RECENT TRENDS IN FERTILITY AND MORTALITY IN RURAL BANGLADESH 1966—1975

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PREFACE

The Cholera Research Laboratory (CRL) operates under a bilateral project agreement between the government of Bangladesh and the United States of America. Research activities of CRL center on the interrelationships between diarrheal disease, nutrition, fertility and their environmental determinants. CRL issues two types of papers: scientific reports and working papers which demonstrate the type of research activity currently in progress at CRL. The views expressed in these papers are those of authors and do not necessarily represent views of Cholera Research Laboratory. They should not be quoted without the permission of the authors.

This paper was presented by Dr. Douglas H. Huber at the Annual Meeting of the Population Association of America, April 21-23, 1977, Missouri, U.S.A.

ABSTRACT

The Cholera Research Laboratory maintains demographic surveillance for a population of 260,000 persons in Matlab Thana and adjacent areas. In 1974-76 mortality rates have risen and fertility declined sharply in association with increased costs of food grains.

The population resides in two areas having different personnel collecting reports. However the birth rate declines occurred in parallel, a reduction of 20 births per thousand population from 1973 to 1975. Crude death rates and infant mortality (primarily post-neonatal mortality) increased sharply in 1974 and remained high in 1975.

The rate of natural increase declined to 0.9% in 1975 compared with 3.0% for the 5 years preceding 1970. We found all age groups of women to have lower fertility rates in 1974 and 1975. This observation, together with the reported contraceptive use rate of 2.4% for married women aged 15-44 in October 1975, suggests that modern contraceptives did not play a major role in the fertility decline.

We find stillbirth ratios have remained fairly constant over the past 6 years. However fetal wastage ratios were highest in 1975, although this indicator may be somewhat imprecise due to incomplete reporting of fetal loss.

Fertility reductions below previous seasonal levels follow roughly 9 months after the rise in foodgrain prices. The largest deviation of birth rates in November - January 1975 - 6 may be accounted for by fewer conceptions during the period of highest rice prices in early 1975. We can say little about other areas of Bangladesh although the increased price of foodgrains in Matlab Thana appears strongly related to the recent short-term increases in mortality and decreased fertility.

INTRODUCTION

The Cholera Research Laboratory was established in Dacca, Bangladesh in 1960 to develop, improve and demonstrate measures for the prevention and eventual eradication of cholera. An essential component of this program is controlled field trials of cholera vaccines which require accurate denominator data. Villages in Matlab Thana, Comilla District, located in the south central area of Bangladesh, were selected for these studies. The basic design of these field trials involves taking a complete census in the villages under study and assigning an identifying census number to every individual. Since field work was begun, field workers have visited every household daily to inquire about the occurrence of acute diarrheas. This frequent contact with the inhabitants has remained an essential feature of the CRL program.

The first field work in 1963 initially covered 23 villages with a population of 28,000 individuals. In 1964, the trial area was expanded to include an additional 35 villages covering a total population of 60,000. The area was further expanded in 1966 to cover an additional 74 villages, giving a total population of 112,000 in 132 villages under surveillance. This area is named the Old Trial Area (OTA).

In 1968, 101 more villages with a population of 109,000 were added to the study. These 101 villages are called New Trial Area (NTA). Since the expansion of the Old Trial Area in March-April 1966, the field staff have been maintaining a regular registration of all births, deaths, and migrations, in addition to carrying out their regular surveillance for acute diarrheal diseases. The surveillance of vital events has been maintained in the New Trial Area since its inclusion in 1968.

This paper describes the trends in fertility and mortality rates of the last 10 years of Old and New Trial Areas separately.

THE STUDY AREA

Matlab is located in the deltaic area of Bangladesh, which is intersected by innumerable tidal rivers, canals, and branches of the major rivers: the Ganges, Brahmaputra and Meghna. The climate is subtropical, with the Tropic of Cancer passing through the area.

The people are almost entirely indigenous Bengalis. Over 80 percent are Muslim; the remainder are Hindu. Less than 25 percent of the adults are literate. The principal occupations are agriculture and fishing, the latter being mainly a Hindu occupation. Most of the farmland is given to rice, the dietary staple, and jute, the cash crop.

Villages have an average population of 1,000 persons. Each village is divided into many baris, a unit of two or more patrilineally-related families. Each family has its own one or two-room house with a mud floor, jute stick walls, and a thatched grass or galvanized iron roof. The houses in baris are arranged around a central courtyard. The average population density is approximately 2,000 per square mile. During the monsoon, when most of the land is under water, the actual population density is much higher. This area has only one road; internal communication is accomplished primarily by country boat or on foot. A few motorised passenger launches provide transport to Dacca and other large towns.

METHODS

In the Old Trial Area, the census was taken in March and April of 1966 by four teams, each consisting of two trained field workers. The workers went from house to house collecting the basic information from each family on a simple form. In the New Trial Area, the census was taken in March - April, 1968 by a similar method.

A family was defined as a hearth unit, i.e. a group which eats together. Families were identified by the name of the family head, bari and the location. The family members were listed by name, age and sex. Efforts were made to obtain reasonably accurate ages by beginning with the age of the youngest child in the family and then asking the ages of the older children and of the parents and other family members. The census workers made an effort to correct any obvious discrepancies in the ages reported by the informants. No effort was made, however, to verify the reported ages by such means as dating of historical events.

At the completion of this census, triplicate copies of the census books were made from the family census sheets arranged in geographical order. Every individual was assigned the village census number and an individual serial number within the village.

One copy of the census book was returned to the field worker who used it to issue individual family census cards to every family. At this time, any discrepancies which were noted by the field workers were reported to the central office and corrected.

Surveillance for births and deaths is maintained by several levels of workers. A local female resident of each village visits each household daily and inquires about births and deaths. A male field assistant supervises from 10 to 15 of these lady field workers. These men, with the equivalent of a high school education (matriculates), visit each family an average of once monthly and register all births, deaths, and migrations on standard forms. The supervision of this phase of the work is maintained by the senior field assistants (usually Sanitary Inspectors) who visit each household approximately once in three months to check on the completeness of birth and death registration by independently enquiring about these events. In turn, these workers are supervised by the Field Surveillance Supervisor and his deputy who coordinate the field work.

RESULTS

Mortality

Table 1 shows the crude death rate and infant mortality rate of the last 10 years in the Old Trial Area, and the last eight years in the New Trial Area. Two distinct patterns were observed in the crude death rate. In the first five-year period (1966-70), the death rates were stable with only slight year-to-year variation. In the second five-year period (1971-76), these showed an upward trend with significant year-to-year fluctuations. Once in 1971, and again in 1974, death rates rose sharply to levels over 25 percent of the first five-year average.

Infant mortality rates, both for the Old and New Trial Areas, have shown a more distinct upward trend than that found for crude death rates; however, similar peaks were observed in 1971 and 1974. Unlike crude death rates, infant mortality rates remained high in 1975. These patterns were seen in both the Old and New Trial Areas as shown in figure 1.

TABLE 1

CRUDE DEATH RATES AND INFANT MORTALITY RATES OF OLD AND NEW TRIAL AREAS IN MATLAB FOR LAST TEN YEARS

	Old Trial Area		New Trial Area	
Year	CDR	IMR	CDR	IMR
1966	16.0	110.7	-	-
1967	17.2	125.4	-	-
1968	15.7	123.8	14.0	121.3
1969	15.1	127.5	14.7	139.3
1970	14.6	131.3	15.9	144.5
1971	21.3	146.6	19.7	147.3
1972	16.4	129.2	16.0	125.9
1973	14.6	128.8	13.2	122.0
1974	20.0	167.2	21.3	180.5
1975	18.2	150.4	17.6	153.6

Table 2 shows the crude birth rates, total fertility rates and sex ratio at birth for the last 10 years in the Old Trial Area and the last eight years for the New Trial Area. Except for 1973, both crude birth rates and total fertility rates showed a very slow downward trend until 1974. In 1975, the decline was dramatic. As noted in figure 2, prior to 1974, the trend in age-specific fertility rate, there was virtually no decline in any but the 10-19 year age group. In the 10-19 year age-group, a pronounced decline was observed before 1974. In 1975, the age-specific fertility rates for all age-groups declined dramatically as noted in the crude birth rate and total fertility rate.

TABLE 2

CRUDE BIRTH RATES, TOTAL FERTILITY RATES AND RATIO AT BIRTH OF OLD AND NEW TRIAL AREAS IN MATLAB FOR LAST TEN YEARS

Year	Old Trial Area			New Trial Area		
	CBR	TFR	Sex Ratio	CBR	TFR	Sex Ratio
1966	46.8	6.66	104	-	-	-
1967	45.2	6.43	104	-	-	-
1968	46.4	6.68	104	44.9	6.72	106
1969	45.2	6.56	105	44.0	6.47	106
1970	43.6	6.40	101	44.8	6.58	101
1971	44.5	6.54	103	43.8	6.40	106
1972	41.8	6.06	102	41.8	6.08	106
1973	47.8	7.25	104	46.6	7.19	104
1974	40.1	6.11	105	39.0	5.72	103
1975	27.6	4.15	106	26.5	3.94	107

Table 3 shows the rate of natural increase in recent years in Matlab. A steady declining trend in natural growth was seen. This is partly the reflection of a decline in fertility of young women, (but it is mostly due to increasing crude death rates). During 1966 through 1970, the yearly growth rate was 3.0 percent which declined to 2.5 percent during 1971-74. In 1975, the growth rate was 0.9 percent, a remarkable decline by any standards. This was due primarily to the dramatic decline in fertility for that year. For the last 10 years, the average annual growth rate was 2.6 percent. Similar trends were observed in both the Old and New Trial Areas.

TABLE 3

RATE OF NATURAL INCREASES AND INTRINSIC GROWTH RATE OF OLD AND NEW TRIAL AREA IN MATLAB FOR LAST TEN YEARS

Year	Rate of Natural Increase in Percent OTA	NTA
1966	3.1	-
1967	2.8	-
1968	3.1	3.1
1969	3.0	2.9
1970	2.9	2.9
Mean (upto 70)	3.0	3.0
Intrinsic Growth (upto 70)	3.2	3.2
1971	2.3	2.4
1972	2.5	2.6
1973	3.3	3.3
1974	2.0	1.8
Mean (71-74)	2.5	2.5
Intrinsic Growth Rate (71-74)	2.8	2.7
1975	0.9	0.9
Mean (upto 75)	2.6	2.5
Intrinsic Growth Rate(upto 75)	2.8	2.8

Intrinsic growth rates were estimated at 3.2 percent for the period 1966-70; these declined during 1971-74 to 2.8 percent.

DISCUSSION

The first issue which deserves comment is the quality of the registration data. Remarkable conformity of yearly rates and sex ratio at birth between the two areas suggests the data were highly reliable throughout the period of observation. Although the data are not presented here, two other techniques to estimate fertility in this population - an analysis of birth intervals of 2,000 women and a pregnancy prevalence survey - have independently confirmed a crude birth rate of approximately 28/1,000.

The abrupt change in the pattern of mortality rates which began with the period of civil unrest in 1971 is striking. From a five-year period of relatively low, stable rates, a 35 percent increase in the crude death rate was noted in the Old Trial Area. A similar increase of 33 percent over the previous three years was observed in the New Trial Area. Previous analysis of these observations showed the excess deaths to be concentrated in the children and the elderly. Although the period of unrest in 1971 lasted only nine months, an analysis of the pattern of mortality, which included broad classifications of the causes of deaths, suggested that the increase in mortality was due to a variety of specific causes.

Crude death rates returned to low levels in the two years after independence, but some age groups continued to experience high mortality rates. Thus, the mortality rate for the 5-9 year age group was higher in 1972 than in 1971. The excess mortality was attributed largely to dysentery which might have been related to a decreased level of nutrition.

In 1974, crude death rates in both areas jumped dramatically to levels which were almost 50 percent higher than those of the previous year. Although we have not analysed in detail the deaths for 1974, the period was marked by severe economic hardship and food shortages for those on a money economy. There was no war nor mass migration out of the country. The hospital functioned smoothly and there were no apparent epidemics which could account

for a large part of the excess mortality. The only factor in common between 1971 and 1974 was the disruption in the intricate food-grain distribution system in a rice-deficit area. Although our analysis is incomplete, we are left with the working hypothesis that food shortage was the common denominator for both 1971 and 1974. Defining the mechanism by which the lack of availability of food was reflected in higher death rates is of primary concern.

The qualitative change in the pattern of mortality is very revealing. One must emphasize the instability which describes the crude death rates in the past five years. It demonstrates that society is able to recover from significant insults, but it also shows how little reserve exists in the system to deal with stress. There appears to be a tremendous inelastic relationship between the complex foodgrain marketplace and mortality in Matlab at the present time.

The decline in fertility among young women is probably due to the increasing age of marriage. The median age of marriage was 14.8 years in 1968 and rose to 17.4 years in 1975. The drastic fall in birth rate in 1975 is due to variables which are yet to be explored. However, the food shortage observed in 1974, which caused out-migrations, postponed marriages, increased divorces and separations in this population, undoubtedly affected the fertility rates in 1975 (Appexdix 1). In addition to these major social disruptions, the food shortage probably decreased the nutritional status of women which caused a reduction in fecundity and lengthened the period of temporary infertility. Thus, the food shortage might have affected both biological and social factors regulating fertility in a non-contracepting society.

We expect the downward trend in fertility to be reversed in the future as the Matlab area recovers from the disruptions of 1974. But we are unsure if fertility rates will rebound to the high levels observed in the past. It is reasonable to assume we may be entering an era of unstable fertility rates and that significant fluctuations in both fertility and mortality may be the pattern in the future as the cushion of reserve resources available to families to deal with social and economic disruptions is exhausted.

These data illustrate the composite nature of changes in the crude rate of natural increase. During the last two years of observation, 75 percent of the decrease in the rate was due to the decline in fertility, and 25 percent due to an increase in mortality; but in 1974, changes in fertility and mortality shared equally in the decline.

We feel confident our data accurately reflects the true picture of mortality and fertility in Matlab, but we cannot document to what extent the Matlab experience represents the overall picture of population growth in Bangladesh. We are at a loss to identify factors unique to Matlab which are sufficient to explain either the significant increases in mortality or the striking fall in fertility. Matlab is simply not that different from other rural areas of the delta. Therefore, we feel the Matlab data probably does reflect significant changes which occurred elsewhere in Bangladesh until proven otherwise.

Appendix 1

RECENT MIGRATION TREND
IN MATLAB

	68	69	70	71	72	73	74	75
Migration-In (Total)								
OTA	3673	3100	3840	4315	3074	1891	1974	3131
NTA	2912	3104	3610	2948	3099	1716	1850	3075
Migration-Out (Total)								
OTA	3058	3664	2751	4439	4525	2300	5548	4632
NTA	4162	3620	2871	3093	4251	2041	5275	5010
Migration-In (Marriage)								
OTA	455	494	468	263	563	438	222	445
NTA	388	470	441	303	545	372	227	532
Migration-Out (Marriage)								
OTA	517	522	494	325	581	508	229	569
NTA	477	528	562	323	647	487	285	548
Migration-In (Divorce & Separation)								
OTA	105	81	74	58	86	42	148	135
NTA	79	102	86	74	99	73	155	163
Migration-Out (Divorce & Separation)								
OTA	80	95	81	76	97	56	131	136
NTA	60	97	98	91	87	44	164	134

CRL publications can be obtained from Publications Unit, Cholera Research Laboratory, G.P.O. Box 128, Dacca - 2, Bangladesh.

List of current publications available:

A. CRL Annual Report 1976.

CRL Annual Report 1977.

B. Working Paper:

No. 1. The influence of drinking tubewell water on diarrhea rates in Matlab Thana, Bangladesh by George T. Curlin, K.M.A. Aziz and M.R. Khan.

No. 2. Water and the transmission of El Tor cholera in rural Bangladesh by James M. Hughes, John M. Boyce, Richard J. Levine, Moslemuddin Khan and George T. Curlin.

C. Scientific Report:

No. 1. Double round survey on pregnancy and estimate of traditional fertility rates by A.K.M. Alauddin Chowdhury.

No. 2. Pattern of medical care for diarrheal patients in Dacca urban area by Moslemuddin Khan, George T. Curlin and Md. Shahidullah.

No. 3. The effects of nutrition on natural fertility by W. Henry Mosley.

No. 4. Early childhood survivorship related to the subsequent interpregnancy interval and outcome of the subsequent pregnancy by Ingrid Swenson.

No. 5. Household distribution of contraceptives in Bangladesh-the rural experience by Atiqur R. Khan, Douglas H. Huber and Makhlisur Rahman.

No. 6. The role of water supply in improving health in poor countries (with special reference to Bangladesh) by John Briscoe.

No. 7. Urban cholera study, 1974 and 1975, Dacca by Moslemuddin Khan, George T. Curlin.

D. Special Reprint:

Management of cholera and other acute diarrhoeas in adults and children - World Health Organization.