

# Infant Mortality and the Decline of Fertility in Bangladesh

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## Abstract

*The main purpose of this article is to determine the effect of infant mortality on fertility decline with a comparative review of the decline in infant mortality and fertility in Bangladesh. The possible relation and interaction between infant mortality decline and fertility decline are described, based mainly on the Bangladesh Fertility Survey (BFS) 1989. In addition, information from other sources will be utilized to assess consistency and to arrive at reasonable conclusions concerning the levels and trends of fertility and infant mortality and also the increasing contraceptive prevalence rate.*

*Fertility and infant mortality have declined considerably between 1975 and 1990. The decline is greater in urban areas than in rural areas. The use of contraceptives increased steadily in Bangladesh between 1983 and 1991. Bangladesh is unique in having a relatively high contraceptive prevalence rate in an environment of low socioeconomic development. The high level of contraceptive use in Bangladesh has had an indirect effect on the decline of infant mortality.*

**Keywords:** Fertility, infant mortality, family planning, contraception and Bangladesh.

## Introduction

Bangladesh is one of the most populous and unurbanized countries in the world. In January 1990, the population of Bangladesh was estimated to be 113 million. The crude birth rate of 34 and crude death rate of 12 resulted in a growth rate of 2.2 percent per year. Having an area of only 144,000 km<sup>2</sup> and 819 inhabitants per km<sup>2</sup>, it is one of the most densely populated and poorest countries in the world. The illiteracy rate is high and women's status low, the economy is based on agriculture and high dependency on families, especially male children. Infant and child mortality is high despite a rapid mortality decline (World Bank, 1992). More than 80 percent of the population lives in rural areas. Rural society remains feudal, conservative, traditional and agrarian, much as it has been for centuries. While moderate poverty decreased,

extreme poverty increased between 1973-74 and 1985-86 (Osmani, as cited in World Bank 1992). Economic conditions are not improving; rather, analyses of the rural economy show that the economic conditions have deteriorated markedly in the past three decades (Bangladesh Bureau of Statistics (BBS) 1977, 1984, 1985).

The age structure of the Bangladesh population is young. According to the Bangladesh Fertility Survey (BFS) in 1989, 43.3 percent of the male and 43.4 percent of the female population are 0-14 years old. The dependency ratio (the ratio of population under 15 and over 60 years of age per 100 of population aged 15-59 years) is very high, 96 in Bangladesh. The sex ratio is 100 men per 104 women. Women aged 15-49 make up 44.7 percent of the total female population. In the terms of religion, over 85 percent of Bangladeshi inhabitants are Muslim, 13 percent are Hindu, and the remaining 2 percent are Buddhist or Christian (BFS 1989). The mother tongue is Bengalee and 98 percent of the people speak Bengalee languages.

Compared with some South Asian countries, especially in the Indian sub-continent, the level of fertility is about the same as in India. According to the Indian sample registration system (SRS) of 1984, the total fertility rate was 4.5. The total fertility rate of Pakistan and Nepal is higher than that of Bangladesh. According to the Pakistan Demographic and Health Survey (PDHS) in 1990-1991, the total fertility rate was 5.5. (Leete and Alam 1993; Shah and Cleland 1993).

Among the reasons for the high level of fertility in South Asia, especially in the Indian sub-continent are the early and universal marriage pattern, low rate of literacy, cultural and religious factors, and the low proportion of women using contraceptives - although, the family planning programs of Bangladesh, Pakistan, and India have been working since 1953 at launching of the program to control fertility. The infant mortality rate is about the same in India, Pakistan and Bangladesh; it is higher only in Nepal. According to the Indian sample registration system of 1984, the infant mortality rate was 105 per 1,000 live births, and 106 (PDHS 1989) in Pakistan.

During the last two decades, infant mortality and fertility rates have declined in almost all Asian countries to a greater or lesser degree. Bangladesh has witnessed a substantial fertility decline between 1975 and 1990 (BFS 1989). According to the Bangladesh Bureau of Statistics (1990), the total fertility rate and infant mortality rate were 4.3 and 94 respectively. The decline probably started in the late 1970s and accelerated in the mid-1980s. According to the World Bank (1992) the infant and child mortality fell gradually, probably between 1975 and 1985 and markedly in the late 1980s. Infant mortality declined at a faster pace than child mortality (Kabir 1993). Evidence of this recent trend comes from the sample registration results of the Bangladesh Bureau of Statistics, from the International Centre for Diarrhoeal Disease Research in Bangladesh surveillance data for the comparison area Matlab, and from the Bangladesh Fertility Survey of 1989. Nevertheless, infant mortality decline has not been very remarkable in Bangladesh compared with other developing countries in Asia, but the decline of the urban infant mortality rate is higher than the rural, 69 and 84 respectively, according to the Contraceptive Prevalence Survey in 1991 (CPS). Infant mortality has remained too high to reduce the birth rate significantly. There is also noticeable evidence of

the relationship between the decline in infant mortality and fertility in developed countries prior to the onset of the modern fertility transition (Knodel 1979). Several demographers have argued that child mortality is an important determinant of fertility and that the reduction of child mortality may be a precondition of successful population control efforts. Subsequently, the role of mortality decline in decreasing fertility is of fundamental importance in Bangladesh. The Bangladesh Fertility Survey of 1989 points out that there has been a positive association between the decline of infant mortality and fertility in recent decades.

The Bangladesh family planning program and the use of contraceptives are the main reasons for fertility decline in Bangladesh. During the last two decades, contraceptive use has increased rapidly, 31.3 percent according to BFS (1989) and 40 percent according to CPS (1991). Infant mortality declined and the contraceptive prevalence rate increased between 1979 and 1990. The contraceptive prevalence rate is increasing and the infant mortality rate is simultaneously decreasing, indirectly strengthening the decline of fertility. Infant and child mortality in Bangladesh have long been of interest to demographers because of their apparent relationship with fertility and, indirectly, with the acceptance of modern contraception (Kabir and Chowdhury 1993). In preventing the birth of unwanted children and infant deaths, the use of contraceptives may lower the infant mortality rate.

## Aim of study

The present study is based on the relationship between the decline of infant mortality and fertility in Bangladesh. The main purpose of this paper is to describe and examine the effect of infant mortality and modern contraception on the decline of fertility. The study is concentrated on the decline of fertility and infant mortality in Bangladesh especially in the period between 1979 and 1990. The main reasons for fertility decline in Bangladesh, family planning, and the rapidly increasing use of contraceptives are also discussed in this article. The last section describes the relationship between the decline of infant mortality and fertility in Bangladesh.

## Method and materials

This paper is mostly based on the 1989 Bangladesh Fertility Survey (BFS) which was financially and technically assisted by the World Bank and conducted by the National Institute of Population Research and Training. In addition, information from other sources will be utilized to assess consistency and to arrive at reasonable conclusions concerning the levels and trends of fertility and infant mortality as well as the increasing contraceptive prevalence rate. These sources are mainly the Bangladesh Bureau of Statistics, the Contraceptive Prevalence Survey of 1991, and the Bangladesh Demographic and Health Survey of 1993-94. The result of this paper is presented on the basis of the BFS (1989) which was calculated by several national and international demographers. The main part of the BFS 1989 was reviewed and analyzed by Dr. John Cleland, Professor M. Nurul Islam and Dr. M. Mazharul Islam, Professor M. Kabir and Rafiqul Islam Chowdhury, especially on the decline of fertility and infant mortality in Bangladesh.

The BFS 1989 was a nationwide sample survey of a total of 12,096 women under 50 years who have ever been married and who were identified as eligible for an individual interview. Of these married women, 11,906 or 98 percent were successfully interviewed. The BFS 1989 was supported and coordinated by the Bangladesh Bureau of Statistics and Mitra & Associates. The main aim of the survey was to provide information on the levels and trends in fertility and infant and child mortality which have occurred in the 10 years preceding the survey. The Bangladesh Bureau of Statistics is a poor government organization. The Bureau has been registering the vital statistics of population and carrying out the census survey every 10 years. Mitra & Associates have worked as pioneers in the Contraceptive Prevalence Survey which was sponsored by the Government of Bangladesh and also funded by the United States Agency for International Development. The contraceptive prevalence survey has acted as an important monitoring tool in evaluating and assessing the progress of the family planning program every two years. Hence, reliable information is now available on fertility, family planning, contraception, and infant and child mortality which was not available in Bangladesh before 1975.

## Results

### **The decline in fertility 1975-1989**

Total fertility has declined in many high fertility societies even in low social and economic conditions, most likely as a result of the family planning program between 1960 and 1990. The Bangladesh Studies conducted in the early 1960s and early 1970s reported that the historical level of fertility was high with a total fertility rate of over 7.0 and perhaps as high as 7.5 (Khan and Ruzicka 1981). The total marital fertility rate of 7.4 in 1975 has decreased to 6.3 by 1989 (BFS 1989).

Total fertility has declined (Table 1) according to several national surveys from about seven births to 4.3 births. The starting level of fertility, however, is implausibly low because of the early marriage age and the low level of contraceptive practice (Cleland et al. 1993). The appreciable decline has taken place from an average of 5.7 births in the early 1970s to an average of 5.0 births in the middle of the 1980s. At the end of the 1980s, all surveys show an appreciable fertility decline, although there is no dramatic change. After evening out annual fluctuations by taking three-year averages, the BFS indicates a sharp decline of two births between 1979 and 1987. The BBS data indicated a still sharper decline but the BFS data shows much higher and more plausible at the beginning. The BFS and CPS show a remarkable consistency and a very steep decline between 1980 and 1987 of 30 percent, in the total fertility rate (Cleland 1993). All surveys (Table 1) display a similar trend of fertility at the end of the 1980s.

Table 1. Total annual fertility rates (TFR) from the BBS sample registration scheme, and from the 1989 BFS and the 1989 and 1991 CPS

Year	BBS	BFS 1989	CPS 1989	CPS 1991
1979	-	6.8	-	-
1980	5.0	6.8	-	-
1981	5.0	6.7	-	-
1982	5.2	6.4	-	-
1983	5.1	6.1	-	-
1984	4.8	5.9	5.6	-
1985	4.7	5.5	5.5	5.6
1986	4.7	5.1	5.0	5.0
1987	4.4	4.8	4.6	4.9
1988	4.4	-	4.9	4.6
1989	4.3	4.8	-	4.1
1990	4.3	-	-	4.2

Source: Cleland et al. 1993.

BBS: Bangladesh Bureau of Statistics

BFS: Bangladesh Fertility Survey

CPS: Contraceptive Prevalence Survey

The BFS 1989 estimate that an appreciable decline had occurred in the total fertility rate and total marital fertility rate. Fertility among teenage women has declined, because of the rising marriage age. The mean age at first marriage is one of the lowest in the world. The mean age at first marriage among all women ever married aged 15-49 is reported to be 12.3 in the BFS 1975 and increased to 14.8 years in the BFS 1989. The BFS 1989 study stated that the mean age at first marriage is well below the minimum legal marriage age of 18 for females as established by the government in 1976. The singulate mean age at marriage was 22.9 years for males and 13.9 for females (Census 1961) and it has increased to 25.5 for males and 18.0 for females (BFS 1989).

An increase in the marriage age is expected to have some negative effect on fertility. According to the census of 1961, 8.3 percent of females and 24 percent of males were unmarried, but this percentage grew to 49 and 72 percent respectively by 1989, due to postponed marriage (BFS 1989). This represented great social change and was of great significance for population development. A comparison of the three recent Contraceptive Prevalence Surveys (1982, 1987, 1991) reveals a decline in the mean number of children born. Childhood marriage is still prevalent in rural Bangladesh because of the low level of public education, cultural heterogeneity and traditional social customs. The BFS 1975 and 1989 showed that particularly the mean number of children ever-born display a notable decline. The overall standardized mean has changed from 3.79 in the BFS 1975 to 3.14 in the BFS 1989, showing a drop of 17 percent and fluctuating erratically between 3.1 and 3.8 births. The BFS 1989 estimated that the noticeable age-specific fertility rates have declined within the age groups

30-35 and 35-39 because of the demand for children among women who already have three or more children who survive. The age-specific fertility rates for five-year periods (1974-78) in the age groups 30-35 and 35-39 were .2605 and .1810, decreasing to .1692 and .1141 in the period of 1984-88, and respectively resulting in a 35 and 37 percent decline. The BBS 1990 and the BFS 1989 stated that the total fertility rate had declined but the decline of urban fertility rate is 25 percent higher than rural fertility. According to Islam and Islam (1993), fertility has declined at least 20 percent between 1975 and 1989.

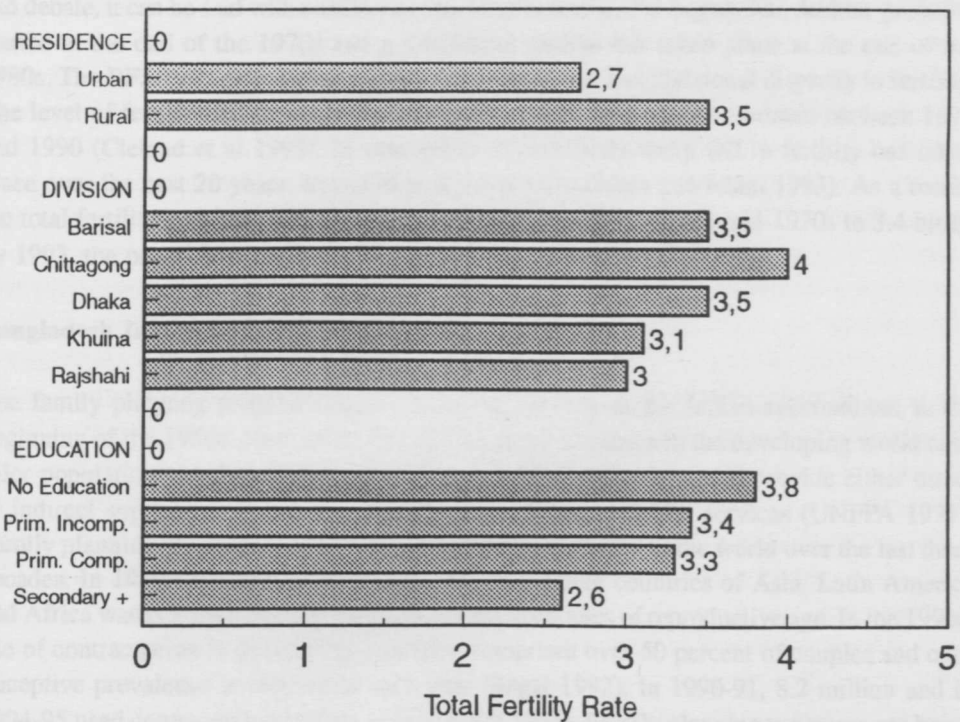
In Matlab, a subdistrict of Bangladesh and an area internationally well known for family planning, a substantial decline in fertility has occurred in recent decades. The total fertility rate was 5.0 in the treatment area and 6.3 in the comparison area in 1982. The unprecedented decline in fertility between 1982 and 1993 is due to a rise in the female marriage age and the high level of contraceptive use (BDHS 1993-1994). The contraceptive prevalence had reached 57 percent in the Matlab treatment area and nearly 27 percent in the comparison area for all currently married women aged 15-49 years by 1990 (Koenig et al. 1992). The total fertility rate has declined to 2.9 in the treatment area and 3.9 in the comparison area by 1993 (BDHS 1993-1994). The Matlab sub-district in Bangladesh is well known for the Demographic Surveillance System, a population laboratory operated in the locality by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) since 1966. This centre was established originally for epidemiological research on cholera, but the DDS has been used since 1977 to examine the demographic effectiveness of family planning services. Approximately 100,000 inhabitants reside in the villages in the treatment area, and a comparable population of an equivalent size resides in the villages of the comparison area. Demographic dynamics are monitored in each area, providing comprehensive data on the impact of health and family planning services in Matlab. Contraceptive prevalence rose from about 5 percent in 1977 to about 57 percent in 1993 (Rahman et al. 1992).

### *Differentials in fertility*

There are few pronounced fertility variations between regions and rural-urban areas in most early studies in Bangladesh. According to the BFS 1989, a rural-urban disparity exists, and reflects the greater use of contraception and a later marriage age among females in urban areas. Rather surprisingly, inhabitants of the large cities (Dhaka, Chittagong, Rajshahi, and Khulna) differ in their behavior from those living in smaller urban localities. Regional disparity is more marked than the urban-rural differences. The total fertility rate of rural areas was 5.3 and 3.8 in urban areas, and 3.8 on average in large cities (Dhaka, Chittagong, Khulna, and Rajshahi).

The BDHS 1993-94 stated that a substantial differential in fertility can be seen according to residence, region and education. Total urban fertility rates declined more markedly than in all other national surveys. The total fertility rate between 1991 and 1993, three years before the survey, was 3.4 children per woman. The fertility rate is higher in rural areas than in urban areas (Figure 1), 3.5 and 2.7 respectively. According to various censuses and demographic surveys, the fertility rate is about 30 percent higher in rural areas than in urban areas (BDHS 1993-94).

Figure 1. Total fertility rates by residence, division (region) and education



BDHS 1993-94

The total fertility rate was highest in the Chittagong region with 4.0 children per woman and lowest in Rajshahi and Khulna with fertility rates of 3.0 and 3.1 respectively. The Barisal and Dhaka regions have intermediate levels of fertility, with a fertility rate of 3.5 children per each woman. Female education is strongly related to the fertility levels in Bangladesh. A woman with no formal education would give birth to an average of 3.8 children, compared to 2.6 children for women with at least some secondary education, a difference of 33 percent (BDHS 1993-94). Bangladesh is divided into five administrative divisions or regions, namely Barisal, Chittagong, Dhaka, Khulna and Rajshahi. Among 490 sub-districts, Matlab is one of them where substantial fertility declined and contraceptive use increased markedly between 1977 and 1993 (SYBB 1994).

Although fertility levels and trends in Bangladesh have long been the subject of discussion and debate, it can be said with confidence that fertility decline has begun. The decline probably started at the end of the 1970s and a substantial decline has taken place at the end of the 1980s. The BFS 1989 revealed an appreciable rural-urban and divisional disparity in fertility. The level of fertility fell from about 7.0 births to about 4.5 births per woman between 1975 and 1990 (Cleland et al. 1993). In conclusion an extremely sharp fall in fertility has taken place over the past 20 years; one of at least 20 percent (Islam and Islam 1993). As a result, the total fertility rate has declined from 6.3 births per woman in the mid-1970s to 3.4 births by 1993, the probable cause being the effect of contraceptive use.

### **Bangladesh family planning program**

The family planning program began controlling fertility in the Indian subcontinent in the beginning of the 1950s. Now, more than one hundred countries in the developing world consider population matters important for their national development and provide either direct or indirect support for family planning and maternal and health services (UNFPA 1991). Family planning and contraceptive use have rapidly increased in the world over the last three decades. In 1960-65, contraceptive use in the developing countries of Asia, Latin America and Africa was practised by nine percent of married couples of reproductive age. In the 1990s, use of contraception in developing countries comprises over 50 percent of couples and contraceptive prevalence is increasing each year (Segal 1992). In 1990-91, 8.2 million and in 1994-95 used contraception in Bangladesh (SYB 1994). Family planning programs are being carried out as an integral part of reducing birth rates, improving the welfare of mother and child, and controlling population growth.

In the South Asian subcontinent, India, Pakistan, and Bangladesh together have a contraceptive prevalence rate of about 35 percent. Overall, they account for about one-third of non-users of contraception among married women of reproductive age in all developing countries (China excluded; Freedman and Freedman 1992). Although the family planning program history is quite old in the Indian subcontinent, from the beginning of the 1950s, India still has an estimated prevalence rate of only 40 percent, and Pakistan, with a long history of family planning programs, has an estimated rate of seven percent (Freedman and Freedman 1992). Sri Lanka is the only country in South Asia where contraceptive use among currently married women increased from 32 percent in 1975 to 62 percent in 1987 due to a high literacy rate in



the society (Leete and Alam 1993). The contraceptive prevalence rate increased in Bangladesh from eight percent in 1975 to 45 percent in 1993 with an average increase of about two percentage points a year (BDHS 1993-1994).

Bangladesh was one of the first Asian countries to recognize the need to reduce rates of population growth, and for the last two decades this recognition has been an important element in the country's development planning. Family planning was introduced in the early 1950s as a voluntary association of social and medical workers in Bangladesh. The National Family Planning Program of Bangladesh was initiated in 1965, and it recognized the urgency of moderating population growth and adopted a family planning program. The present family planning infrastructure of Bangladesh has gone through a development process over the last 35 years (BDHS 1993-1994). During its long history, it has undergone a series of evolutionary changes in terms of organizational structure, programmatic strategy, and goals.

The family planning program received virtually unanimous, high level political support in 1972. In January 1976, the government declared that solving the population problem was of great importance to the nation. The National Population Policy was formulated and officially approved, stating as a central aim the reduction of population growth through a field based Family Planning Program, the welfare of mother and child health through the Maternal and Child Health Program in June 1976 (CPS 1991). The Family Planning (FP) and Maternal and Child Health (MCH) programs have been working together since 1980 (Khan 1981). The Maternal and Child Health Program has been working as an integral part of the program to reduce maternal, child and infant mortality. The Bangladesh family planning workers are important in achieving the goals of the program. The integrated Health and Family Planning Program theoretically has three types of front line workers in the field level, namely, Health Assistants, Family Planning Assistants and Family Welfare Assistants. The total strength of these field level workers was about 32,000 (Planning Commission 1990). Their main task is to deliver family planning information and distribute contraceptive methods to the households of the village.

There is a close connection between mortality, fertility and family planning in population development. This connection is based on birth, contraception, and infant deaths. The use of contraceptives lowers the number of births in a population. At constant mortality rates, fewer births mean fewer infant and child deaths. Fewer deaths lessen the strain on health care systems and increase the per capita expenditure on health for any given level of funding, which may also act to reduce infant and child mortality (Bongaarts 1987). Major fertility decline has taken place through strong family planning programs in countries where social and economic conditions were believed to be unfavorable; prominent examples are China, Indonesia, and Thailand, and certain states of India and Bangladesh (Freedman and Freedman 1992). The significant increase in contraceptive practice and the fertility decline in Bangladesh have been associated with an extensive family planning program and considerable donor commitment (World Bank 1992). The effect of contraceptive use on fertility depends on the level of contraceptive prevalence. The level of fertility decreased according to the various surveys between 1975 and 1991 from 6.5 to 4.2 (Table 2).

Table 2. Estimated use of contraception and effect of contraception on fertility according to several successive surveys, 1975-1989.

Year	CPR%	TFR	Reduction in fertility	Proportion currently using	Average effectiveness of method used
1975	BFS 8	6.5	6.5	0.077	0.779
1979	CPS 13	6.2	10.7	0.122	0.812
1981	CPS 19	6.1	15.8	0.186	0.786
1983	CPS 19	6.1	17.3	0.196	0.839
1986	CPS 25	5.0	23.1	0.253	0.845
1989	BFS 32	4.8	38.8	0.314	0.849

Source: BFS 1989

CPR = Contraceptive Prevalence Rate

### *Level of contraceptive practice*

Contraception and breastfeeding form a contributing factor in reducing fertility in a population control and policy oriented country. Breastfeeding is universal and common in low income countries and the duration of breastfeeding in Bangladesh is one of the longest in the world. The long period of breastfeeding and amenorrhea reduce fertility by at least 35 percent (BFS 1989). According to the application of Bongaarts' proximate determinants model (Islam and Islam 1993), the effect of lactational infecundability on fertility decline was 68.5 in BFS 1975 and 41.8 percent in BFS 1989. The effect of contraception on fertility decline was 9.9 in BFS 1975 and 35.4 percent in BFS 1989. The practice of contraception in Bangladesh is the important factor which effects the decline in fertility and was responsible for the substantial decline in fertility between 1975 and 1989. The magnitude of the effect, a reduction of 29 percent in the TFR, has been achieved by the use of contraception (Islam and Islam 1993). The Contraceptive Prevalence Survey estimated that the contraceptive use rate grew on average by two percent annually between 1983 and 1989, but soared by over 4 percent per annually between 1989 and 1991.

According to the BDHS 1993-1994, 99.7 percent of women who have been married at some time and 99.8 percent of currently married women aged 10-49 know of at least one method. By 1991, 40 percent of all married women in Bangladesh were using contraception (CPS 1991). The contraceptive prevalence rate was 32.8, according to BFS 1989. Contraceptive use rose steadily between 1983 and 1991, and the country is unique among the countries of the world in having a relatively high contraceptive prevalence rate (CPR) in an environment of low socioeconomic development (Mauldin and Ross 1991). The estimated contraceptive prevalence rate of 52.0 percent in the Khulna division was higher in 1990 than in the other three regional divisions, Dhaka, Chittagong and Rajshahi. In the Matlab sub-district, the contraceptive prevalence rate has increased rapidly from 38.1 percent in 1984 to 57.1 percent in 1990 (Koenig et al. 1992). During the last sixteen years (1975-1991), the level of contraceptive use rate increased by 32.2 percentage points; the annual rate of change is 2.0 percentage points (BFS 1989). Almost all surveys in Bangladesh estimated that contraceptive prac-

tice is much higher among women above 30 years of age who already have more than three living children than it is among younger women. Two thirds of the current users belong to the age group of 30-44 years (Mabud 1992). This is probably the cause of decreasing infant deaths and surviving children according to the demand of child and the supply and facilities of contraception.

Despite the long history of family planning programs, the contraceptive prevalence levels remain low and consequently the rate of population growth in Bangladesh has remained persistently high (compared with developing countries like Sri Lanka and Indonesia). The contraceptive prevalence rate is relatively low in Bangladesh compared to other developing countries because of the low level of education and low economic development.

Several factors can be attributed to the low prevalence of contraception in Bangladesh compared to other developing countries. The most important reasons are the low level of socio-economic development, low status of women, strong preference of male children, women's strong dependency on men, high level of infant and child mortality, and limited access to health and family planning facilities (e.g. Cain 1981; Mita and Simon 1982; McNicoll 1978, as cited in Kabir et al. 1990). A low level of universal education is also one of the prime causes of low prevalence of contraception in Bangladesh. According to several recent scientific reports, Bangladesh offers the best proof that family planning can change fertility, even in poor communities (Egerö 1996).

According to BFS 1989, breastfeeding and the use of contraceptives played an important and influential role not only in child health but also in fertility. The average duration of breastfeeding was 30.4 months in 1989. The mean duration of postpartum amenorrhea was estimated to be 11.2 months for the country as a whole. There is a positive association between the duration of breastfeeding and the duration of amenorrhea; longer breastfeeding is associated with longer amenorrhea. Ford and Kim (1987; as cited in Islam and Islam 1993) reported that the median amenorrhea in Bangladesh (Matlab) was 14.7 months during 1975-1979. Salway et al. 1992, as cited in Islam and Islam 1993, also observed that the increased use of contraception may be one of the important contributing factors decreasing the length of postpartum amenorrhea in Bangladesh.

Islam and Islam (1993) noted that lactational infecundability has the highest fertility reducing effect and this may be the single most important determinant of fertility reduction before the 1980s in Bangladesh. Contraception played a very important role in the reduction of fertility in the 1980s. The fertility reducing effect of contraception is rapidly increasing (Table 2), whereas the effect of lactational infecundability remains nearly constant with a 26.7 percent reduction from 68.5 percent in 1975 to 41.8 percent in 1989.

## The decline in mortality

During the last four decades, mortality levels in the world as a whole have declined, but the most spectacular decline has occurred in the developing countries. In the sixties, the crude death rate (CDR) in the developed countries was 8-12 per a 1,000 population, while developing countries were still experiencing the CDR as high as 20-30 per 1,000 population (Mabud 1992). The crude death rate in Asia was 9 per a 1,000 population, compared with 10 per 1,000 as the world average by 1985-1990 (UNFPA 1991). Mortality decline in Bangladesh compared with other developing countries in South Asia (Sri Lanka excluded) has improved in the same direction. Life expectancy rose from about 32 years in 1941 to almost 50 years in the early 1960s and from 50 to 55 years between 1960 and 1990. The International Conference on Population and Development (1994) reported that as a consequence of declining infant mortality rates, life expectancy at birth has risen rapidly.

### *Infant mortality rates in 1911-1977*

The infant mortality rate (IMR) has declined in the world during the last 20 years because of the improvement of health care facilities and modern medicine. Remarkable reductions occurred in the countries of Northern Africa, Western Asia, and South America, where the IMR declined by more than half by 1990. Nevertheless, infant mortality in developing countries is currently four times higher than in the OECD member countries, while in 1970 it was three times higher (UNFPA 1994). The infant mortality rate declined in South Asia by 1990 but the remarkable decline occurred in Sri Lanka, where the IMR is four times lower than the sub-regional average of 82.24, at 20.30 per a 1,000 population. The World Bank (1992) stated that the infant mortality rate declined between 1980 and 1990 in Bangladesh.

Infant mortality has traditionally been considered an important indicator for describing mortality conditions, health progress and indeed, the overall social and economic well-being of a country (United Nations 1988). The health benefits to mothers and their children resulting from the practice of contraception constitute a primary rationale for providing family planning services. The implications of family formation patterns for the health and survival of children have received particular attention (Kabir and Chowdhury 1993). The health conditions of children in Bangladesh in general are very poor. Neonatal mortality is very high and the rate is about 85 per 1,000 live births. Infant mortality makes up more than a half of total mortality in Bangladesh. It was estimated to be 205 per 1,000 live births in 1911 (Davis 1951). Since then, infant mortality has gone down, but the pace of decline has been rather slow (Table 3).

Table 3. Infant mortality rate (IMR), 1911-1974.

		(per 1,000 live births)
1911	Davis 1951	205
1961	Population growth estimate	144
1971	Cholera research laboratory	125
1974	Retrospective Survey	153
1975	Cholera research laboratory	192
1976	Cholera research laboratory	103
1977	Cholera research laboratory	113

Source: Elahi and Ruzicka 1981.

A considerable decline in the infant mortality rate (IMR) was noted in the first half of the 20th century. The rate declined further and infant mortality hovered around 140 deaths per 1,000 live births in the 1960s. The slow decline in the IMR in the 1970s reflects the unsettled social and economic conditions, the liberation war, periods of local famine, and floods. In 1975 the annual IMR based on the CRL report rose to almost 200 as a result of the 1974-1975 famine. The national life expectancy at birth was 23 in 1911 (Davis 1951) and about 50 in the 1960s in Bangladesh.

#### *Recent trends in infant mortality*

The BFS 1989 and BDHS 1993-94 indicated that child health has improved in general in the 1980s. Bangladesh witnessed considerable developments in rural health infrastructures in the form of the construction of MCH and welfare centres, sub-district health complexes and local welfare centres. In addition, the country experienced an aggressive promotion of oral rehydration therapy (ORT) for the management of diarrhoea and immunization against six major preventable childhood diseases, especially mothers' tetanus toxoid injection for survival during infancy (Ahmed, S. & al., 1991). It is very clear that trends in infant and child mortality are more relevant than trends in the crude death rate or overall life expectancy. Improvement in life expectancy at birth is related to the decline in infant mortality. The decline of infant mortality probably began after 1975 (Table 3).

Kabir and Chowdhury (1993), in their indirect estimation of the BFS 1989 and the CPS 1989, have shown that infant mortality was in the range of 121-127. In their direct estimation, infant mortality was about 100 per 1,000 live births. The analysis of five-year birth cohorts of children suggests that infant mortality began to decline from the 1973-1977 birth cohort when infant mortality was 159 per 1,000 births. Infant mortality of the children born between 1983-1987 was 112.2 (direct estimate) per 1,000 births indicating that the current level of infant mortality mentioned earlier is possibly true (Kabir and Chowdhury 1993).

Table 4. Recent infant mortality rates according to several sources in 1980-1990.

Year	Infant mortality rate		
	BFS	BBS	ICDDR,B
1980	127	101	114
1981	124	111	115
1982	129	112	118
1983	128	117	113
1984	121	119	127
1985	114	112	119
1986	102	116	90
1987	98	113	94
1988	91	110	97
1989	-	102	-
1990	-	94	-

Source: Kabir and Chowdhury 1993.

BBS: Bangladesh Bureau of Statistics

BFS: Bangladesh Fertility Survey

ICDDR,B: International Centre for Diarrhoeal Disease Research in Bangladesh.

All the surveys estimated (Table 4) that infant mortality fell gradually between 1980 and 1985 and that a sharp fall in infant mortality was observed in 1985. The decline in child mortality is less than the decline of infant mortality (BFS 1989). According to the direct estimates by Kabir and Chowdhury (1993), infant mortality decreases more rapidly than child mortality. The variations in the levels are much more pronounced for the ICDDR,B data than those for the BBS data. The sudden rise in infant mortality in 1984 in the ICDDR,B data was due to an outbreak of infection in Matlab. The BBS data displays a slight rise between 1980 and 1985 followed by a decline. The BFS data indicated a higher level of infant mortality in early 1980 but noticeable decline appeared at the end of 1980s. According to several national surveys, including the BDHS 1993-94, the infant mortality rate fell at the end of 1980s.

The high rate of infant mortality largely reflects the extremely high rate of neonatal mortality. In order to achieve a substantial decline in infant mortality, Bangladesh must reduce the rate of neonatal mortality (Kamal et al. 1993). According to the demographic investigation BBS 1990, the infant mortality is higher for male children while child mortality is higher for female children. The female child is less cared for than the male child by parents because of male sex preference in Bangladesh. The BFS 1989 analyzed the causes of death and found that two-thirds of the deaths of neonates occurred due to neonatal tetanus and prematurity. There are encouraging signs that preventive health care of mothers and children has improved radically over the last decade. Neonatal tetanus has declined in recent years, especially since 1987 (BFS 1989). Health care facilities and the improvement of health care may be considered as an important determinant of healthy birth and healthy life expectancy, particularly in developing countries where child health care is not ensured. However, the measurement and analysis of infant death in developing countries like Bangladesh is quite complicated because of inadequate birth registration statistics.

## Discussion and conclusions

### Discussion

The relationship between mortality and fertility is one of the most significant areas of policy-oriented population research (Chowdhury et al. 1978). Mortality may be considered as one of the major factors of fertility decline. Preston (1978) emphasized that a variety of possible links between mortality and fertility have long been recognized, but, until recently, careful attempts to identify empirically the strength of any particular connection have been seriously deficient. Freedman (1961) came to a general conclusion that a secular decline in mortality must eventually produce a decline in fertility, but argued that very little systematic empirical work had been done on the subject. Notestein and Davis (1945) suggested that mortality reduction would lead to fertility reduction because parents would need to bear fewer children in order to achieve the particular desired number of surviving offspring. Mortality decline, especially infant and child mortality decline, can help parents to plan their families better and provide them a better guarantee that their children will survive to adulthood. Improvements in child survival are expected to have an effect on the practice of family planning and effectiveness of contraceptives during the recent decade in Bangladesh. The Bangladesh Demographic and Health Survey (1993-1994) indicates that child survival has improved since the early 1980s.

The relation between fertility and mortality is based on birth rates and infant deaths; decreasing infant deaths increase life expectancy at birth. Several demographers have suggested that decreasing infant mortality is a prerequisite for decreasing birth rates in several developing countries. Hanson et al. (1994) analyzed the contemporary relationship between infant mortality and birth rates of nearly 100 developing countries making use of data published by UNICEF, and found that there is a positive association between birth rates and infant death rates, especially in recent times. The correlation coefficient between infant mortality and birth rates was 0.58 in 1960 and 0.79 in 1985 and was expected to be higher in 1990. There is no evidence to support an independent association between IMR and CBR on the calculation of the multiple regression analysis of 1960, but significant association between these two variables emerges in 1985 (Hanson et al. 1994). The very recent survey BFS 1989 indicated that there is a positive association between the decline in fertility and infant mortality in Bangladesh.

Women experiencing infant deaths have shorter birth intervals on average than women whose children survive. Hence, they would be more likely to reach higher parity (Knodel 1979). Improvements in child survival generate changes in patterns of reproduction that result in lower levels of fertility. A general increase in child survival chances would tend to lengthen average birth intervals and result in a decline in fertility rates (Kamal et al. 1993). The most noteworthy interval effects operate through lactation. Breastfeeding often inhibits ovulation, although the relationship is not deterministic and may vary according to a woman's nutritional level or other characteristics (Van Ginneken 1974, as cited in Preston 1978). The relationship between breastfeeding and child mortality should be most influential in populations where breastfeeding is most common and extended and nonlactational contraception for spacing

purposes is infrequent (Preston 1978). The interval effects are reasonably strong in high fertility societies, such as the extensively breastfeeding populations of Bangladesh and tropical Africa (Chowdhury 1978 and Knodel 1979). Infant death shortened the median birth interval from 37.2 to 24.1 months. The difference of 13.1 months is attributable to the biological effects of infant death, i.e., interruption of lactation, earlier onset of postpartum ovulation, and susceptibility to conception. Chowdhury et al. (1978), analyzed birth intervals in 1966-1967 in the Matlab treatment area and discovered that biological factors are more powerful than behavioral factors in rural Bangladesh. When biological factors are not present, no behavioral effects are observed. It is probably true that in 1966-1967 lactational infecundability was the only proximate determinant factor of fertility decline in Bangladesh. Legrand and Phillips (1996) have discovered the mortality-fertility relationship through the quasi-experimental design of the FPHSP in the Matlab sub-district in Bangladesh. The reductions in total fertility had little effect on the mortality rates of infants and perhaps toddlers (aged 12-23 months) between 1976 and 1985. Fertility reductions can have only a limited effect on toddlers, and especially infant mortality in this way, and perhaps also many other areas of the developing society. However, declining fertility led to substantially lower mortality rates, even after having controlled for the effects of other FPHSP interventions (Legrand and Phillips 1996).

Lutz (1987) investigated the links between infant mortality and fertility also in pre-industrial European society. He stated that there was a physiological effect of infant mortality on fertility in pre-industrial European populations. Chowdhury et al. (1978) indicated that there are a number of relatively recent studies showing this kind of effect in historical European situations as well as in contemporary conditions in less developed countries. Infant mortality affects the length of birth intervals independently of the physiological effect. The duration of postpartum amenorrhea is considerably long, and in general, the longer the period of breastfeeding, the longer the period of amenorrhea. This is true for a country where per capita income is low and the level of nutrition considered very low. Bangladesh is a country where breastfeeding is most widely practised and malnutrition is considerable. In an environment where breastfeeding is widely practised, there is a link between infant death and the mother's ability to conceive. Breastfeeding leads to decreased infant mortality, increased birth intervals, and decreased fertility (Hanson et al. 1994). Even without behavioral effects, elimination of infant mortality in Bangladesh would reduce fertility by prolonging the average period of postpartum sterility (Chowdhury et al. 1978).

Many studies emphasize that the secular relationship between mortality and fertility is one of the most significant areas of policy oriented population and fertility controlling program, especially in a country with rapid population growth. The levels and trends of infant and child mortality have provided clear evidence that both infant and child mortality declined substantially between 1975 and 1989. The Maternal and Child Health (MCH) program had an effect on the decline of infant and child mortality in Bangladesh. The effect of infant mortality and use of modern contraception probably influenced fertility between 1979 and 1990. Contraceptive use effectiveness leads to decreased infant mortality, increased birth interval and decreased fertility. Potters (1988) agreed upon Bongaarts opinion that family planning can potentially influence infant mortality through improving the poor reproductive health status



by changing family relationships and parenting practices in developing society. The United Nations Department of Economic and Social Affairs (1972) suggested that the reduction of infant mortality may be a necessary pre-requisite to the acceptance of family planning particularly in developing countries.

The World Bank (1992) reports exaggerate their opinion favoring the influence of infant mortality as a factor of fertility decline, though the link is chronologically remote. Without mortality decline, it is most improbable that the fertility decline of the late 1970s and 1980s would have occurred. There is also a positive relationship between a relatively high but declining fertility and a rapidly declining mortality (Kabir 1993). But it may be possible and indeed plausible that the steady decline in infant mortality from 1980s and earlier contributed to the awareness of changing social conditions and hence to fertility decline. According to all scientific resources, between 1975 and 1990, declining fertility led to substantially lower mortality rates, and reductions in total fertility most likely had little effect on the mortality rates of infants in Bangladesh.

### Conclusions

The effect of infant mortality on the decline of fertility is controversial and chronologically remote when considering demographic transition theory and fertility transition in Bangladesh. There is extensive evidence that an increased supply of contraceptives and a reduction in fertility through family planning programs world-wide over the past 20 years have considerably reduced infant mortality (Kuti 1991). In Europe, there is some evidence of infant mortality affecting fertility decline and the interaction between fertility decline and infant and child mortality decline prior to the onset of the modern fertility transition. A positive correlation has been found between infant mortality and fertility in Finland and Sweden in the 19th century. Similarly, the considerable decrease in infant mortality during the 1970s in Costa Rica showed a significant relation to decreasing fertility rates (Hanson et al. 1994). Family planning can and probably does affect infant mortality favorably; indirectly the effect of infant mortality on fertility takes place through the use of contraception (Bongaarts 1988).

The relationship between the decrease of child mortality and birth rates is quite complex, but the weight of the evidence is in favor of the interpretation that decreasing infant mortality may lead to decreasing birth rates. This relationship enhances the availability of contraceptives particularly in the developing countries. Several recent scientific studies, but not all, found that there is a positive connection between the decrease of birth rates and infant deaths. The evidence of the contemporary decline in fertility and infant mortality between 1980 and 1990 may be an indication that there is a visible connection between fertility and infant mortality in Bangladesh. Family planning and the use of contraceptives have an impact on fertility and the MCH program has an effect on the decline in infant mortality. Some experience suggests that through saving the lives and improving the well-being of children, population growth can be slowed down. The reduced mortality of infants would have a dual effect; fertility would be reduced and survivorship, a central element of net reproduction, would be improved. The relation between infant mortality and fertility was not unique in early 1960s and 1970s, but observations show a visible sign and positive association between the recent decline in infant mortality and fertility (Tables 1 and 4) in Bangladesh.

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