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Decreases in Male and Female Mortality and Missing Women in Bangladesh

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ABSTRACT

Data from the Matlab Demographic Surveillance System and two national surveys were used to determine to what extent discrimination against girls, as measured by child (1-4 years of age) mortality, malnutrition, and health service use has decreased and to identify some of the factors responsible for this change. We found that a considerable decline in child mortality has taken place in Matlab in the past 30 years and that the male/female difference has decreased considerably. The decrease in gender difference in child mortality was influenced by several factors. One of these was the decrease in fertility that took place in Matlab (as well as in Bangladesh in general) making it possible for parents to provide more care and attention to the children, especially girls. A second factor was probably the expansion of access to child health services available to children in general and girls in particular. A third factor was probably expansion of women development programmes in general and women's education in particular in the past 30 years. It cannot be concluded that discrimination against girls has disappeared altogether; our study was limited to study of few indicators of discrimination against girls namely child health indicators. We end by mentioning a number of problems involved in translating these decreases in male/female child mortality in changes in sex ratios.

Introduction

Amartya Sen (1990) estimated that some 100 million women were missing as a result of higher than expected (or "excess") female mortality in parts of the developing world, most notably South Asia, China, West Asia and parts of the North Africa. The girls and women who died as a result of differential access to nutrition and health care are called by him "missing women". Stephan Klasen and Claudia Wink (2002) estimated missing women, around 1980, to be nearly 88 million, or 7.7 percent of all females in countries affected. Ten years later the corresponding estimated figures were 94 million and 6.8 percent. They estimated missing women in Bangladesh to be 3.8 million (8.9 percent of the female population) around 1980, and 3.7 million (or 6.9 percent) around 1990. All these estimates confirmed the enormity of the problem and the toll that excess female mortality was exacting on women in female-deficit regions, including Bangladesh.

In Bangladesh, parents have a preference for balance in sex composition of children; most couples want two sons and one daughter (Chowdhury and Bairagi 1990). There is a debate over whether the pro-son bias is a product of economic structure or sociocultural. The social institutions that shape norms and values prevailing in a number of Asian countries dispose parents and other caretakers to treat boys and girls differently on the ground of their sex, which does not imply deliberate discrimination. Parents do not engage in conscious discrimination between sons and daughters, but sex discrimination is embodied in cultural beliefs (Waldron 1987). The differential treatment on the ground of sex often leads to poor health and survival of girls. The 1994 International Conference of Population and Development placed special emphasis on the need to improve health, welfare and survival of girls.

The parents' intention for more sons than daughters has often led to discrimination against girls, and the worst consequence of discrimination is the lower male-to-female mortality ratio (or excess female mortality) in age below 5. The male-to-female mortality ratio depends on the level and age structure of mortality and cause of death patterns. Child (age 1-4 years) mortality rates is a more sensitive test of female disadvantage than infant mortality rates. In childhood, exogenous causes rather than genetic causes of death predominate. As the risk of death from communicable diseases recedes, the contribution of accidents or violence to total mortality increases and these factors also act to elevate mortality risks among boys relative to girls. Klasen and Wink (2003) point out that the comparative neglect of female children is generally worse in rural areas and is particularly severe for later born girls, and even worse for girls with elder sisters.

In Bangladesh, under-five mortality did fall from a very high level very slowly until 1985. Bhuiya and Streatfield (1991) and Bairagi (1986) analyzing mortality data of early 1980s reported that higher socioeconomic status and higher mother's education did not help to reduce female disadvantage, although these variables helped to improve the chances of survival and nutritional status of children in Matlab, Bangladesh. Muhuri and Preston (1991) reported that disadvantage of female children was selective: girls who had sister(s) at the time of their birth were more disadvantaged than girls who did not have a sister. Das Gupta (1987) and Amin (1990) showed similar results in Punjab, India.

However, a couple of studies analyzing child mortality and nutrition data of late 1980s and 1996, the period of rapid under-five mortality decline, suggest that disadvantages of female children in survival and nutrition are diminishing in Matlab (Alam and Bairagi 1995; Trap et al 2004). The mortality decline has been faster for girls than for boys, which resulted in higher life expectancy at birth for females than for males since 1988 (ICDDR,B 2004). The mortality decline has not been uniform every where; it has declined at a faster rate in the area with more easy accessible primary health care services compared with an adjacent area with less easy accessible primary health care services (ICDDR,B 2004). Sex differentials may have reduced earlier in the former area than in the later area.

While increasing availability of health (preventive and curative) services and changing attitudes towards girls are important for lowering, if not for stopping, maltreatment to girls, the fertility decline lowers female disadvantage by lowering the percent of higher order girls, who experience higher mortality than only girl in families (Muhuri and Preston 1991). For example, the percent of third and higher rank order female births in families has reduced from 27.5 percent in 1982-84 birth cohort to 16.8 percent in 2000-2003 birth cohort.

Sex differences in prevalence of childhood diseases are generally insignificant (Hossain and Glass 1988; Alam 2000), and infectious diseases and accidents account for majority of child deaths in Matab. Therefore, the explanation for excess female child mortality must be from differences in case-fatality. Case-fatality is largely determined by nutritional status and curative care, both within home and from healthcare providers. Undernourished children are at higher risk of dying than well-nourished children (Bairagi 1981). Poor nutritional intake in combination with repeated illnesses results in undernutrition. Discrimination against female children in distribution of food has been noted in Bangladesh and India (Chen, Huq and D'Souza 1981; Das Gupta 1987).

Basu (1989) debates over whether discrimination in feeding practices is a cause of excess female child mortality, especially in India. A strong preference for sons may induce parents to provide better medical to a son than to a daughter when they become ill. Only girls who are considered to be in excess of parental wishes may suffer more from relatively poor treatment. Several small-scale studies have shown modest sex differences in the treatment of sick children (Hossain and Glass 1988; Alam 2000). With regard to children with symptoms of ARI, levels of treatment are significantly higher for boys than for girls and boys are also more likely to be taken to health facility (BDHS 2004). Timaeus et al (1998) express concern whether moderate or small sex differences in sickness care are enough to explain the excess female mortality.

A very different mechanism that may contribute to female disadvantage in survival is family formation pattern. The birth of daughter is followed swiftly by another birth (Chowdhury and Bairagi 1990) in the hope that the additional child will be a son than in case of the birth of son. Conversely, parents to whom a son has been born may be more likely to discontinue childbearing or delay the next birth. Such a pattern of family formation may disadvantage girls because they are at higher risk of death with sort subsequent birth interval (Muhuri and Menken 1997). While in son preferring societies, birth spacing patterns contribute to excess female mortality, and cannot account for more than a small faction of the mortality disadvantage, deliberate discrimination against girls need to be based on parity specific probabilities of dying taking into accounts family formation patterns and birth spacing.

The declines in child mortality levels and in sex differentials must also have been facilitated by a number of women focus development programmes, for example, stipends for girls' secondary and higher secondary education, micro-credit for income generating activities, awareness raising campaigns, etc. Education may erode sex differentials in child mortality for having more modern egalitarian values; for having greater resources available and for better use of those resources; or for changing cause of death structure (higher male child mortality from accidents than female children). Recent survey reports gender equity in education in younger cohorts in than older cohorts (BHDS 20004).

The objectives of the study are to examine whether discrimination against girls persists or has shifted over time and to identify changes in behavioural mechanisms involved. This study focused on mortality of infants and children aged 1-4 years and nutritional status of children. Sex differentials in mortality of twins are also explored for refined evidence of sex bias in care. Sex differential in use of child health services is also considered as well as changes education of young men and women.

METHODS

The data for this study came from number of sources; sex ratios in the Bangladesh population from censuses undertaken during 1951-2001; infant and child mortality data generated by the Matlab health and demographic surveillance system (HDSS) during 1966-2004; and data on nutritional status and use of child health services from different cross-sectional surveys. Matlab is the site of the HDSS of the International Cenntre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) which has been in operation since 1966. It is located in a rural and a low-lying deltaic floodplain intersected by canals and branches of two big rivers of Bangladesh. It is about 50 kilometers southeast of Dhaka, the capital of the country. In Matlab, travel between villages and the market town is on foot or by country boat during the rainy season when ─ except for household courtyards ─ most of the area goes under water. Floods, which occur quite frequently, create havoc in the area. Farming is the main occupation, but 60% of families are landless or marginally landless (own land less 50 decimals). Muslims account for eighty nine percent of the population and the rest are Hindus.

A description of the Matlab MCH-FP Project is available in several places (Phillips et al. 1984). The Matlab MCH-FP project was introduced in late 1977 in one half of the Matlab HDSS area (called the MCH-FP area) with a population of about 100,000. MCH-FP services have been improved in an incremental fashion in the MCH-FP area. The other half of the HDSS area, called the comparison area, has received the same governmental services as other rural areas of Bangladesh. This area receives usual services from the government programmes.

At the beginning of the MCH-FP projects, both areas had the similar level of socioeconomic development and similar demographic rates. Since then the MCH-FP area had faster decline in fertility and mortality than the comparison area till 1993 and subsequently the differences between these two areas had narrowed down. The trends life expectancy at birth, and of infant and child mortality by gender were examined for the entire period of 1966-2003.

Mortality of children under five years of age by sex and sex-specific order of the child was examined for five birth cohorts of 1976-79, 1980-84, 1985-89, 1990-94 and 1995-99. The 1976-79 birth cohort was selected purposively as the 1976-79 period was quite normal after the 1974-75 famine. The under-five mortality was divided into neonatal (0-28 days), post-neonatal (29 days –11 months) and child mortality (12-59 months) to exhibit when male mortality exceeds female mortality. Independent variables included sex and sex-specific rank order of the child, maternal age and education, household wealth index, religion and exposure to the public health intervention. Household socioeconomic information was recorded in 1974, 1982 and 1996 censuses. Wealth index based on household durable articles (cot, wardrobe, chair and table, quilt, watch, radio, television, bicycle, motorcycle, house construction material, sanitary toilet, remittance and land in ownership) was calculated using principal components analysis. The higher the wealth index the better is household economic condition.

To assess whether the levels of malnutrition, prevalence of morbidity, use of health services for treating illness and education differ between boys and girls and whether they are changed in course of time, the pertinent data from different survey and research reports were put together.

Data Analysis:

The genetic evidence of difference between boys and girls in susceptibility to disease serves to demonstrate the difficulty of reaching an objective definition of female disadvantage or excess female child mortality. Biologically, females are more capable to survive. So for any age group, male-to-female mortality ratio should be greater than one. In developed countries, 1-4 year old male-to-female mortality ratio is around 1.05. Any gender inequalities in child mortality are less likely to be masked by genetic factors. The ratio measures the disparity between males and females, the lower the ratio less than 1.05 the higher is the disparity for females in survival and vice versa.

The analysis is comparative in nature over the years, and carried out mostly by cross-tabulation and simple statistical tests. Logistic regression was used to estimate the effect of sex and sex-specific rank order of the child in a family on mortality, controlling for maternal age and education, households asset index, religion and exposure to the public health intervention.

RESULTS

Trends in sex ratios in population censuses and at birth

The overall male-to-female sex ratios in national censuses show a little, but with some fluctuations, decline during 1951-2001 (Table 1), which is not entirely unexpected. A little increase in sex ratio in 2001 compared with the 1991 census is contrary to the evidence of faster decline in female child mortality than male child mortality and higher life expectancy of females than males since 1989. The overall sex ratios of the de jure population censuses undertaken in Matlab HDSS area show a gradual declining trend during 1974-1996 (Table 2). The sex ratios of under-ten children, who are subject to less (and no sex-selective) migration, has increased a little in 1982 from 1974 followed by a fall in 1996. The sex ratio at birth has been fairly similar during 1974-1999, suggesting for no evidence of sex-selective abortion in HDSS area (Table 3).

Levels and Trends in Life Expectancy and Under-Five Mortality

Figure 1 shows that life expectancy at birth in Matlab HDSS area has slowly increased for both males and females since 1966, except for 1970 and 1975 – the periods of Bangladesh liberation war and the 1974-75 famine respectively. It has been higher for males than for females till 1984 by more than two years. From 1985, the rise in life expectancy has been faster for females than for males, resulting in higher life expectancy for females than for males since 1989. Females live longer than males by more than two years since 2000.

Parallel to the rise in life expectancy, under-five mortality has declined from above 200 per 1000 live births in 1966 to 59 in 2003 (Figure 2). The decline has been faster for child mortality than for infant mortality, and higher for girls than for boys, resulting little or no difference between boys and girls since 1989 (Figures 3 and 4).

Sex Differentials in Child Mortality

Table 4 shows that sex differentials in child mortality depend on mortality level, children's age and access to the high-quality primary health care services. Neonatal mortality rates are higher for males than for females in all birth cohorts in both areas, and the opposite is true for the post-neonatal mortality rates (in fact, the male-to-female mortality ratios are found to be very close to one in all birth cohorts during 29 days –5 months of age, but less than one during 6-11 months of age. The data are not shown). During child period (between ages 12 and 59 months), the male-to-female morality rate ratio has increased with decreased in mortality rates in both areas. The ratio has increased earlier (since 1980) in the MCH-FP area than in the comparison area (since 1990), which has usual government and private primary health care services.

The results of the logistic regression models for each birth cohort in each area reveal that sex differentials in child mortality persisted for a longer period in the comparison area than in the MCH-FP area (Table 5). The odds of boys' dying with reference to girls were 0.56 in the comparison area and 0.53 in the MCH-FP area. These odds ratios are fairly close to the crude estimates of the male-to-female mortality ratios of 0.60 and 0.56 respectively for the 1976-79 birth cohort in Table 4. The odds ratio increased faster in the MCH-FP area than in the comparison area, but remained statistically significant in all birth cohorts except for 1995-99 cohort in the MCH-FP area.

Sex-Specific Rank Order of Index Child and Child Mortality

Table 6 highlights the shift in the risk pattern of child mortality by the sex-specific rank of the index child in the family in the comparison and the MCH-FP areas over the years. Compared to only female child in a family, only male child in a family continued experiencing lower mortality latest in 1985-89 birth cohort in the comparison area, and latest in 1980-84 birth cohort in the MCH-FP area. Compared to only female child in families, higher rank-order female children in families, with few exceptions, continued experiencing higher mortality in all birth cohorts in the comparison area, and latest in 1990-94 birth cohort in the MCH-FP area. Higher rank-order male children also experienced higher mortality than only male child in families in both areas in birth cohorts of 1976-79 and 1980-84.

Twins and Sex Differentials in Mortality

During 1982-2002, HDSS recorded 2,561 twins (2% of 128,350 live births) and 45 triplets (0.04%). Compared to the singles, twins experienced very high mortality during neonatal and post neonatal periods and the triplets experience even higher mortality (Table 7a). Male-to-female sex ratio of neonatal mortality of singles and twins (including triplets) is comparable, but the sex ratio of post-neonatal mortality deteriorates considerably for twins than for singles, suggesting that among twins, girls are more vulnerable to death than boys during post neonatal period.

Neonatal and post-neonatal mortality risks of index twin boys and girls are compared by sex of other sibling of the twin pair. The post-neonatal mortality rate is found to be very high for girls whose other sibling was a boy (233.2 per 1000 post-neonates) compared to boys whose other sibling was a girl (139.3 per 1000 post-neonates) (Table 7b) and the male-to-female mortality rate ratio deteriorates further, 0.60. This is quite suggestive of pro-son bias in the care to female children within families from early months of life.

Maternal Education and Household Wealth Index and Sex Differentials in Child Mortality

Maternal education is not found to reduce sex differentials in child mortality in both areas (Table 8a), and so is the household wealth index (Table 8b).

Sex Differentials in Nutritional Status

Table 9a compares the nutritional status (indicated by weight-for-age percent of median in WHO standard) of children aged 1-4 years in 1978 and 1996 in Matlab HDSS area. There were not only reductions in the prevalence of severe malnutrition (defined by weight-for-age <60% of median in WHO standard), but also reductions in prevalence of severe malnutrition in female children in Matlab between 1978 and 1996. The degree of underweight is indicated by weight-for-age Z-score and stunting by height-for-age Z-score in National Nutrition Project baseline survey 2004 (Table 9b). The prevalence of severe underweight (weight-for-age <-3 SD) and severe stunting (height-for-age <-3 SD) was quite low and sex differential did not exist in children aged 6-23 months. The levels of moderate underweight and stunting were quite high, but no sex differentials in children aged 6-23 months. Both underweight and stunting are more common among girls than among boys when they aged between 24 and 59 months.

Sex Differentials in Health Service Use

The Bangladesh Demographic and Health Survey (BDHS) 2004 reported equality between boys and girls in immunization coverage (Table 10a). The same survey also reported equality in use of curative care from trained providers for children sick with fever or diarrhoea, but with ARI (23.3 percent for boys and 16.8 percent for girls) (Table 10b).

BDHS 1993/94 reported very little difference in use of curative services between boys and girls sick with ARI or diarrhoea (Table 10c).

Sex Differentials in Education

Table 11 shows that education has become more widespread over the years among both men and women. Rates of ever enrolled in school and completed grade 5 and above are little higher for women than for men in 2004, but it was not the case in 1993-94. The rate of completed grade 10 is higher for men than for women in both periods, because some women at ages 15-19 get married and off from school.

DISCUSSION

This study highlights the diminishing trends in male-to-female sex ratio, and female disadvantages in survival, nutrition, health service use and education in Bangladesh. Sex ratio in a population is primarily determined by three factors: fertility, mortality and migration (net loss or gain). Especially relevant for the purposes of this paper with respect to fertility and mortality are the sex ratio at birth and the sex bias in mortality. At national level, there was no evidence of massive sex-selective international migration until late 1970s, when temporary migration of mostly young unskilled or semi-skilled men, to oil-rich, but man-power poor middle-east countries had started. Temporary international migration accounted for more than one million by 1995 (BBS 2000). The trends in sex ratio in Bangladesh were probably not only effected by decrease in male-female mortality gap, but also considerably by more male than female international migration. Although the population census data could have been affected by under or over enumeration, the population censuses undertaken during 1951-2001 showed a very small decline in male-to-female ratio over the years. The decline in sex ratios in Matlab HDSS area in 1974-96 were, however, more substantial than in Bangladesh as a whole. Despite parental son preference, the sex ratio at birth was fairly constant over the years, suggesting for no sex selective abortion in the area. The decline in population sex ratio may suggest that there were less missing women in recent years than before.

Muhuri and Preston (1991) report that excess female mortality starts from 6 months of life, after weaning of breastfeeding for differential treatment in Bangladesh. The evidence of higher post-neonatal mortality among girls than among boys of the opposite-sex twins suggest that differential treatment starts, perhaps from early months of life if parents have to make a choice.

The Matlab male-to-female child mortality ratio showed considerable increase in recent birth cohorts with marked difference between the comparison and the MCH-FP areas. The ratio increased from 0.56 in 1976-79 birth cohort to 0.77 in 1995-99 cohort in the comparison area and from 0.53 in 1976-79 cohort to 1.1 (about complete elimination of female disadvantage) in 1995-99 cohort in the MCH-FP area. The ratio increased at a faster rate in the MCH-FP area than in the comparison area. The ratio did not start to reduce in the MCH-FP area until 1980 and in the comparison area until 1985. Perhaps, boys and girls benefited equally from easy access to health services, resulting lower sex differentials in child mortality in the area with more accessible health services than the other. This suggests that a health programme can reduce male and female disadvantage in mortality.

The increase in mortality sex ratio has been accompanied by declines in fertility and mortality and changes in cause of death pattern. The fertility decline contributes to reduce sex differentials in mortality by lowering the so-called “parity effect” that changes the balance between boys and girls at different parities. Our results showed that the only girl was in a better position than the girl with older sisters, and so were the only boys than the boys with brothers in early birth cohorts – the period with relatively high mortality. This is consistent with results of other studies (Muhuri and Preston 1991; Das Gupta 1987). Probably child neglect is more severe for girls with sisters than for boys with brothers, but to a lesser extent in recent birth cohorts. With decline in mortality the pattern of cause of death changes. Mortality decreases at a higher rate from infectious diseases than from non-communicable diseases and accidents. Though mortality decline increases share of accidental and violent deaths to which boys are more susceptible (Waldron 1987), it is associated with narrowing gap in the relative survival of boys and girls.

There is a debate about whether maternal education and household economic status mediate the sex differentials in child mortality. Arokiasamy (2004) report that women's education (secondary and above and) and better-off household condition reduce excess female child mortality in India. Consistent with the findings of earlier studies (Bhuiya and Streatfield 1991; Das Gupta 1987), our results revealed that maternal education did not reduce the sex differential in mortality in either area, when it persisted in Matlab, Bangladesh. Also household wealth index did not help to reduce the sex differential in mortality. Equality between sons and daughter persisted both among children of uneducated and of educated mothers in recent birth cohorts.

Boys and girls differ, but little by nutritional status and access to health care in Bangladesh. More girls are undernourished than boys in ages between 24 and 59 months, not between 6 and 23 months. This finding is consistent with the conclusion of Sommerfelt and Arnold (1998), who analyzed child nutrition data of 41 surveys from 31 countries, that there are relatively small differences between boys and girls in terms of prevalence of stunting, underweight and wasting. This result implies that the diets and domestic welfare of girls and boys differ, but not radically.

Although boys and girls are equally immunized, boys are favoured over girls in resort of treatment of sickness due to ARI – a major killer disease in the country (BDHS 2004). Curative healthcare nearly always involves cost, and parents may be more willing to incur health costs for sons than for daughters. Though gender difference is narrow, a great majority of children were not taken to facilities for treatment of illness.

In conclusion, the male-to-female ratios in mortality, malnutrition, and use of health service are becoming more equal in recent years than before. It raises the question whether one can make an estimate of the impact of the decline in male/female mortality on sex ratios in Bangladesh. We are of the opinion that this is very difficult to do. It is likely that in Bangladesh the number of missing girls has decreased in the past 30 years, but we cannot be more specific. As already pointed out earlier, sex ratios are influenced by a large number of factors relating to developments in fertility, mortality and migration and it is difficult to separate the effect of decreases in male/female mortality from all the other factors. Especially the impact of differences in migration patterns by country or by regions within a country and changes in migration patterns over time are difficult to quantify and take into account.

Policy Implications

Excess female mortality in childhood is a reflection of wider economic and social realities that assign a higher value to boys than to girls. Women's economic contributions are restricted to domestic domain and daughters are considered to be expensive because of dowry system. Conversely, sons are valued for their potential wealth. The obvious long-term policy prescription is to press ahead with reforms that will facilitate greater educational, employment and financial opportunities to women, and better access to high-quality health services. In accordance with this policy, the government of Bangladesh in partnerships with national and international NGOs is implementing different women development programmes, for example, stipends for primary schooling, stipends to girl students up to grade 12, micro-credit to women for social and economic empowerment and employment for women in formal sectors. Moreover, the government of Bangladesh is committed to eliminate all forms of discrimination against women and children. Commitments are not enough, however. Resources have to mobilized and monitoring has to be in place to determine whether repressors of women and children, acid throwers, women and child traffickers or family members who demand unreasonable dowry are punished

This study indicates that high-quality free primary health care services results in more egalitarian sex ratios of child mortality in Bangladesh. Such services were available in the MCH-FP area, but they were less accessible and of less good quality in the comparison area. This led to disappearance of the sex differential in mortality in MCH-FP area, although this sex differential in mortality still persists in the comparison area, but it is at a much lower level than in the past. The government policy shift towards greater cost recovery and reliance on the private sector is of concern because poor families may be less able and willing to spend money on daughters than on sons. Concomitant changes in social, economic and political statuses of women are needed to eliminate inequalities. This is in accordance to the finding of increased female education in recent time and its relationship with declining fertility and mortality. Any acceleration of trend toward smaller family is of special benefit to girls.

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TABLES AND FIGURES

Table 1: Sex ratio in Bangladesh de facto population censuses, 1951-2001		
Year of census	Population (in million)	Sex ratio (males/100 females)
1951	41.912	109.61
1961	50.840	107.59
1974	71.476	107.74
1981	87.120	106.44
1991	111.456	105.86
2001	123.850	106.56

Table 2: Sex ratio in de jure population censuses in Matlab HDSS area							
Year of census	Population	Sex ratio (males per 100 females)					
		All ages	0-4 years	5-9 years	10-14 years	15-50 years	50 years+
1974	167641	103.1	105.2	106.3	103.0	97.3	119.5
1982	187574	102.5	108.7	109.8	108.1	94.3	113.9
1996	212328	97.3	102.3	101.2	107.3	93.8	93.0

Table 3. Sex ratio at births in Matlab HDSS area, 1974-1999			
Period	Male births	Female births	Sex ratio
1974-79	19368	18594	104.2
1980-89	36357	35120	103.5
1990-99	29080	28190	103.2
1974-99	84805	81904	103.5

Figure 1

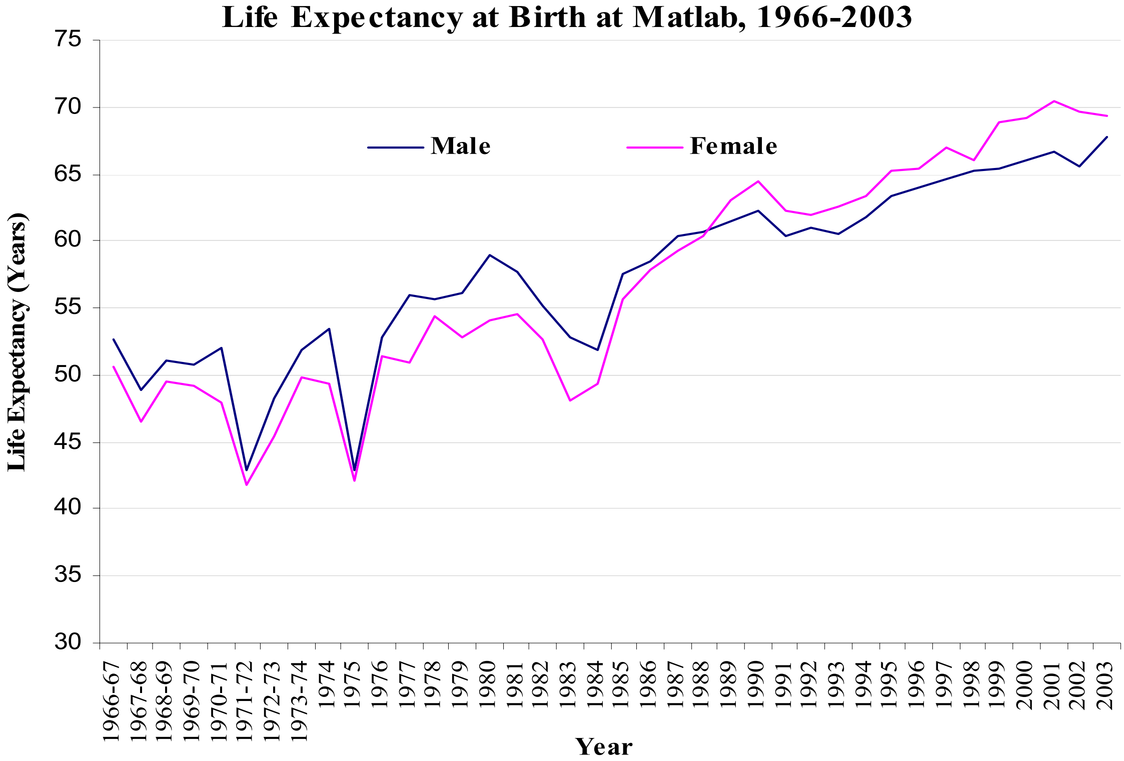

Figure 2

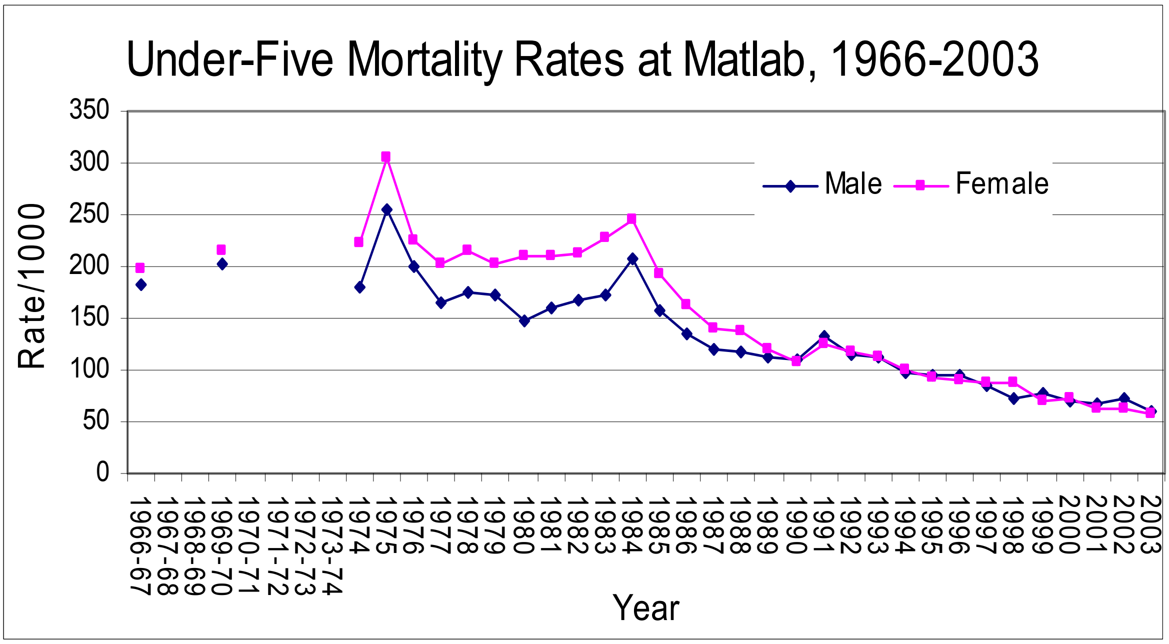

Figure 3

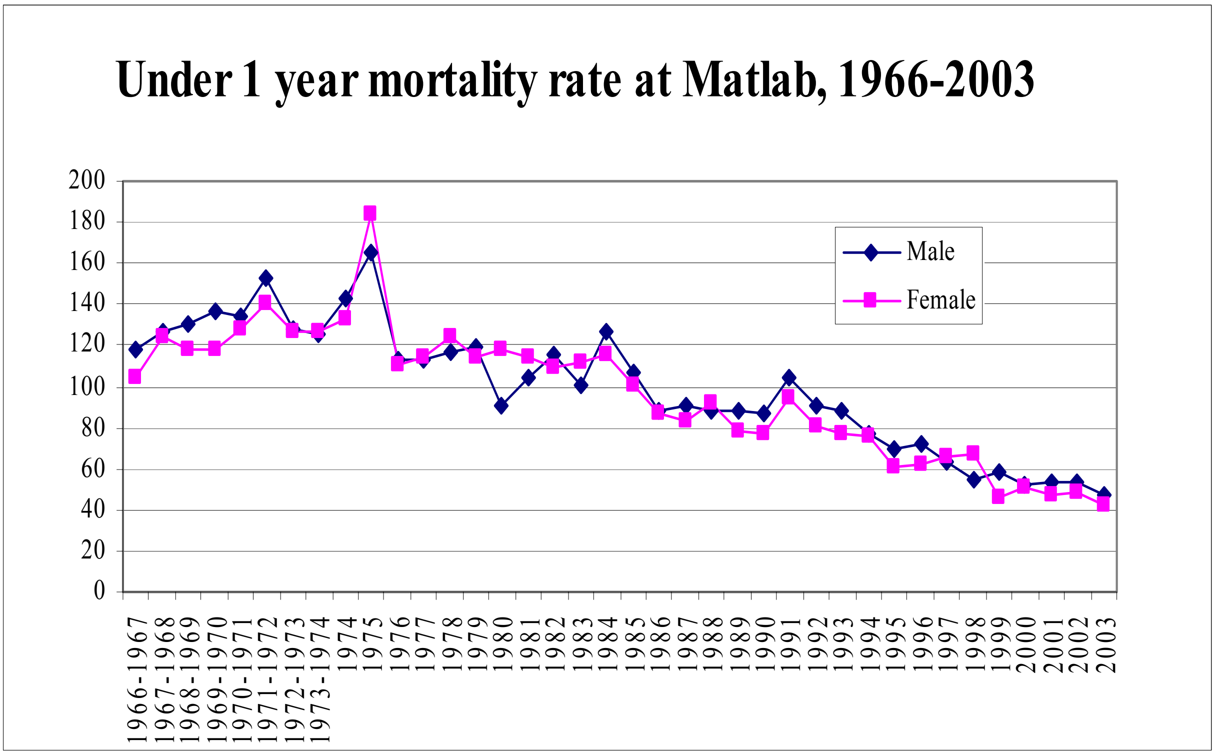

Figure 4

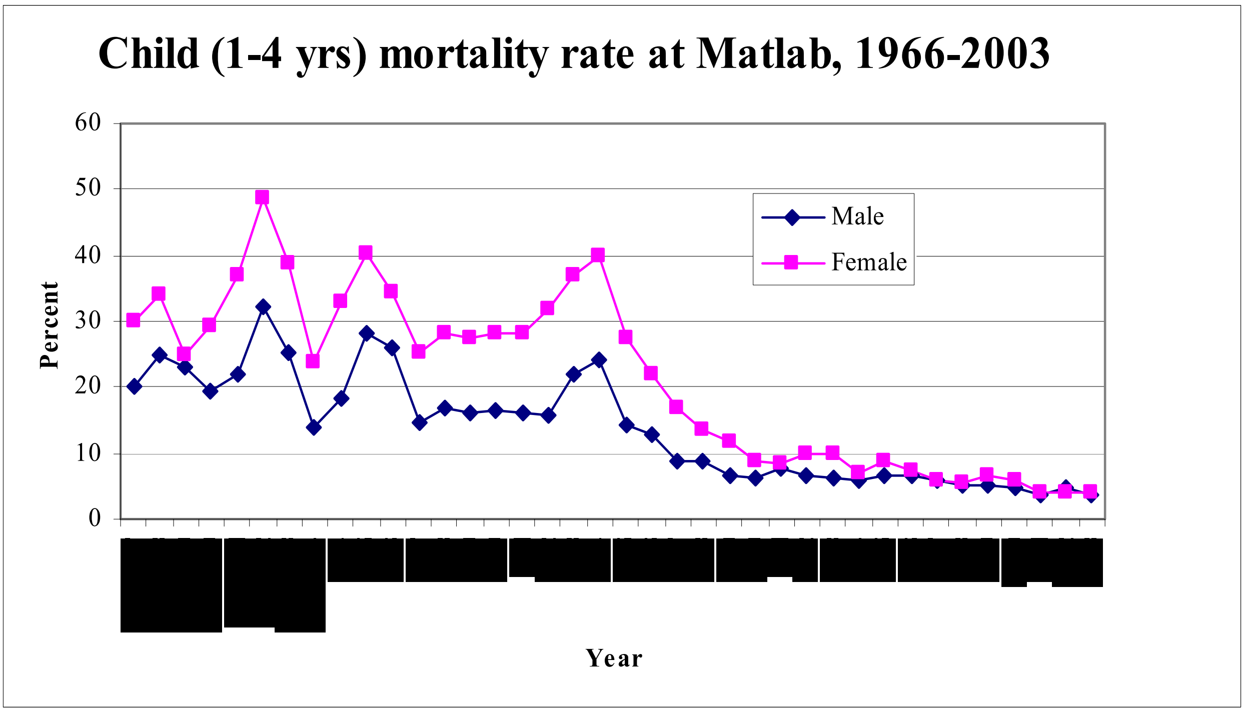

Table 4: Male-to-female mortality ratios during neonatal, post-neonatal and child periods by area and birth cohorts, Matlab HDSS , 1977-2004

	Neonatal mortality rate			Post-neonatal mortality rate			Child (1-4 years) mortality rate*		
	Male	Female	M/F ratio	Male	Female	M/F ratio	Male	Female	M/F ratio
Birth cohort (and its size)Comparison area									
1976-79 (14793)	74.3	63.9	1.16	44.5	53.4	0.83	71.8	120.4	0.60
1980-84 (20199)	70.8	67.3	1.08	49.7	56.6	0.88	73.5	100.2	0.59
1985-89 (20201)	62.0	53.7	1.15	39.5	44.3	0.89	32.5	53.8	0.60
1990-94 (16982)	59.7	52.6	1.13	39.3	39.5	0.99	27.6	35.8	0.77
1995-99 (14960)	48.8	40.5	1.20	25.8	27.8	0.93	21.7	27.9	0.78
Birth cohort (and size) in MCH-FP area									
1976-79 (13478)	70.2	61.6	1.14	38.9	47.9	0.81	55.2	99.0	0.56
1980-84 (15878)	60.3	60.4	1.00	43.9	48.9	0.89	49.4	81.5	0.61
1985-89 (15200)	48.2	40.5	1.19	36.3	34.7	1.05	24.8	31.3	0.79
1990-94 (12863)	51.1	39.6	1.29	28.6	29.8	0.96	19.9	27.3	0.73
1995-99 (12468)	32.5	30.9	1.05	16.7	22.2	0.75	17.0	15.4	1.10

*death rate due of drowning has remained constant over the time, but the rate from other causes has declined.

Table 5a: The male-to-female odds ratio[a] of dying during 12-59 months of age in different births cohorts in the comparison and the MCH-FP areas, Matlab HDSS, 1976-2004

Sex of the child	**Birth cohorts in Comparison area**				
	1976-79	1980-84	1985-89	1990-94	1995-99
Male (ref)	1.00	1.00	1.00	1.00	1.00
Female	0.56** (0.49-0.63)	0.56** (0.50-0.62)	0.59** (0.50-0.68))	0.76** (0.63-0.92)	0.77* (0.61-0.97)
No. of deaths	1161	1625	731	449	297
No. of children[b]	12137	16538	16948	14186	12029
Sex of the child	**Birth cohorts in MCH-FP area**				
	1976-79	1980-84	1985-89	1990-94	1995-99
Male (ref)	1.00	1.00	1.00	1.00	1.00
Female	0.53** (0.47-0.61)	0.58** (0.51-0.67)	0.79* (0.64-0.97)	0.74* (0.56-0.93)	1.10 (0.82-1.51)
No. of deaths	874	884	369	257	171
No. of children[b]	11417	13592	13170	10884	10538

[a]controlled for maternal age and education, birth order, household economic status and religion, and number of children of the same women in the same cohort

Table 6: The odds ratio[a] of dying during 12-59 months of age, according to sex-specific rank order of the index child in different births cohorts in the comparison and the MCH-FP areas, Matlab HDSS, 1976-2004					
Sex of specific rank order of the child	**Birth cohorts in Comparison area**				
	1976-79	1980-84	1985-89	1990-94	1995-99
First female child (ref)	1.00	1.00	1.00	1.00	1.00
Second female child	1.42**	1.23*	1.26$	1.50*	1.38$
Third or higher order female child	1.41**	1.34**	1.70**	1.99**	1.43$
First male child	0.57**	0.53**	0.62**	0.94	0.86
Second male child	0.77*	0.63**	0.840	1.14	0.99
Third or higher order male child	0.79*	0.82*	0.84	1.29	1.01
Sex of specific rank order of the child	**Birth cohorts in MCHFP area**				
	1976-79	1980-84	1985-89	1990-94	1995-99
First female child (ref)	1.00	1.00	1.00	1.00	1.00
Second female child	1.26$	1.49*	1.28	0.89	0.63
Third or higher order female child	1.35*	1.47**	1.46*	1.44$	1.19
First male child	0.51**	0.75**	0.80	0.69$	1.04
Second male child	0.69**	0.64**	0.99	0.89	1.05
Third or higher order male child	0.72*	0.82	1.17	0.83	0.98

[a]controlled for maternal age and education, household economic status, religion and number of children of the same women in the same cohort

$P<0.1, *P<0.05, **P<0.01

Table 7a: Male-to-female mortality ratio in single and twin births, Matlab HDSS area, 1982-2002						
Whether birth was single or twin	0-28 days			29 days-11 months		
	Male	Female	Sex ratio (M/F)	Male	Female	Sex ratio (M/F)
Single (N=125744)	46.1	40.1	1.15	31.0	32.5	0.95
Twin[a] (N=2606)	350.1	294.2	1.19	133.2	193.2	0.69

[a]includes triplets. N=number of live births

Table 7b: Male-to-female ratio of mortality of twins in Matlab HDSS area, 1982-2002						
Sex of the other child of the pair	0-28 days			29 days-11 months		
	Sex of the index child		Sex ratio (M/F)	Sex of the index child		Sex ratio (M/F)
	Male	Female		Male	Female	
Male	365.0	296.0	1.24	130.5	232.3	0.56
Female	309.6	294.6	1.07	139.9	176.2	0.79

Table 8a: Maternal education[a] and male-to-female child mortality ratio[b], Matlab HDSS area, 1976-99

Birth cohort	Sex of child	Comparison area		MCH-FP area	
		Edu: none	Edu: grade 5+	Edu: none	Edu: grade 5+
1976-79	Female Male	1.00 0.54**	1.00 0.64*	1.00 0.55**	1.00 0.51**
1980-84	Female Male	1.00 0.56**	1.00 0.57**	1.00 0.58**	1.00 0.51**
1985-89	Female Male	1.00 0.57**	1.00 0.54*	1.00 0.84	1.00 0.85
1990-94	Female Male	1.00 0.72**	1.00 0.89	1.00 0.81	1.00 0.73
1995-99	Female Male	1.00 0.81	1.00 0.72	1.00 1.06	1.00 0.91

[a]analysis excluded children born to mothers having education grade 1-4.
[b]controlled for maternal age, household economic status, religion and number of children of the same women in the same cohort
$P<0.1, *P<0.05, **P<0.01

Table 8b: Household wealth index[a] and male-to-female child mortality ratio[b] in HDSS area, 1976-99

Birth cohort	Sex of the child	Comparison area		MCH-FP area	
		Lowest two quintiles	Top two quintiles	Lowest two quintiles	Top two quintiles
1976079	Female Male	1.00 0.56**	1.00 0.54**	1.00 0.49**	1.00 0.58**
1980-84	Female Male	1.00 0.55**	1.00 0.51**	1.00 0.62**	1.00 0.75**
1985-89	Female Male	1.00 0.55**	1.00 0.56**	1.00 0.79$	1.00 0.83
1990-94	Female Male	1.00 0.84	1.00 0.88	1.00 0.66*	1.00 0.74
1995-99	Female Male	1.00 0.76	1.00 0.66$	1.00 1.26	1.00 1.15

[a]analysis excluded children born to households in middle (3rd) quintile.
[b]controlled for maternal age and education, religion and number of children of the same women in the same cohort
$P<0.1, *P<0.05, **P<0.01

Table 9a: Percent of wasted children aged 1-4 years by sex, Matlab HDSS area, 1978 and 1996				
Level of wasting*	1978		1996	
	Boys	Girls	Boys	Girls
Mild/normal (80% +)	40.1	26.0	54.5	43.1
Moderate (60%-79%)	54.8	59.6	42.3	53.6
Severe (<60%)	5.1	14.4	3.2	3.3

Sources: Chen et al 1981 & Matlab Health and Socioeconomic Survey 1996.
*defined by weight-for-age as percent of median weight in WHO standard population

Table 9b: Sex differentials in nutritional status in Bangladeshi children, NNP baseline Survey 2004						
Sex of the child	Age 6-23 months Weight-for-age Z-score			Age 24-59 months Weight-for-age Z-score		
	<-3 SD	-3 SD-<-2 SD	≥ -2 SD	<-3 SD	-3 SD-<-2 SD	≥ -2 SD
Male	14.3	34.5	51.2	10.7	39.6	49.7
Female	13.6	35.4	51.0	16.2	44.2	39.6
Sex of the child	Height-for-age Z-score			Height-for-age Z-score		
	<-3 SD	-3 SD-<-2 SD	≥–2 SD	<-3 SD	-3 SD-<-2 SD	≥–2 SD
Male	13.7	27.9	58.4	16.5	29.2	54.3
Female	13.9	27.4	58.7	20.5	31.9	47.5

Table 10a: Percentage of children age 12-23 months who received specific vaccinations by their gender, BDHS 2004						
Sex of the child	BCG	DPT 3 doses	Polio 3 doses	Measles	All[a]	Number of children
Male	93.4	81.2	82.6	75.6	73.4	589
Female	93.4	80.8	82.0	75.7	72.8	676

[a]Complete coverage of immunization (BCG, three doses of DPT and polio and measles)

Table 10b: Percentage of children under five years who had acute respiratory infection (ARI), fever or diarrhea in two weeks preceding the survey for whom treatment was sought from a heath facility or medically trained providers by their gender, BDHS 2004				
Child morbidity	Percentages of under-fives with illness		% of under-fives taken to a health facility or provider	
	Boys	Girls	Boys	Girls
ARI	22.0	19.6	23.3	16.8
Fever	40.8	39.3	19.8	17.2
Diarrhoea	7.7	7.3	16.3	15.1

Table 10c: Male-to-female ratios of diarrhea and ARI morbidity and treatment among children aged under 3 years, BDHS 1993/94.			
Morbidity type	Sex ration on prevalence	Received any treatment as proportion of those sick	Health facility/provider
ARI (2 weeks recall)	1.26	1.12	1.06
Diarrhoea (1 week recall)	0.92	0.98	0.96

Table 11: Percentage of the de facto household population age 6-24 years by age, sex and schooling, BDHS1993-4 and 2004						
Age group	% ever enrolled in school		% completed grade 5 and above		% completed grade 10 and above	
	BDHS 2004					
	Male	Female	Male	Female	Male	Female
6-9	84.5	87.6	-	0.5	-	-
10-14	91.3	92.7	34.9	43.2	-	0.1
15-19	86.7	88.0	66.7	70.5	8.9	7.7
20-24	84.2	76.1	66.8	72.9	23.8	16.4
Age group	**BDHS 1993-94**					
6-9	76.5	73.6	0.3	0.2	-	-
10-14	79.1	77.8	17.9	18.1	-	0.1
15-19	73.6	63.8	43.3	33.1	5.9	4.7
20-24	67.0	50.6	42.1	23.5	15.6	6.4

Sources: Bangladesh Demographic and Health Surveys 1993-94 and 2004