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Young Single Women Using Abortion in Hanoi, Viet Nam

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If unmarried youth had better reproductive health information and skills, their use of pregnancy termination could be reduced

Data on legal induced abortion in Viet Nam suggest that the number of abortions has dramatically increased between 1975 and the early 1990s. Between 1990 and 1993, the annual number of abortions reached 1.2 million (Ministry of Health, 1990-1993). For 1992, the total abortion rate was estimated at 2.5 abortions per woman, the highest rate in Asia and one of the highest in the world (Goodkind, 1994). One of the reasons for Viet Nam's rising abortion rate may be the increase in premarital sexuality, leading to more unwanted pregnancies and hence an increasing demand for abortion. A number of factors confirm this hypothesis.

First, demographic analyses show that more young women than older ones are having premarital conceptions and a shorter interval between marriage and their first birth (Bélanger, 1997; Johansson and others, 1996b). As suggested by Rindfuss and Morgan (1983) for other Asian countries where they had observed the same trends, a "quiet sexual revolution" appears to be under way currently in Viet Nam. Second, the transition from a socialist, planned economy to a market economy initiated in the mid-1980s was accompanied by an opening of the country to cultural influences from Western and other Asian countries, such as movies, magazines and television programmes. These imports expose Vietnamese youth to different values and life-styles and may well affect behaviour in areas such as dating and sexual activity (Khuat, 1998; Le, 1997; Marr, 1997). Third, marriage changes indicate an intensification of premarital relations. That marriage patterns are changing is indicated by the fact that arranged marriage by the parental generation has given way to more freedom of choice by young people themselves (Bélanger and Khuat, 1996; Goodkind, 1996; Nguyen, 1997). Premarital relations today are more intimate than in the past and young people no longer need parental supervision to meet each other and enjoy activities together. These changes associated with rising premarital sexuality have also been observed in other Asian countries (Xenos, 1990).

This evidence, coupled with reports of low contraceptive use by unmarried youth (National Committee for Population and Family Planning [NCPFP], 1996; NCPFP and Vietnamese-German Technical Cooperation, 1995), suggests that the demand for abortion from single women indeed might have contributed to the overall increase in the number of abortions performed yearly in the country. However, the proportion of single women among all women having an abortion is difficult to estimate since those using abortion services are guaranteed anonymity from providers. As a result, false declarations of age and marital status are common, as no identification documents are required, except in cases of complicated or late abortions. Rough estimates from the service providers published in newspapers in 1995 and collected by the World Health Organization (WHO) in 1997 range from 25 to 30 per cent (Le, 1995; WHO, 1997). This proportion suggests that a growing number of single women are facing unwanted pregnancies. Since NCPFP has the objective of reducing the use of abortion in Viet Nam (WHO, 1997), studying unmarried youth using abortion services should provide insights as to how to plan policies aimed at fulfilling this objective.

This article presents the results of an exploratory study conducted during the period 1995-1996 in Hanoi involving single women having abortions. The main objective of our study was to explore the context and process of abortion use for single women. We wished to identify paths leading to abortion use in relation to dating, sexual and contraceptive behaviour. Four gynecologists performing abortions surveyed a total of 259 single women who had an abortion in two hospitals and one district health centre in Hanoi. In addition to the women surveyed by questionnaire, 20 other women participated in in-depth interviews, 10 of which took place at the district health centre and 10 at a private clinic.

The quantitative survey provides mainly descriptive information about our sample. Results suggest that few women used a contraceptive method before having an abortion. A pattern of low contraceptive use also prevails among women who had repeat abortions, although the likelihood of use is higher among them than among first users. We argue that this low contraceptive use among all the women concerned is due mainly to a lack of information, skills and post-abortion counseling and services. Results on information sources and support networks about sexuality and contraception, as well as on the self-perceived need for information, clearly suggest that policy makers should take into account the needs of unmarried youth.

The qualitative interviews clarify results generated from the quantitative data and provide information as to what are the obstacles to contraceptive use. The analysis points to barriers linked to poor knowledge and misconceptions about family planning methods. Communication barriers between women and their boyfriends about sexuality and contraceptives also reduce contraceptive use. Results show a clear distinction made by the women between

menstrual regulation and abortion, the former being considered minor and used as a post-gestation contraceptive method and the latter, as a more severe intervention.

The social taboo associated with premarital sexuality makes difficult the use of contraceptive methods on a regular basis for some women. We conclude that, although information about and access to contraceptive methods need to be improved, older generations must come to terms with the necessity to inform adequately unmarried youth for the sake of their reproductive health, as most countries have agreed to do at the 1994 International Conference on Population and Development (ICPD). Policy makers should work in concert with unmarried youth, parents and schools to enhance awareness about the potential risks of unprotected sex and repeat abortion.

## Background

Abortion has been legal in Viet Nam since the 1960s and currently is widely available. Most pregnancy terminations are performed in public health service centres at the provincial or district level, although the private sector also offers abortion services. In Hanoi, the capital of Viet Nam located in the northern part of the country, many health institutions provide abortion services, the most important ones being the public central hospital and municipal hospitals, maternal and child health care and family planning centres, and district health centres. A number of private centres have opened in recent years, but there are no statistics available on private health services in Viet Nam. Almost all hospitals in Hanoi have an obstetrics department that provides abortions. Among them, the most important ones are the Obstetrical Hospital of Hanoi, and the Institute for the Protection of Mother and Newborn (formerly Hospital C). At the district level, Maternity Hospitals A and B are the institutions performing the greatest number of menstrual regulations and abortions.

Viet Nam's health providers distinguish between two types of procedure: menstrual regulation and abortion. Menstrual regulation (*hút thai*) is a pregnancy termination performed during the first six weeks of pregnancy, while the term abortion (*nao thai* or *phá thai*) describes abortions done after six weeks of pregnancy. The distinction is used in statistics published by the Ministry of Health. However, menstrual regulation may not be systematically preceded by a pregnancy test in all health facilities. This might be the case for 50 per cent of menstrual regulations (General Statistical Office [GSO], 1996:3). Thus, in these cases, a woman would not know whether or not she was actually pregnant.

As mentioned in the introduction, abortions performed in Viet Nam have increased sharply since the early 1990s. According to the Ministry of Health's statistics, the annual number of abortions rose by a factor of 10 between 1976 and 1986, leading to an average number of menstrual regulations and abortions of 700,000 between 1986 and 1989 (Ministry of Health, 1983-1990). In the late 1980s, abortion rates continued to increase, partly as a result of an increase in the number of institutions providing abortion services. In 1992, 660 abortions were done for every 1,000 births in Viet Nam. Part of this increase was also linked to a relaxation of the requirements for users. Until 1987, abortion services were provided according to a woman's residential sector, and disclosure of her identity was compulsory. This meant that women could request abortion services only at the health centres in the sector where they were registered as residents. In 1988, the system of service delivery according to the place of registration was dismantled. Subsequently, women who wanted menstrual regulation or abortion services could go to any public health institution offering the service and their anonymity would be guaranteed. In November 1996, the cost of a menstrual regulation was 32,000 dong (US\$1 = about 10,500 dong) and 52,000 dong for an abortion. All single women must pay the fees for the abortion procedures.

Before the 1990s, research on abortion in Viet Nam was non-existent. Over the last few years, the increase in abortions performed in the country has drawn the attention of research institutions and some initial surveys addressing the question of abortion have been carried out. In 1991, a survey was conducted of 2,088 women in five Hanoi hospitals and nine hospitals in Thai Binh Province, which is also located in the northern part of the country (Do and others, 1993). These hospitals had performed an average of 1,000 abortions in the year preceding the survey. The results show that nearly all the women surveyed had an abortion either because they had not used any contraceptive method or because they had experienced contraceptive failure. Only 20 per cent of the women were using a modern contraceptive method; however, the survey also showed that a high proportion of the women had had two or more abortions. Moreover, 7 per cent of the sample of the women in this survey were unmarried. Johansson and her collaborators (Johansson and others, 1996a) studied the issue of abortion in Thai Binh Province in 1991. For their sample, they calculated a very high total abortion rate and also found that most women chose abortion to save money or avoid being fined for exceeding the two-child limit prescribed by the national population policy. According to their survey, husbands were the most important persons sharing the abortion decision; parents and parents-in-law often did not agree with the decision. In the survey area, post-abortion counseling was either absent or inadequate.

## Methodology and data

The quantitative data for our study come from a hospital-based sample of 259 single women who had an abortion and who were living in Hanoi at the time of the survey. Our sample of women does not represent all single women

having an abortion, as the survey was conducted in a few health institutions only and the women interviewed were not selected randomly from a larger population. Four young female gynecologists working in two Hanoi hospitals administered a questionnaire to the 259 women prior to or after the pregnancy termination. The selection of women depended on the gynecologists' ability to take 30-40 minutes to do an interview during their busy work day. In spite of this non-random procedure, these gynecologists did not give preference to women sharing certain characteristics over others. We opted for the collaboration of the medical staff after having tested a self-administered questionnaire which gathered poor data. A trained interviewer completed 10 questionnaires and 10 in-depth individual interviews in a district health centre. An additional 10 in-depth interviews were done by the same interviewer at a private clinic in Hadong, a Hanoi suburb. These qualitative interviews were not conducted immediately before or after the abortion; instead, the women interviewed had had the abortion between two and six months prior to the interview. This time-lag between the abortion and the interview enabled the interview to be conducted in a more relaxed atmosphere which is often helpful for a long, qualitative interview. The survey took six months to complete and was conducted between November 1995 and May 1996, a time-frame which included the training of interviewers, pretests of the questionnaire and the interview guidelines.

The four survey sites were selected for two reasons. First, we met substantial resistance from the authorities in the conduct of the survey. While some institutions were afraid that young women would not come to their institutions if they knew about this survey, others refused even to discuss the issue of single women seeking an abortion. This resistance, we believe, reflected the difficulties authorities were facing in dealing with the new issue of premarital sexuality and pregnancy in the mid-1990s.<sup>1</sup> Second, our survey sites allowed for a good screening of women according to their marital status. As mentioned previously, it is not uncommon for single women to declare that they are married in order to avoid the stigma associated with premarital pregnancy. However, some institutions are more concerned with collecting accurate information on marital status and the age of the users of this service. During the time of the survey, the Hanoi Obstetrical Hospital was testing the pill known as RU486, which causes an abortion, giving priority to single women in this process. It was thus imperative to distinguish married from single women and to gather information on the women's identity. In Hospital C, most of the women were being referred by another doctor because they were having a late abortion (more than 12 weeks) and, therefore, the gathering of personal information and medical history was a strict requirement. In the district and private clinics, all of which are small institutions, contacts are more personal, and single women are more at ease to declare their marital status and age. Details on the number of women interviewed in each survey are contained in table 1.

Table 1. Number of women interviewed per institution: greater Hanoi

<b>Institution</b>	<b>Obstetrical Hospital of Hanoi</b>	<b>Institute for Protection of Mother and Newborn</b>	<b>District clinic</b>	<b>Private clinic</b>	<b>Total</b>
Questionnaire	182	57	10	—	259
Qualitative interview	—	—	10	10	20
Total	182	57	20	10	279

The questionnaire used covered the following topics: onset of sexual relations, number of partners, types and duration of relationships, knowledge and use of contraceptive methods, knowledge of sexually transmitted diseases and of the female menstrual cycle, and sources of information about sexuality and contraceptive methods, including family members, peers, boyfriends, the media, school and printed material. In the section of the questionnaire about contraceptive knowledge and use, we collected spontaneous mentions of methods and did not prompt afterwards. Considering the population investigated, prompting of the methods by the interviewer would have led to an overestimation of knowledge and use.

Two questions were aimed at evaluating contraceptive use since the onset of sexual relations. At the beginning of the questioning we asked the young women to name all the contraceptive methods about which they had knowledge and had ever used. Towards the end of the questioning the women were asked if they had ever used any method to avoid pregnancy. If so, they were asked to list the methods. By combining the responses to the two questions (some women answered the second question more thoroughly), a variable was obtained measuring the use at any point of a contraceptive method. Also, a specific question was asked about knowledge and use at first intercourse, and about use with the current boyfriend prior to the unwanted pregnancy.

The qualitative interview included questions about all love episodes and sexual partners, sharing of these experiences with family members and friends, contraceptive use and the decision to have a pregnancy termination. Since these women had had the abortion a few months before the interview, it was possible to investigate sexual and contraceptive behaviour after the abortion. Less than 5 per cent of the women approached refused to participate. All the women interviewed, a total of 279, had undergone pregnancy testing, including those who underwent menstrual regulation.

#### Study limitations

The study design we had to use in order to reach single women having an abortion has some limitations. The major limitation comes from the fact that the sample is not statistically representative of all women using abortion. For example, the few institutions surveyed may attract women sharing common characteristics. Women from the countryside and living in university dormitories in the city, for instance, may have less financial resources and thus might more often choose public services, which are cheaper than private ones. On the other hand, women from Hanoi may not want to go to a public hospital, for fear of meeting someone they know; thus, they might choose a district health centre far from their residence. In view of the fact that the three institutions surveyed were located in different parts of Hanoi, we thus increased the chances of reaching different sub-populations of single women.

The second main limitation pertains to the time and context in which the questionnaire was administered. Young women who answered the questions were interviewed before or shortly after having an abortion, which was a time of stress for some of them. This aspect may have affected the quality of the data. Furthermore, that a medical doctor conducted the interview may have been intimidating for the women. None the less, the medical staff who participated in the survey expressed confidence in the quality of the data collected. According to them, most young women had not had a chance previously to talk about their sexuality and therefore felt relieved to be able to speak in a confidential setting with a knowledgeable person. The fact that all interviewers were themselves young women and did not have a judgmental attitude facilitated the conduct of the interviews. For our study, we purposely selected women gynecologists genuinely concerned about the issue of single women using abortion.

Some limitations also arise from our study of contraceptive use patterns, since the women using abortion could have been less likely to use contraceptives, or alternatively, could have been better informed than other women, since they had had contact with abortion providers. The general population of young women having premarital sex probably features a different pattern of knowledge and use than the women in our sample. As previously mentioned, the exclusion of prompting about contraceptive methods in our investigation might have under-estimated knowledge. Also, the questionnaire did not include very detailed questions about the depth of knowledge and the regularity of use because our objective was not to focus on knowledge and use but rather on the overall context of abortion use. This lack of information in the questionnaire, however, is compensated by more elaborate data provided in the qualitative interviews.

Finally, we believe that gathering information on unmarried abortion users remains a difficult endeavour since in Vietnamese society the topic of premarital pregnancy is taboo in the extreme and users' anonymity is closely guarded. In this context, personal information about age and marital status declared by users is unreliable anyway and the drawing of a representative sample is therefore not possible.

## Results

### The survey questionnaire

The characteristics of women surveyed by the questionnaire are shown in table 2. Over 90 per cent of them were teenagers (15-19 years) and young unmarried adults in their early twenties (20-24 years). Three-fourths of the women are natives of Hanoi; the ones not born in the capital had been living there for an average of four years. Most migrants moved to Hanoi to continue their studies and therefore lived either in a university dormitory or with relatives living in the capital city. Many women (over 80 per cent) in the sample, however, lived with their parents or other relatives. Close to 20 per cent lived alone, with friends or in a student dormitory. Among those living with family members, over 60 per cent lived in a privately owned house (as opposed to a state-owned housing unit), which is an indication of a higher socio-economic profile. Those from families with less financial resources were more likely to live in publicly owned housing (26 per cent). Close to 40 per cent of the women had a college or university level of education; almost 50 per cent of them had completed their upper secondary education. The current main activity of most women was either work (46 per cent) or studies (39 per cent), while a small proportion was staying at home. Most employed women worked in a factory or private enterprise, which in many cases was owned by their family. Nearly two-thirds of the women received money from their parents and one-third obtained an income from a monthly salary (results not shown in the table). Their average monthly income was 358,000 dong per month, with some women not receiving anything and others receiving up to 2 million dong a month. The education level of their parents was high, and a significant proportion of the parents comprised government cadres (results not shown).

Table 2. Characteristics of women in the greater Hanoi sample

	Age
15-19	37.5
20-24	55.6
25-29	5.8
30 and older	1.1
Current main activity	

Working	45.9
Studying	39.0
At home	12.0
Other	3.1
Type of residence	
Private	63.3
Collective	26.3
School dormitory	7.0
Others	3.4
Level of education	
6-9 years of schooling (lower secondary)	8.8
10-12 years of schooling (upper secondary)	53.6
College	19.3
University	17.8
Other	0.4
Living arrangements	
Nuclear family (two parents)	66.8
Nuclear family (one parent)	6.6
Extended family	5.0
Other relative	7.3
Friends (including student dormitory)	11.6
Alone	2.0
No answer	0.7
Father's education	
Upper secondary and lower	27.8
More than upper secondary (college or university)	68.4
No answer	3.8
Mother's education	
Upper secondary and lower	54.5
More than upper secondary (college or university)	41.3
No answer	4.2

In sum, women in our sample came from different socio-economic groups and were at different stages in their life-course; a significant proportion of them, however, lived with their parents, have a high level of education and are from Hanoi.

It is relevant to compare our sample with the general population of women aged 15-24 living in Hanoi. To do so, we generated tabulations from the urban clusters of Hanoi included in the 5 per cent sample of the 1989 census (results not shown here). In comparison with women aged 15-24 living in Hanoi in 1989, our sample of women is more educated and is composed of more working women than found in the general population. Also, a comparison of their parents' characteristics with those of the adult population of Hanoi, by sex (for the corresponding age groups), reveals that the parents of the women surveyed are also more educated, and are more often government workers than indicated by the census for adults of the same age groups.

To explore the path to an unwanted pregnancy in relation to dating and sexual behaviour, we collected information on the timing of three events: age at having their first boyfriend, age at first sexual intercourse and age at first abortion. For the sub-sample of women who had two abortions, the questionnaire also provided information on the age at the second abortion. These data enabled the construction of life tables for each "transition": from first boyfriend to first sexual intercourse, from first sexual intercourse to first abortion, and from the first to the second abortion. The timing of these transitions is relevant to our understanding of when and how dating and the onset of sexual intercourse affect subsequent unwanted pregnancies. Cumulative proportions of women who experienced the transition at different time intervals are shown in table 3.

Table 3. Cumulative proportions of single Vietnamese women experiencing first intercourse, first abortion and second abortion

**First boyfriend to first    First intercourse to first    First abortion to second**

Interval in years	intercourse	abortion	abortion (N=59)
0	37	50	5
1	67	92	75
2	87	96	85
3	93	98	94
4 or more	100	100	100
Average duration between the two events	15.5 months	6 months	17 months

The study of the onset of dating is important because most women in our sample engaged in sex in the context of a committed relationship. Over 95 per cent of the women in our sample had a boyfriend at the time of the survey. Clearly, women defined a boyfriend as a male friend with whom they had a committed relationship, and in most cases, a person with whom they had sexual intercourse.<sup>2</sup> Once dating was initiated, one-third of the women had had their first sexual experience in less than a year (table 3). After a year, two-thirds were no longer virgins. The average duration between the two events was about 15 months. Between their first relationship and their first sexual experience, 33 per cent of the women had more than one romantic episode. If we calculate the average interval only for women who had their first intercourse with their first boyfriend, we obtain an average of seven months. This average indicates that sexual relations do not follow dating until the relationship is well established. We also observed this behaviour from a direct question on their current relationship: For how long did you have a relationship with your current boyfriend before you started having sexual relations with him? In responding, 45 per cent said after six months of dating, and 38 per cent said that they waited one year. These results show that the women in our sample did not engage in sex unless they knew their boyfriend for some time; however, dating and sexuality are strongly associated, as most relationships involved sexual relations.

The second column of table 3 shows that once women started having sexual intercourse, the first abortion occurred rapidly: for 50 per cent of the women, it took less than a year to occur; by one year after the start of their sexual activity, 92 per cent of the women in our sample had had their first abortion. It took an average of six months for the women to have an abortion after their first sexual experience.<sup>3</sup> This relatively short period of time is indicative of the contraceptive behaviour of women before their first pregnancy. First, if we look at the proportion of women who ever used a contraceptive method, we find that only one-fourth of the women did (table 4). Among first abortion users, less than 20 per cent had ever used a contraceptive method. Among those who mentioned having used a method, the condom, withdrawal, the oral pill and periodic abstinence were the methods most commonly used. Two women in the sample had previously had an IUD inserted. A comparison of knowledge and use shows that knowledge is much higher than use, particularly for modern methods. A question on use of a contraceptive method with the current boyfriend prior to the abortion revealed that only 22 per cent of the women had used a method, and that most of these had used the condom or withdrawal methods. Among the women who mentioned having used periodic abstinence (16), only two of them had a correct sense of when a woman was most likely to get pregnant during her menstrual cycle. These results indicate that, between the onset of sexual intercourse and the first unwanted pregnancy, few couples used a contraceptive method, and of those who did, they used it either ineffectively or irregularly.<sup>4</sup> Women who had their first abortion more than one year after their first sexual intercourse did not tend to use contraception more than the ones who had an abortion earlier.

Table 4. Knowledge and use of contraceptive methods among single women in greater Hanoi

Method	Knowledge	Use
Any method	78.0	26.0
Condom	76.0	13.5
Pill	42.5	7.7
IUD	4.0	0.7
Sterilization (female)	10.0	0.0
Withdrawal	12.4	11.2
Periodic abstinence	12.3	6.2

To explore why few couples attempted to prevent a premarital pregnancy, we conducted bivariate analyses to evaluate which variables are significant in relation to having used or not used a contraceptive method (table 5). While having ever used a contraceptive method is a rough measure of contraceptive behaviour, it does indicate that a woman and her boyfriend had attempted to avoid a pregnancy. Age, number of boyfriends, number of abortions, education, current activity and knowledge of methods are all statistically significant with contraceptive use. More

experienced women are more likely to have used a method than less experienced ones. Experience refers to being older and working, being more educated, having had more than one boyfriend and more than one abortion.

Table 5. Characteristics of single Vietnamese women according to contraceptive behaviour

Characteristics	Has never used a method	Has ever used a method	$\chi^2$ TEST
Age			
15-19	88.6	11.3	
20-24	69.4	30.6	$c^2$ 33.59 <sup>a</sup>
25-29	33.3	66.7	
30 and older	0.0	100.0	
Current activity			
Work	61.34	38.66	
Study	82.18	17.82	$c^2$ 15.60 <sup>a</sup>
At home	87.10	12.90	
Education			
Secondary	83.22	16.78	
College	66.00	34.00	$c^2$ 18.08 <sup>a</sup>
University	55.93	44.07	
Number of boyfriends			
One	76.67	23.33	
Two	69.51	30.49	$c^2$ 5.74 <sup>b</sup>
Three or more	50.00	50.00	
Number of abortions			
One	80.31	19.69	
Two	54.39	45.61	$c^2$ 16.86 <sup>a</sup>
Three	55.56	44.44	
Spontaneous mention of knowledge of method			
No method	94.92	5.08	$c^2$ 17.68 <sup>a</sup>
At least one method	67.50	32.50	
Communication about sexuality/contraceptive methods			
Never	92.70	7.20	$c^2$ 45.30 <sup>a</sup>
Yes, with boyfriend, friend or family member	55.97	44.03	

aSignificant at 0.001

b Significant at 0.05

Opportunities for exchanges and communication about sexuality partly indicate whether or not women get the needed information. Close to half of the women revealed that they had never talked about sexuality with anyone, and did not have anyone to turn to when they needed information. As shown in table 6, one-third of the women discussed sex with female peers, but only 20 per cent did so with a boyfriend and 17 per cent did so with a family member. Clearly, women in our sample did not have many opportunities for exchanges with other people on sexual matters. This situation could have hampered them from obtaining appropriate information and acquiring proper contraceptive skills. In our sample, 75 per cent of the women mentioned having learned the most about sexuality from printed material. However, between reading and actually acting to prevent an unwanted pregnancy, there are many obstacles to action that remain in Vietnamese society today.

Table 6. Communication about sexuality and/or contraceptive methods among single Vietnamese women

Communication with:	Yes	No
Female friend(s)	34.36	65.64
Boyfriend(s)	20.46	79.54
Family members	17.37	82.63

Other people (in school, with health worker) 5.02 94.98

A self-perceived need for information could indicate whether young couples engaged in a risk-taking behaviour as a result of a lack of information and skills, or because they consciously relied on abortion in cases of unwanted pregnancy. More than 93 per cent of the women believed they could have avoided their pregnancy had they been better informed about sexuality and contraceptive methods. Most women (90 per cent) agreed that single women need more information, and that single youth should be provided with information about, and easy access to, contraceptives. Most women (95 per cent) appeared particularly interested in having access to good-quality printed information and over 80 per cent of them thought that an information centre or a clinic specifically addressing the needs of youth is necessary and would have been useful to them. Such high proportions of women expressing the need for better information and accessibility suggest that they feel ill informed and ill prepared to have safe and protected sexual relations.

While low contraceptive use was characteristic of all the women in our sample, it would be interesting to observe women who had more than one abortion to determine whether or not their behaviour differed from that of others. One-fourth of the women we surveyed by questionnaire were having their second or third abortion at the time of the survey. Since the questionnaire did not trace a detailed history of contraceptive use patterns between each abortion, the data do not allow for a thorough study of this question. In fact, in preparing the questionnaire, we did not expect to find such a high proportion of repeat abortions among our sample of single women. However, results show that repeat users tend to use contraception more, although more than 60 per cent of them still never used it at all. The modest difference in contraceptive use between first-time abortion users and second- or third-time abortion users implies that, after having had one abortion, a significant proportion of the women we surveyed would rely on abortion if they had a second unwanted pregnancy. In fact, we found that second- or third-time users had a pregnancy termination earlier in their pregnancy than first-time users; they also had a greater proportion of menstrual regulations than the first-time users, who had a higher proportion of abortions. Also, second- and third-time abortion users exchanged information about sexuality more often with their boyfriend, girlfriends or family than others. Further, the duration from the first to the second abortion was twice as short on average as the one between the onset of intercourse and the first abortion. These statistics (results not shown) indicate that, after having had one abortion, women are motivated to limit their fertility, although for the majority this desire might not be translated into the adoption of contraceptive use. Issues of limited access and negative social attitudes towards single women using contraception most likely are continuing to play a role in limiting contraceptive use after a first abortion.

#### The qualitative survey

In light of the quantitative results, we analysed our textual data with the objective of exploring in greater depth the process leading up to the unwanted pregnancy for the women we sampled. Since we interviewed these women after they had the abortion, we also studied the period following the abortion. We wished to gain a better understanding of the obstacles to contraceptive use. We did a content analysis of the textual data using the Ethnograph software package, which supports Vietnamese language scripts. Overall, the quantitative and the qualitative data proved to be very consistent concerning sexual and contraceptive behaviour.

Misconceptions about contraceptive methods prevented some women from using any method. For example, some women understood from family planning campaigns that contraceptive methods were for married women only; others associated the condom only with the prevention of HIV/AIDS. Incredibly, a woman working for the National AIDS Committee had three boyfriends, three abortions and yet never used a condom. She said that she did not because she trusted her boyfriends and knew they were not visiting prostitutes and that the condom was too uncomfortable anyway to use every time. For her, the condom was mainly to avoid the transmission of STDs and not to prevent unwanted pregnancies. Some other women thought that using the pill could lead to infertility. These examples illustrate to what degree some women lack adequate information on contraceptive methods. Other research on adolescents' concepts about and knowledge of sexuality has documented the serious misconceptions that exist in Viet Nam that can lead to unsafe behaviour (Efroymson, 1996; Efroymson and others, 1997).

Following their first abortion, the women were concerned about avoiding another unwanted pregnancy, but few used a contraceptive method. Women who had repeat abortions thus provided an interesting case for the study of why and how some women apparently rely on abortion to avoid unwanted pregnancies. In the case of these women, some did use a contraceptive method, but relied on withdrawal, or on irregular use of condoms. A few ended their relationship and a few relied on abstinence. Some clearly considered menstrual regulation and abortion to be contraceptive methods, as shown by the following discussion between the interviewer (I) and respondent (R):

Woman from Hanoi: Aged 22, she had already had two abortions at the time of the survey. She was not using any contraceptive method and was having sexual relations for two years.

:When you started having sexual relations, did you know about contraceptive methods?

:I did, a little bit.

:What did you know about?



:I knew about menstrual regulation and abortion. There is medication also, a few kinds.  
 :Did you know about the condom?  
 :I did; I hear a lot about it on television.  
 :So you had a fairly good knowledge of how to prevent a pregnancy?  
 :Yes, but how could I have used a method?  
 :Why not?  
 :I was not prepared at all. I could not know.  
 :Since you had an abortion, how is your relationship? Do you continue to have sexual relations?  
 :No, I refuse. I do not agree.  
 :Would your boyfriend like to continue?  
 :Of course.  
 :How do you manage?  
 :I think that if a man wants it (to have sex), it is important to listen. But I think that if the woman refuses, it (her objection) has to be respected.  
 :Have you discussed contraception with him at all?  
 :Not yet.

Among those who had repeat abortions, a clear distinction emerges from the data in the self-perception of women concerning a menstrual regulation procedure versus an abortion. As mentioned previously, all women interviewed had been tested for pregnancy and, therefore, knew they were pregnant and were not simply experiencing a delay in their menstruation. However, the women described a menstrual regulation procedure as being of minor importance, whereas the procedure performed after six weeks of pregnancy was described as being more serious and as raising more concerns. Menstrual regulation appeared to be used as a post-gestation method, or as a form of emergency contraception. This conceptual distinction between an early and later abortion could affect the contraceptive behaviour of these women. If a menstrual regulation is perceived as a convenient way to avoid an unwanted pregnancy, then the low use of contraceptive methods after a first abortion could be linked to this perception. The following examples illustrate this point:

Another woman from Hanoi: The following extract was taken from an interview with a 22-year-old woman. Her current boyfriend was her second one. She had her third pregnancy at the time of the interview and had decided to keep the child and to marry her boyfriend. She previously had two pregnancies with her first boyfriend. She had one menstrual regulation and one abortion. She and her second boyfriend used condoms, but as their relationship became more committed, they stopped using this method.

:You had sexual relations and became pregnant by your first boyfriend, you told me. If I understand (you) well, you had an abortion at that time.  
 :No, I had only a menstrual regulation; it was not an abortion yet! So I had this one; after that, I became pregnant again (and waited a long time). Then, I was afraid (of having an abortion) and I told my boyfriend I wanted to keep the child.  
 :So you were pregnant twice from your first boyfriend? The first time you had a menstrual regulation and the second time, an abortion.  
 :Yes.

:So he did not agree with you to keep the child the second time?  
 :He did not. He did not tell me clearly, but I understood how he felt about it and I had an abortion. After the abortion, I did not love him anymore and we ended our relationship.  
 Third woman from Hanoi: In this example, the woman was 28 years old. She had four boyfriends and three unwanted pregnancies. The first two times that she became pregnant she had an abortion and the third time, she had a menstrual regulation. Each pregnancy was with a different boyfriend. She and her boyfriend were currently using condoms. The initiative to use the condom method came from her boyfriend.

:With your third boyfriend, did you become pregnant or not?  
 :I also had a pregnancy with him.  
 :You also had an abortion?  
 :That time I had only a menstrual regulation. That time I had been pregnant for only a month and I knew it, so I went right away.

As in the case of this last example, women who had more than one abortion rarely became pregnant by the same boyfriend more than once. In other words, these women became pregnant as a result of subsequent relationships rather than within the context of the same relationship. We identified a pattern of re-negotiation at the beginning of each relationship between the woman and her boyfriend. Some women who used a contraceptive method with a previous boyfriend did not use any method when they started having sexual intercourse with a new boyfriend. The women expressed a fear of becoming pregnant but were reluctant to raise the issue with their boyfriend, waiting for him to take the initiative instead. This result points to the importance of reaching young men in promoting the use of contraceptive methods, both to avoid unwanted pregnancies and to prevent the transmission of STDs.

But why is there such a reluctance among women to express to their boyfriend their desire to avoid an unwanted pregnancy? None of the women who already had a pregnancy termination with a previous boyfriend revealed this

information to their current boyfriend. Women were apprehensive of anything that might lower their boyfriends' opinion of them; thus, insisting on the need to use a contraceptive method might lead the man to suspect that the woman had had previous sexual experiences. The women felt that, if they revealed their previous experiences to their current boyfriend, they might lose his respect and thus damage the relationship.

Woman from Hadong: This 20-year-old woman was in a relationship with the same young man since she was 16 years old. However, she was of the opinion that she would not be able to marry him since her parents did not approve of her relationship at all.

:Do you intend to marry your boyfriend?

:I would like to, but I think my family will refuse.

:So if your family does not agree, you will not marry him?

:That is the way it is.

:And personally you would like to marry him?

:Of course!

:But if you cannot, you will have to have a second boyfriend?

:I want to have one boyfriend only in my life; otherwise, I will not be respected by the second one (because I will not be a virgin anymore).

Another woman from Hadong: She was 22 years old.

:What do you think about virginity?

:I think it is very important. If I had sexual relations with someone else before, only if my husband is very tolerant might he be able to forgive me. But if he does not understand, he will not forgive me.

Society's ideal of virginity prevents some women from applying their knowledge and skills to their current situation. All the women but one said that their boyfriend took the initiative to engage in sexual relations; many women also were of the opinion that contraceptive use should come from the man as well. Of course, if the method is strictly a "female-method", it may be adopted in secret; one woman pretended she was pregnant, but actually went to a clinic to request an IUD. Normally, women rarely take the lead to initiate sexual relations and so are rarely the first ones to bring up the topic of contraception.

The low use of contraceptive methods also appears to be linked to the perception of one's relationship. Not using any method is perceived as a sign of faithfulness in the partner and confidence that the relationship will lead to marriage. The belief that a pregnancy would be a sign of destiny, meaning that fate had led them to their husband, was expressed by some women. In some cases, as the relationship became more stable, the couple gave up using any contraceptive method. Choosing abortion, however, does not mean that marriage is out of question; it can simply be a strategy to postpone it.

In fact, feelings about having an abortion varied according to the degree of commitment in the women's relationship. Women less committed to their boyfriend decided with little hesitation to undergo the abortion, and some of them never shared with their boyfriend the fact that they had been pregnant at all. Among the reasons for such behaviour was their desire to keep their freedom by avoiding any situation that would pressure them into marriage. For these women, their boyfriend was perhaps not the man they wished to marry. Women more committed to their boyfriend, but not foreseeing marriage with assurance, thought abortion was the best option. These women usually shared information about their pregnancy and the decision to abort with their boyfriend, but in most cases made the decision themselves and imposed it on their boyfriend if he suggested that they might marry. Finally, women who were sure that they would marry the man by whom they were pregnant perceived abortion as a way to postpone the marriage. There were several reasons for such a postponement. In some cases, the season of the year was not the traditional one for getting married. But for most of them, the women expressed the desire to finish their studies and the necessity for the couple to be stable financially before marrying. In these cases, they considered abortion as an obvious solution, enabling them to have a better start for their marriage and one that could be timed properly.

## Conclusion

In sum, our results suggest that, for our sample, the majority of single women having abortions failed to use contraceptives because of poor knowledge and limited skills. According to our results, this situation appears to stem from the social taboo associated with premarital sex and pregnancy, scarce and weak information sources and networks, and a lack of post-abortion counseling in order to prevent repeat abortions. These observations have implications for future research and policy.

Studies based on representative samples of young single men and women are needed. While large-scale youth surveys have been conducted in other Asian countries, such an initiative has yet to be taken in Viet Nam. Premarital sexuality, contraceptive behaviour and abortion use are among other important issues affecting young people's lives that need to be researched. Also, future demographic and fertility surveys could include a sub-sample of women who never married. While this is common practice in African and Latin American countries, it is very seldom done in Asia. Also, the availability and cost of contraceptives for unmarried couples represents a research area that needs to

be investigated. Overall, the bulk of research on reproductive health has been focused until now on married women. However, unmarried youth should definitely be included in future research initiatives addressing this issue.

The policy and programme implications arising from our study correspond to many recommendations of the 1994 ICPD Programme of Action (United Nations, 1994). First, population, family planning, health and education policies should address issues of sexual and reproductive health of adolescents, such as unwanted pregnancy, unsafe abortion and sexually transmitted diseases, including HIV/AIDS. As in many other countries, Viet Nam's family planning programme addresses the needs of married couples only. Evidence of increasing premarital sexuality calls for changes in this approach and for a rapid integration of single youth into the national programme. Post-abortion counseling should automatically be offered to all single women using abortion services in order to reduce repeat abortions. In the context of the HIV/AIDS pandemic, the promotion of condoms aimed at single youth as a target audience should stress the utility of this method which can also be used as an effective contraceptive method. The low contraceptive use rate following the onset of sexual relations suggests that there is greater potential for promotion of all forms of birth control. While single women having an abortion should definitely be included in the family planning programme, ideally, all single youth should also be granted access to adequate information and complete services to ensure the greatest protection of their reproductive health.

Second, our study indicates that gender equality needs to be promoted among single youth. Our results show that young men play an important role in the couple's use of contraceptive methods and abortion. Therefore, male responsibility should be encouraged. Information, education and communication (IEC) initiatives should promote their active involvement in using effective contraceptive methods. Also, young women's empowerment could be enhanced by increasing knowledge, skills and self-confidence. Our study points to a need to improve communication between young men and women on sexuality and reproductive health matters. Promotion of their joint and equal responsibility should be emphasized.

Third, education and social policy should promote dialogue between families, schools and youth. Our results show that social and family pressure to hide sexual activity is an important barrier to contraceptive use. The education of parents in order to improve the interaction between them and their children could help parents to deal with their responsibility to educate their children about sexuality and reproductive health. Teachers should be better prepared to provide comprehensive information about sexuality and contraceptive methods. A public education campaign could be designed to create a better social environment in order to encourage single youth to adopt safe sexual reproductive health behaviour.

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#### Endnotes

1. Since then, the issue of premarital sexuality has been more openly discussed and researched. In December 1997, the Population Council organized a seminar on adolescents' reproductive health; the most important government agencies involved in family planning and health participated.
2. We used the word *ngu'o'i yêu* in our questionnaire. This word for boyfriend literally means "the loved person" and clearly refers to a love relationship as opposed to a friendship.
3. The average progress of pregnancy at the time of the first abortion was 10 weeks.
4. First-time abortion users either used the condom or withdrawal, while safer methods such as the pill or the IUD were used mainly by second- or third-time abortion users.

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Impact of Maternal Education and Health Services on Child Mortality in Uttar Pradesh, India

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Improvements in health services, education and provision of safe drinking water, all have a desirable impact on child survival

The risk of death among infants and young children is closely associated with their mother's characteristics as well as the environment in which they live. Studies from developing countries have suggested that child mortality is more closely associated with maternal education than with any other factor. Using Nigerian data, Caldwell (1979) argued that education of the woman plays an important role in determining child survival even after controlling for a number of other factors such as socio-economic characteristics of the husband, including his educational level and occupation. Mosley (1985), in a study based on macro-level indicators for the provinces within Kenya, observed powerful associations of child mortality with levels of female education and poverty. Hobcraft and others (1984) showed that increased levels of the mother's education are associated with improved chances of child survival in a wide range of developing countries and the association survives control for a number of socio-economic variables including husband's education and occupation. They also suggest that the husband's socio-economic characteristics, especially husband's education, are slightly more strongly associated with improved survival in Sub-Saharan Africa. Studies from the micro level to macro inter-country comparison invariably reaffirm the influence of maternal education on infant and child mortality (Cochrane and others, 1980; United Nations, 1985, 1994; Da Vanzo and Habicht, 1986; Cleland and van Ginneken, 1989; Bicego and Boerma, 1993).

This article attempts to identify the factors through which maternal education influences infant and child mortality with data from Uttar Pradesh, an Indian State where the infant mortality rate is very high, the level of fertility remains high, utilization of health services is low and the level of literacy and social development is low. It also examines how much the survival of infants could be improved by health services within the given educational and social context.

#### Data and method

Data for this study are drawn from the National Family Health Survey, Uttar Pradesh, which was conducted between 10 October 1992 and 22 February 1993 by the Population Research Centre (PRC), Lucknow and the International Institute for Population Sciences (IIPS), Mumbai. For the purpose of data collection, Uttar Pradesh was divided into four zones, namely Lucknow, Bareilly, Agra and Gorakhpur, and data collection operations were carried out separately in these four zones by independent teams. Three different schedules were administered: (a) a village schedule giving information about the village, (b) a household schedule giving details about basic amenities available and (c) an individual woman's schedule from ever married women 13-49 years of age, which contained detailed information about the respondents' background, reproduction, contraception, health of children and fertility preferences.

A total of 11,438 ever married women in that age group were contacted from a representative sample of 10,110 households. In all, these women accounted for a total of 40,811 births. Since detailed data on pregnancy and breastfeeding as well as immunization were available only for recent births, i.e. births that took place during the period 1988 to 1992/93, this study is restricted to births that took place during the above-mentioned period of 61 months. For these births, corresponding information on the mother and household characteristics were matched and a comprehensive child-based data file was created. Of the total of 9,727 such births, there were 1,038 infant and childhood deaths.

The variables used in the study include the following: based on information on the survival status of the child at the time of the survey and age at death (given in months), deaths are classified into two categories: neonatal deaths (zero completed months or less than one month) and deaths at later childhood ages (1-61 months). The conventional post-neonatal (1-11 months) and childhood (12-48 months) periods have been combined because such a classification would reduce the number of deaths included in the analysis as well as the significance of the study.

The explanatory variables influencing mortality at the neonatal and later childhood ages are grouped into the following categories. The socio-economic variables included are maternal education, place of residence, caste, religion and an index for economic standard of living. Religion and caste have been

pooled to form a single categorical variable, i.e. scheduled caste (SC) and scheduled tribe (ST) Hindus, non-SC and non-ST Hindus, and Muslims/others. No direct data on household income per se were collected by the NFHS, so an index for economic standard of living was computed based on a slightly modified version of the model used by Roy and Jayachandran (1995). Since type of toilet facility and source of drinking water are treated as variables indicating exposure to water-borne diseases, in this study, they have been excluded from the index. The index computed for the present study is based on the type of house, availability of a separate room for cooking, source of lighting, type of fuel used for cooking, ownership of various livestock, and ownership of various household goods such as radio, television, bicycle and refrigerator. Further, based on the score, the households are grouped into two categories: low and medium economic standards of living. The variables describing family formation pattern are birth interval, birth order and maternal age at birth of the child. Information relating to whether the mother received antenatal care, received a tetanus injection during pregnancy, used iron and folic acid tablets, as well as place of delivery and assistance at the time of delivery are termed as maternal health service utilization factors. However, tetanus injection and use of iron and folic acid tablets have been dropped from the analysis as they are strongly associated with antenatal care. Child health services utilization variables include the following vaccinations: BCG (bacille Calmette Guerin), DPT (diphtheria-pertussis-tetanus), polio and measles. For each type of immunization received by the child, a score of 1 is assigned and the score ranges from 0 to 4. Indicators of water-borne exposure to disease are source of drinking water and type of toilet facility.

Mortality in the neonatal period is studied using a logistic regression model. As our primary concern is to see the effect of maternal education on infant and child mortality through other intervening variables, a set of generalized equations are derived, as follows:

$$\text{logit } q_1 = b_0 + b_1 X_1 \quad (\text{eq. 1})$$

$$\text{logit } q_{1,2} = b_0 + b_1 X_1 + b_2 X_2 \quad (\text{eq. 2})$$

$$\text{logit } q_{1,2,3} = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 \quad (\text{eq. 3})$$

$$\text{logit } q_{1,2,3,k} = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + \dots b_k X_k \quad (\text{eq. 4})$$

Whereas equation (eq.) 1 includes only maternal education, equation 2 adds socio-economic factors, equation 3 includes family formation patterns, and equation 4 adds maternal health service utilization. To study mortality in the later childhood period, hazards model analysis (Cox, 1972) has been carried out with a set of similar equations. Child health services and exposure to water-borne diseases are incorporated in the analysis of mortality in the later childhood stage.

## Results

### Neonatal mortality

As expected, children of illiterate women experienced higher neonatal mortality in comparison with the educated women (table 1, eq. 1). With the inclusion of socio-economic determinants, the effect of maternal education is reduced but still remains significant (eq. 2). Children of mothers residing in a rural setting experienced higher odds of dying compared with those dwelling in urban areas. This is probably due to the availability of better infrastructural facilities in the urban areas. The addition of family formation patterns generally tends to move the education coefficients towards null value, thus suggesting that these variables mediate the effect of education advantage (eq. 3). Neonates born at intervals of less than 24 months had about 1.5 times the odds ratio of dying than those of more widely spaced neonates. Children of first, second and third order births experienced higher odds of dying than those of higher order births (4+). Further, children born to teenage mothers (under 18 years of age) experienced higher odds while infants of older mothers (older than 35 years) experienced lower odds of dying than those of babies born to mothers in the age group 18-34 years. The introduction of health service variables changes the education coefficient to a small extent only (eq. 4). Among the health service variables, antenatal care of the mother during pregnancy as well as assistance at delivery played an important role in explaining the educational advantage. As expected, women who had received antenatal care faced lower odds of dying. Births that were attended by nurse/midwife/trained birth-attendant had lower odds when compared with those that were attended by traditional birth-attendants or relatives.

Table 1. Odds ratio of neonatal mortality associated with maternal education, gross effect, effects controlled for socio-economic factors, effects with addition of family formation patterns and maternal health service utilization in Uttar Pradesh, India

<b>Explanatory variables</b>	<b>Equation 1</b>	<b>Equation 2</b>	<b>Equation 3</b>	<b>Equation 4</b>
Maternal education (Ref: Middle level and above)				
Illiterate	1.5358 <sup>a</sup>	1.3773 <sup>a</sup>	1.4310 <sup>a</sup>	1.3850 <sup>a</sup>
Primary	0.7678 <sup>b</sup>	0.7458 <sup>b</sup>	0.7269 <sup>b</sup>	0.7315 <sup>b</sup>
Residence (Ref: Urban)				
Rural	—	1.3323 <sup>a</sup>	1.3089 <sup>a</sup>	1.3297 <sup>a</sup>
Religion and caste (Ref: SC and ST Hindu)				
Other Hindu	—	1.0433	1.0452	1.0036
Muslim/others	—	0.9023	0.9076	0.9535
Economic standard of the household (Ref: Low)				
Moderate	—	0.9365	0.9180 <sup>c</sup>	0.9193
Birth interval (Ref: 24+ months)				
<24 months	—	—	1.5217 <sup>a</sup>	1.5318 <sup>a</sup>
Birth order (Ref: 4+)				
1-3	—	—	1.1126 <sup>b</sup>	1.1251 <sup>b</sup>
Maternal age (Ref: 18-34 years)				
<18 years	—	—	1.2889 <sup>b</sup>	1.3192 <sup>d</sup>
35+ years	—	—	0.9714	0.9429
Antenatal care (Ref: No)				
Yes	—	—	—	0.8047 <sup>a</sup>
Place of delivery (Ref: Institution)				
Home	—	—	—	0.8851
Assistance at delivery (Ref: TBA/relative)				
Nurse/midwife	—	—	—	0.8102 <sup>c</sup>
Doctor	—	—	—	1.3291

a p<.001; b p<.05; c p<.10; d p<.01.

#### Mortality during later childhood ages

The results of hazards model analyses showing the effect of maternal education, socio-economic, demographic, maternal and child health services as well as environmental factors on later childhood mortality (1-61 months) are presented in table 2. The gross effect of maternal education shows a highly significant association (table 2, eq. 1). Children of illiterate mothers experienced 1.9 times the risk of dying as those born to mothers who had at least middle school and above education.

Table 2. Relative risk of post-neonatal mortality associated with maternal education, gross effect, effects controlled for socio-economic factors, effects with addition of family formation patterns, maternal health service utilization, child health services and exposure water-borne diseases in Uttar Pradesh, India

<b>Explanatory variables</b>	<b>Equation 1</b>	<b>Equation 2</b>	<b>Equation 3</b>	<b>Equation 4</b>	<b>Equation 5</b>
Maternal education (Ref: Middle level and above)					

Illiterate	1.9080 <sup>a</sup>	1.6281 <sup>a</sup>	1.6065 <sup>a</sup>	1.3694 <sup>a</sup>	1.0659
Primary	0.8105	0.8025	0.7876	0.8086	0.8106
Residence (Ref: Urban)					
Rural	—	1.1430 <sup>c</sup>	1.1415 <sup>c</sup>	1.0503	0.9977
Religion and caste (Ref: SC and ST Hindu)					
Other Hindu	—	0.9638	0.9805	0.9962	1.0602
Muslim/others	—	0.7962 <sup>d</sup>	0.7999 <sup>d</sup>	0.8170 <sup>d</sup>	0.7979 <sup>d</sup>
Economic standard of the household (Ref: Low)					
Moderate	—	0.8465 <sup>b</sup>	0.8521 <sup>d</sup>	0.8692 <sup>b</sup>	0.9651
Birth interval (Ref: 24+ months)					
<24 months	—	—	1.5201 <sup>a</sup>	1.5455 <sup>a</sup>	1.5323 <sup>a</sup>
Birth order (Ref: 4+)					
1-3	—	—	0.8880 <sup>d</sup>	0.8970 <sup>d</sup>	0.8901 <sup>d</sup>
Maternal age (Ref: 18-34 years)					
<18 years	—	—	1.2684 <sup>d</sup>	1.2908 <sup>d</sup>	1.3614 <sup>b</sup>
35+ years	—	—	0.9811	0.9603	0.9105
Antenatal care (Ref: No)					
Yes	—	—	—	0.7021 <sup>a</sup>	0.8940 <sup>c</sup>
Place of delivery (Ref: Institution)					
Home	—	—	—	1.0974	0.9859
Assistance at delivery (Ref: TBA/relative)					
Nurse/midwife	—	—	—	0.8061	0.8519
Doctor	—	—	—	1.1528	1.1659
Immunization	—	—	—	—	0.5670 <sup>a</sup>
Toilet facility (Ref: No facility)					
Facility	—	—	—	—	1.0142
Drinking water (Ref: Own facility)					
Other facility	—	—	—	—	0.8491
Public facility	—	—	—	—	1.2903 <sup>b</sup>

a p<.001; b p<.01; c p<.10; d p<.05.

In spite of the induction of other socio-economic variables, maternal education continued to be important, revealing that illiterate women faced a 1.6 times higher risk of later childhood deaths of their children compared with women educated to at least the middle school level. The other variables which showed impact during the later childhood period were the religion/caste variable and place of residence. Children of Muslims/others faced a lower risk of dying compared with those of SC and ST Hindus. Children born in rural areas experienced a 14 per cent higher risk of dying compared with their urban counterparts. The economic standard of the household, a proxy for income, also proved to be important during the childhood period and showed a negative relationship. Children born in households with a moderate economic standard experienced an approximately 16 per cent lower risk of dying compared with those at a lower economic standard.

With the inclusion of family formation variables into the model (eq. 3), birth interval and birth order of the



child show significant effects as in the case of the neonatal period. The independent effect of maternal education continued to be significant even after the inclusion of family formation variables into the model. Children of mothers who had delivered at shorter intervals (<24 months) had a 52 per cent higher risk of dying than those with longer birth intervals (24+ months). Children of first, second and third order births experienced a lower risk of dying than those of higher order births. Religion/caste and economic standard continued to exert a significant independent impact. Children born to mothers younger than 18 years of age had a higher risk of dying than those born to mothers aged 18-34 years.

When maternal health service utilization variables were added to the model (eq. 4), antenatal care of the mother showed a highly significant negative effect on mortality. Children born to mothers who received antenatal care experienced a 30 per cent lower risk of dying than those of mothers who did not receive antenatal care. Birth intervals also showed a highly significant effect. Besides maternal education, economic standard of living of the household, birth order, religion/caste and maternal age, all continued to be important.

Most of the four immunizations previously mentioned are given within the first few months of life. Exogenous factors such as the use of toilet are more likely to be influential during the childhood period only. Thus, at the next stage, immunization as well as variables indicating exposure to water-borne diseases are included.

(Click here for photo) This Indian girl's future is likely to be brighter than that of her peers because her mother was educated and sought health care for her daughter since the time of her birth.

When child health services and environmental characteristics are inducted into the model (eq. 5), the education effect no longer seems to be important. This implies that a substantial effect of education on childhood mortality is mediated through child health services and exposure to water-borne diseases. Among the socio-economic factors only religion/caste showed a notable effect, with Muslims/others experiencing a lower risk of childhood death than scheduled caste and scheduled tribe Hindus. Birth intervals continued to exhibit a highly significant positive effect. Besides these, the birth order of the child, maternal age and antenatal care continued to show significant independent effects. Among the child health services, immunization of the child played a vital role in reducing later childhood mortality by about 44 per cent. The variable depicting exposure to water-borne diseases, i.e. source of drinking water, also showed a notable effect. In households drawing water from public sources, children had a 29 per cent higher risk of dying than in those households obtaining water from sources available at the residence. Surprisingly, households that used other sources (streams/lakes etc.) had a lower risk, but the results are not statistically significant.

## Discussion

The importance of education, particularly that of the mother, has been well established and widely accepted. It is generally agreed that maternal education acts as an independent determinant of infant and child mortality and is at times considered a proxy for other social variables. Maternal education influences child survival through various pathways: enhanced socio-economic status, greater health choice for children, including interaction with medical personnel, cleanliness, emphasis on child quality in terms of fewer children, and greater food and capital investments (Caldwell, 1979; Ware, 1984). Our study is in agreement with the earlier findings that the mother's education is a more decisive determinant of child survival even after controlling for a number of socio-economic variables. In Uttar Pradesh, the differentials in mortality are large among women who are illiterate and those with a middle school and above education. Women with a primary school education do not differ significantly from those with a middle school and above education. Maternal education seems to have direct as well as indirect effects through the mother's antenatal care as well as family formation patterns in the case of neonatal mortality.

Maternal education continues to be an important determinant of mortality in the post-neonatal and childhood ages. The education advantage is effected through greater access to child health services and environmental factors for the better educated. Children of teenage mothers experienced a higher risk of dying both in the neonatal and later childhood periods. The effect of teenage pregnancy in neonatal mortality is biologically determined and may be characterized by immaturity and low birth weight. Children born in households with moderate economic standards experienced a low mortality risk, particularly after the first month of life; this outcome may be due to the provision of better nutritional requirements to both the mother and child. Children of Muslims experienced a lower risk of dying compared with the scheduled caste and scheduled tribe Hindus.

Children of first, second and third order births experienced higher risks of dying during the neonatal period compared with fourth and higher order births. However, during the later childhood period, children of first,

second and third order births faced lower risks when compared with those of higher order births. A plausible reason could be that children of higher order births receive poorer food and care by virtue of being born in large families.

Indicators of exposure to water-borne diseases, particularly the source of drinking water, proved to be vital at later childhood ages. Higher risk of death was observed for those depending on water from public sources than those having their own sources at their residence. The quality of water from public sources is suspect. It is possible that water available at one's own residence is more likely to be kept clean and protected than those that are provided by public sources.

The question that now arises is whether, within a given educational and social context, improvements in health services could have a desirable impact on child survival. According to the model, a well-spaced higher order baby born at home to an illiterate scheduled caste (or scheduled tribe) woman aged 18-34 years, residing in a rural area with low socio-economic status, who was assisted by a traditional birth attendant or relative without receiving any antenatal care, faces a neonatal mortality risk of 0.049. At the same time, a baby born to a woman with all of the above-mentioned characteristics, except for the mother having received antenatal care, the neonatal mortality risk is 0.032. This would imply that, irrespective of socio-economic or bio-demographic conditions, mere utilization of antenatal care by pregnant women would help in reducing neonatal mortality by about 17 units.

Certainly, enhancing maternal education will maximize the utilization of health services. However, raising the level of education is a long-term goal. Therefore, one of the policy options is making investments in maternal health programmes because this could help to reduce neonatal deaths. The findings from the study also suggest that investment in child health services as well as provision of safe drinking water, particularly from public sources, could help to achieve a reduction in mortality during the later childhood ages in Uttar Pradesh.

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The Determinants of First and Subsequent Births in Urban and Rural Areas of Bangladesh

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Increasing urbanization will hasten the current trend in fertility reduction

The decision of parents to have a subsequent baby depends on many factors, such as their education and occupation, number of existing children, sex of each child born and experience of a child's death. These factors influence the parents' demand for subsequent births and prompt couples to change their reproductive goals during their childbearing periods (Lee, 1980). If there is a very rapid change at one period in time, the change might have an impact on all or most birth orders (Hobcraft and McDonald, 1984). From a theoretical point of view, timing of the first birth and the subsequent birth are very important in fertility studies. According to Rodriguez and Hobcraft (1980:8), the process of family building consists of "a series of stages where women move successively from marriage to first birth, from first to second, and so on, until they reach their completed family size".

A first birth is one of the most significant events in a woman's life (see Rindfuss and John, 1983) and it signals the beginning of intensive responsibilities and child-care tasks (Rao and Balakrishnan, 1988). Studies suggest that the timing of a first birth has a substantial influence on subsequent birth-spacing as well as childbearing patterns of women (see, for example, Trussel and Menken, 1978; Millman and Hendershott, 1980; Yamaguchi and Ferguson, 1995). An early first birth is likely to increase the probability of having second- or higher-order births within a given period (Rao and Balakrishnan, 1988). It is hypothesized that parents' demand for having a specific birth order may differ with respect to the number of children they already have.

Past studies have concentrated mostly on age at first birth (for details, see Rao and Balakrishnan, 1988; Rindfuss and John, 1983; Rao and Murty, 1987; Hirschman and Rindfuss, 1980; Lehrer, 1985). Relatively little literature, however, is available on the fertility determinants of subsequent births. Among the studies available, most focus on the consequences for developed countries. For example, Cooman and others (1987) have developed econometric models of births based on the first four birth orders in England and Wales. In another study, Wright and others (1988) developed a proportional hazard model for determining the third birth in Great Britain.

Modelling with birth intervals became possible with the availability of reasonably good quality birth history data in the World Fertility Survey (WFS) programme (Rodriguez and Hobcraft, 1980; Rodriguez and others, 1984; Srinivasan, 1980; Hobcraft and Casterline, 1983; Ford, 1984). Various studies have utilized sophisticated statistical techniques to determine the factors associated with fertility and have compared various countries participating in the WFS along with Bangladesh (see Rodriguez and Hobcraft, 1980; Hobcraft and McDonald, 1984; Rodriguez and others 1984). These studies, however, do not provide sufficient insights into the determinants of subsequent births in urban and rural Bangladesh.

The determinants of the probability of having subsequent births in Bangladesh for women living in both urban and rural areas are explored in this article using a survival analysis methodology. This will elucidate how the factors influencing parents' demand for children change from one birth order to another. Both univariate and multivariate analyses are presented.

## Materials

### The data

The data used in this study were collected in the 1989 Bangladesh Fertility Survey (BFS) which was conducted during the period from December 1988 to April 1989 under the auspices of the National Institute of Population Research and Training (NIPORT) in Dhaka. In the survey, a two-stage sampling design was used to collect data from both the urban and rural areas. At the first stage, 175 rural and 100 urban clusters were selected as the sample. In the second stage, 11,729 households were selected. Finally, a total of 11,905 ever married women, aged 10-49 years, dwelling in the household were interviewed. Among them were 8,466 respondents in rural areas and 3,439 in urban areas. Respondents were also asked a battery of questions about their demographic, socio-economic, cultural and decision-making circumstances. The data are thought to be very good in terms of their quality; a detailed discussion on the survey methodology can be found in the report of Huq and Cleland (1990).

### Variables selected for survival analysis

The dependent variable used in this article is the birth intervals for different parities, which are measured in single months. In this particular analysis, the birth interval is considered up to 144 months in order to provide sufficient

information for the analysis. This duration is relatively longer than the earlier studies conducted in Bangladesh (Rodriguez and Hobcraft, 1980; Hobcraft and McDonald, 1984; Rodriguez and others 1984). Five duration-dependent variables were used, namely time from marriage to first birth, duration since first birth, duration between first and second birth, duration between second and third birth, and duration between third and fourth birth to subsequent birth or the survey date.

Variables examined in this study were classified as demographic, socio-economic, cultural and decision-making (see table 1); they account for a large portion of the variation in urban and rural fertility in Bangladesh (Khan, 1996). Three demographic variables are examined in the analysis: the age of the woman at the start of the intervals (i.e. age at the time of first marriage, age at the time of first birth, and so on), mother's experience of a child's death categorized as ever and never, and length of previous birth intervals.

Table 1. Covariates selected for the survival analysis: Bangladesh

<b>Covariates</b>	<b>Abbreviation</b>	<b>Classification of variable</b>
Age of woman at the time of $i^{\text{th}}$ birth ( $i = 1, 2, 3, 4, 5$ ) or age at start of the interval	AGE1	Under 20 years
	AGE2	20-29 years
	AGE3	30 years or more
Sex of most recent birth	SEX1	Sex of first child: son = 1, girl = 0
	SEX2	Sex of second child: son = 1, girl = 0
	SEX3	Sex of third child: son = 1, girl = 0
	SEX4	Sex of fourth child: son = 1, girl = 0
Death of most recent birth	DEATH1	Death of first child: dead = 1, alive = 0
	DEATH2	Death of second child: dead = 1, alive = 0
	DEATH3	Death of third child: dead = 1, alive = 0
	DEATH4	Death of fourth child: dead = 1, alive = 0
Years before the survey (period)	YBS1	0-5 years
	YBS2	6-10 years
	YBS3	11-15 years
Length of previous interval (in months)	LPI1	Under 25 months
	LPI2	25-47 months
	LPI3	48 or more months
Woman's education (years of schooling)	EDW1	No schooling
	EDW2	1-5 years
	EDW3	6 or more years
Husband's education (years of schooling)	EDH1	No schooling
	EDH2	1-5 years
	EDH3	6 or more years
Woman's work experience before first birth	WW	Yes = 1, no = 0
Religion	REL	Muslim = 1, non-Muslim = 0
Practise religion (religiosity)	PREL	Strongly = 1, average = 0
Childhood background of woman	CBW	Urban = 1, rural = 0
	RR1	Chittagong
Region of residence	RR2	Dhaka
	RR3	Khulna
	RR4	Rajshahi
	RR4	Rajshahi
Family planning decisions	FPD	Jointly with husband = 1, individually = 0

The following socio-economic variables were considered in the models: woman's education (in years of schooling), which is a trichotomous variable categorized into no schooling, 1 to 5 years, and 6 or more years of schooling, and a similar pattern for husband's years of schooling.

Past studies have demonstrated that the cultural setting and tradition exert important influences on reproductive behaviour. Four culture-related variables are investigated: religion (Muslim, non-Muslim) and the practice of religion (strict or not). How strictly women practised religion was ascertained from the following question in the 1989 BFS: "Would you say that your household observes religious practices more strictly or less strictly than other households in the locality?". The respondent was asked to tick "more strictly", "less strictly" or "average". The responses less strictly and average were then merged into the less-strict group.

Region of residence (Chittagong, Dhaka, Khulna and Rajshahi) is considered as evidence suggesting that the Chittagong region is culturally different from other parts of Bangladesh, because people adhere to traditional beliefs and values there more than those in other regions with regard to religion and preference for male children. The respondents' childhood background is also considered and has been categorized as "rural" and "urban" types.

Other new variables included in this analysis are: if the woman worked outside the home before the first birth, sex of the most recent birth(s) (or the preceding birth), death of the most recent birth(s), age at start of interval, length of previous interval and years before the survey (period). Age at the start of the birth interval is defined in completed years.

The importance of period effects in fertility studies has been described by several demographers (for details, see Rodriguez and Hobcraft, 1980; Hobcraft and McDonald, 1984; Rodriguez and others, 1984, Hobcraft, 1980; Hobcraft and Casterline, 1983; Ford, 1984). Hobcraft and Casterline (1983) argued that period effects are surrogates for a whole set of contemporaneous influences, including economic circumstances, availability and acceptability of contraception, abortion and societal or normative pressures. Thus, an investigation of period effect will provide some evidence of the demand trend for subsequent births over a period of years. Some authors have pointed out the difficulties in measuring the trends in birth interval from a cross-sectional survey (Ford, 1984); however, others have argued that the data may be of good quality for at least 15 years before the survey (Hobcraft, 1980). For this investigation of trends, only three time periods are considered: 0-5, 6-10 and 11-15 years before the survey. Rodriguez and others (1984) used a similar classification. The 15-year duration will help to investigate further evidence of the recent fertility decline in Bangladesh, which has been outlined in Khan and Raeside (1994).

Some variables were not considered as there is no information contained in the 1989 BFS on women's activities before the first birth. For example, the variable contraception was not used because there is no information on when contraception was used relative to birth orders.

## Methods

For the analysis of subsequent fertility in Bangladesh, up to the fifth order of the mother's parity is examined. Parity is ordered as the first, second, third, fourth and fifth birth of mothers. Higher order parity (six or more births) is ignored in this study because an assumption is made that parents' demand for higher order parity is similar to that of level five. In Bangladesh, childbearing is practised mostly within marriage; births outside marriage are rare (Khan, 1996). Hence, this analysis is conducted for ever married women only. The birth history data in the 1989 BFS includes records of information for each birth, such as the date of birth, sex and the mortality status of each birth.

In survival analysis, the data are normally found to be incomplete because some individuals may leave the study before reaching the end-point (e.g. death or, in this case, the next birth). Thus, there are two problems caused by such incomplete data, namely selectivity and censoring. Life-table techniques can handle such censored observations in the calculation of survival probabilities. In this analysis, the event of women who have had a birth within a specific duration is denoted as a "failure" event (uncensored); if it does not occur, then the event is termed as "censored". For example, for the first birth model, if a woman gave birth within the duration of marriage to first birth, the event of having the first baby is denoted a failure event. For the second birth, all the women concerned must have had at least a first birth (selectivity). If a woman had another birth, the event is termed as a failure event and if she did not give birth by the date of the survey, then the event is termed as censored. Events are similarly defined for the third, fourth and fifth births.

In this study, the marital fertility differentials for the timing of childbearing and the factors influencing the likelihood of having subsequent births are examined by using the following statistical tools: tabular analysis, non-parametric survival analysis and Cox proportional hazards regression analysis.

The non-parametric analysis is used to determine the differences in survival probabilities, whereas the hazard model is utilized in order to identify the influences of selected variables. In this article, the non-parametric and Cox's regression analyses have been carried out using the statistical analysis system procedures "PROC LIFETEST" and "PROC PHREG", respectively (SAS, 1988, 1992).

## Tabular analysis

Tabulations of the mean have been carried out in order to examine how the timing of subsequent births of women varies with respect to their socio-economic, demographic, cultural and decision-making characteristics. The mean timing of subsequent births for women in urban and rural areas of Bangladesh is not shown in the text, but can be found in the thesis of Khan (1996). The mean ages are calculated in respect of those women who have completed a certain birth order. The means are computed for each birth order and censoring is allowed.

From this analysis, it is apparent that later age at the start of each birth interval delays the timing of subsequent births in both urban and rural Bangladesh. It was observed that the higher the educational attainment of women, the later

they would have had subsequent births. A similar result is also found for the husband's education. Therefore, it is clear that the number of years of schooling is positively associated with delaying subsequent fertility. It has been hypothesized for religion that Muslim women tend to become mothers earlier than non-Muslims. The results support the hypothesis that Muslim women have a comparatively earlier age of subsequent births than their non-Muslim counterparts. Religiosity (practice of religion) was also assumed to have an influence on the timing of subsequent fertility. However, in most cases, women who seriously practise their religion are found to have only a slightly longer timing for subsequent births.

From this analysis, it was revealed that joint decisions about the use of contraception delays in all cases the mean ages of having a birth for women in both urban and rural areas. Another important variable is the work status of women before the first birth. It has been observed that there are large differences in the timing of subsequent births depending on whether the woman worked before the first birth or not. Women who have worked outside the home were found to have delayed their births longer than their non-working counterparts. Region of residence does not show any significant effect. Urban childhood background of women and male sex of the most recent birth are found to be associated with a longer timing for subsequent births. On the other hand, experience of previous child death is associated with a slightly shorter mean timing of having subsequent births in both urban and rural areas. The period variable shows that the mother's age at the time of her first child has increased in recent years. It was found to be lower 6-10 years previously and much lower 11-15 years before the survey.

#### Non-parametric survival analysis

The SAS statistical package enables the estimation of the survival function either by the product-limit method or the life-table method. This package was used in order to examine the differences between categories of variables (strata); statistics were also computed for testing the homogeneity of the strata. The analysis also gives the survival function  $S(t)$ , the hazard function  $l(t)$  and the probability density function  $f(t)$  (see Cox, 1972; Namboodiri and Suchindran, 1987; Lee, 1992).

The birth function will be used in this analysis and is defined as being analogous to the life-table failure function, which indicates the cumulative proportion of women having a subsequent birth by single months of duration since the previous birth (or marriage). This has also been discussed in earlier work conducted by many authors such as Rodriguez and Hobcraft (1980) and Hobcraft and McDonald (1984).

#### Comparison of birth curves

The Log-rank test and the Wilcoxon test were used to compare two or more survival curves (Lee, 1992). Results of non-parametric survival analysis for the subsequent births are presented in Khan (1996). From this analysis, it has been found that the woman's education, her husband's education, work status, family planning decisions, region of residence, and the woman's childhood background are associated with significant variations in failure time among the subgroups in both the urban and rural areas. Additionally, in rural areas the woman's age at the start of the interval and the period effects are important.

It has been observed that the older the mother's age at first birth, the higher would be her level of education. Higher levels of husbands' education, an urban childhood background of mothers and lower levels of child death were found to have statistically significant effects in increasing the time to the next birth in urban areas. In rural areas, lower age at first birth, lower levels of women's education, a longer period before the survey, a higher level of religiosity, residence in the Chittagong region and death of the first child, all were observed to have statistically significant effects in shortening the periods to the next birth.

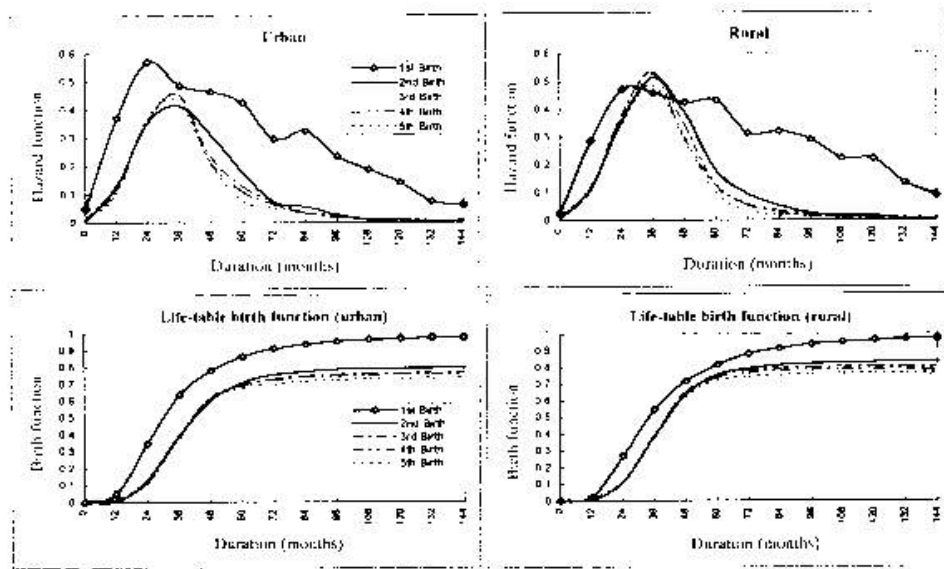
As far as the fertility transition from second birth to third birth is concerned, important variables in both urban and rural areas are the timing of the second birth for women, period, her education, their husband's education, religiosity, family planning decisions, childhood background, sex and death of second child. All these variables influence the likelihood of another birth similar to the progression to second birth, as would be expected. Working women, religious adherence and region of residence were significant only in the rural areas.

When the transition from third to fourth birth in urban and rural areas is examined, it may be observed that the timing of the third birth for the woman, period, the level of the mother's education, lower levels of husband's education, family planning decision-making, rural childhood background of mother and death of the third child vary significantly between the subgroups in both urban and rural areas. Other variables which were found to be significant only in increasing the likelihood of another birth in rural areas were high proportions of Muslims, stronger practice of religion and residence in the Chittagong region.

Finally, the transition probabilities from fourth to fifth birth were estimated. It was found that later timing of the fourth birth for the woman, period, higher levels of the mother's education, higher levels of the husband's education, greater levels of family planning decision-making, and lower levels of death of the fourth child were significant in reducing fertility in both urban and rural areas. In addition to these, women who worked before first marriage,

religion, religiosity, region of residence and sex of the fourth baby were found to be significant only in rural areas.

Figure 1. Hazard and birth curves for subsequent births in urban and rural situations in Bangladesh



A comparison of the hazard and birth functions for subsequent births in urban and rural situations is presented in figure 1. It may be observed that the hazard rate is found to be the highest for first birth and the hazard rate for urban first birth is higher than rural hazards. However, for higher order births, the urban hazard rate is much lower than the rural rate. This means that urban mothers have their first baby soon after first marriage and are less likely to have subsequent births. Rural women have a tendency to have a larger family size and consequently they are found to have a higher risk of subsequent births. One can also observe from figure 1 that the birth function for the first birth is different from higher-order births in both urban and rural situations. This phenomenon can be explained partly by the fact that fecundability is somewhat higher at younger ages of women and the pattern of coital frequency tends to reduce as marriage duration increases. Socio-economic factors also contribute to making a couple's first and second births occur more rapidly than higher-order births. For example, it has been found that educated mothers often have fewer but more closely spaced children earlier in their marriage. A similar type of birth function has been found for Colombia by Rodriguez and Hobcraft (1980).

#### The Cox model

Cox (1972) first introduced the proportional hazards regression model, which has further been developed by many other authors (see Breslow, 1974; Kalbfleisch and Prentice, 1980; Cox and Oakes, 1984). This model can be used to explain the effect of covariates on survival times (SAS, 1988, 1992; Retherford and Choe, 1993; Collett, 1994; Hess, 1994).

Recently, this method has been applied in demographic research and work has been done on marriage dissolution (Menken and others, 1981; Balakrishnan and others, 1987); contraceptive continuation (Akhter and Ahmed, 1992); timing of birth and birth intervals (Rodriguez and others, 1984; Newman and McCulloch, 1984; Rao and Murty, 1987; Rao and Balakrishnan, 1988; Wright and others 1988; Retherford and Choe, 1993; Ahn and Shariff, 1993). Some demographers and statisticians (see, for example, Rodriguez and others, 1984; Newman and McCulloch, 1984) have expressed the view that the hazards technique is particularly well suited in fertility studies for determining the risk of having a birth. The proportional hazards model is used in this study to investigate the covariate effects on subsequent fertility in urban and rural Bangladesh. This will enable evaluation of the probability of having the next birth for a mother in view of her particular circumstances.

Like the standard life table, it is assumed that there is a hazard (or risk) at each duration  $t$ , of the occurrence of the end-point event (a birth). The hazard function is the product of an underlying duration-dependent risk  $\lambda_0(t)$  and covariates ( $z$ ) expressed as  $\exp(\beta z)$ . It is assumed that the duration-specific rates or risks for a given individual's characteristics are proportional. This is defined as:

$$Y$$

$$\lambda(z; t) = \lambda_0(t) e^{\beta z}$$



$$\frac{\lambda(z; t)}{\lambda_0(t)} = e^{\beta z}$$

where  $\lambda(z; t)$  is the hazard of failure for an individual with covariate  $z$  at time  $t$ ,  
 $\lambda_0(t)$  is the unspecified baseline hazard when  $z = 0$ , called the reference group,  
 $z$  is a row vector of covariates, and  
 $b$  is a column vector of unknown parameters to be estimated in the model.

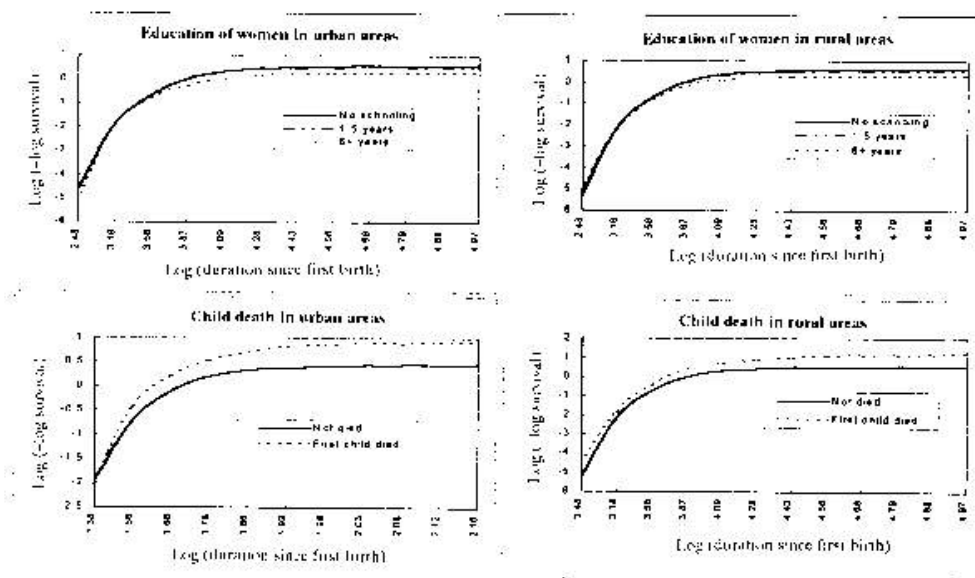
The term  $\exp(bz)$  is the relative hazard function or relative risk associated with having the characteristics  $z$ . Therefore, the hazard function enables one to estimate the relative risks of other groups in relation to the baseline group (reference group). When there is no covariate present in the model, then  $\exp(bz)$  is unity. Values greater than unity indicate that the relative risk of having a baby is greater for that group compared with the reference group. The parameters in the model ( $H_0: b = 0$ ) can be tested by the Wald statistic:

$$\chi^2 = \frac{\hat{\beta}}{SE(\hat{\beta})}$$

where SE stands for standard errors.

In using a proportional hazards model, it is assumed that the hazards associated with covariates are proportional. This assumption is checked by inspecting the plots of  $\ln(-\ln(S))$  against duration for each covariate. These plots are found to be nearly parallel and the assumption is taken to be valid. Two examples of the diagnostic plots are displayed in figure 2.

Figure 2. Log-minus-log plots of the observed life table indicating proportion not having second birth, by duration since first birth: Bangladesh



### The proportional hazards model

Both univariate and multivariate hazards regression models have been formed and the results are presented in the following sections. Univariate analysis was conducted in order to examine the direct influences of selected covariates on subsequent birth intervals in Bangladesh. From the analysis, it may be observed that different birth orders respond differently to the variables. The estimated coefficients from the proportional hazards model are presented in tables 2 to 8 for urban and rural models in which significant parameter estimates are marked with an asterisk. The dash indicates that the covariates do not follow proportional assumptions.

### Univariate analysis

The univariate proportional hazards results are summarized in table 2. The parameter estimates show the effect of each covariate on the timing of the next birth. The effects have been examined for different stages of a woman's life-cycle, such as first, second, third, fourth and fifth births, and models have been developed separately for urban and

rural areas. From this univariate analysis, several interesting findings emerge.

Table 2. Univariate hazards model estimates of the effects of selected variables on subsequent births for urban and rural areas of Bangladesh

Variables	First birth		Second birth		Third birth		Fourth birth		Fifth birth		
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	
Woman's education:											
1-5 years	0.068 (1.071)	0.112 <sup>a</sup> (1.119)	-0.033 (0.967)	- (0.925)	0.078 <sup>a</sup> (1.005)	0.005 (0.951)	-0.051 (0.949)	-0.053 (0.896)	-0.110 <sup>a</sup> (0.945)	-0.057 (0.990)	0.010 <sup>b</sup> (0.990)
6 or more years	0.241 <sup>a</sup> (1.273)	0.218 <sup>a</sup> (1.244)	0.232 <sup>a</sup> (0.793)	0.252 <sup>a</sup> (0.777)	0.300 <sup>a</sup> (0.741)	0.388 <sup>a</sup> (0.678)	0.451 <sup>a</sup> (0.637)	-0.467 <sup>a</sup> (0.627)	0.403 <sup>a</sup> (0.668)	0.393 <sup>a</sup> (0.675)	- (0.675)
Husband's education:											
1-5 years	0.003 (1.003)	0.073 <sup>b</sup> (1.076)	0.055 (1.057)	-0.003 (0.996)	-0.033 (0.967)	0.043 (1.044)	-0.019 (0.980)	0.035 (1.036)	- (0.847)	0.166 <sup>b</sup> (0.847)	-0.009 (0.991)
6 or more years	0.190 <sup>a</sup> (1.209)	0.112 <sup>a</sup> (1.119)	0.087 <sup>b</sup> (0.916)	-0.039 (0.962)	0.161 <sup>a</sup> (0.851)	0.083 <sup>a</sup> (0.920)	0.262 <sup>a</sup> (0.769)	-0.101 <sup>a</sup> (0.904)	0.175 <sup>a</sup> (0.839)	0.116 <sup>a</sup> (0.891)	- (0.891)
Woman's work experience	0.025 (1.026)	0.116 <sup>a</sup> (1.123)	- (1.123)	- (1.123)	- (1.123)	- (1.123)	- (1.123)	- (1.123)	- (1.123)	- (1.123)	0.098 <sup>b</sup> (0.906)
Religion	-	-	-	-	-	0.089 <sup>b</sup> (1.094)	-	0.121 <sup>a</sup> (1.129)	-	0.105 <sup>b</sup> (1.111)	-
Religiosity	-	-	-	0.112 <sup>a</sup> (1.084)	-	0.081 <sup>b</sup> (1.155)	-	0.144 <sup>a</sup> (1.086)	-	0.082 <sup>b</sup> (1.086)	-
Family planning decisions	0.139 <sup>a</sup> (1.150)	0.066 <sup>a</sup> (1.069)	- (1.069)	- (1.069)	- (1.069)	0.113 <sup>b</sup> (0.893)	0.084 <sup>a</sup> (0.919)	0.212 <sup>a</sup> (0.809)	-0.125 <sup>a</sup> (0.882)	0.159 <sup>b</sup> (0.852)	0.162 <sup>a</sup> (0.850)
Years before the survey:											
6-10	-	0.108 <sup>a</sup> (0.897)	0.342 <sup>a</sup> (1.408)	0.230 <sup>a</sup> (1.259)	0.462 <sup>a</sup> (1.589)	0.286 <sup>a</sup> (1.331)	0.208 <sup>a</sup> (1.232)	0.224 <sup>a</sup> (1.251)	0.048 (1.049)	0.174 <sup>a</sup> (1.190)	-
11-15	-	0.164 <sup>a</sup> (0.848)	0.395 <sup>a</sup> (1.485)	0.321 <sup>a</sup> (1.378)	0.487 <sup>a</sup> (1.581)	0.330 <sup>a</sup> (1.392)	0.181 <sup>b</sup> (1.199)	0.309 <sup>a</sup> (1.362)	0.287 <sup>a</sup> (1.333)	0.257 <sup>a</sup> (1.224)	-
Age at start of interval:											
20-29 years	-	0.249 <sup>b</sup> (1.283)	0.494 <sup>a</sup> (0.610)	0.323 <sup>a</sup> (0.724)	0.488 <sup>a</sup> (0.613)	0.342 <sup>a</sup> (0.710)	0.409 <sup>a</sup> (0.664)	-0.379 <sup>a</sup> (0.685)	0.348 <sup>a</sup> (0.706)	0.575 <sup>a</sup> (0.562)	-
30 or more years	-	-	-	-0.314 (0.730)	-	-0.033 (0.967)	-	-	-	0.275 <sup>a</sup> (0.759)	-
Length of previous interval:											
25-47 months	-	-	0.066 (1.068)	-0.015 (0.985)	- (0.894)	0.112 <sup>b</sup> (0.849)	0.163 <sup>a</sup> (0.885)	0.123 <sup>b</sup> (0.815)	-0.205 <sup>a</sup> (0.850)	0.162 <sup>b</sup> (0.850)	0.171 <sup>a</sup> (0.843)
48 or more months	-	-	0.168 <sup>a</sup> (0.845)	0.128 <sup>a</sup> (0.879)	0.837 <sup>a</sup> (0.433)	0.495 <sup>a</sup> (0.610)	0.765 <sup>a</sup> (0.465)	-0.667 <sup>a</sup> (0.513)	0.561 <sup>a</sup> (0.571)	0.627 <sup>a</sup> (0.534)	-
Region of residence:											
	-	-	-	-	-	-	-	-	-	-	-

Dhaka	-0.088	0.071 <sup>b</sup>	-	-0.046	-	-0.062	-	-0.069	-	0.132 <sup>a</sup>
	(0.915)	(0.931)		(0.955)		(0.939)		(0.932)		(0.875)
Khulna	-0.049	0.067 <sup>b</sup>	-	-0.043	-	0.081 <sup>b</sup>	-	-0.101 <sup>b</sup>	-	0.183 <sup>a</sup>
	(0.052)	(0.934)		(0.958)		(0.922)		(0.903)		(0.833)
Rajshahi	-0.007	-0.031	-	-0.036	-	0.087 <sup>b</sup>	-	-0.101 <sup>b</sup>	-	-0.072
	(0.993)	(0.969)		(0.965)		(0.917)		(0.904)		(0.931)
Childhood background of woman	0.128 <sup>a</sup>	0.180 <sup>b</sup>	-	0.152 <sup>a</sup>	-	0.138 <sup>a</sup>	0.192 <sup>b</sup>	0.161 <sup>a</sup>	-0.237 <sup>b</sup>	-
	(1.137)	(1.198)		(0.859)		(0.871)		(0.852)	(0.788)	
Death of children:										
First child	-	-	0.269 <sup>a</sup>	0.328 <sup>a</sup>	0.325 <sup>a</sup>	0.186 <sup>a</sup>	0.251 <sup>a</sup>	0.177 <sup>a</sup>	0.242 <sup>b</sup>	0.173 <sup>a</sup>
			(1.310)	(1.389)	(1.385)	(1.204)	(1.286)	(1.194)	(1.273)	(1.189)
Second child	-	-	-	0.454 <sup>a</sup>	0.438 <sup>a</sup>	0.226 <sup>a</sup>	0.205 <sup>a</sup>	-	-	-
				(1.575)	(1.550)	(1.254)	(1.229)			
Third child	-	-	-	-	-	0.508 <sup>a</sup>	0.339 <sup>a</sup>	-	0.208 <sup>a</sup>	-
						(1.662)	(1.404)		(1.232)	
Fourth child	-	-	-	-	-	-	-	0.226 <sup>b</sup>	0.340 <sup>a</sup>	-
								(1.255)	(1.406)	
Sex of children:										
First child	-	-	-	-	0.096 <sup>b</sup>	-	-	-	-	-
					(0.908)					
Second child	-	-	-	-	-0.057	0.068 <sup>a</sup>	-	-	-	-
					(0.944)	(0.933)				
Third child	-	-	-	-	-	-	-	-0.046	-	-0.061
								(0.955)		(0.940)
Fourth child	-	-	-	-	-	-	-	-	-	-0.006
										(0.994)

Notes: Figures in parentheses are the relative risks of the variables.

a Significant at  $p < 0.01$ .

b Significant at  $p < 0.05$ .

Women's education is found to be the most important variable. Educated women have their first baby earlier in their marriage than non-educated women. This effect is greater for urban women than their rural counterparts and can be partially explained by the fact that urban educated women usually marry later than rural women and they desire to have their first child soon after marriage. Rao and Murty (1987) found a similar result in Guyana. For second and higher order births, education reduces the chance of having a birth. For example, urban educated mothers having six or more years of schooling are found to have 21 per cent  $\{[1 - \exp(-0.232)] \times 100\}$ , 26 per cent, 36 per cent and 33 per cent lower probabilities of having their second, third, fourth and fifth births, respectively, than uneducated women. A similar pattern is also observed for husband's education in Bangladesh. It is found that the education of a husband with six or more years of schooling is statistically significant in almost all the models, which indicates a lower likelihood of having the next birth or higher order births.

For the urban case, whether or not women worked outside the home before their first birth does not contribute much towards the likelihood of having the next birth; however, in the rural areas, work outside the home for a woman is found to have a significant positive influence on the likelihood of a first birth. There is a negative significant influence on the fifth birth, implying that employment opportunity reduces the probability of higher order births.

Religion and religiosity are found to have a statistically significant positive influence on having second and higher order births in rural areas, while in urban areas, these factors are not significant at all. It is also observed from table 2 that religion and religiosity have no statistically significant effect on first birth. Thus, it can be concluded that the contribution of religion is particularly strong in rural areas. This study indicates that Muslims in rural Bangladesh are more likely to have higher order births compared with non-Muslims.

The probability of a first birth is positively influenced by the joint family planning decisions of couples in both urban and rural areas. There is no significant effect on second birth, whereas joint family planning decisions contribute to lowering the likelihood of having three and higher order births.

From this analysis, it is demonstrated that the period effect is important in the model of subsequent births in urban and rural Bangladesh. Accounting for the period effect has, unexpectedly, a negative effect on the first birth in rural areas. Similar results were found by Hobcraft and McDonald (1984), who explained this finding as an artefact of errors in the recording procedures. For proceeding from first to second, third, fourth and fifth births, the effects are as expected, in that the risks of births decrease over the years. This evidence of declining period effects becomes clearer for higher order births and is consistent with the earlier findings of Rodriguez and Hobcraft (1980).

The length of the preceding birth interval is found to have a direct effect on subsequent births in both urban and rural Bangladesh. The parameter estimates reveal that the longer the preceding birth interval a woman has had, the lower is the risk of progressing towards having the next birth. This finding confirms earlier work carried out by Rodriguez and others (1984).

It can be observed from table 2 that there is a significant regional effect only in rural areas. The coefficient has a positive sign, which indicates that residence in the Chittagong region poses a higher risk of a woman having subsequent births compared with women living elsewhere in the country.

The coefficient of childhood background of the respondent indicates a positive influence on first birth. An urban childhood background for women is associated with a higher risk of having a first birth than for their rural counterparts. On the other hand, for second and higher order births, the effect becomes negative. This indicates that women from urban backgrounds have a lower risk of having second and higher order births compared with their rural counterparts.

Table 2 shows that the death of a previous child increases the hazard of a next birth in both urban and rural areas. In every stage, there is a significant positive risk of having a next birth for women who experienced the death of at least one of their children. In table 2, those women who experienced a first child death are found to have the greater hazard of a second birth by 31 per cent in urban and 39 per cent in rural areas compared with those who had no experience of first child death. In urban areas, the risk of having a third birth is higher by 57 per cent for those women who experienced a second child death and it is greater by 38 per cent for those women who had already experienced their first child death. A similar pattern has also been observed in rural areas. Thus, a cohort which experienced successive child deaths has greater risks of having higher order births in both urban and rural areas. It can be concluded that the incidence of first child death increases the hazard of a second birth, and a second child death increases the hazard of a third birth and so on, for higher order birth(s).

It is hypothesized that the sex of previous babies may influence the next birth; thus, these factors are examined for the first four births. In proportional hazards models, coefficients of the child's sex are found to be significant only for rural women progressing to the third, fourth and fifth births. It was found that rural women who have sons have a lower risk of progressing to the next birth. This analysis also reveals a significant negative influence of having a third birth for urban mothers whose second child is a son.

#### Multivariate analysis

This section deals with the multivariate case of hazard modelling. Fertility models have been constructed for each birth parity and the results are presented in tables 3 to 8. It has been observed that all the models fit very well. In the tables, the parameter estimates and relative risks for each of the variables are displayed. The standard errors of the estimates (SE) and the 95 per cent confidence interval (CI) of risk ratios are also presented. Dashes represent those variables which violate the proportionality assumption and these have not been included in this modelling (for methods to tackle non-proportionality, see Collett [1994]). The results of multivariate analysis are discussed and interpreted below.

#### First birth

The analysis reveals that women who got married for the first time between the ages of 20 and 29 years are found to have a higher risk of having a first birth compared with those who married under 20 years of age in rural areas (table 3). The risk of having a first birth is found to be relatively higher in rural women for 0-5 years before the survey. It is also observed that both the husband's and wife's education are found to be significant at the 5 per cent level in urban and rural areas. This indicates that education is associated with a shorter first birth interval compared with their uneducated counterparts. This may be a result of educated women delaying their marriage and so tending to have the first birth soon after the marriage. This effect is statistically more significant for the category six or more years of schooling in urban areas.

Table 3. Hazard regression results for having first birth in rural and urban areas of Bangladesh

Variable	Urban			Rural		
	$\hat{\beta}$	SE( $\hat{\beta}$ )	Risk ratio (95% CI)	$\hat{\beta}$	SE( $\hat{\beta}$ )	Risk ratio (95% CI) <sup>a</sup>
Age at start of interval:						
20-29 years	-	-	-	0.437 <sup>b</sup>	0.113	1.548 (1.24-1.93)
30 or more years	-	-	-	-	-	-
Years before the survey:						
6-10 years	-	-	-	-0.101 <sup>b</sup>	0.031	0.903 (0.85-0.96)
11-15 years	-	-	-	-0.151 <sup>b</sup>	0.049	0.859 (0.78-0.94)
Woman's education:						
1-5 years	0.019	0.051	1.019 (0.92-1.12)	0.090 <sup>b</sup>	0.032	1.094 (1.02-1.16)
6 or more years	0.131 <sup>c</sup>	0.057	1.140 (1.02-1.27)	0.219 <sup>b</sup>	0.055	1.245 (1.11-1.38)
Husband's education:						
1-5 years	-0.008	0.055	0.991 (0.89-1.10)	0.028	0.031	1.029 (0.96-1.09)
6 or more years	0.112 <sup>c</sup>	0.054	1.119 (1.01-1.24)	0.041	0.035	1.042 (0.97-1.11)
Woman's work experience before first birth	0.085	0.047	1.089 (0.99-1.19)	0.037	0.036	1.039 (0.96-1.11)
Religion	-	-	-	-	-	-
Religiosity	-	-	-	-	-	-
Family planning decisions	0.107 <sup>b</sup>	0.042	1.113 (1.02-1.21)	0.031	0.026	1.031 (0.98-1.08)
Region of residence:						
Dhaka	-0.108 <sup>c</sup>	0.052	0.897 (0.81-0.99)	-0.085 <sup>b</sup>	0.032	0.918 (0.86-0.97)
Khulna	-0.057	0.058	0.945 (0.84-1.58)	-0.049	0.035	0.952 (0.88-1.01)
Rajshahi	-0.003	0.055	0.996 (0.89-1.11)	-0.001	0.034	0.999 (0.93-1.06)
Childhood background of woman	0.097 <sup>b</sup>	0.037	1.103 (1.02-1.18)	0.146	0.083	1.157 (0.98-1.36)
-2 log likelihood Model $\chi^2(\delta\phi)$	44,581			112,392		
	57.49 <sup>b</sup> (10)			94.23 <sup>b</sup> (13)		

a CI stands for confidence interval in this and subsequent table.

b Significant at  $p < 0.01$

c Significant at  $p < 0.05$ .

Women's work experience before first birth is found to have a significant positive influence on having a first birth in both urban and rural areas. A couple's joint family planning decisions also have a positive effect in both urban and rural areas. The region of residence, mainly Dhaka, is observed to result in a significantly lower risk of having a first birth compared with Chittagong. Similar observations have been reported in the thesis of Khan (1996).

Women's childhood background is found to have a significantly positive influence on first birth in urban areas whereas it is not significant in rural areas. This means that women from an urban background have a higher risk of having the first birth than those with rural backgrounds. These findings are consistent with those derived from the univariate analysis.

## Second birth

Table 4 shows the Cox regression results for having a second birth in urban and rural Bangladesh. It may be observed that an older age at first birth is associated with a lower risk of having a second birth in both urban and rural areas. This table shows a period effect influencing the likelihood of having the second birth in urban and rural Bangladesh. From the analysis, one may conclude that the risk of having a second baby was the lowest within 0-5 years before the survey. The risk was highest 11-15 years before the interview. Thus, a declining pattern in hazard rates over time is indicated. The length of the preceding birth interval does not appear to be statistically significant for the second birth.

Table 4. Hazard regression results for having second birth in urban and rural areas of Bangladesh

Variable	Urban		Risk ratio (95% CI)	Rural		Risk ratio (95% CI)
	$\hat{\beta}$	SE( $\hat{\beta}$ )		$\hat{\beta}$	SE( $\hat{\beta}$ )	
Age at start of interval:						
20-29 years	-0.398 <sup>a</sup>	0.079	0.671 (0.57-0.78)	-0.250 <sup>a</sup>	0.051	0.778 (0.70-0.86)
30 or more years	-	-	-	-0.343	0.578	0.709 (0.22-2.20)
Years before the survey:						
6-10 years	0.342 <sup>a</sup>	0.054	1.409 (1.26-1.56)	0.207 <sup>a</sup>	0.035	1.231 (1.14-1.31)
11-15 years	0.372 <sup>a</sup>	0.073	1.451 (1.25-1.67)	0.283 <sup>a</sup>	0.056	1.328 (1.18-1.48)
Length of previous interval:						
25-47 months	0.092	0.062	1.097 (0.97-1.23)	-0.009	0.036	0.991 (0.92-1.06)
48 or more months	-0.086	0.083	0.917 (0.77-1.07)	-0.053	0.044	0.948 (0.87-1.03)
Woman's education:						
1-5 years	-0.032	0.062	0.968 (0.85-1.09)	-0.088 <sup>b</sup>	0.038	0.915 (0.85-0.98)
6 or more years	-0.198 <sup>a</sup>	0.072	0.820 (0.71-0.94)	-0.267 <sup>a</sup>	0.067	0.765 (0.67-0.87)
Husband's education:						
0-5 years	0.067	1.062	0.039 (0.93-1.20)	0.039	1.040	1.040 (0.96-1.12)
6 or more years	0.054	0.067	1.056 (0.92-1.20)	0.062	0.041	1.065 (0.98-1.15)
Woman's work experience before first birth	-	-	-	-	-	-
Family planning decisions	-	-	-	-	-	-
Religion	-	-	-	-	-	-
	-	-	-	0.080 <sup>b</sup>	0.035	1.084

Religiosity						(1.01-1.16)
Region of residence:						
Dhaka	-	-	-	-0.081 <sup>b</sup>	0.038	0.922 (0.85-0.99)
Khulna	-	-	-	-0.084 <sup>b</sup>	0.041	0.919 (0.84-0.99)
Rajshahi	-	-	-	-0.089 <sup>b</sup>	0.040	0.915 (0.84-0.98)
Childhood background of woman	-0.077 <sup>b</sup>	0.036	0.925 (0.86-0.99)	0.004	0.098	1.005 (0.82-1.21)
Sex of first child	-	-	-	-	-	-
Death of first child	0.156	0.103	1.169 (0.95-1.43)	0.304 <sup>a</sup>	0.053	1.356 (1.22-1.50)
-2 log likelihood Model $\chi^2$ ( $\delta\phi$ )	28,661			83,081		
	128.36 <sup>a</sup> (11)			160.70 <sup>a</sup> (16)		

a Significant at  $p < 0.01$   
b Significant at  $p < 0.05$ .

In urban areas, women with a high educational level (six or more years of schooling) are found to have a significantly lower risk of progressing to the next birth. However, for rural areas, women with some education as well as those with the highest level of education are found to have a statistically significant negative effect on the probability of a second birth. Thus, one can conclude that an increased level of education reduces the demand for the second birth.

Religiosity is only important in rural areas which means that those who strongly practise religion tend to have a higher risk of having a second birth than their non-religious counterparts. The effect of region of residence is found to be statistically significant in rural areas which demonstrates that Chittagong is associated with a higher risk of having a second birth.

The childhood background of a woman is negatively associated with a second birth in urban areas, while the effect is not significant in rural areas. This significant negative value implies that the urban childhood background of women poses a lower risk of their having a second birth in urban areas compared with women in rural areas. The sex of the first child has no impact on a second birth in each area. The death of a first child has a positive influence on having a second birth; it is found to be statistically significant in rural areas. It may also be observed that, among women who experienced their first child's death, the hazard rate is higher (35 per cent) for rural women than their urban counterparts (17 per cent), when other variables are held constant.

### Third birth

Factors influencing the transition from the second to the third birth in urban and rural Bangladesh are presented in table 5. It can be seen from the table that higher age at the time of the second birth reduces the risk of having a third birth. In this modelling, it is evident that more factors influence rural women to progress to the third birth. The analysis shows that there has been a declining trend in hazard rates for having third births over a 15-year period. The effect of the preceding birth interval is found to be important for having a third birth. The longer the duration of the second birth interval, the lower is the risk of progressing towards having third births. This supports the earlier work carried out by Rodriguez and others (1984).

Table 5. Hazard regression results for having a third birth in urban and rural areas of Bangladesh

Variable	Urban			Rural		
	$\hat{\beta}$	SE( $\hat{\beta}$ )	Risk ratio (95% CI)	$\hat{\beta}$	SE( $\hat{\beta}$ )	Risk ratio (95% CI)

Age at start of interval:						
20-29 years	-0.263 <sup>a</sup>	0.067	0.768 (0.67-0.87)	-0.171 <sup>a</sup>	0.039	0.842 (0.78-0.99)
30 or more years	-	-	-	0.155	0.241	1.169 (0.72-1.87)
Years before the survey:						
6-10 years	0.471 <sup>a</sup>	0.064	1.601 (1.41-1.81)	0.265 <sup>a</sup>	0.040	1.303 (1.20-1.41)
11-15 years	0.485 <sup>a</sup>	0.086	1.625 (1.37-1.92)	0.284 <sup>a</sup>	0.063	1.329 (1.17-1.50)
Length of previous interval:						
25-47 months	-0.025	0.064	0.974 (0.86-1.10)	-0.144 <sup>a</sup>	0.037	0.865 (0.80-0.93)
48 or more months	-0.597 <sup>a</sup>	0.110	0.550 (0.44-0.68)	-0.370 <sup>a</sup>	0.064	0.690 (0.60-0.78)
Woman's education:						
1-5 years	0.112	0.076	1.119 (0.96-1.29)	-0.039	0.046	0.961 (0.87-1.05)
6 or more years	-0.215 <sup>b</sup>	0.093	0.806 (0.67-0.96)	-0.320 <sup>a</sup>	0.087	0.726 (0.61-0.86)
Husband's education:						
1-5 years	-0.073	0.080	0.929 (0.79-1.08)	0.073	0.043	1.076 (0.98-1.17)
6 or more years	-0.110	0.081	0.896 (0.76-1.04)	0.009	0.049	1.009 (0.91-1.11)
Woman's work experience before first birth						
Family planning decisions	-0.021	0.065	0.978 (0.86-1.11)	-0.025	0.036	0.975 (0.90-1.04)
Religion	-	-	-	0.045	0.050	1.046 (0.94-1.15)
Religiosity	0.033	0.063	1.034 (0.91-1.16)	0.089 <sup>b</sup>	0.042	1.094 (1.01-1.18)
Region of residence:						
Dhaka	-	-	-	-0.047	0.045	0.954 (0.87-1.04)
Khulna	-	-	-	-0.036	0.050	0.964 (0.87-1.06)
Rajshahi	-	-	-	-0.083	0.049	0.920 (0.83-1.01)
Childhood background of woman	-0.058	0.057	0.944 (0.84-1.05)	-0.146	0.123	0.863 (0.67-1.09)
Sex of second child	-0.083	0.056	0.920 (0.82-1.02)	-0.069 <sup>b</sup>	0.033	0.932 (0.87-0.99)
Death of second child	0.343 <sup>a</sup>	0.122	1.410 (1.10-1.78)	0.399 <sup>a</sup>	0.059	1.491 (0.13-1.67)
-2 log likelihood Model $\chi^2$ ( $\delta\phi$ )	17,796			56,019		
	214.60 <sup>a</sup> (14)			265.75 <sup>a</sup> (19)		

a Significant at  $p < 0.01$   
b Significant at  $p < 0.05$ .

It is observed from table 5 that a higher level of women's education, particularly six or more years of schooling,



reduces the hazard rate in both urban and rural areas, although the effect is stronger in rural areas. The sex of the second child has a negative effect in both areas, but it is found to be significant only in the case of rural women. A 7 per cent lower risk is associated with the sex of the birth if the second child is a boy rather than a girl, while holding other variables constant in the model. The husband's education, the woman's work experience before the first birth, family planning decisions, religion, region of residence and childhood background are not statistically significant at the 5 per cent level in either area.

Religiosity is found to have a significant positive influence in rural areas only, which indicates that strong religious practice is associated with a higher risk of having a third birth. In both areas, the death of the second child is found to have a positive influence on having a third birth and the magnitude of the effect is greater in rural areas than in urban ones. This analysis also confirms that child death is an important determinant of fertility.

#### Fourth birth

The results from the proportional hazards model in urban and rural situations in transition from the third to the fourth birth are displayed in table 6, from which it is revealed that the mother's age at the time of the third birth has a negative influence on giving birth to a fourth child in both urban and rural areas. The period effect indicates that there has been a declining period trend in the hazard function over the 15-year period prior to the interview and the risk is lowest in the five-year period immediately before the 1989 BFS.

Table 6. Hazard regression results for having a fourth birth in urban and rural areas of Bangladesh

Variable	Urban			Rural		
	$\hat{\beta}$	SE( $\hat{\beta}$ )	Risk ratio (95% CI)	$\hat{\beta}$	SE( $\hat{\beta}$ )	Risk ratio (95% CI)
Age at start of interval:						
20-29 years	-0.297 <sup>a</sup>	0.075	0.742 (0.64-0.86)	-0.228 <sup>a</sup>	0.044	0.796 (0.73-0.86)
30 or more years	-	-	-	-	-	-
Years before the survey:						
6-10 years	0.222 <sup>a</sup>	0.070	1.250 (1.08-1.43)	0.198 <sup>a</sup>	0.044	1.219 (1.11-1.32)
11-15 years	0.228 <sup>a</sup>	0.093	1.257 (1.04-1.50)	0.288 <sup>a</sup>	0.066	1.335 (1.17-1.51)
Length of previous interval:						
25-47 months	-0.065	0.071	0.936 (0.81-1.07)	-0.141 <sup>a</sup>	0.041	0.868 (0.80-0.94)
48 or more months	-0.568 <sup>a</sup>	0.121	0.566 (0.44-0.71)	-0.572 <sup>a</sup>	0.079	0.564 (0.48-0.65)
Woman's education:						
1-5 years	-0.005	0.080	0.995 (0.85-1.16)	-0.136 <sup>a</sup>	0.051	0.873 (0.78-0.96)
6 or more years	-0.275 <sup>a</sup>	0.103	0.759 (0.62-0.92)	-0.436 <sup>a</sup>	0.105	0.646 (0.52-0.79)
Husband's education:						
1-5 years	0.109	0.088	1.116 (0.93-1.32)	0.037	0.047	1.039 (0.94-1.13)
6 or more years	-0.052	0.088	0.949 (0.79-1.12)	0.056	0.054	1.058 (0.95-1.17)
Woman's work before first birth	-	-	-	-	-	-
Family planning decisions	-0.119	0.070	0.887 (0.77-1.01)	-0.099 <sup>a</sup>	0.040	0.905 (0.83-0.97)
Religion	-	-	-	0.103	0.057	1.109 (0.99-1.23)

Religiosity	-	-	-	0.118 <sup>a</sup>	0.046	1.126 (1.02-1.23)
Region of residence:						
Dhaka	-	-	-	-0.045	0.050	0.956 (0.86-1.05)
Khulna	-	-	-	-0.114 <sup>b</sup>	0.056	0.892 (0.79-0.99)
Rajshahi	-	-	-	-0.101	0.054	0.904 (0.81-1.00)
Childhood background of woman	-0.127 <sup>b</sup>	0.065	0.880 (0.77-1.00)	-0.187	0.147	0.829 (0.62-1.10)
Sex of third child	-	-	-	-0.051	0.037	0.950 (0.88-1.02)
Death of third child	0.443 <sup>a</sup>	0.118	1.557 (1.23-1.96)	0.263 <sup>a</sup>	0.065	1.302 (1.20-1.39)
-2 log likelihood	13,809			43,831		
Model $\chi^2(\delta\phi)$	118.91 <sup>a</sup> (12)			220.60 <sup>a</sup> (18)		

a Significant at  $p < 0.01$

b Significant at  $p < 0.05$ .

This analysis suggests that a longer preceding birth interval reduces the risk of progressing towards having a fourth birth. The effect of a preceding birth interval is statistically stronger in rural areas than in urban areas. This may be due to the fact that women in rural areas practise breastfeeding for a longer time than their urban counterparts, which in turn lengthens birth intervals.

The analysis reveals the fact that increased levels of education are associated with a lower likelihood of having a fourth birth in both urban and rural areas. The effect of six or more years of schooling is found to be statistically significant and this allows one to conclude that the more education a woman has the less is her risk of experiencing a fourth birth. It is observed that husband's education, woman's work experience, region of residence, childhood background, and sex of the third child do not have significant effects at the 5 per cent level.

#### Fifth birth

The factors responsible for having a fifth birth in urban and rural areas are presented in table 7. This table reveals that few variables contribute to a fifth birth for those urban mothers who have already experienced four births. These variables are: age of mother at the time of the fourth birth, years before the survey, length of previous interval and mother's education. Additional variables found to be significant in rural Bangladesh are: age of mother at the time of the fourth birth, years before the survey, length of previous interval, educational level of the mother, family planning decisions, religiosity, region of residence and the experience of the fourth child's death. Interpretation of these coefficients is similar to that of the previous case. From table 7, it may be observed that there is a period effect, which shows a trend of risks over the 15-year period, in that the risk of having a fifth birth started to decline in 1974, continuing to the date of the survey. A longer duration of the preceding birth interval also reduces the likelihood of having a fifth birth in urban and rural areas.

Table 7. Hazard regression results for having a fifth birth in urban and rural areas of Bangladesh

Variable	Urban			Rural		
	$\hat{\beta}$	SE( $\hat{\beta}$ )	Risk ratio (95% CI)	$\hat{\beta}$	SE( $\hat{\beta}$ )	Risk ratio (95% CI)
Age at start of interval:						
20-29 years	-0.336 <sup>a</sup>	0.116	0.714 (0.56-0.89)	-0.427 <sup>a</sup>	0.088	0.652 (0.54-0.77)
30 or more years	-	-	-	0.034	0.132	1.036 (0.79-1.34)
Years before the survey:						

6-10 years	0.056	0.080	1.058 (0.90-1.23)	0.205 <sup>a</sup>	0.048	1.228 (1.11-1.34)
11-15 years	0.235 <sup>a</sup>	0.107	1.264 (1.02-1.56)	0.316 <sup>a</sup>	0.070	1.372 (1.19-1.57)
Length of previous interval:						
25-47 months	-0.092	0.078	0.912 (0.78-1.06)	-0.112 <sup>a</sup>	0.044	0.894 (0.82-0.97)
48 or more months	-0.478 <sup>a</sup>	0.145	0.620 (0.46-0.82)	-0.653 <sup>a</sup>	0.100	0.520 (0.42-0.63)
Woman's education:						
1-5 years	-0.069	0.094	0.933 (0.77-1.12)	0.055	0.058	1.057 (0.94-1.18)
6 or more years	-0.430 <sup>a</sup>	0.127	0.650 (0.50-0.83)	-0.363 <sup>a</sup>	0.137	0.695 (0.53-0.90)
Husband's education:						
1-5 years	-0.067	0.099	0.935 (0.77-1.13)	-0.023	0.051	0.976 (0.88-1.07)
6 or more years	-0.005	0.102	0.995 (0.81-1.21)	-0.032	0.062	0.968 (0.85-1.09)
Woman's work before first birth	-	-	-	-0.097	0.062	0.907 (0.80-1.02)
Family planning decisions	-0.044	0.080	0.957 (0.81-1.11)	-0.120 <sup>a</sup>	0.043	0.886 (0.81-0.96)
Religion	-	-	-	0.112	0.065	1.119 (0.98-1.27)
Religiosity	-	-	-	0.099 <sup>b</sup>	0.050	1.105 (1.01-1.21)
Region of residence:						
Dhaka	-	-	-	-0.154 <sup>a</sup>	0.055	0.857 (0.76-0.95)
Khulna	-	-	-	-0.158 <sup>a</sup>	0.062	0.853 (0.75-0.96)
Rajshahi	-	-	-	-0.066	0.059	0.935 (0.83-1.05)
Childhood background of woman	-	-	-	-	-	-
Sex of fourth child	-	-	-	-0.016	0.041	0.984 (0.90-1.06)
Death of fourth child	0.132	0.142	1.142 (0.86-1.50)	0.373 <sup>a</sup>	0.072	1.453 (1.26-1.67)
-2 log likelihood	10,214			35,167		
Model $\chi^2(\delta\phi)$	52.07 <sup>a</sup> (11)			192.19 <sup>a</sup> (19)		

a Significant at  $p < 0.01$

b Significant at  $p < 0.05$ .

Work experience reduces the risk considerably, implying that those women who worked before their first birth delay their fifth birth in rural areas. For rural women who worked, there is a 10 per cent lower risk of progressing towards the fifth birth compared with those who did not work. Child death was found to have a significant fertility-enhancing effect in all the models.

Interaction effects

The analyses undertaken so far in this article are based on the main effects of the variables. To allow for non-linearity in the model, a two-factor interaction effect is also investigated along with all the main effects. It has been found that the magnitudes of parameter estimates are almost the same; for simplicity, only the interaction effects are presented in table 8. From the table, it may be observed that only a few interaction terms are statistically significant; these are period by age at start of interval, period by length of previous interval, period by education and period by child death. No interaction was significant for a first birth in urban and rural areas.

Table 8. Interaction effects of selected variables on subsequent births for urban and rural areas of Bangladesh

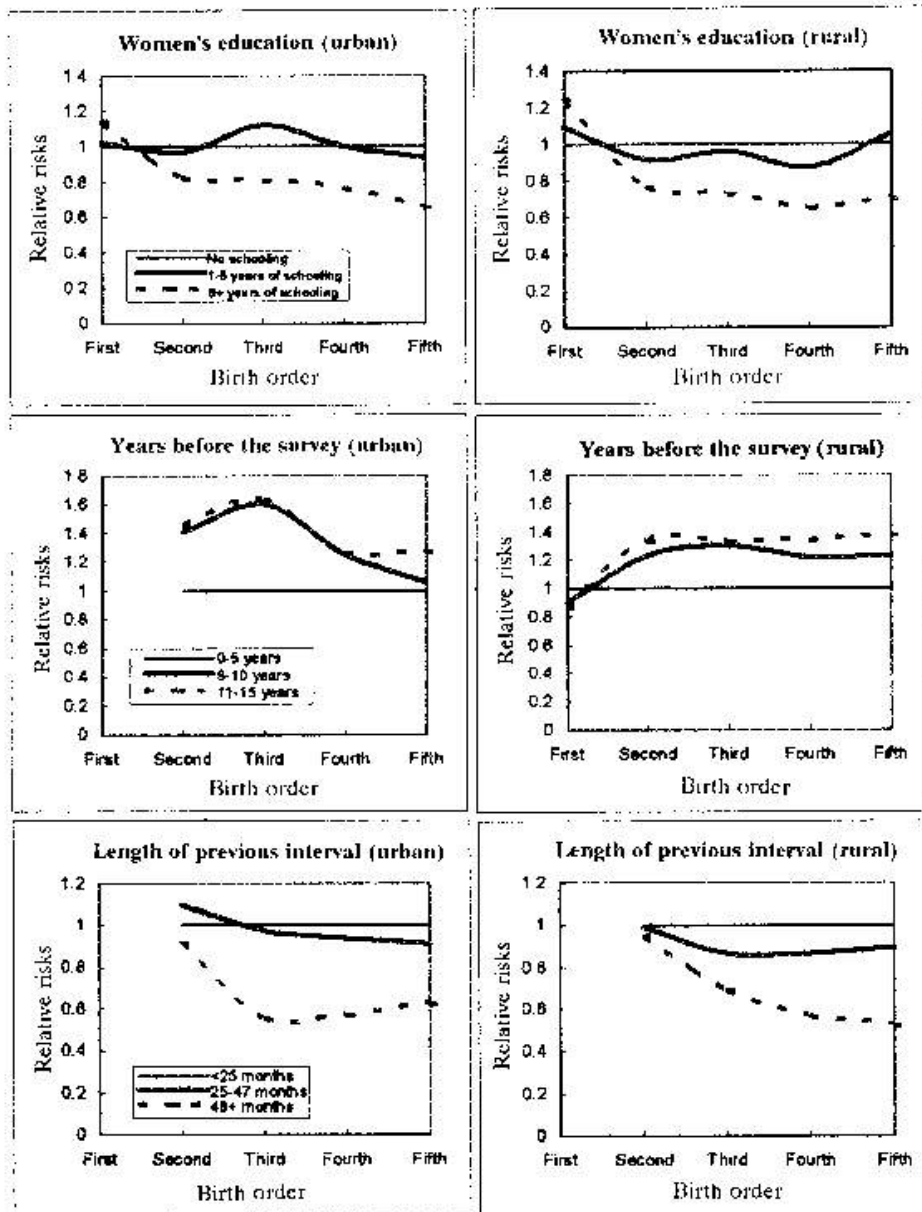
Variables	First birth		Second birth		Third birth		Fourth birth		Fifth birth	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
YBS2 x AGE2	-	-0.009	-0.081	0.206	0.070	0.003	-0.361 <sup>a</sup>	-0.131	-0.023	-0.030
YBS2 x AGE3	-	-	-	0.050	1.178	-0.184	-	-	0.112	-0.213
YBS3 x AGE2	-	-0.121	0.309	0.105	-0.058	0.032	-0.572 <sup>b</sup>	-0.121	0.403	-0.062
YBS3 x AGE3	-	-	-	-	-	0.517	-	-	0.975	-0.611
YBS2 x LPI2	-	-	-0.139	-0.014	0.010	0.041	0.065	0.034	0.013	0.010
YBS2 x LPI3	-	-	-0.064	-0.249 <sup>a</sup>	0.240	-0.144	0.055	-0.012	0.221	0.180
YBS3 x LPI2	-	-	-0.055	0.023	0.127	-0.215	0.009	0.088	-0.189	0.070
YBS3 x LPI3	-	-	-0.123	-0.190	0.154	-0.036	-0.160	0.092	-0.607	0.293
YBS2 x EDW2	-0.029	0.103	0.253	0.017	0.029	0.234 <sup>a</sup>	0.270	-0.017	-0.353	0.032
YBS2 x EDW3	-0.081	0.150	0.450 <sup>b</sup>	0.236	0.128	0.227	0.171	-0.251	-0.520	-0.649
YBS2 x EDH2	-0.052	0.092	0.116	-0.005	0.078	0.052	0.001	0.054	0.167	-0.047
YBS2 x EDH3	-	0.059	-0.067	-0.042	-0.010	-0.115	-0.152	0.081	0.624 <sup>b</sup>	0.043
YBS2 x EDH2	0.066	-	-	-	-	-	-	-	-	-
YBS3 x EDW2	0.019	0.003	0.390	0.018	-0.020	0.204	0.193	-0.077	0.041	0.016
YBS3 x EDW3	0.147	0.135	0.352	-0.098	0.037	0.172	-0.233	-0.016	-0.232	0.160
YBS3 x EDH2	-0.109	0.075	-0.012	-0.095	0.238	-0.003	-0.140	0.044	0.139	-0.035
YBS3 x EDH3	-0.119	0.054	0.257	0.026	0.370	-0.236	0.190	0.041	0.165	0.072
YBS2 x DEATH (2, 3, 4)	-	-	-0.411	-0.380 <sup>b</sup>	-0.418	-0.358 <sup>b</sup>	-0.030	-0.267	-0.165	-0.260
YBS3 x DEATH (2, 3, 4)	-	-	-0.263	-0.234	-0.291	-0.474 <sup>a</sup>	-0.199	-0.398	-	-

a Significant at  $p < 0.05$

b Significant at  $p < 0.01$ .

The pattern of the relative risks is similar to that observed in the univariate analysis output (table 8); hence, the particular model specification used here seems to describe the data accurately. The relative risks by the mother's education, years before the survey (period) and by length of previous birth interval are presented in figure 3. The relative risks by mother's education show a declining pattern, which means that a higher level of schooling is associated with a lower risk of a next birth. The longer the previous birth interval a woman has, the lower is her risk of progressing to the next birth. This finding supports the results of Hobcraft and McDonald (1984). The period relative risks show evidence of fertility decline over a 15-year span. A declining fertility trend is evident with respect to time (figure 3), but the decline is sharper for urban women than for rural women.

Figure 3. Relative risks for women's education, period and length of previous birth interval, by birth order for final model



## Discussion and conclusion

From the above results, it can be concluded that different factors have different effects for the first birth and higher order births. Relatively more variables have an influence on the next birth(s) for women in rural areas compared with those in urban areas; however, this situation may be an effect of sample size. Some variables have a continued influence over successive births, whereas, others do not. For example, education increases the risk of having a first birth on the one hand, and reduces the risk of higher order births on the other. This can be partly explained by the fact that educated women delay their marriage and therefore have a first baby earlier in the marriage. Husband's education also influences the first birth, but becomes insignificant in higher order births. From this finding, it may be concluded that, in Bangladesh, a woman's education has a greater influence on her fertility than the education of her husband.

The period effect is found to be significant in all models and to be consistent with earlier studies. Our study confirmed that fertility decline in Bangladesh is recent and the decline (lower risk) is stronger in urban than in rural areas. The declining period effect on subsequent birth intervals indicates that the risk of having another birth is the lowest in recent years compared with 6-10 years prior to the survey. This result also supports the view that fertility will continue to decline in the years to come (see Khan and Raeside, 1994).

Age at start of the interval is found to be significant, as is length of the previous birth interval. These are expected findings, since childbearing may stop as a result of the ageing process in that women gradually become infecund as they grow older. The analysis demonstrates that the longer the duration of the preceding birth interval, the greater is

the delay in a woman progressing to higher order births in both urban and rural areas. The decline in risk of a birth is relatively sharper for a longer duration of the interval in rural areas, perhaps because of prolonged breastfeeding.

A woman's work experience variable shows the expected relationship with subsequent births, i.e. the risk of another birth declines according to the work experience of the woman. Although it is not significant in all models, religion does not have any statistically significant influence in urban areas. However, in rural areas, it plays a significant role in the progression to higher order births. The data indicate that Muslims have a higher risk in moving towards the next birth (a higher-order birth) than their non-Muslim counterparts.

Religiosity does not have any significant effect on the first birth. It has, however, a significant continued impact on higher order rural births. For example, except for the third birth in urban areas, strict practice of religion is associated with a greater risk of having higher order birth(s) in all rural models, but there is little effect in urban areas.

The region of residence has a significant influence on subsequent births. Residence in the Dhaka region is found to pose a lower risk of having a first birth in both urban and rural areas when compared with the Chittagong region. On the other hand, neither Khulna nor Rajshahi is significantly different from the Chittagong region. In rural areas, the regions all have a lower risk than Chittagong for higher order births. In particular, a large difference can be observed in the transition from the fourth to fifth birth, which may be due to the fact that a region such as Dhaka is more urbanized and has more opportunities for education and work, compared with the Chittagong region. Similarly, in Khulna, female education and work force participation have increased significantly in recent years and this situation has resulted in a lower fertility rate than in Chittagong. Also in Chittagong, cultural norms encourage relatively larger family size irrespective of other characteristics (Cleland and others, 1994; Ahn and Shariff; 1993).

From the analysis conducted in this study, son preference is found to be not significant in all the models. However, it is found to have a significant negative influence on the third birth in rural areas. This situation indicates that rural women who begin a second to third birth interval, whose last child is a daughter, are likely to have a short birth interval. Death of the most recent child has a strong positive effect on promoting subsequent births. In particular, the risk is found to be higher in rural than in urban Bangladesh. This effect can be explained partly by the following factors:

- (a) A child's death may shorten a woman's breastfeeding period, which tends to result in the resumption of ovulation,
- (b) Parents have a tendency to replace their dead child as soon as possible. Ahn and Shariff (1993) found a similar result in Togo and Uganda.

The interaction terms add little to the explanatory power of both the urban and rural fertility models shown in table 8. However, some of the interactions between period and child death, and between period and education are informative. These interactions illustrate the importance of the period effect on education and on child death and the consequent impact on fertility.

From this study, a number of important findings have emerged which are useful for national population policy-making purposes. The Government of Bangladesh should therefore strengthen its maternal and child health care programme throughout the country not only for the sake of this portion of the total population but also in order to reduce the level of child mortality. Lengthening the birth interval can reduce fertility in both urban and rural areas of the country. Thus, the government should encourage people via the mass media to give enough time (at least five years) between successive births and to use contraception to help to achieve such a goal. Perhaps later age at marriage will be another observable effect of increased female status, which would have a subsequent fertility-reducing effect. Therefore, the encouragement of early marriage should be stopped, especially for adolescents. Since the fertility of urban women is much lower than that of rural women, increasing urbanization will hasten the current trend in fertility reduction. Similarly, reducing religious barriers and improving the quality of care services throughout the country could help significantly in reducing the fertility rate of Bangladesh.

Further research clearly needs to be focused on gaining a better understanding of other unexplained variables in the models. In particular, there is a need to investigate the non-proportional factors in fertility models.

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Asia is in the midst of social transformations that are dramatic in pace and effect. Families, schools and labour markets are all changing, generally in ways that broaden opportunities for young people and may ultimately alter relationships between the sexes. An important element of these changes is the pattern of delayed marriage, coupled with higher rates of permanent celibacy, that have emerged throughout much of the region (Xenos and Gultiano, 1992).

A review of the recent literature provides evidence that, despite the changing pattern towards later marriage, Asian countries display considerable variations in marriage patterns. In South Asia, the age at marriage for females increased from levels under 15 years in the early part of the century to well over 15 years or even approaching age 20 by the 1980s. The female age at marriage in India increased nearly five years over this period, i.e. from 13.2 to 18.1 years. Pakistan experienced an even greater jump, from 13.3 to 19.7 years, during the period 1921-1981. Sri Lanka started out with a much later female age at marriage, i.e. 18.1 years in 1901; nevertheless, the age at marriage increased to 24.2 years in 1981 and 25.5 in 1993 (De Silva, 1997:21). Korean women marry much later than their South Asian peers (except for Sri Lankans), while in the Philippines marriages begin at more typical ages. But interestingly, one pattern is shared in all Asian countries: 95 per cent or more of women ultimately marry.

In Bangladesh, there is ample evidence to suggest that the trend towards later marriage is less dramatic: age at marriage in that country is the lowest among all South Asian countries, a geographical area that lags far behind others in Asia. While studies on fertility, mortality and contraception have been numerous, the topic of marriage and related issues has not yet been the subject of systematic research in Bangladesh. This situation has resulted primarily from a lack of data on this matter and a failure to understand the importance of marriage in regulating the reproductive behaviour of women vis-a-vis the contribution of that institution to small family size. Procreation occurs almost totally within marriage in Bangladesh. This is in sharp contrast with some Western societies, where marriage is not necessarily the precursor of childbearing. Because of this, any upward or downward trend in marriage in Bangladesh is likely to influence the reproductive behaviour of women. Thus, for a country like Bangladesh, it would be impossible to achieve a replacement level of fertility by increasing the level of control of marital fertility alone; age at marriage and/or the proportion who ever marry would have to rise as well. These issues tend to attach importance to the necessity of studying marriage patterns and their changes in Bangladesh. The analysis will be confined to first marriages only because they have more relevance for public policy owing to their precise impact on fertility compared with subsequent marriages.

The data for this analysis are drawn primarily from the 1989 Bangladesh Fertility Survey (BFS). To substantiate the results thus obtained, data from other published sources have also been presented. The 1989 BFS sample is a two-stage stratified probability sample representative of the whole country. Data on marriage in the 1989 BFS come from two sources: the household questionnaire and the individual questionnaire. The latter was used to interview 11,906 ever married women aged 15-49 years.

### Marriage in Bangladesh

Islam, which is the predominant religion of Bangladesh, attaches great importance to the family by strengthening the ties bonding its members and safeguarding it against undermining influences. Hence, marriage is an important religious duty as well as an important social institution. Consequently, marriage has been nearly universal in Bangladesh; there are few men and still fewer women who remain single throughout their lives. Illegitimate births are very rare; virtually all fertility occurs within wedlock. Childhood marriage was in vogue and very common before the Muslim Family Law ordinance of 1961, which prohibited child marriage and fixed the minimum age at marriage for females at 16 and that for males at 21. Early marriage arose from cultural influences that took a dim view of a daughter's marriage after her first menarche. This custom, which is not limited to Bangladesh in South Asia, has been responsible for many social problems. One of the primary objectives of the above-mentioned ordinance was to remove these social problems. In 1984, through a government order, the minimum legal age at marriage in Bangladesh was fixed at 18 years for females and 21 for males. These requirements, however, are hardly known in the countryside and have little impact on marriage behaviour in non-urban areas.

According to the aforementioned 1961 ordinance, "no man, during the subsistence of an existing marriage, except with the previous permission in writing of local council, can contract another marriage". Marriage is viewed by religion as the only legitimate outlet for sexual activity. Sex outside marriage for both men and women is regarded with severity; proof of non-virginity in a bride remains a major cause of divorce. Divorce is not a common phenomenon in Bangladesh as it is in many developing and developed countries, despite the fact that it is allowed both legally and religiously. Further, divorce is highly infrequent among females in Bangladesh. Social status, sense of social status and prestige, and the opinion of society are major factors in the stability of marriage. In formal Hindu tradition, there is no provision for divorce. The Muslim religion also seriously discourages divorce. Thus, most people in Bangladesh marry only once.

Except in rare cases, marriages are negotiated and arranged by guardians through marriage brokers (ghatoks or raibors). Marriage involves an agreement between guardians and sometimes dissolution is also decided by guardians. The practice of mehr (dower) has been an indispensable element in Muslim marriage contracts for untold generations. In pre-Islamic days, however, mehr was paid to the father of the bride as a bride price and was the equivalent of a sales price. In contemporary Bangladesh, mehr is the sum of money the groom agrees to pay the bride either at the time of marriage or at a later date.

#### Trends in age at marriage

There are several ways of ascertaining the trends in age at marriage. Looking at the data in table 1, it may be observed that there has been an appreciable gradual change in the proportions single over time. According to the 1951 census, only 11.3 per cent of females aged 15 to 19 were unmarried. By 1991, the proportion had grown to nearly 49 per cent, a change of great social as well as demographic significance. In the 20-24 age group, this proportion has shown an increase from 3 per cent in 1951 to 12 per cent in 1991. A major shift has occurred since 1981. This trend reflects a rise in the age of marriage. A second notable change since 1975 was that the proportions widowed in 1989 and 1991 were radically different from those in 1975. For example, among women aged 40 to 44, the percentage widowed fell from 20 per cent in 1975 to 17 per cent in 1981 and to 13 per cent in 1989. The main reason for this trend is declining adult mortality, but higher probabilities of re-marriage for widows may also have played some role. As a result of declining widowhood, the proportions of women currently married were higher in 1989 and 1991 than in 1975 (table not shown).

Table 1. Percentage of never married females in Bangladesh by current age: 1951-1991

Age	Census 1951	Census 1961	Census 1974	BFS 1975	Census 1981	BFS 1989	Census 1991
10-14	73.7	67.4	90.5	91.2	93.0	96.2	96.8
15-19	11.3	8.3	24.5	29.8	31.3	49.0	48.7
20-24	3.0	1.3	3.2	4.6	5.1	12.0	10.5
25-29	1.1	0.5	0.9	1.0	1.3	2.3	2.4
30-34	0.5	0.4	0.6	0.2	1.0	0.3	1.1
35-39	0.2	0.2	0.4	0.4	0.7	0.2	0.6
40-44	0.2	0.1	0.4	0.2	0.7	0.2	0.6
45-49	0.2	0.1	0.3	0.0	0.3	0.1	0.4

Source: ESCAP (1981): Population of Bangladesh Country Monograph Series No. 8, ST/ESCAP/147 (New York: United Nations), and Huq, M. Nazmul and John Cleland (1990). Bangladesh Fertility Survey 1989, Main Report (Dhaka: National Institute for Population Research and Training [NIPORT]).

The singulate mean age at marriage (SMAM) calculated from the proportions single from various sources is presented in table 2. SMAM demonstrates that there has been a long-standing trend towards later marriage in Bangladesh, and it is still continuing. The age at marriage has increased by 5.7 years, from 12.3 years in 1921 to 18 years in 1991, implying an annual increase of only 0.08 year, i.e. less than a month. This increase, however, was not uniform throughout the period. The dip in marriage age in 1931 could be attributed to the Child Marriage Restraint Act of 1930. This act prohibited all marriages involving girls under 14 and boys under 18. To a certain extent, this act interfered with Hindu and Muslim personal laws and thus elicited resistance throughout what was then Hindustan, or greater India. Before it was enacted as a bill it was debated in the national assembly; it became law in October 1929 but was not enforced until 1 April 1930. Therefore, many people took advantage of this six-month delay and quickly married off their girls early, which might not have taken place in the ordinary course of time had that law not been passed (ESCAP, 1981). The somewhat higher age at marriage in 1951 than in 1961 may be explained as a

consequence of the emergence of Pakistan as an independent state in 1947. During the immediate post-liberation period, many people migrated in and out of what was then East Pakistan (now Bangladesh) and there was dislocation in every aspect of society and the economy. As a result, young people had to postpone their marriage for a few years, resulting in an upturn in the age at marriage.

Table 2. Trends in singulate mean age at marriage in Bangladesh: 1921-1991

Year	Data type	Males	Females	Difference
1921	Census	21.9	12.3	9.6
1931	Census	18.7	10.8	7.9
1941	Census	21.7	13.4	8.3
1951	Census	22.4	14.4	8.0
1961	Census	22.9	13.9	9.0
1974	Census	23.9	15.9	8.0
1975	BFS	24.0	16.3	7.3
1981	Census	23.9	16.6	7.3
1989	BFS	25.5	18.0	7.5
1991	Census	24.9	18.0	6.9

Source: ESCAP (1981): Population of Bangladesh Country Monograph Series No. 8, ST/ESCAP/147 (New York: United Nations), and Huq, M. Nazmul and John Cleland (1990). Bangladesh Fertility Survey 1989, Main Report (Dhaka: National Institute for Population Research and Training [NIPORT]).

The increase in men's age at marriage over the same period has been from 21.9 years to 24.9 years. This mean is relatively higher and is comparable with that of other Asian countries. As a result, the average inter-spousal age difference has been very wide. In 1921, the difference was 9.6 years. Although it narrowed to 6.9 years by 1991, the difference still remains appreciable.

The proportion of never married females in the age group 15-19 years is shown in table 3 along with the singulate age at marriage of a few selected Asian countries. Of these countries, the never married females in the age group 15-19 is the lowest in Bangladesh. This has clearly resulted in a very low age at marriage. Both South-East Asian and East Asian countries display a very high proportion of never married population compared with South Asian countries. In most of these countries (other than those of South Asia), all males in the 15-19 age group remained virtually never married.

Table 3. Percentage of never married female aged 15-19 years and singulate mean age at marriage by sex for selected countries and areas in Asia

Country or area	Census/survey year	Percentage never married at 15-19		SMAM	
		Male	Female	Male	Female
<b>South Asia</b>					
Bangladesh	1981	93.3	31.3	23.9	16.7
Bangladesh	1991	95.0	48.7	24.9	18.0
India	1981	87.5	55.8	23.4	18.7
Maldives	1985	89.8	48.8	22.1	17.9
Nepal	1981	74.1	49.2	21.5	17.9
Pakistan	1981	92.5	68.9	24.9	19.8
Sri Lanka	1981	99.0	90.1	27.9	24.4
<b>South-East Asia</b>					
Indonesia	1985	98.2	81.2	24.8	21.1
Malaysia	1980	98.7	89.7	26.6	23.5
Myanmar	1983	93.3	83.2	24.5	22.4
Philippines	1980	96.3	85.9	24.8	22.4
Thailand	1980	96.3	83.3	24.9	22.8
<b>East-Asia</b>					
China	1987	98.5	95.7	24.0	22.0

Hong Kong	1986	99.4	97.9	29.2	26.8
Japan	1985	99.5	99.0	29.5	25.7
Republic of Korea	1985	99.8	99.1	27.8	24.5

Source: For Bangladesh, Census Report, 1991 and for other Asian countries, United Nations (1991). United Nations Nuptiality Chart - 1991. New York.

The singulate mean represents the mean age at first marriage of those ultimately marrying by age 50 for a hypothetical cohort experiencing the same age-specific probabilities of remaining single that are represented in the cross-sectional proportions never marrying. When a marriage pattern is changing, SMAM does not reflect the changes in the real age at marriage that took place in the past. This age at marriage indicator, when compared with the one obtained from the direct reporting of age at marriage in the 1989 BFS, appears to be nearly three years higher. This outcome is the same in the 1993/94 Bangladesh Demographic and Health Survey (BDHS). For example, the 1989 BFS yielded an estimated mean age at marriage of 15.3, while the 1993/94 BDHS estimate is even lower, i.e. 14.3 years. This difference cannot be entirely attributed to the changes in the marriage pattern that have taken place over the last 15-20 years. Under-reporting of age at marriage has largely been responsible for this deficit in the direct estimate of mean age at marriage. Based on the data collected by the BFS and the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) in their respective experimental areas, the best estimate of mean age at marriage for Bangladesh appears to be in the neighbourhood of 18 years. Since our primary goal is to present an analysis of the marriage pattern among the socio-economic sub-groups of the population and the singulate mean age at marriage is not available for these sub-groups, measures of the central age at marriage, such as mean or median, obtained from the 1989 BFS, will be used. The assessment of the relative importance of the variables with these depressed means is not expected to be affected much if the under-reporting of age at marriage is systematic among the sub-groups of the population.

Table 4. Mean and median ages at marriage by birth cohort and marriage cohort in Bangladesh

<b>Birth cohort</b>	<b>Mean age</b>	<b>Median age</b>	<b>Marriage cohort</b>	<b>Mean age</b>	<b>Median age</b>
Before 1943	14.3	13.9	Before 1960	13.5	13.5
1943-1947	14.6	14.2	1960-1964	14.3	14.2
1948-1952	14.9	14.6	1965-1969	14.6	14.7
1953-1957	15.4	15.0	1970-1974	15.0	14.7
1958-1962	15.6	15.2	1975-1979	15.5	15.2
1963-1967	15.9	15.6	1980-1984	15.7	15.3
1968-1972	15.3	15.3	1985-1989	16.5	16.1
<b>All cohorts</b>	<b>15.3</b>	<b>14.9</b>	<b>All cohorts</b>	<b>15.3</b>	<b>14.9</b>

Both birth cohort and marriage cohort approaches were followed to provide further evidence of a rising trend in the age at first marriage in Bangladesh. The mean age at first marriage reported for women surviving from the 1943 birth cohort in the 1989 BFS was 14.3 years (table 4). Since then, there appears to have been a rising trend during the 30-year interval, reaching 15.3 years for the 1968-1972 birth cohort. Marriage cohort data also demonstrate a clear rise in age at first marriage. This rising trend is evident from the table under reference. The mean age for those who married before 1960 is 13.5 years; for those who married in the period 1985-1989, it is 16.5 years. Indications are that this trend is likely to continue in the future.

Table 5. Percentage distribution of Bangladeshi women according to whether they first married before or after their first menarche

<b>Timing of marriage</b>	<b>Current age</b>						
	<b>&lt;25</b>	<b>25-29</b>	<b>30-34</b>	<b>35-39</b>	<b>40-44</b>	<b>45-49</b>	<b>All</b>
Before menarche	11.3	15.0	16.6	22.5	26.3	27.6	16.8
After/same time	88.7	85.0	83.4	77.5	73.7	72.4	83.2
Median age	15.6 *	15.3	15.1	14.6	14.3	14.0	15.3
Total	100	100	100	100	100	100	100
<b>N</b>	<b>2,521</b>	<b>2,100</b>	<b>1,886</b>	<b>1,364</b>	<b>1,168</b>	<b>944</b>	<b>11,906</b>

\* Refers to age group 20-24 years.

The rising trend in increasing age at marriage is also reinforced by other indicators contained in the 1989 BFS survey. The timing of first marriages in relation to menarche is shown in table 5. Up to 27.6 per cent of women aged 45-49 reported that their first marriage occurred before menarche. This proportion steadily declines to 11.3 per cent for those who were aged 20 to 24. This trend is in clear agreement with the rise in age at marriage. The median age at marriage shown in the table under reference, by current age, shows a rise in age at marriage from 14 years for the cohort aged 45-49 to 15.6 years for the cohort currently aged 20-24.

A clear-cut monotonic trend towards later marriage was also evident from data tabulated by current age and the age at marriage. For instance, the percentage who first married before age 15 falls from 68 per cent among women aged 45-49 to 37 per cent for women currently aged 20-24. The proportions are 95 per cent and 73 per cent for those who first married before the age of 18 years (table not shown).

Table 6. Trends in Coale's nuptiality parameter values for Bangladesh: 1951-1991

Parameter	Census 1951	Census 1961	PGE 1962-1965	BRSFM 1974	BFS 1975	Census 1981	BFS 1989	Census 1991
$a_0$	10.6	10.0	11.0	11.9	11.4	11.7	12.3	12.4
k	0.31	0.33	0.36	0.40	0.43	0.41	0.52	0.52
C	99.8	99.9	99.0	99.6	100	100	100	100
$A_0$	12.4	13.2	14.4	16.0	17.2	16.4	20.8	20.8
A	23.0	23.2	25.4	27.9	28.6	28.1	33.1	33.2

Coale's nuptiality parameters were also calculated for the period 1951-1991 to provide further evidence of the rising trend in age at marriage. These estimates are shown in table 6. The values of  $a_0$  demonstrate that the earliest age at which a significant number of first marriages takes place has increased significantly over the period 1951-1991, i.e. from 10.6 to 12.6 years. The table under reference also provides some inter-related parameters, such as  $A_0$  and A.  $A_0$  measures the age span within which the majority of the first marriages take place and the maximum age beyond which first marriages are unlikely to take place. The value of  $A_0$  has changed from 12.4 years in 1951 to 20.8 years in 1991, demonstrating that marriages are now taking place over a wider age range than before. The increasing value of A implies that Bangladeshi women nowadays have acquired an extended scope in terms of delaying their marriage.

#### Age at marriage differentials

Age at marriage is a cultural variable which may be influenced by a host of socio-economic factors. The factors which have been examined are current residence, childhood residence, religion, education, husband's education, pre-marital work experience, husband's occupation, religiosity and region of residence. These factors are chosen because of the availability of data and because the available evidence suggests that they are important determinants of age at marriage in other developing countries.

Before reporting the results of the analysis on age at marriage differentials, it may be worthwhile to present a few characteristic features of marriage practices in Bangladesh. Bangladeshi women enter marriage within a very narrow age range and at a very early age also. Although the legally sanctioned age of marriage is 18 years, it is seldom observed in the countryside; further only about 12 per cent of single women remain to be married beyond this age. The 1989 BFS data show that nearly 18 per cent of the women marry before they experience their first menarche, which is estimated to commence within the timeframe of 12-13 years of age. Between ages 13 and 14, another 40 per cent of them marry.

Table 7. Cumulative probabilities of first marriage at specified ages by background characteristics of Bangladeshi women

Characteristics	Age					
	10	13	15	17	19	20
<b>Region</b>						
Chittagong	0.01	0.29	0.67	0.88	0.94	0.98
Dhaka	0.02	0.32	0.66	0.84	0.96	0.96

Khulna	0.02	0.32	0.65	0.86	0.93	0.92
Rajshahi	0.02	0.33	0.59	0.69	0.92	0.90
<b>Residence</b>						
Rural	0.02	0.33	0.69	0.89	0.97	0.98
Urban	0.01	0.28	0.60	0.83	0.92	0.95
<b>Education</b>						
None	0.02	0.37	0.73	0.91	0.97	0.99
Primary	0.01	0.28	0.65	0.88	0.97	0.98
Secondary+	-	0.12	0.39	0.69	0.85	0.90
<b>Religion</b>						
Muslim	0.02	0.33	0.68	0.88	0.96	0.98
Non-Muslim	0.01	0.25	0.59	0.83	0.94	0.96
<b>Work status</b>						
Worked	0.02	0.33	0.66	0.85	0.93	0.96
Not worked	0.02	0.31	0.66	0.88	0.96	0.98
<b>Husband's education</b>						
None	0.02	0.37	0.73	0.91	0.97	0.99
Primary	0.02	0.33	0.70	0.90	0.97	0.99
Secondary+	0.01	0.22	0.55	0.80	0.92	0.95

The prevalence of marriage differentials has been studied by life table technique. This table looks at the cumulative probability of the women marrying at various specified ages. The results of this exercise are presented in table 7. As the table shows, only a small proportion of the women (1-2 per cent) get married by age 10. This proportion rises abruptly to 30 per cent on the average by age 13, when most (60-65 per cent) have yet to experience puberty. At this point, Muslim, uneducated and rural females are more likely to marry than their respective counterparts. The differences still continue to exist until age 15, at which time the cumulative proportion of females marrying rises to about 65 per cent on average. As previously noted, the role of religion, current residence and education has been pronounced throughout the age span 10-20 years. On average, only about 4 per cent of women remain to be married beyond age 19. Education appears to have a significant impact on the marriage behaviour of women. For example, only about 1 per cent of the women who have up to a primary level of education remain to be married beyond age 20, while as many as 10 per cent of them remain to be married if they have more than a primary level of education.

The mean age at marriage differentials have been studied in this article through a cohort approach with a view to see if there is any trend in age at marriage. The cohorts have been derived from current age: those under 30 and those 30 and older. These roughly correspond to two birth cohorts: respondents born before 1960 and respondents born in 1960 or later. This categorization of the cohorts will reflect the relative contribution of socio-economic factors in the changes in the age at marriage, if any, over time. Table 8 shows these differentials.

Table 8. Socio-economic differentials of age at first marriage in Bangladesh

Background variables	Mean age at marriage for women aged			Increase in mean age	N
	<30	30+	Total		
<b>Current residence</b>					
Rural	15.4	14.8	15.1	0.6	8,467
Urban	15.9	15.5	15.7	0.4	3,439
<b>Childhood residence</b>					
Rural	15.4	14.9	15.2	0.5	10,183
Urban	16.2	15.8	16.0	0.4	1,723
<b>Religion</b>					
Muslim	15.5	14.9	15.2	0.6	10,267
Non-Muslim	16.1	15.4	15.7	0.7	1,639
<b>Woman's education</b>					
None	15.1	14.6	14.9	0.5	7,583

Primary	15.5	15.1	15.3	0.4	2,001
Higher	17.0	17.2	17.0	-0.2	1,722
<b>Husband's education</b>					
None	15.1	14.6	14.9	0.5	5,528
Primary	15.4	14.6	15.0	0.8	2,405
Higher	16.2	15.8	16.0	0.4	3,973
<b>Woman's work status</b>					
Worked	15.7	15.1	15.4	0.6	1,843
Not worked	15.5	15.0	15.3	0.5	10,063
<b>Husband's occupation</b>					
Professional/administrative	15.9	15.5	15.7	0.4	1,605
Non-agricultural	15.2	14.7	15.0	0.5	3,791
Agricultural labourer	15.4	14.7	15.0	0.7	6,510
<b>Religiosity</b>					
Strictly observe	15.8	15.1	15.4	0.7	2,516
Not strictly observe	15.5	15.0	15.3	0.5	9,390
<b>Frequency of prayer</b>					
Every day	15.8	15.0	15.4	0.8	6,915
Not every day	15.4	14.9	15.2	0.5	4,991
<b>Region of residence</b>					
Chittagong	15.9	15.3	15.6	0.6	2,717
Dhaka	15.6	14.9	15.3	0.7	3,778
Khulna	15.3	14.7	15.0	0.6	2,325
Rajshahi	15.5	15.1	15.3	0.4	3,086
<b>Bangladesh as a whole</b>	<b>15.5</b>	<b>15.0</b>	<b>15.3</b>	<b>0.5</b>	<b>11,906</b>

#### Current residence

Variations in age at marriage are evident when the respondents are differentiated by place of current residence. Urban females marry, on average, at 15.7 years, while their rural counterparts marry at 15.1 years.

Those who were born and reared in urban areas have an average age at first marriage of 16.0 years, while the mean age at first marriage for their rural counterparts is 15.2 years. As the data show, childhood type of residence is a stronger differentiating background variable than current residence, probably owing to rural-to-urban migration. This was evident from the cross-classification of the data by current residence and childhood type residence. The cross-classification shows that respondents born in rural areas and currently living in rural areas have the lowest mean age at marriage (14.8 years). The highest mean (15.9 years) was noted for those whose childhood and current residence is urban. For women having a rural childhood background but are currently living in urban areas, the mean age at marriage is 15.2 years, whereas it is only a little higher (15.6 years) for the women who were born in urban areas but are currently living in rural areas. This pattern of age at marriage could indicate that women, having completed their marriage at an early age while they were in a rural area, migrated to urban areas. Also, those who moved to cities while unmarried retained the norms and values of their rural background. This is likely to have a depressing effect on the age at marriage of those who are reported to be currently living in urban areas but who have a rural childhood residential background.

Data presented so far tend to indicate that, whatever differentials in age at marriage could be discerned in the context of urban/rural differences, these have been primarily due to differences in the level of education. The distribution of women by type of residence and level of education also supports this view. Table 8 further shows that increases in age at marriage have been experienced in both rural and urban areas. This increase is relatively more pronounced for rural than urban areas.

#### Education

Education levels appear to have a significant positive association with age at marriage. The marriage of women with higher levels of education was delayed by at least two years more than that of their illiterate counterparts. The increase in the mean was of about equal magnitude (0.5 year) among the illiterate women

and women with a primary level of education, whereas among the women with a higher level of education, the age at marriage declined by 0.2 year over the period. Rather than being a positive effect, this situation may be an indication that uneducated women are encountering a "marriage squeeze" in recent years largely because of economic hardship.

The husband's education appears to make less of an impact on age at marriage than the wife's education. Mean age at marriage calculated from the cross-classification of husband's education and wife's education revealed that, when the husband has some education but his wife does not, the mean age at marriage is 15. For an educated wife married to an illiterate husband, the age at marriage is 15.2 years.

### Religion

Over time both Muslims and Hindus recorded a rise of 0.6-0.7 year in age at marriage specified by cohorts. Despite higher educational attainment among Hindus than among Muslims, the religious differential proved to be not significant. Non-Muslims in Bangladesh are mostly Hindus and almost half of them are from the scheduled castes whose average age at marriage is likely to be lower than that of caste Hindus. This phenomenon tends to have a depressing effect on age at marriage among the non-Muslim population as a whole.

### Pre-marital work experience

The pre-marital work status of women does not seem to cause any variation in age at marriage. In rural areas, women who worked before marriage, married earlier, presumably because rural work, being largely agriculture-based, is included under household activities. This is probably the reason why rural household activities have little influence on raising the age at marriage (McDonald and Rahman, 1974; Smith, 1976).

### Husband's occupation

The husband's occupation, when broadly classified as professional and non-professional, seems to make a significant difference (0.7 year) in the average age at marriage. The spouses of professional and technical people have an average age at marriage of 15.7 years, while those of non-professionals have an average age at marriage of 15 years. However, the increase in the age at marriage has been more pronounced for the latter group (0.7 year) than the former (-4 years).

### Region of residence

The country's administrative zones also vary with respect to mean age at marriage. The highest mean age at marriage (15.6 years) has been observed in Chittagong Division. A large proportion of the population in Chittagong Division live in areas populated by tribals, among whom the age at marriage has been found to be at least four years higher (19.8 years) than the national average (Rahman, 1997). This situation may be expected to contribute to the higher age at marriage in Chittagong Division. Tribals in Bangladesh constitute a special population group in respect of their socio-cultural and demographic behaviour. Although the literacy rate of the Division as a whole is poor, the tribal population is characterized by a high rate of literacy. As Rahman (forthcoming) observed, 71 per cent of the women in the study areas were reported to be literate. This is at least 15 percentage points higher than the national figure. There are more than 11 tribes in Chittagong Division; among the major ones are the Marma, Chakma and Tripura. The marriage practices of these groups differ significantly from the rest of the population. Although marriage among pre-pubescent girls in Bangladesh is highly prevalent (18 per cent), such marriages are exceedingly rare among tribal populations. As a rule, tribal girls are not allowed to be married before the age of 16 years, whereas nearly 40 per cent of non-tribal girls in Bangladesh get married by this age. Higher levels of education among the tribal population constitute a contributory factor in accounting for their higher age at marriage (Rahman, forthcoming).

### Determinants of age at marriage

To this point, marriage age differentials have been presented using a few selected background variables by simple cross-tabulations. These simple tabulations, however, present only part of the results. An assessment of the effects of, say, education on age at marriage encounters complications arising from the influence of other background variables which may be correlated. To disentangle the effects on the dependent variable of each of the inter-correlated variables, multivariate treatment of the data is necessary.

In this study, the analytic technique adopted to identify the determinants of age at marriage is simple and straightforward. First, an analysis of covariance was performed to assess the effect of independent



variables. The dependent variable here is the age at first marriage; the independent variables include the respondent's age, her education, region of residence, current residence and pre-marital work status. Among the husband's characteristics, only his education was included in the analysis. Other variables were not included because they bore no statistically significant relationship to the dependent variable.

All two-way interactions (16 in number) were evaluated at the 0.01 level of significance. Four of the interactions added only 0.008 to the squared multiple correlation coefficients: region and religion; residence and education; education and work status; respondent's education and husband's education. The effects of the respondent's education and her pre-marital work status were the largest (0.004). When evaluated against the 0.05 level, with the additional two variables (region and education, and region and residence), the contribution still remained well below 0.01. Thus, the interaction terms were not included in the final model.

All the selected variables included in the model were introduced into the analysis of covariance in a hierarchical fashion. Age and its function "age-squared" were treated as covariates. The variable age-squared was entered into the model for the sake of possible curvilinearity of age at marriage by current age. The negative beta (b) coefficient of age-squared (-0.004), calculated from the ANOVA procedure, in fact hinted at a symptom of convexity in the relationship. In the model, covariates were introduced first followed by the factors. The sequence of the variables was as follows:

Dependent variable: age at first marriage  
 Covariates: age, age-squared  
 Factors: region, current residence, education, religion, work-status and husband's education.

Following the covariance analysis, multiple classification analysis (MCA) was applied to the data in order to assess the effects of various background characteristics more fully and to provide a succinct summary of the effects. Here also the age at first marriage was used as a dependent variable. The independent variables are those used in the covariance analysis.

Table 9. Hierarchical analysis of covariance of age at first marriage and selected variables: Bangladesh

Source of variation	Sum of square	Degree of freedom	Mean square	F-test	Significance of F-test	Par-tial R <sup>2</sup> x 100
<b>Covariates</b>	2,600.106	2	1,300.053	247.309	.000	-
<b>Age</b>	1,007.397	1	1,007.397	191.637	.000	1.40
<b>Age squared</b>	1,592.710	1	1,592.710	302.981	.000	2.21
<b>Factors</b>	6,810.347	10	681.035	129.553	.000	-
Region	418.229	3	139.410	26.520	.000	0.58
Residence	822.723	1	822.723	156.507	.000	1.14
Education	4,936.359	2	2,468.180	469.522	.000	6.86
Religion	451.539	1	451.539	85.896	.000	0.63
Work status	50.600	1	50.600	9.626	.002	0.07
Husband's education	130.897	2	65.449	12.450	.000	0.18
<b>Explained</b>	9,410.453	12	784.204	149.179	.000	-
<b>Residual</b>	62,519.058	11,893	5.257	-	-	-
<b>Total</b>	71,929.512	11,905	6.042	-	-	-

Note: b(age) = - 0.032, b(age squared) = - 0.004.

The results of the hierarchical analysis are presented in table 9. The analysis indicates that age alone explains 1.4 per cent of the variance out of a total of 13.1 per cent for all the variables under consideration. The regression coefficient of age (-0.032) demonstrates a negative relationship between age at marriage and current age: the older cohorts tended to marry earlier, implying an upward trend in age at marriage over time. The negative beta coefficient of the age-squared variable (b=-0.004) confirms the suspected curvilinear negative relationship with age at marriage. This variable has a larger explanatory power (partial R<sup>2</sup>=2.21) than the current age. Only a small proportion of explained variation (0.58) is ascribed to the region of residence of the respondents after controlling for age and age-squared. The current residential

status of the respondents bears a statistically significant relationship with age at first marriage. It alone explains a little over 1.1 per cent of the total variation even after controlling for age, age-squared and region of residence. The net effect of education of women appears to be the largest among all independent variables. Its contribution to total variation (13.1 per cent), when controlled for the four preceding variables, namely age, age squared, region and current residence, is 6.9 per cent. Religion also plays a significant role in influencing age at first marriage, contributing 0.63 per cent of the variation to the total. Pre-marital work experience of women provides a negligible percentage (0.07) in explaining the variation in marriage age. This is because the occupation in which women were engaged before marriage was often agriculture. The nature of this kind of work does not seem to delay marriage in rural Bangladesh. Husband's education is also a weak predictor of age at first marriage; it explains only 18 per cent of the variation. The poor explanation of variance of mean age at marriage by husband's education is probably due to the fact that a major proportion of the variation has been covered by the level of education of women and other variables, which are assumed to be causal prior to the husband's education in the hierarchical analysis.

Table 10. Results of multiple classification analysis of age at first marriage of ever married women in Bangladesh

Characteristics	Number of women	Mean age at marriage	
		Unadjusted	Adjusted*
<b>Region</b> ( $\eta=0.08$ , $\beta=0.09$ )			
Chittagong	2,717	15.6	15.6
Dhaka	3,778	15.3	15.3
Khulna	2,325	15.0	14.9
Rajshahi	3,086	15.3	15.4
<b>Residence</b> ( $\eta=0.11$ , $\beta=0.02$ )			
Rural	8,467	15.1	15.3
Urban	3,439	15.7	15.4
<b>Education</b> ( $\eta=0.30$ , $\beta=0.25$ )			
None	7,583	14.9	15.0
Primary	2,601	15.3	15.3
Secondary+	1,722	17.0	16.7
<b>Religion</b> ( $\nu=0.07$ , $\beta=0.08$ )			
Muslim	10,284	15.2	15.2
Non-Muslim	1,622	15.7	15.8
<b>Work status</b> ( $\eta=0.02$ , $\beta=0.03$ )			
Worked	1,842	15.4	15.5
Not worked	10,064	15.3	15.3
<b>Husband's education</b> ( $\eta=0.21$ , $\beta=0.05$ )			
None	5,528	14.9	15.2
Primary	2,405	15.0	15.2
Primary+	3,973	16.0	15.5

\* Covariates age and age squared were adjusted as well as the variables listed here.

R=0.362, R<sup>2</sup>=0.131, grand mean = 15.3.

The results of the MCA are presented in table 10. So far as the regional background variable is concerned, there is a differential of 0.6 year between the region with the highest age (15.6 years for Chittagong) and the lowest (15.0 years for Khulna). The statistical adjustment increases this difference by only 0.1 year. The values of h (eta) and b also vary by only 0.1, implying no inter-correlation of this variable with other predictors. This holds true also for remaining variables, except for religion and husband's education, where the multivariate adjustment of data did not change the differentials in mean age at marriage in any important way.

The unadjusted mean age at marriage for urban and rural residential status shows the expected pattern. It is higher in urban areas. This pattern remains the same after making allowances for the effects of other

variables, but the difference between mean ages narrows to only 0.1 year from 0.6 year. As previously, the predictive capacity of the respondent's education remains the highest even when adjusted for other variables ( $h=0.30$ ,  $b=0.25$ ). The adjustment retains the expected patterns: women with a higher education level have higher mean ages at marriage than their illiterate counterparts. The effect of the husband's education is less pronounced. The beta value reduces to one-fourth of the eta value, indicating an inter-correlation with other predictors. For work status and religion, small differences are found to exist in both the unadjusted and adjusted means. Muslim women and women with no pre-marital exposure to work have a lower mean age at marriage. The near invariance of eta and beta values indicates that there exists little inter-correlation of these predictors with other predictors included in the analysis.

## Conclusions

The rise in age at marriage in Bangladesh has been remarkably slow during the last 70 years as compared with other South Asian countries. Celibacy is exceedingly rare and a significant proportion (18 per cent) of women marry before they reach puberty. Of the several background variables included in the analysis, illiteracy has emerged as the most significant factor in explaining the high incidence of early marriage. The high proportion of uneducated women who had married at an early age and were living in urban areas is a reflection of a high level of migration of such women from rural to urban areas.

Although the Government of Bangladesh in 1984 established the legal age at marriage as 18 years for females and 21 for males, the law is hardly observed in rural areas. As a result, the age at marriage remains appreciably low in such places. The traditional marriage system in rural areas places great emphasis on protecting family honour by ensuring that daughters are married off before they could bring disgrace to the family through either becoming pregnant outside marriage or reaching an age where they could be considered to be "old maids". People start to worry about old-maid status if a woman reaches the age of 18 or 19 without marrying. Among rural people, a more sanguine attitude concerning this perception is that girls are considered old maids if they remain unmarried at 15.

Unlike in other Asian countries, the pre-marital work status of women in Bangladesh remains a very weak predictor of age at marriage. This does not mean that work status does not have any effect on the age at marriage; it simply tends to show that the kind of work in which the women are engaged is mostly unpaid or family work, or of low status, and this is unlikely to influence age at marriage in any significant way. Such women are easily withdrawn from this kind of work soon after their marriage has been arranged. A lower level of education results in low-status jobs, with many such women being involved in agriculture.

It is believed that, whatever is the impact of the differentials that could be discerned from the analysis, a lower age at marriage (a) among rural women, (b) among those who are Muslims and (c) among those without pre-marital exposure to work is associated with a low level of education. The 1993/94 BDHS revealed that 58 per cent of the women had never gone to school, with 27 per cent having only a primary to secondary level of education, and the remaining 15 per cent having attained education beyond the secondary level. The corresponding proportions in Indonesia are 20, 50 and 30 per cent, respectively. However, it is encouraging to note that recently the government has begun actively to enforce its policy of encouraging parents to send their children to school, which, up to the primary level, is free of cost for both boys and girls, and up to the secondary level for girls. This action is expected to encourage female education.

The above discussion leads to the conclusion that education is one of the most viable means for enhancing the status of women vis-a-vis raising the age at marriage. Therefore, even more vigorous attempts should be made to keep the girls in school for an extended period. Along with formal education, women must have access to informal education. One dimension of informal education is that women should be made aware of the risks and consequences of early marriage. The mass media can play an effective role in this regard. A social mobilization programme through the same media might also be an effective way to change the orthodox religious and cultural values regarding "when to marry" and "whom to marry". Public opinion may also be sought in coming to a consensus regarding a clear legal age at marriage. Moreover, marriage should be entered into with the full consent of the intending couples. Special efforts should be made to provide paid employment for women in suitable places. In respect of the education of children, efforts should be made at multiple levels to ensure that there is no discrimination according to sex.

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