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# Infant and Child Mortality in Bangladesh, 1959-1976

## Introduction

IN recent years, a number of studies have focused on the trends and differentials in infant and child mortality in developing countries (Haines *et al.*, 1983; Frenzen and Ilogan, 1982; Preston, 1978; Caldwell, 1979; Balakrishnan, 1978; Gwatkin, 1980; Cochran and Zachariah, 1983). Most of these studies have tended to stress the importance of general increase in socio-economic development and imported advances in public health technology in the reduction of child mortality and its effect on subsequent fertility of women. However, few of these studies have analyzed the trends and differentials of infant and child mortality in societies where rapid population growth and low level of development have worsened general socioeconomic conditions over the years.

Infant or child mortality is a sensitive indicator of socioeconomic differentials and is closely associated with national socioeconomic development (Shin, 1975) as well as the social class of parents (Antonovsky and Bernstein, 1977). The inverse relationship between socioeconomic variables and child mortality often reflects differences in parental knowledge and skills as well as family resources (Schultz, 1980; Caldwell, 1979; Frenzen and Hogan, 1982). Cultural norms governing sex preference in the treatment of children have been found to be associated with child mortality differentials (Chen, Huq, and D'Souza, 1981; Scrimshaw, 1978; Poffenberger, 1981). Other factors which have been responsible for child mortality differentials include differences in access to health care after birth (Smucker *et al.*, 1980; Haines and Avery, 1978) and differences in the demographic characteristics of mothers such as age or parity (Bouvier and Van der Tak, 1976; Frenzen and Hogan, 1982).

However, in a society where no major socioeconomic development has occur-

red and where the quality and quantity of available modern health care facilities are poor, one can hardly expect any major change or major socioeconomic differences in child mortality. Socioeconomic differentials in child mortality are also likely to be minimal there because of underutilization or non-availability of modern health care facilities which have to often compete with the system of traditional medicines.

The purpose of this paper is to explore the trends and differentials in infant and child mortality in a society where no major improvement in the basic needs of human survival has been observed. Specifically, we shall examine socioeconomic differences in infant and child mortality using data from three sample surveys from Bangladesh: the National Impact Survey of 1968, the World Fertility (WF) Survey of 1975, and the Fertility and Poverty Survey of 1977, conducted by the Bangladesh Institute of Development Studies (BIDS). All single live births to married couples interviewed in these three surveys are classified according to birth outcome as well as the socioeconomic and demographic characteristics of mother, infant, and child. Using live single births recorded in the pregnancy histories of the mothers as the units of analysis, this study seeks to conduct a multivariate analysis of child mortality in Bangladesh. This analysis is somewhat unique in that unlike most of the previous individual-level studies on Bangladesh (Blacker, 1977; National Research Council, 1981), current study employs multivariate models to delineate the net effect of a socioeconomic variable on child mortality. Specifically, socioeconomic characteristics of the mother, the infant and the child are used as proxies for different aspects of a given family's ability and willingness to utilize adequate infant and child care.

### **Infant and Child Mortality in Bangladesh**

Bangladesh, like other developing countries, experienced some decline in mortality in recent decades, although the decline was somewhat lower than those in other developing countries in Asia. For instance, recent female life expectancy increased to 60.9 in Thailand (Economic and Social Commission for Asia and the Pacific, 1976), while for Bangladesh the level was only 49.7 (National Research Council, 1981). In the absence of an organized vital registration system, no reliable account of the infant and child mortality level in Bangladesh can actually be made. However, indirect estimation or estimation from sample surveys shows that infant mortality rate had declined slightly from about 160 per thousand live births in the 1950's to about 130 in the 1970's (Sirageldin *et al.*, 1975; National Research Council, 1981). Since these estimates were based on survey data with possible sampling error, there might be some doubt as to their reliability. Nevertheless, the remarkable consistency of survey results over time seem to confirm that infant and child mortality changed little from the 1950's to 1970's (National Research Council, 1981). Similarly, no regional difference in infant and child mortality emerged in Bangladesh (National

Research Council, 1981).

The lack of any substantial decline in infant and child mortality in Bangladesh can be attributed to both low level of socioeconomic development and generally poor health care facilities (Northrup, 1973). For instance, there are virtually no maternal and child health services in rural Bangladesh. Consequently, despite the availability of more than average resources, a family may fail to provide adequate health care for the survival of their infants and children.

### Data **Inscriptions**, Variables, and Methods

The National Impact Survey, a nationally representative retrospective survey, had detailed questions on pregnancy histories, socioeconomic background, marriage history, family planning knowledge, attitude and habits of respondents. The sampling frame consisted of all households in Bangladesh in 1968-69. A national probability sample of "ever married" women between the ages of 10-50 were selected and stratified by urban and rural residence,

The World Fertility Survey (WFS) for Bangladesh (19-75-76) was also a national probability sample of all married women between the ages of 10-50. It contained all the variables used in the Impact Survey and in addition had information on lactation, postpartum amenorrhea, and age at supplemental feeding. A three-stage sample design was adopted: the first two stages were area selections, and the third stage -was household selection. Once the- households were selected, all ever-married women between the ages of 10-50 in each household were interviewed.

The data from Rural Fertility and Poverty Survey (1977-78) by BIDS came from four localized areas in four different regions of Bangladesh. Although not nationally representative, it too collected information on variables comparable to those in the other two surveys. In the present study, we have only used data on currently married women: 3,088 in the Impact Survey; 5,772 in the World Fertility Survey; 1,247 in the Fertility and Poverty Survey. Since BIDS data are from rural areas, these data are compared with the corresponding data of the rural samples of the Impact and World Fertility Surveys.

The primary focus of the present study is on infants and young children up to the age of 3 who were born within 10 years preceding a survey. While children up to age 3 are by far the most vulnerable group to adverse health risks within the immediate family and community environment, data for the recent periods from the date of a survey is likely to be more reliable because of better recall of the outcome of past pregnancies by the respondents.

The independent variables for this analysis measure demographic and socio-economic factors. The demographic factors are mother's age at time of birth (29 + = 1; 29 or less = 0); sex of child (male = 1; female = 0). Younger and older women both have higher rates of infant mortality (Bouvier and Van der Tak, 1976). Sex differences in infant mortality may reflect innate biologi-

cal differences in infant viability, as well as sex differentials in the quality of infant care (Scrimshaw, 1978). Breastfeeding has been found to be related to the decline in infant mortality (Bulzet *al.*, 1982).

Parental ability to provide adequate care to their infants and children can vary according to the level of family resource and parental skills and knowledge. The level of family resources is measured in the present analysis by parents' social status as reflected by parents' educational level (1 year or more = 1; none = 0) and modern items owned (1 or more items = 1; none — 0). Parents are also divided into agricultural and non-agricultural occupations. Since agricultural occupations are largely dominated by landless agricultural labourers and small farmers (Alamgir, 1978), level of family resources possessed by the members of this occupation is likely to be lower than those in non-agricultural occupations. Remote rural areas or remote regions are also more likely to have fewer health care facilities than their urban counterparts.

Since this analysis is primarily concerned with the effects of family characteristics on infant and child mortality, the study population is restricted to the currently married women. The units of analysis for the study are live single births recorded in the pregnancy histories of the women, classified as a dead (died during first three years of life) or a live child (lived more than three years after birth). Each birth record is assigned the characteristics of the parents as reported in the surveys. In the initial analysis, we focused upon infant and child mortality rates up to age 3 by cross-tabulating them with various independent variables. Subsequently, we assessed the net contribution of each of the independent variables in the explanation of infant and child mortality up to age 3 by logit regression.

## Results

In Table 1, we present some descriptive statistics for currently-married women from our three sample surveys. Although the three sets of data are considerably different in sample size, the sample distribution by the categories of some selected variables are somewhat similar for all the three surveys. This result enhances our confidence in the quality of all the data sets and their comparability since no significant change in the socioeconomic conditions of Bangladesh had happened during the period these three surveys were conducted (Arthur and McNicoll, 1978).

**1. With** our dichotomous dependent variable, the constant variance assumption of the **general linear** model is **violated** and ordinary least square estimates are rendered inefficient. **Likewise**, because dichotomous variables can be non-normal in their distribution, the assumption of a normal error term and the usual test of significance for least square techniques are inappropriate. Logit regression technique deals with all these problems (Goodman, 1972).

**TABLE 1-DESCRIPTIVE STATISTICS FOR CURRENTLY-MARRIED WOMEN  
FROM THE THREE SURVEYS : IMPACT SURVEY OF 1968, WORLD  
FERTILITY SURVEY (WFS) OF 1975, AND BIDS  
SURVEY OF 1977**

<i>Variables</i>	<i>Impact Survey</i>	<i>WFS Survey</i>	<i>BIDS Survey</i>
<b>Percent of Husbands Having One or More Years of Schooling</b>	49.0%	42.0%	45.0%
<b>Percent of Mothers Having One or More Years of Schooling</b>	<b>24.0</b>	<b>21.0</b>	<b>21.0</b>
<b>Percent of Husbands Doing Non-Agricultural Jobs</b>	39.0	38.0	36.0
Mean Number of Children Ever Born	4.07	4.80	4.12
Average Ag; of First Marriage	13-3	12.3	13.8
Average Proportion" of Children Dead	0.23	0.24	0.23
Percent of Households Possessing One or more Modern Items	22.0	30.0	24.0
Average Duration of Breast feeding	<i>b</i>	25.5	23.7

<sup>a</sup>Average of the proportion of children **died** after birth for the age-groups : **15-19, 20-24, 25-29, 30-34, 35-39, 40-44.** and 45-49.

<sup>b</sup>Not available.

SOURCES : Impact Survey (1968); World Fertility Survey (1975); **BIDS Survey** (1977)

### **Infant and Child Mortality Differences by Socio-demographic Factors**

In Table 2 we have cross-classified child mortality with our various socio-economic and demographic factors for the period 1959 through 1976. Although the recent child mortality rate up to age 3 is somewhat underestimated by the Impact Survey (Sirageldin, *et al.*, 1975), the differences in child mortality levels by categories within each of the variables suggest that the sociodemographic variables have had some impact on infant and child mortality. Families with higher resources, as reflected by parental education or modern items owned, tended to have lower mortality rates than those with lower resources. However, there was no evidence of any systematic decline in infant and child mortality over the years. Within each survey, the infant and child mortality rates of the recent periods were not very different from that of earlier periods. This finding confirms earlier finding that there was no evidence of any consistent change in the child mortality level of Bangladesh (National Research Council, 1981).

No systematic regional variation across the three surveys is discernable in

TABLE 2-SOCIOECONOMIC AND DEMOGRAPHIC DIFFERENTIALS IN  
RATES OF INFANT AND CHILD MORTALITY IN  
BANGLADESH : 1959-76

Socioeconomic and Demographic Variables	Deaths up to Age 3 per 1,000 Births					
	Impact Survey (1959-1968)		WFS Survey (1965-1974)		BIDS Survey (1967-1976)	
	N	Death Rates	N	Death Rates	N	Death Rates
Father's Education :						
No Education	2,640	116.3	5,888	181.6	1,720	204.7
Primary and Above	2,625	119.6	4,287	158.2	1,408	166.2
Mother's Education :						
No Education	3,987	120.4	5,150	177.4	2,517	196.3
Primary and Above	1,273	110.3	2,025	148.7	611	150.6
Modern Hems Owned :						
None	4,145	119.2	7,223	177.5	2,437	199.8
One or More	1,120	113.4	2,952	157.5	6,911	143.2
Father's Occupation :						
Agricultural	3,278	119.3	6,349	174.8	1,945	193.4
Non-Agricultural	1,987	115.8	3,811	166.6	1,065	182.0
Age of Mother :						
15-29	1,300	112.3	5,690	184.8	1,357	185.7
30-49	3,965	119.8	4,477	155.0	1,736	187.2
Residence :						
Rural	5,265	118.0	10,175	171.7	NA	
Urban	1,264	107.6	2,947	134.4	NA	
Years :						
1959-63	2,234	124.4	NA	NA	NA	
1964-66	1,740	115.5	NA	NA	NA	
1966-69	NA	NA	3,927	179.3	1,013	223.0
1970-73	NA	NA	3,904	184.4	1,098	198.5
Region :						
Chittagong	1,113	106.9	1,682	149.2	659	151.7
Dacca	1,343	116.2	3,188	169.1	985	210.2
Khulna	1,501	119.3	2,138	158.1	794	230.5
Rajshahi	1,107	120.1	3,167	195.5	690	139.1
Duration of Lactation :						
< 24 Months	NA	NA	1,132	141.3	1,310	164.9
>=24Months	NA	NA	1,133	95.3	1,807	202.5
Sex of Child :						
Male	2,665	125.0	6,109	175.1	1,582	194.7
Female	2,600	110.8	5,954	170.2	1,546	179.8
Total Population (Rural)	5,265	118.0	10,175	171.72	3,128	187.3

SOURCES; Impact Survey (1969); World Fertility Survey, Bangladesh (1975); and Rural  
Poverty and Fertility Survey (1977).

Table 2. While the Impact Survey data show no major regional variation in infant and child mortality, the data from the WF Survey and the BIDS Survey show some variation. However, pattern of variation differs between the WF Survey and the BIDS Survey. For instance, in the WF Survey, infant and child mortality level was highest for the Rajshahi region, whereas in the Impact Survey it was the Khulna region which had the highest level of child mortality. While the higher rates of Rajshahi region in the WF Survey could be explained by the limited availability of modern medicine, given the remoteness of this region, the variation in the BIDS survey could be an artifact of the chance fluctuation associated with its small sample size. It could also conceivably arise from local areal differences in socioeconomic factors, given that the BIDS data were selected from four localized areas rather than from the country as a whole. An earlier study using similar child survival data, also found very little regional variation in the level of child mortality (National Research Council, 1981).

Although, the Impact and the BIDS data showed that female children were slightly associated with lower mortality, no such difference was observed from the WFS data. We shall examine this issue further in our multivariate analysis below.

Urban residence was also associated with lower infant and child mortality. The lower infant and child mortality of urban areas could be explained by the better accessibility to the improved health facilities. Table 3 further presents child mortality data within urban and rural areas. The data in the table show that although families with higher resources in both the rural and the urban areas tended to have lower infant and child mortality rates than those with lower resources, this difference was more consistent and marked in the urban areas. The wider differentials in the urban areas could, again, be explained by the improved health facilities which were likely to be more accessible to the rich than to the poor.

The data in Tables 2 and 3 further show that socioeconomic differences in infant and child mortality were more pronounced in the WF Survey and the BIDS Survey than in the Impact Survey. This higher socioeconomic differences of the WF Survey and the BIDS Survey might have resulted from the recent increased availability of modern medicine which was more likely to be used by those in the higher socioeconomic strata.

These findings confirm that, during the period 1959-1976, there were socioeconomic differentials in infant and child mortality in Bangladesh. However, because of simple bivariate analysis employed, these findings might not reveal the net effect of an independent variable which could be distorted by the confounding effects of other socioeconomic and demographic variables. To separate the effect of each variable on infant and child mortality, we have employed multivariate analysis. The statistical technique deemed appropriate for this analysis is logit regression, using the dependent variables expressed as the logarithmic function of odds.

TABLE 3—DIFFERENTIAL IN RATES OF INFANT AND CHILD MORTALITY  
IN RURAL AND URBAN AREAS OF BANGLADESH : 1959-1976

Socioeconomic Variables and Urban-Rural, Residence	Deaths Up to Age 3 per 7,000 birth.-1			
	Impact Survey (1959-1968)		WFS Survey (1965-1974)	
	NRates	Death	DeathRates	Death
<b>Father's Education :</b>				
Urban with no Education	379	1240	385	18.27
Rural with no Education	2,640	116.3	666	118.5
Urban with Primary and above	885	100.6	1,816	195.0
Rural with Primary and above	2,625	119.6	1,481	169.3
<b>Mother's Education :</b>				
Urban with no Education	723	117.6	591	175.4
Rural with no Education	3,987	120.4	2,533	189.6
Urban with Primary and above	541	94.3	460	96.4
Rural with Primary and above	1,278	110.3	764	161.8
<b>Modern Items Owned :</b>				
Urban with no Item	607	110.4	470	176.2
Rural with no Item	4,115	119.2	2,258	190.0
Urban with One or More	657	105.0	581	114.2
Rural with One or More	1,120	113.4	1,039	170.4

SOURCES : Impact Survey (1969); and World Fertility Survey, Bangladesh (1975).

#### Multivariate Analysis of Infant and Child Mortality by Logit Regression Technique

Table 4 shows the net results of our multivariate analysis of the dependent variable by logit regression technique. Since the BIDS data are from rural areas, these data are compared with the corresponding data of the rural samples of the Impact and World Fertility Surveys. It may be noted that when the dependent variable is skewed, as in the present case of infant and child mortality,

TABLE 4-LOGIT ANALYSIS OF INFANT AND CHILD MORTALITY 1)Y  
**SOCIOECONOMIC AND DEMOGRAPHIC VARIABLES IN RURAL**  
**BANGLADESH : 1959-1976**

<i>Socio-economic and Demographic Variables</i>	<i>Impact Survey (1959-1968)</i>	<i>WF Survey (1965-1974)</i>	<i>BIDS Survey (1967-2976)</i>
Father's Education	-.074*	-.061*	-.200*
Mother's Education	-.045*	-.214*	-.300*
Modern Items Owned	-.104*	-.042*	-.221*
Non-Agricultural Occupation	.053*	-.008	.074*
Age of Mother	.302*	.193*	.559*
Male Child	.006	.035*	-.256*
Constant	-1.575	-1.494	-1.285*
(Fit of Model)	$X^2 = 42.97$ d.f. = 57	$X^2 = 95.40$ d.f. = 57	$X^2 = 182.13$ d.f. = 57

\* $p < .05$

SOURCES: **Impact Survey (1969)**; **World Fertility Survey, Bangladesh (1975)**; and **Rural Poverty and Fertility Survey (1977)**.

the assumptions underlying ordinary least-square estimation are less appropriate (Hanushek and Jackson, 1977).

It did not prove possible to include all of the variables analyzed in Table 2 in a single *logit* model due to the consideration of sample sizes and matrix sizes. Therefore, region and breast-feeding were excluded from the multivariate analysis. Region was not controlled since there was no systematic major regional differences in infant and child mortality in Bangladesh. On the other hand, duration of breast-feeding was likely to be subjected to measurement error or bias since the information on which it was based might not coincide with each birth and might be distorted by the fact that children who die in early infancy had shorter periods of breastfeeding.

Higher family resources or higher socioeconomic status, as represented by parental education or modern items owned, had a statistically significant effect on the reduction of infant and child mortality. This may reflect the beneficial effects of the improved level of child's nutrition and increased utilization of modern medical facilities. However, the effect of both education and modern items, with the exception of father's education and modern items for the WF Survey, tended to be higher in the WF Survey and the BIDS Survey than in the Impact Survey. Since the former two surveys were conducted in the later period of mid 1970s, their pronounced negative effect of parental education or modern items might have resulted from the availability of modern medicines

and the relatively higher accessibility of modern health care facilities to the rich than to the poor.

Contrary to our expectation, once the other sociodemographic factors were controlled, the non-agricultural occupations were associated with higher child mortality. On the other hand, male child showed no consistent relationship with child mortality across the surveys. While these inconsistent coefficients of sex variable could be an artifact of counterbalancing effects of low female infant mortality immediately after birth, the low male child mortality as the infant grows due to favourable treatment and care accorded to male child, and the underreporting of female child deaths, the positive effect of the non-agricultural occupations might reflect the nature of those occupations in rural Bangladesh, which were more likely to be occupied by poor landless cultivators pushed out of the mainstreams of the Nation's agriculture (Adnan & Rahman, 1978). An earlier study found evidence of sex discrimination in the family allocation of food and health care in rural Bangladesh, increasing the survival prospect of male children after infancy (Chen, Huq & D'Souza, 1981). Lastly, the positive coefficient of age of mother in Table 4 suggests the higher mortality of earlier periods, arising out of malaria and other endemicities.

Overall, the results shown in Table 4 confirm our earlier finding in Tables 2 and 3 that the socioeconomic variables—father's education, mother's education, or modern items—had significant independent effects upon the reduction of infant and child mortality even when the effects of the other sociodemographic variables were controlled and that their effects have become pronounced over the years.

## Summary and Discussion

Our analysis shows that the levels of infant and child mortality continued to be high in Bangladesh by a developing country standard. Several factors affected infant and child mortality. Infants whose fathers belong to higher socioeconomic strata, whose families live in urban areas, and whose parents have better resources were more likely to have lower child mortality. The magnitude of the difference in infant and child mortality by these variables had become more pronounced over the years, reflecting the recent availability of modern medicines which were more likely to be used by those in the higher socioeconomic strata. On the other hand, because of the non-availability of modern medicines in the earlier periods, many families might have failed, despite their more than average resources, to provide adequate health care for their infants and children, resulting in lower socioeconomic differences in infant and child mortality.

The persistence of high level of infant and child mortality and its difference by socioeconomic variables could be explained by the overall low level of development in Bangladesh (Arthur and McNicoll, 1978) and the types of

available health facilities. The environmental conditions in Bangladesh are extremely poor; housing conditions are deplorable and unhygienic; and sanitation, water supply, and public health facilities are inadequate or non-existent. In the absence of adequate maternal and child care facilities, various diseases, such as diarrhoea and tetanus, adversely affect large numbers of children (McCormack & Curlin, 1973; Northrup, 1973). When these surrounding environmental conditions are inimical to child survival, only those who have resources can partially improve the survival prospects of their children. Many of these conditions are interdependent and mutually reinforcing, resulting in a cumulative disadvantage for all families. While the negative coefficients of our socioeconomic variables on infant and child mortality indicate the importance of modern influence and modern disease treatment in reducing child mortality, the continued high mortality levels across socioeconomic groups points to the prevalence of an environment of disease as a major factor underlying Bangladeshi mortality conditions. Further studies are needed to delineate the major features of this high child mortality pattern.

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