains a major concern for developed and developing nations alike. While the social consequences of adolescent childbearing depend on specific cultural, familial, and community settings, its physical or health-related consequences at the individual level are more problematic (Buvinic and Kurz, 1998; Acsadi and Johnson-Acsadi, 1986). Evidence suggests that due to their physiological immaturity, teenage mothers have an increased risk of premature labor and complications during and after delivery, leading to high morbidity and mortality for themselves, and their children are more likely to be low birth weight and to die before the age of one (Senderowitz, 1995). Early childbearing also denies young women the opportunity to pursue their education, which is detrimental to their future prospects and which often reduces their status in society. It has been estimated that population growth is more rapid when women have their first child in their teen years (Singh, 1998; Mazur, 1997; Senderowitz and Paxman, 1985) as early initiation into childbearing lengthens the reproductive period and subsequently increases individual lifetime fertility rates. Finally, early initiation of childbearing is also a major determinant of large family size and rapid population growth, particularly in countries where contraception is not widely practiced (Islam, 1999).

Due to early marriage, low contraceptive use, and the social expectation to have children soon after marriage, childbearing begins early in Bangladesh. Although the average age at marriage for females has been rising intermittently since the 1960s (United Nations, 2000; Xenos and Gultiano, 1992), the median age at which Bangladeshi women marry is low compared to other developing countries. There has also been a substantial decrease in the total fertility rate in the last four decades, but most of the decrease was observed among the older cohorts (age 25 and above), not the younger group, and without any substantial increase in the age of first birth.

According to the most recent Bangladesh Demographic and Health Survey (NIPORT, Mitra and Associates, and ORC Macro, 2005), about half of women age 15-19 are married, and 68% of women age 20-24 got married before reaching age 18, which is the legal age for marriage for women in Bangladesh. One third of adolescents age 15-19 have begun childbearing; of these adolescents, 28% have given birth and another 5% are pregnant with their first child.

One of the recent trends in fertility research is to examine macro effect on fertility to detect the amount of context contribution and its effect -- direct and indirect, additive and interactive -- in the total variation of individual behavior, and to identify which macro-characteristics are mainly responsible for the contextual effect (Zaccarin and Rivellini, 2002). While there have been attempts to examine the levels, trends and determinants of fertility in Bangladesh, relatively little is known about the trends, and determinants of adolescent childbearing. Fewer attempts have been made to understand the effect of community in explaining differentials in contraception and fertility (Kamal et al., 1999; Amin et al., 1996), but not adolescent first birth.

This understanding is important given the fact that the Bangladesh's adolescent fertility rate is one of the highest in the world, and consistent high adolescent fertility is one of the main reasons for the slow fertility decline in recent years (NIPORT, Mitra and Associates, and ORC Macro, 2005). Therefore, to achieve replacement level fertility by 2010, there is a need to understand the reasons behind early childbearing and identify programmatic and non-programmatic factors that can potentially delay timing of first birth and thus, decrease adolescent childbearing.

With this backdrop, the primary objective of this paper is to examine the trends and determinants of adolescent childbearing in Bangladesh, and more specifically, to identify area-level effects in explaining differentials in adolescent first birth. Using data from four successive Bangladesh Demographic and Health Surveys conducted in 1993/94, 1996/97, 1999/00, and 2004, the paper presents a descriptive analysis of key individual, household, and community variables that are included in the analysis, and their relationships to adolescent childbearing. Then, the life table approach is used to calculate the probability of first birth before age 20 by these characteristics. Finally, discrete-time multilevel hazard modeling is used to estimate the hazard of timing of first birth in teen years after controlling the effects of other individual, household, and community-level factors.

2. Background

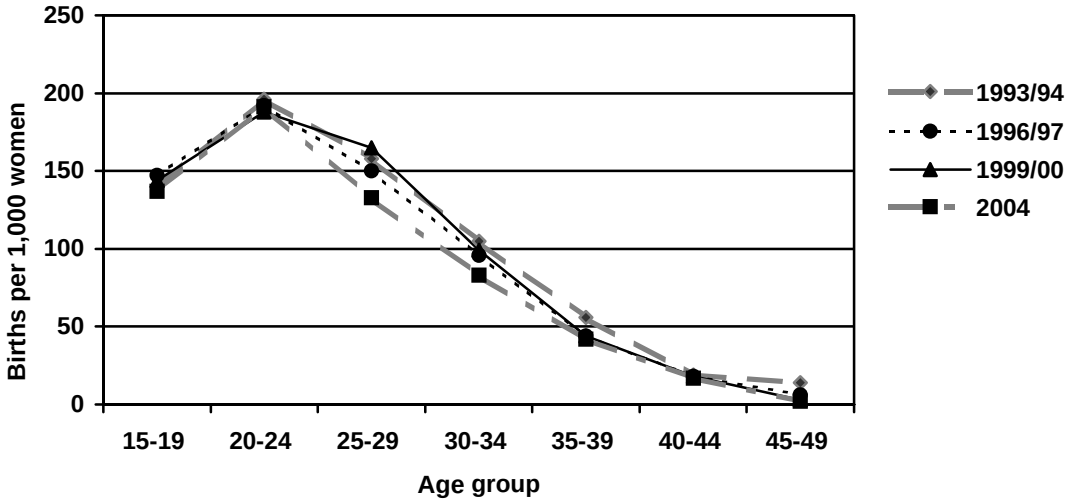
2.1 The fertility transition in Bangladesh

Bangladesh has experienced a rapid fertility decline over the last few decades, dropping from an average of 6.3 children per woman in 1975 to 3.3 children per woman in 1993/94 (NIPORT, Mitra and Associates, and ORC Macro, 2005). No country has achieved this level of fertility drop-off, with an infant mortality rate of 82 per 1,000 live births and a life expectancy at birth of 58 years, in the same time period. After the rapid decline, the level of fertility remained unchanged until 2000, a phenomenon called "plateauing of fertility," and then started to decline slowly again, beginning in 2004 (NIPORT, Mitra and Associates, and ORC Macro, 2005). In addition to other reasons, consistent high adolescent fertility is cited as one of the major factors for slow fertility decline in recent years (NIPORT, Mitra and Associates, and ORC Macro, 2005).

2.2 Characteristics and fertility trends of the Bangladeshi adolescent population

During the sharp decline in fertility from 1975 to 1990, most of the decrease was observed among women 20 years and older as compared to women in their teen years. This made teenage fertility in Bangladesh among the highest in South Asian countries and made it comparable to some sub-Saharan African countries (Singh, 1998). Even though a large decline in the age-specific fertility rate for women age 15-19 was observed during the 1970s through the 1990s–from a rate of 219 in the 1970s to 182 in the 1980s and 140 in the 1990s (Singh, 1998)–there was very little change during the 1990s (Figure 1). The proportion of births to teenage mothers has also been steadily rising: 20% of the total births were to teenagers in 1996/97 compared to 22% in 1999/00. However, all these findings need to be analyzed with the understanding that the country has been experiencing the "youth bulge" in recent years.

Figure 1: Age-specific fertility rates in Bangladesh, 1993-2004



(Source: Bangladesh Demographic and Health Surveys, 1993/94, 1996/97, 1999/00, and 2004)

In Bangladesh, about 23% of the total population is 10-19 years old (Rob and Bhuiya, 2001), the most commonly used age bracket for adolescents. The current size of this adolescent population is about 30 million, 48% of whom are female (Barakat, 2000). The size of the adolescent population is projected to rise to about 35 million by the year 2010. In terms of sheer numbers, these young people have tremendous demographic significance. Because of population momentum, even if there were to be a rapid decline in age-specific fertility rates among young people, the country's population would still not stabilize for at least 10 or 20 more years.

There are four plausible explanations for high age-specific fertility among adolescents: early age at marriage; early first birth; low contraceptive use among teenagers, and short birth interval, especially between the first and the second birth. Even though there has been significant improvement in the level of female education and urban employment opportunities for young females in recent years, their effects on delaying age at marriage or age at first birth are not visible (NIPORT, Mitra and Associates, and ORC Macro, 2005). Given the potential impact age at marriage and age at first birth can have on lowering fertility among adolescents, the

government of Bangladesh has emphasized delaying age at first marriage and age at first pregnancy in its current five-year plan. However, to date, there is a lack of clear understanding about the factors that affect adolescent fertility in general, and adolescent first birth in particular. The next section briefly summarizes available knowledge on the determinants of adolescent childbearing in Bangladeshi context.

2.3 Determinants of adolescent childbearing

Factors influencing fertility can be classified into two groups: (1) proximate variables and (2) "background" variables (Bongaarts, 1982). While the proximate variables consist of biological and behavioral factors, which have direct influence on fertility, the background variables comprised of socioeconomic and environmental factors, which affects fertility only indirectly by modifying the proximate variables. Although Davis and Blake (1956) were the first to identify a set of 11 proximate determinants, Bongaarts (1978) reclassified this list into eight variables – proportions married, contraception, induced abortion, lactational infecundability, frequency of intercourse, sterility, spontaneous intrauterine mortality, and duration of fertile period. The present paper is focused on the effect of background variables, not the proximate determinants. Thus, the following review is limited to individual, economic, and cultural factors, which are known to affect fertility behavior in general and adolescent fertility in particular.

One of the most consistent findings of analyses of fertility behavior in developing countries is a strong correlation between the level of women's education and fertility behavior. Schooling of women, which is often considered an indicator of socio-economic development, is found to be associated with delayed marriage, increased contraceptive use, decreased family size, and reduced infant mortality. Yet, the effect of schooling on adolescent childbearing is not straightforward. Even though there is evidence that higher levels of education are associated with lower probability of giving birth during adolescence in Bangladesh (Islam, 1999) and elsewhere (Gupta and Leite, 1999), teenage girls may discontinue schooling after getting married and/or getting pregnant. Similarly, they can postpone marriage and delay childbearing in order to complete schooling.

Another socio-economic factor that is thought to be associated with women's fertility behavior is women's place of residence (Schultz, 1981). As hypothesized by Singh (1998), young girls living in urban areas may have greater motivation to attain higher education and to work for wages, as well as a greater availability of work opportunities, and thus, are less likely to have teenage pregnancy compared to their rural counterparts. Limited analyses from Bangladesh support this hypothesis and suggest that early childbearing among teenagers is less common among urban residents than rural residents (NIPORT, Mitra and Associates, and ORC Macro, 2005).

The effect of income or economic status on fertility behavior is harder to predict than that of women's education or place of residence (Dreze and Murthi, 2001). The literature has argued that the effect of income depends on whether children are considered as an economic burden or valued as a productive asset. However, this argument may not be applicable to the timing of teenage birth as the effect of economic status may be different for the first birth compared to overall fertility status.

Mass media plays an important role in disseminating information and bringing social changes with respect to attitude towards fertility behavior. A recent analysis of DHS data from Northeast Brazil supported this assumption and found that access to media is the most important predictor of fertility among women age 20-30 years (Gupta and Leite, 1999).

Differential fertility behaviors have been reported among different religious and cultural groups throughout the world. In particular, studies conducted in North America suggested that Catholics have higher fertility rates compared to other religious groups (Gupta and Leite, 1999). Similarly, higher fertility rates were reported among Indian Muslims compared to other religious groups (Dreze and Murthi, 2001). Yet, religious affiliation as a determinant of teenage fertility needs to be examined.

Very little has been done to examine the effect of contextual factors in explaining fertility among Bangladeshi women. Amin et al. (1996) found district-level aggregate measures of literacy and religiosity as important explanatory factors for variations in the use of modern

contraceptives between areas. They found that the between-cluster[3] variation in contraceptive use was higher than the between-district variation. Another study conducted by Kamal et al. (1999) examined the effects of *bari*[4] and cluster level variables in explaining contraceptive use among ever married women. Thus, to the best of our knowledge to date, no study has focused on the effects of contextual factors in explaining adolescent fertility in general, and adolescent childbearing in particular.

3. Data and Methods

3.1 Data source

The paper is based on data from four BDHS, conducted in 1993/94, 1996/97, 1999/00, and 2004. The BDHS was not specifically designed to examine adolescent fertility; nevertheless, each of these surveys collected information on nationally representative samples of about 10,000 ever married women age 10-49 years, of which a sizable proportion was less than 24 years of age (Table 1).

Table 1: Total number and percentage of ever married women sample[5], by age groups, BDHS 1993-2004

Age group	1993/94		1996/97		1999/00		2004	
	N	%	N	%	N	%	N	%
15-19	1,268	13.2	1,272	13.9	1,451	13.8	1,563	13.7
20-24	2,038	21.1	1,716	18.9	1,910	18.1	2,202	19.2
10-49	9,640	100.0	9,127	100.0	10,544	100.0	11,440	100.0

3.2 Methodology

Adolescent childbearing can be measured by two means: (1) the age-specific fertility rate of women age 15-19 years, and (2) the proportion of women who have had a child by a given adolescent age, for example, by age 15, 17, or 19, based on responses from teenagers age 15-19

[3] Clusters are primary sampling units (PSU) defined by the National Census of 1981, and correspond approximately to villages in rural areas.
[4] *Bari* is the dwelling unit and a patrilineal family home in rural Bangladesh and is comprised of one or more huts.
[5] Unweighted sample

and 20-24 years who have completed their teenage years. The first measure describes the current incidence of childbearing in the three years prior to the survey for ever married women age 15-19. However, it does not present the complete fertility experience of this cohort, as they have not completed their adolescent years. On the other hand, the latter measure presents the complete experience up to age 19 for those age 20-24 years, and additional information from the 15-19 years age cohort, and has the advantage of describing more exactly the timing of childbearing. In this paper, we use the latter measure to examine the trends in adolescent childbearing. We use life-table analysis to calculate the cumulative probability of giving first birth before age 20, and to compare the trend over time. Since the primary interest of this paper is fertility behavior of the youngest cohorts (that is, fertility close to the survey date), we focus on female respondents age 15-24 years at the time of the survey. However, we use the women's sample from all sampled households to create area-level mean years of schooling for women age 10-49 years, which we used as a proxy measure for area-level development.

We use discrete-time multilevel hazard models to analyze the determinants of adolescent childbearing (first birth before age 20). We hypothesize that individuals living in the same area may share some unobserved characteristics and thus do not adhere to the standard assumptions that the observations are independent. Similarly, smaller geographic units within regions may have other commonalities (Kradval, 2001) and fertility behavior may be embedded in certain community characteristics and thus, a multilevel analysis is more appropriate as used by others in similar situations (Callens and Croux, 2005; Barber et al., 2000). We use the hierarchical generalized linear model (HGLM) to handle the discrete-time variable.

We transformed women's data into a person-year file where individuals contribute the number of person-years they lived before having a first birth before age 20 or before the end of the survey period if no birth is reported during the specified period. The event variable is dichotomous (yes=1, no=0), indicating whether each woman had the event (the first birth) during the observation period (before age 20) or not. We used HLM 6.0 as the statistical package for the multilevel analysis (Raudenbush et al., 2004). For the rest of the analysis, SPSS version 15 was used.

3.3 Variables

Dependent variable: time to first birth before age 20 in completed years. Beginning of exposure to first birth was measured from date of mother's birth; therefore, the dependent variable represents age at first birth for the respondents who have given first birth before age 20. For those who have not given birth and were 19 years or younger on the date of the interview, the variable represents respondent's age on the date of the interview. However, if a respondent was more than 20 years old at the time of the interview and did not give birth by age 20, the time contributed by this woman is 20 years.

Independent variables: independent variables are included at two different levels. Level 1 represents individual respondents, whereas level 2 represents geographic units. For the purpose of this paper, we have created geographic units using two different variables: region and type of area. Region represents six administrative divisions -- Barisal, Chittagong, Dhaka, Khulna, Rajshahi and Sylhet. Area includes four divisions: large metropolitan city, small city, town, and countryside[6]. When these two variables are combined, there are 24 geographic units in the analysis. As shown in Table 2, for certain geographic units there were no samples in a particular survey. In addition, during the 1993-94 survey there were five administrative divisions instead of six and Sylhet was included under the Chittagong division.

We have included eight independent variables at level 1: woman's religion, media exposure, age at first marriage, woman's school attainment, her husband's school attainment, age difference between them, household headship, and household wealth index. At level 2 (area level) we have only one variable, which is mean years of schooling of women age 10-49 residing in the area.

a. Woman's religion: coded as Muslim and others (Hindus, Christians and others)
b. Frequent media exposure: measured by asking respondents whether they watched television. If the answer was yes, then they were asked about the frequency of watching television. The respondents who watched television at least once in a week are considered

[6] While large city, smaller city, and town are considered urban, the countryside is rural.

as having frequent media exposure, as compared to those who had either watched television less than once a week or never watched it and are considered as having non-frequent media exposure.

c. Age at first marriage[7]: recorded as completed years.

d. Woman's school attainment: recorded as years of schooling completed. The variable has five categories: no schooling (which includes never been to school and no year of schooling completed), primary incomplete (0-4 years of schooling completed), primary completed (5 years of schooling completed), secondary incomplete (6-9 years of schooling completed), secondary completed (10 years of schooling completed), and higher (11 and more years of schooling completed).

e. Husband's school attainment: recorded as years of schooling completed. The variable has five categories: no schooling (which includes never been to school and no year of schooling completed), primary incomplete (0-4 years of schooling completed), primary completed (5 years of schooling completed), secondary incomplete (6-9 years of schooling completed), secondary completed (10 years of schooling completed), and higher (11 and more years of schooling completed).

f. Difference between husband's and wife's age: calculated from the woman's current age and her husband's current age, and coded in completed years.

g. Household headship: whether a household was headed by the respondent herself or her husband or by any other member in the household, including mother-in-law, father-in-law, mother or father of the respondent, or any other member in the family.

h. Household wealth index: a composite variable, created by using household ownership of assets and use of selected services[8]. The variable is presented as quintiles.

[7] In Bangladesh, it is common for a woman to wait several months or even years after formal marriage before going to live with her husband. Since the researchers who designed the BDHS were interested in marriage mainly as it affects exposure to the risk of pregnancy, interviewers were instructed to ask the questions about marriage not in the sense of formal marriage, but as cohabitation.

[8] The index is created by using information on household ownership of a number of consumer items, ranging from a television to a bicycle, as well as dwelling characteristics, such as source of drinking water, sanitation facilities, and types of materials used for flooring. The index used in this analysis was constructed and provided by DHS, Macro International. The index used here was developed and tested in a large number of countries in relation to inequities in household, including the use of health services and health outcomes (Gwatkin et al., 2000) and is consistent with expenditure and income measures (Rutstein, 1999).

i. Mean years of schooling of women age 10-49 years living in the area: this is the only variable at level 2. The variable is constructed using the level of school attainment of all women age 10-49 years living in the study area, and registered during the household census. Mean years of schooling completed by these women was calculated for each of 24 geographic units, and later used as a level 2 variable. This variable is used as a proxy measure for area-level development. It is hypothesized that if women are better educated in one area than another, the former area is more developed compared to the latter because education of women is often considered an indicator of socio-economic development.

4. Results

Table 2 presents descriptive statistics for samples included in the analysis. As shown in the table, the proportion of women giving first birth during teen years increased from the 1993/94 survey to the 1996/97 survey, then dropped slightly in 1999/00 and dropped further in 2004. More specifically, during the 10-year study period, the overall proportion of women who have given first birth decreased by 2.8%. During the same period, there has been significant improvement in frequent media exposure: in 1993/94 only 15.4% of women age 15-24 reported watching television at least once a week. The same figure increased to 50.8% in 2004.

There has been a major upward shift in the level of schooling completed by both women and their husbands during the study period. In 1993/94, only 24.4% of women age 15-24 had primary or more than primary education; the same figure increased to 54.3% in 2004. Similarly, in 1993/94, 33.2% of husbands had primary or more than primary education, the same figure increased to 47.2% in 2004. There is also an increase in the mean years of schooling, completed by women age 10-49 years living in the study area (not shown in Table 2). While the mean years of schooling for women age 10-49 years was 2.8 years in 1993/94, the corresponding figures for 1996/97, 1999/00, and 2004 are 3.2, 4.1, and 4.2 years, respectively. This rising level of women's education is consistent with the national evidence of increasing female school enrollment in recent years.

Table 2: Descriptive statistics, ever married women age 15-24, Bangladesh, 1993-2004

Variable	1993/94	1996/97	1999/00	2004
	%	%	%	%
First birth before 20	75.9	78.6	77.2	73.1
Muslim	90.3	92.2	89.4	91.8
Watch television weekly or more	15.4	25.1	35.3	50.8
Women's school attainment				
No schooling	56.4	51.8	39.3	23.7
Incomplete, primary	19.3	18.7	20.9	22.0
Complete, primary	9.9	11	11.6	10.2
Incomplete, secondary	11.2	13.8	21.9	37.1
Complete, secondary	1.7	2.2	3.0	2.5
More than secondary	1.6	2.4	3.2	4.6
Husband's school attainment				
No schooling	49.5	49.2	46.2	34.4
Incomplete, primary	17.1	16.7	15.0	18.4
Complete, primary	8.2	9.1	8.9	10.9
Incomplete, secondary	15.3	14.3	16.6	23.7
Complete, secondary	3.7	4.3	4.7	3.4
More than secondary	6.0	6.3	8.6	9.2
Age difference between spouse				
0 to 4 years	-	8.0	8.4	10.2
5 to 9 years	-	45.9	42.0	43.5
10 years or more	-	46.1	49.6	46.3
Households headed by women or their husbands	84.3	84.2	81.2	61.6
Divisions				
Barisal	5.8	6.2	6.2	5.8
Chittagong	21.9	17.1	16.3	17.6
Dhaka	32.8	31.0	30.1	30.3
Khulna	11.7	11.8	12.5	12.9
Rajshahi	27.8	29.3	30.1	26.9
Sylhet	-	4.6	4.8	6.4
Type of area				
Metropolitan city	5.5	5.8	4.5	3.5
Smaller city	1.1	0.7	0.8	3.3
Town	4.5	3.9	11.7	13.9
Countryside	88.9	89.7	83.0	79.3
Age at first marriage				
10 to 12 years	21.2	26.5	10.6	8.0
13 to 15 years	54.8	52.5	61.4	62.2
16 to 17 years	15.2	12.9	18.0	21.0
18 to 19 years	6.4	5.5	7.4	8.3
20 years or more	2.4	2.6	2.5	0.5
N[9]	2,278	2,075	2,275	3,171

[9] Weighted

Table 3: Probability of having a first birth before age 20 by selected characteristics[10], among ever married women, Bangladesh, 1993-2004

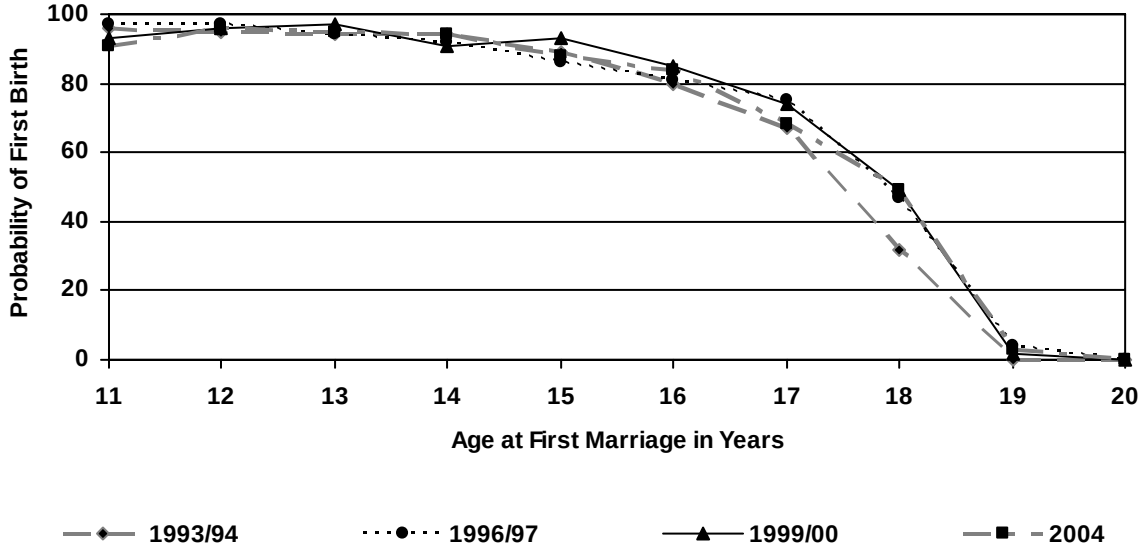
Characteristics		1993/94	1996/97	1999/00	2004
		%	%	%	%
Overall		82.2	84.5	83.4	82.9
Religion	Muslim	83.1	84.4	84.2	83.4
	Other	73.7	85.0	76.9	78.2
Watch television weekly	Yes	84.5	86.8	87.3	85.0
	No	70.2	77.6	76.1	80.9
Woman's school attainment	No schooling	85.4	88.0	89.8	89.6
	Primary, incomplete	86.3	89.2	86.9	87.6
	Primary, complete	80.6	84.3	81.8	86.2
	Secondary, incomplete	71.4	80.4	81.5	81.7
	Secondary, complete	55.9	52.1	57.2	66.2
	Higher than secondary	39.9	35.7	30.3	43.5
Husband's school attainment	No schooling	85.0	88.6	89.2	88.7
	Primary, incomplete	85.5	89.0	86.1	87.5
	Primary, complete	84.2	83.5	87.8	82.9
	Secondary, incomplete	78.6	82.8	81.4	81.5
	Secondary, complete	89.4	62.2	66.0	73.7
	Higher than secondary	56.4	63.0	59.5	61.3
Age difference between spouse	0 to 4 years	-	72.4	70.8	66.6
	5 to 9 years	-	84.0	83.0	83.6
	10 years or more	-	87.1	85.8	85.7
Head of household	Woman or her partner	69.3	72.8	68.5	73.8
	Others	84.4	86.6	86.6	87.8
Wealth index	Lowest	84.8	88.3	87.8	87.8
	Second	89.1	91.3	88.0	87.5
	Middle	82.6	83.0	86.0	85.3
	Fourth	77.8	84.7	81.7	79.1
	Highest	70.6	70.0	65.5	73.4
Division	Barisal	85.3	85.5	84.2	81.4
	Chittagong	78.1	84.2	83.8	79.8
	Dhaka	82.5	82.4	81.3	83.7
	Khulna	82.9	87.4	83.6	86.0
	Rajshahi	84.2	87.2	85.5	84.9
	Sylhet	-	72.4	79.4	75.0
Type of area	Metropolitan city	65.9	66.0	69.5	85.8
	Smaller city	55.7	93.1	75.9	80.2
	Town	78.2	75.1	75.1	78.5
	Countryside	83.8	86.0	85.4	83.7
Age at marriage	13 years	94.3	93.9	96.8	95.1
	14 years	94.3	92.2	90.6	93.9
	15 years	89.4	86.0	93.0	87.9
	16 years	80.4	81.1	85.0	84.4
	17 years	66.8	75.1	73.5	68.0
	18 years	32.3	46.6	48.5	49.4

[10] Data shown relate to characteristics reported at the time of survey and are weighted using sample weight.

Table 3 presents the probability of having a first birth before age 20 by different individual, household, and geographic characteristics. As shown in the table, the overall probability of having a first birth before age 20 increased from 82.2% in 1993-94 to 84.5% in 1996/97, then decreased to 83.4% in 1990/00, and decreased slightly to 82.9% in 2004. That means that over the 10-year study period, the probability of having a first birth before age 20 did not change.

Muslim women have higher probability of having birth before age 20 compared to women from other religions; however, differentials in the level of fertility by religious affiliation have decreased over time. More specifically, the probability of teenage birth among Muslims has increased slightly from 1993 to 2004, whereas the same probability for other religious groups increased by 5% during the same period.

Figure 2: Probability of first birth before 20 by women's age at marriage, Bangladesh, 1993-2004



As expected, early marriage increases the chance of first birth before age 20 and the effect did not change during the 10-year study period (Figure 2). More than 90% of women who married at the age of 12, 13, 14 or 15 had their first birth before reaching age 20. On the other hand, only half of women who married after the legal age of marriage, which is 18 years, had their first birth before the age of 20.

As expected, there are acute differentials in the probability of having a first birth by women's educational status and their husbands' educational status. The effect is more pronounced for women's education compared to their husbands' education and the pattern is consistent for the data for all four years. Among the different categories of women's education, having more than secondary education has the highest effect on the probability of having a teenage first birth compared to other educational attainments.

Age difference between husbands and their wives seems to have a positive effect on delaying teenage birth. Women who are five years or less younger than their husbands are significantly less likely to experience first birth before age 20 compared to women with more than a five year age difference with their husbands. This may be because women who are closer in age to their husbands communicate well with their husbands about fertility decisions and can delay their pregnancy. Similarly, women living in households with their husbands or themselves as the head of household have a lower probability of teen birth compared to women who live in households with other people as the head of the household. This may be because in the former case, women and their partners can make fertility decisions on their own, rather than be influenced by others in the family about their fertility decisions.

Overall, household economic status has a positive effect on the probability of having a teenage first birth, with the lowest probability for women in the households with the highest wealth index. However, the effect on each level of economic status is not consistent over time. While there is a downward trend in the probability of first birth before age 20 among the residents of the Barisal division, the probability remained the same or increased for all other divisions during the 10-year study period. However, there is no particular pattern in first birth before age 20 by the type of area.

Tables 4, 5, and 6 present results from multilevel modeling. Table 4 presents information on the magnitude of variation among areas with regard to first birth among ever married women by estimating an unconditional model; that is, a model with no predictors at either level, often called ANOVA model, which produces point estimates for the grand mean as well as providing information on the variance at the individual and area levels (Raudenbush and Byrk, 2002). As shown in Table 4, the chi-square statistics for ANOVA models for different years are statistically

significant, suggesting the importance of area-level variation in the first birth among teenage women, and thus, multilevel analysis as an appropriate approach to use.

In order to get an idea of how much of variation in first birth before age 20 is attributable to the area-level factors, it is useful to see the intra-class correlation coefficient (ICC), which measures the proportion of variance of the dependent variable (timing of first birth before age 20) that is between areas, not within areas. For instance, the ICC value of .10 in 1993/94 means that 10.0% of the variance in adolescent birth occurs between areas, and that 90.0% of the variance in adolescent birth occurs at the individual level, i.e., within areas. As we can see in table 4, the proportion of the variance between areas is considerable (10%, 12%, 4%, and 3% in 1993/94, 1996/97, 1999/00, and 2004 respectively) for all years. The trend, however, is declining over time suggesting the variance due to area-level factor(s) is diminishing and the effect of individual-level factors is becoming more influential.

Table 4: ANOVA[11] model

Parameter	Timing of first birth before 20			
	1993/94	**1996/97**	**1999/00**	**2004**
Reliability				
Intercept, β0	0.97	0.96	0.96	0.94
Fixed Effects				
Intercept (γ00)	0.63	1.05	0.84	0.76
Standard Error	0.18	0.19	0.09	0.07
T-Ratio	3.50	5.58	9.03	11.16
Random Effects				
Individual-level, σ2	0.19	0.19	0.20	0.21
Area-level, τ00	0.47	0.54	0.13	0.10
Degree of freedom	14	15	15	21
Chi-Square	1,719.46	840.28	957.53	540.63
p-value	0.000	0.000	0.000	0.000
Intraclass correlation (ρ)	0.10	0.12	0.04	0.03

[11] For HLM, an individual woman's record is converted into a person-year file. Thus, the total number of weighted samples for 1993/94, 1996/97, 1999/00, and 2004 are as follows: 13,300; 10,925; 12,248; and 18,307, respectively. Number of geographic units is different for different years as some geographic units are not included in some particular year(s).

Table 5: Estimated coefficient, standard error, and hazard ratio of timing of first birth before 20 from multilevel discrete-time modeling (independent effect), for ever married women age 15-24, Bangladesh, 1993-2004

Variables	1993/94		1996/97		1999/00		2004	
	Coeff. (SE)	HR	Coeff. (SE)	HR	Coeff. (SE)	HR	Coeff. (SE)	HR
Grand mean	1.07(0.29)	2.92**	1.59(0.28)	4.92 ***	1.38 (0.11)	3.98 ***	1.08 (0.10)	2.94 ***
Women's mean education	-0.01 (0.18)	0.99	-0.07 (0.21)	0.94	-0.29 (0.10)	0.75 **	-0.11 (0.11)	0.89
Time of exposure (in years)	-0.76 (0.02)	0.47 ***	-0.83 (0.02)	0.44 ***	-0.75 (0.02)	0.47 ***	-0.61 (0.01)	0.54 ***
Muslim	-0.26 (0.07)	0.77 ***	-0.15 (0.10)	0.86	0.00 (0.06)	1.00	-0.05 (0.04)	0.95
Weekly media exposure	0.04 (0.06)	1.04	-0.11 (0.07)	0.89	-0.08 (0.05)	0.92	-0.17 (0.03)	0.85 ***
Age at marriage (in years)	-0.23 (0.01)	0.80 ***	-0.08 (0.01)	0.92 ***	-0.21 (0.01)	0.81 ***	-0.06 (0.01)	0.94 ***
Spousal age difference (5+ years)	NA	NA	-0.47 (0.09)	0.62 ***	0.35 (0.07)	1.42 ***	0.58 (0.04)	1.78 ***
Woman's school attainment								
No schooling (reference)	- -	1.00	- -	1.00	- -	1.00	- -	1.00
Primary incomplete	-0.03 (0.08)	0.97	-0.45 (0.09)	0.64 ***	-0.49 (0.06)	0.61 ***	-0.17 (0.05)	0.84 ***
Primary complete	-0.17 (0.09)	0.84	0.08 (0.09)	1.09	-0.18 (0.07)	0.83 **	-0.18 (0.06)	0.84 **
Secondary incomplete	-0.13 (0.08)	0.88	-0.11 (0.09)	0.90	-0.24 (0.07)	0.79 ***	-0.40 (0.04)	0.67 ***
Secondary complete	0.56 (0.14)	1.75 ***	-0.07 (0.13)	0.93	0.08 (0.10)	1.08	-0.23 (0.07)	0.79 **
Higher	0.56 (0.14)	1.75 ***	-0.28 (0.14)	0.76 *	-0.63 (0.11)	0.53 ***	-0.46 (0.07)	0.63 ***
Husband's school attainment								
No schooling (reference)	- -	1.00	- -	1.00	- -	1.00	- -	1.00
Primary incomplete	0.08 (0.07)	1.09	0.39 (0.09)	1.48 ***	-0.35 (0.07)	0.70 ***	-0.12 (0.04)	0.89 **
Primary complete	0.49 (0.10)	1.64 ***	-0.28 (0.11)	0.76 **	0.34 (0.08)	1.41 ***	-0.05 (0.05)	0.95
Secondary incomplete	0.35 (0.08)	1.42 ***	-0.27 (0.08)	0.77 **	0.06 (0.06)	1.07	-0.12 (0.04)	0.88 **
Secondary complete	0.20 (0.11)	1.22	-0.44 (0.12)	0.64 ***	0.06 (0.09)	1.07	-0.07 (0.07)	0.94
Higher	-0.22 (0.11)	0.80 *	0.06 (0.11)	1.07	0.03 (0.08)	1.03	-0.08 (0.05)	0.92
Household head – woman/husband	0.54(0.06)	1.72 ***	-0.09 (0.07)	0.92	0.69 (0.05)	2.00 ***	1.20 (0.03)	3.33 ***
Household wealth index								
Poorer (reference)	- -	1.00	- -	1.00	- -	1.00	- -	1.00
Poor	0.21 (0.11)	1.23	0.34 (0.16)	1.40 *	0.11 (0.09)	1.12	0.15 (0.06)	1.16 **
Middle	-0.57 (0.10)	0.56 ***	0.20 (0.15)	1.22	0.39 (0.08)	1.47 ***	0.34 (0.06)	1.41 ***
Rich	-0.13 (0.10)	0.88	0.55 (0.15)	1.73 ***	-0.21 (0.08)	0.81 **	0.90 (0.06)	2.46 ***
Richer	0.12(0.11)	1.13	0.27(0.16)	1.31	0.20 (0.09)	1.22 *	0.77 (0.06)	2.17 ***

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; SE: standard error; HR: hazard ratio

Table 6: Estimated coefficient, standard error, and hazard ratio of timing of first birth before 20 from multilevel discrete-time modeling (interaction effect with level of women's education), for ever married women age 15-24, Bangladesh, 1993-2004

Variables	1993/94		1996/97		1999/00		2004	
	Coeff. (SE)	HR	Coeff. (SE)	HR	Coeff. (SE)	HR	Coeff. (SE)	HR
Time of exposure	-0.09 (0.01)	0.92 ***	-0.06 (0.01)	0.94 ***	-0.01 (0.01)	0.99	0.02 (0.01)	1.02
Muslim	-0.06 (0.05)	0.94	0.06 (0.06)	1.06	0.17 (0.05)	1.19 ***	-0.04 (0.05)	0.96
Weekly media exposure	0.20 (0.04)	1.22 ***	-0.03 (0.05)	0.97	0.25 (0.04)	1.29 ***	-0.01 (0.04)	0.99
Age at marriage	-0.03 (0.01)	0.97 ***	0.01 (0.01)	1.01	-0.08 (0.01)	0.93 ***	-0.03 (0.01)	0.97 **
Spousal age difference (5+ years)	NA	NA	-0.17 (0.06)	0.84 **	0.01 (0.05)	1.01	0.16 (0.04)	1.18 ***
Woman's school attainment								
No schooling (reference)	- -	1.00	- -	1.00	- -	1.00	- -	1.00
Primary incomplete	0.01 (0.05)	1.01	-0.02 (0.06)	0.98	-0.12 (0.050	0.88 **	0.31 (0.05)	1.37 ***
Primary complete	0.02 (0.06)	1.02	0.10 (0.06)	1.11	0.28 (0.06)	1.33 ***	0.26 (0.06)	1.30 ***
Secondary incomplete	0.04 (0.05)	1.05	-0.07 (0.06)	0.93	0.26 (0.05)	1.30 ***	0.29 (0.05)	1.34 ***
Secondary complete	0.59 (0.09)	1.81 ***	0.35 (0.10)	1.42 ***	0.76 (0.090	2.14 ***	0.23 (0.09)	1.26 **
Higher	0.63 (0.11)	1.87 ***	0.02 (0.10)	1.02	0.78 (0.09)	2.18 ***	0.32 (0.07)	1.37 ***
Husband's school attainment								
No schooling (reference)	- -	1.00	- -	1.00	- -	1.00	- -	1.00
Primary incomplete	0.06 (0.05)	1.06	0.03 (0.06)	1.03	0.09 (0.05)	1.10	-0.20 (0.05)	0.82 ***
Primary complete	0.02 (0.07)	1.02	-0.44 (0.07)	0.64 ***	0.16 (0.06)	1.17 **	0.21 (0.06)	1.23 ***
Secondary incomplete	0.23 (0.05)	1.26 ***	-0.26 (0.05)	0.77 ***	-0.07 (0.05)	0.93	-0.17 (0.05)	0.84 ***
Secondary complete	-0.47 (0.08)	0.62 ***	-0.08 (0.08)	0.93	0.13 (0.07)	1.14	-0.01 (0.08)	0.99
Higher	-0.24 (0.07)	0.78 ***	-0.26 (0.08)	0.77 ***	-0.27 (0.07)	0.76 ***	-0.27 (0.06)	0.76 ***
Household head – woman/husband	-0.19 (0.04)	0.83 ***	-0.52 (0.04)	0.60 ***	-0.23 (0.04)	0.79 ***	-0.12 (0.03)	0.88 ***
Household wealth index								
Poorer (reference)	- -	1.00	- -	1.00	- -	1.00	- -	1.00
Poor	-0.06 (0.07)	0.94	0.07 (0.09)	1.07	0.10 (0.07)	1.11	0.31 (0.06)	1.36 ***
Middle	-0.54 (0.06)	0.59 ***	0.18 (0.09)	1.20 *	0.10 (0.07)	1.10	0.25 (0.06)	1.28 ***
Rich	-0.33 (0.06)	0.72 ***	0.29 (0.09)	1.34 **	-0.48 (0.07)	0.62 ***	0.51 (0.07)	1.66 ***
Richer	-0.55 (0.07)	0.58 ***	0.04 (0.10)	1.04	-0.58 (0.08)	0.56 ***	0.19 (0.07)	1.21 **

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; SE: standard error; HR: hazard ratio

Table 5 presents estimated coefficients, standard error, and hazard of timing of first birth before 20 among ever married women age 15-24 years. The coefficients of grand mean for all years are significant. For instance, the coefficient for the year 1993/94 indicates that the expected hazard of first birth among adolescent married women with average values of all independent variables would be almost three times.

The effect of the area-level factor on teen birth supports our hypothesis: increase in mean years of schooling for women in the area does have a delaying impact on adolescent birth. For instance, in 1999/00, women living in the area where women have one more year of mean schooling are 25% less likely to have a teen birth in compared to women who live in areas with less mean education. The effect is significant for 1999/00 data only. At the individual level, women's education has the strongest effect in delaying teenage first birth, when the effects of other factors are controlled and the results are consistent for all four years of data. As shown in the table, the hazard of timing of first birth before age 20 decreases significantly with women's increased level of schooling and the decreasing effect is more pronounced in recent years. In 1999/00, a woman with incomplete secondary education has 21% less hazard of have a first birth before age 20 compared to a woman who had no education. The same figure is 33% in 2004.

As expected, women with the highest level of education (higher than secondary) have the lowest chance of having a teenage first birth compared to women who have no or some levels of education. In 2004, a woman with an incomplete primary education was 16% less likely to have a teenage birth compared to a woman with no education. The same figure is 33%, 21%, and 37% for women who had incomplete secondary, complete secondary, or higher than secondary schooling, respectively.

While women's education is found to be the strongest predictor at the individual level, the husband's education also has a positive impact in delaying teenage first birth in the most recent year. The effect is significant for certain levels, but not all. Unlike the effect of women's education, there is no significant impact of husband's secondary and more than secondary education on the wife's hazard of timing of birth before age 20. That is, if other factors are equal, a woman with more than secondary education has 37% less hazard of having a teenage first birth compared to no effect if she has a husband who has more than secondary education.

Spousal age difference has a significant relationship on the hazard of timing of first teenage birth. Women who are five or more years younger than their husbands are more likely to experience early birth compared to couples who have less than a five year age difference. Similarly, if a woman watches television more frequently she is more likely to delay first birth than those who do not watch television that frequently. The effect of media is found to be significant only for the latest survey.

Adolescent women who live in households with their husbands or themselves as the head of the household are more likely to have early births compared to those who live under the headship of other people such as parents, parents-in-law, or others. This may be because adolescents in adolescent-headed households tend to be older compared to adolescents living with others (Nahar, 2007).

The effect of household wealth on the hazard of timing of teenage birth is not consistent across different categories and over time. While 1993/94 and 1996/97 data show a positive relationship between wealth index and hazard of timing of a teenage birth, the pattern is reversed for 2004 data.

When the effects of mean years of schooling of women age 10-49 in the area and other factors in the model are combined, the direction of the effect of most of the variables remains the same and the strength of the effect decreases slightly (Table 6) except for two variables – women's education and household headship. The most striking effect out of these two variables is the opposite effect of women's education on the hazard of timing of adolescent birth with increase in education of women in the area. More specifically, in 2004, a woman living in an area where women have high mean education and with more than secondary education had 37% more hazard of having a teenage birth compared to women who did not have any education. This finding is contrary to our expectation. Data from the other three surveys show the similar pattern.

On the contrary, if a woman lives in an area with high mean education levels for women and has an educated husband, the effect of her husband's education, not her own, is beneficial for her. This could be because women living in more developed areas have less decision-making power, even if they have higher levels of education, compared to women who live in less developed areas but have higher levels of education, irrespective of their husband's education.

5. Discussion

The present analysis confirms that adolescent childbearing in Bangladesh remains static or has even increased slightly in recent years, which is consistent with other analyses using DHS data (NIPORT, Mitra and Associates, and ORC Macro, 2005; Islam, 1999; Mitra et al., 1997). As suggested by our analysis, the effect of area-level factors is diminishing and individual-level variation has become more influential in determining teenage birth. One plausible explanation for this could be that the continuing economic development sweeping all over Bangladesh is making different geographic areas more homogenous, reducing area level variations and emphasizing individual-level differences in determining teenage fertility. Previous research has suggested area-level variation in contraceptive use (Amin et al., 2002; Kamal et al., 1999; Amin et al., 1996). However, our knowledge of the area-level effect on adolescent childbearing is limited. Moreover, in the present analysis we have used women's mean education as a proxy measure for area-level development, and there may be other contextual factors that have an effect on the timing of first birth. Thus, further research is needed to better understand the effects of contextual variables on teenage fertility.

It is obvious from our analysis that age at marriage has a significant relationship with the timing of first birth. In Bangladesh, sexual relation is permitted only in the context of marriage, and once married, women become pregnant for a variety of reasons. However, there is a little chance of birth if a woman is unmarried. Therefore, policy and programs should focus on targeting means to delay marriage. That will in turn delay getting pregnant and first birth in the teen years.

Among individual- and household-level factors, education is found to be the most significant factor, with the strongest and most consistent effect on delaying adolescent childbearing in Bangladesh during 1993-2004. While education at every level helps women to delay first birth compared to no education, the strongest effect is observed when women have secondary or more than secondary education. This finding reinforces our understanding that it is not only compulsory primary education for girls that will help Bangladeshi women to achieve their future potential, but also keeping them in school to complete secondary and more than secondary education. This will delay getting pregnancy and prevent other social vulnerabilities, such as marriage with dowry, partner violence, and susceptibility to HIV/AIDS (Nahar, 2007).

It is contrary to our expectation that higher education does not help women in delaying teenage first birth if they live in areas where women are better educated. One plausible explanation could be that in these areas, women have less control over their own fertility and may not have decision-making power about their own fertility. On the other hand, if women have more education and live in an area with less education, they are valued highly by their families. They may have more decision-making power in regards to their own fertility and thus can choose the timing of their first birth.

It is important to note that the husband's education has a modest effect on delaying the wife's first birth unless they are from developed areas. This finding has important policy implications, as it is not only women's education but also that of their husbands, which can help women to delay teenage birth.

While exposure to media is another important factor in explaining fertility behavior, we did not find a positive effect of media exposure to decrease the chance of having a teenage birth before 2004. This could be because the huge increase in mass media exposure is recent, and it takes time for media exposure to affect an increase in knowledge about teenage births. However, because of other developmental changes that have been going on in the country it is hard to differentiate between the effects of media and the effects of other kinds of developmental factors that increase access to information. Moreover, we do not know how media exposure influences women in their fertility decisions.

The effect of economic status on teenage first birth is contrary to our expectation. Similarly, we do not find any consistent pattern in timing of birth type by residence. While the chance of having a first birth is highest among rural residents compared to residents from other areas in all years except 2004, the finding is not consistent among three different types of urban areas – large metropolitan city, small city, and towns. Living in a small town decreases the probability of teenage birth compared to living in other urban areas; however, living in a large metropolitan city increases the chance of a first teenage birth compared to small cities. This could be because a large proportion of the population living in metropolitan cities lives in slums that have lower living standards than rural areas and are considered the "poorest of the poor".

While Bangladesh has made a remarkable progress in decreasing overall fertility in recent decades, its teenage fertility rate remains one of the highest among developing countries. This is

particularly baffling given that the country has had remarkable success in increasing female education and female employment without any apparent reduction in teenage fertility. Thus, more research is needed to understand the underlying mechanisms of the effect of rising female employment on delaying teenage fertility.

Finally, there is a need to increase community awareness about the dangers of teenage pregnancy through a mass media campaign. While there are targeted efforts nationally and by several international agencies to delay marriage and first birth, their efforts need to be strengthened further.

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