

DEMOGRAPHIC STUDIES IN RURAL BANGLADESH:
MAY 1969—APRIL 1970

A.I. Chowdhury
K.M.A. Aziz
Kashem Shaikh



INTERNATIONAL CENTRE FOR
DIARRHOEAL DISEASE RESEARCH, BANGLADESH

Dacca, Bangladesh

April 1981

Working Paper No. 16

DEMOGRAPHIC STUDIES IN RURAL BANGLADESH:

MAY 1969 - APRIL 1970

A.I. Chowdhury¹

K.M.A. Aziz²

Kashem Shaikh³

INTERNATIONAL CENTRE FOR
DIARRHOEAL DISEASE RESEARCH, BANGLADESH

G.P.O. Box 128, Dacca 2

Bangladesh

1 Statistical Officer

2 Associate Scientist

3 Sr. Statistical Officer

PREFACE

The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) is an autonomous, international philanthropic and non-profit centre for research, education and training as well as clinical service. The Centre is derived from the Cholera Research Laboratory (CRL). The activities of the institution are to undertake and promote study, research and dissemination of knowledge in diarrhoeal diseases and directly related subjects of nutrition and fertility with a view to develop improved methods of health care and for the prevention and control of diarrhoeal diseases and improvement of public health programmes with special relevance to developing countries. ICDDR,B issues two types of papers: scientific reports and working papers which demonstrate the type of research activity currently in progress at ICDDR,B. The views expressed in these papers are those of authors and do not necessarily represent views of International Centre for Diarrhoeal Disease Research, Bangladesh. They should not be quoted without the permission of the authors.

ABSTRACT

The population of 1968-69 were distributed in single year age with osculatory interpolation and the mid-year population of Matlab Demographic Surveillance System for 1969-70 was estimated by the balancing equation with adjustment of births, deaths and migrations. An average annual rate of increase of 2.03% was found. In this population the proportion of males in the age groups less than 14 years were larger than females. Whereas among 15-34 years, females were more than males and in the age beyond 35 years males were more than females. The CBR and CDR show a crude rate of 3.0% natural increase. The out-migrations were higher than in-migrations and both male and female out-migrants were reported higher than in-migrants.

In both neonatal and post-neonatal periods male deaths were higher than female deaths. The age specific death rates were distributed in a U shape pattern and October to December was the peak period of death. More than three-fourths of the children less than one year died of '*Takuria*' i.e. cause 'unknown'. About one-fourth of the children aged between 1-14 years died of gastrointestinal diseases, and half of the persons above 15 years died of 'other' causes. The male life expectancy was higher than female life expectancy.

The sex ratio at birth was 105.0 males for 100 females. The peak age specific fertility rate was 332.4 for women aged 20-24. The mean length of generation was 26.27 which indicates that a Bangladeshi woman replaces herself with 2.24 females.

INTRODUCTION

The Cholera Research Laboratory (now ICDDR,B), as a part of the Cholera Vaccine Field Trial, has been maintaining a continuous registration of births, deaths and migrations, in a population of over 110,000 in 132 villages at Matlab Thana in Comilla district of Bangladesh since May 1966. Descriptive analyses of the first, second and third year of the demographic surveillance have been published separately.

A description of the area, methods and definitions of the surveillance were given in a previous report. (Mosley *et al.* 1968:1-3). In 1968, the Vaccine Trial area was expanded to include 101 new villages which covered over 110,000 persons. This population added in 1968 has not been included under the present analysis.

This report gives a descriptive analysis of the data obtained from the registration of the fourth year (May 1969 - April 1970) and it also presents some of the yearly patterns for the four-year period covering 1966-1970.

RESULTS

There were 111,848 persons in the 132 villages at the time of census in April 1966. Table 1 shows that the population has reached 119,998 by the middle of the fourth year with an average annual growth rate of 2.03%. This adjusted mid-year population (see Appendix A) for 1969-70 has been calculated by adding the live-births and in-migrants and subtracting deaths and out-migrants with an adjustment of age for the three and one half year period of the study. Table 1 shows that there were 102.1 male per one hundred females. Sex ratios at different ages follow a rather typical pattern. The younger males were in excess of the younger females. This was due to higher number of male births as well as to the excessive female mortality in childhood. In the age group 20-34, the number of females was larger than that of males which reflects the large number of males that have been continuing to move out of the area for work and education. About one half of the total population was under 15 years of age. Approximately 40% of the population was between 15-49 years of age.

Table 2 summarizes the live-births, deaths and migrations for four consecutive twelve-month study periods. The crude birth rate came down from 46.6 in 1968-69 to 45.4 per 1000 in the year 1969-70. The crude death rate was 15.0 per thousand in both the years. The unweighted average crude birth and death rates over the four year period were 46.1 and 15.4 per 1000 respectively which gives a crude rate of natural increase of 3.1%. The in-migration rate for the year 1969-70 decreased from 28.0 in 1968-69 to 25.8 per 1000 and the out-migration rate was slightly higher in the fourth year

TABLE 1

ADJUSTED MID-YEAR POPULATION BY AGE AND SEX 1969-1970

Ages	Male	Female	Total	Sex Ratio	Cumulative Percent		
					Male	Female	Total
< 1	2468	2405	4873	102.6	4.1	4.1	4.1
1 - 4	7699	7315	15014	105.2	16.8	16.4	16.6
5 - 9	10544	10245	20789	102.9	34.2	33.6	33.9
10 - 14	9560	8397	17957	113.8	49.9	47.8	48.9
15 - 19	5728	5180	10908	110.6	59.4	56.5	58.0
20 - 24	3002	4137	7139	72.6	64.3	63.5	63.9
25 - 29	2792	4846	7638	57.6	68.9	71.6	70.3
30 - 34	3280	4150	7430	79.0	74.3	78.6	76.5
35 - 39	3538	3258	6796	108.6	80.2	84.1	82.1
40 - 44	2885	2447	5332	117.9	84.9	88.2	86.6
45 - 49	2232	1695	3927	131.7	88.6	91.1	89.8
50 - 54	2109	1790	3899	117.8	92.1	94.1	93.1
55 - 59	1496	1134	2630	131.9	94.6	96.0	95.3
60 - 64	1215	1033	2248	117.6	96.6	97.7	97.2
65 & above	2078	1340	3418	155.1	100.0	100.0	100.0
Total	60626	59372	119998	102.1			

APPENDIX A

The method of estimation of 1969-70 mid-year population by age and sex.

1. the estimation of the total population for each sex was based on the balancing equation (Shryock *et al.* 736-738)

$$P_1 (1969-70) = P_0 (1968-69) + B - D + I - O$$

where P_1 is mid-year population of all ages

P_0 is the base population of all ages

B is all births

D is all deaths

I is all in-migrants

O is all out-migrants

2. The estimation of population by single year age for each sex was based on the osculatory interpolation of 5-year age groups (Shryock *et al.* 1973: 699-700, 875-878)

Population sizes for different ages:

$$\text{Age under 1 year: } P_0 (1969-70) = B - 0.8 D_0 - 0.5 M_0$$

$$\text{Age one year : } P_1 (1969-70) = P_0 (1968-69) - 0.2 D_0 + 0.5 D_1 - 0.5 M_0 - 0.5 M_1$$

$$\text{Ages 2 year and above : } P_t (1969-70) = P_{t-1} (1968-69) - P_a^t - \frac{1}{2} (D_a - M_a) + \frac{1}{2} (D_{a+1} - M_{a+1})$$

Where D_0 is all deaths of age under one year

M_0 is all net-migrants of age under one year

D_1 is all deaths aged one year

M_1 is all net-migrants aged one year

TABLE 2

SUMMARY OF BIRTH, DEATH AND MIGRATION RATES FOR FOUR CONSECUTIVE YEARS

Events	Rate per 1000 Population				Average for four years
	1966-67	1967-68	1968-69	1969-70	
Live births	47.1	45.4	46.6	45.4	46.1
Death	15.0	16.6	15.0	15.0	15.4
Rate of Natural Increase	32.1	28.8	31.6	30.4	30.7
Migration-in	16.7	35.0	28.0	25.8	26.4
Migration-out	31.4	47.3	29.6	30.5	34.7
Net Migration rate	14.7	12.3	1.6	4.7	8.3

compared to the third year. The average rate of in-migration and out-migration for four consecutive years was 26.4 and 34.7 respectively, giving an average net migration rate of -8.3 per thousand.

Table 3 shows the classification of 695 neonatal and post-neonatal deaths during 1969-70. It reveals that 39.3% of infant deaths occurred in the first week of life and 68.6% in the first month of life. The overall infant mortality rate was 128 per 1000 live births.

The infant mortality rate for 1969-70 was higher than the preceding three years. In the neonatal period, the mortality rate among males was higher than among females reflecting a fundamental biologic characteristics seen in all populations. In the post-neonatal period the sex pattern of mortality was consistent: in two of the four years post-neonatal mortality rate was higher for females than for males; in the other two years the opposite was observed. Overall, male infant mortality rate was constantly higher than that of females during the four year period under reference. Table 4 shows the infant and neonatal mortality rates of four consecutive years. It reveals that an average of 7.5% of newborns died in the first month of life and 12.2% died by the end of the first year.

Table 5 shows that of all deaths those among the children below 1 year represented 38.7% and of children aged 1-4 years 20.2%. In the age groups 10 through 34, the death rate was at the minimum. From the point of view of death this period of life appears to have a low risk with the exception of the child-bearing women. From age 35 the death rates increased at first gradually and above the age of about 50 years quite steeply. Overall, the age specific death rates for females were higher than those for males. In the age group 1-4 the higher female mortality was probably due to a better care given to male children. In the age group 10-34 the higher death rate for females was partly for the reason of risk associated with childbearing.

Table 6 shows the seasonal pattern of mortality in the age groups <1, 1-4, 5-39 and above 40. It shows that there is a relatively large proportion of deaths taking place during the months of October through December. The effect of the seasonal pattern of births is reflected to some extent in the seasonal pattern of death. October through January are the months when the largest number of births occurs and the high neonatal mortality accounts for the seasonal increase in deaths.

It is not possible to define adequately the causes of death in this population because they have been recorded by the non-medical personnel as reported by the family members of the deceased person. As shown in Table 7 gastrointestinal disease including acute and chronic diarrhoeas and dysenteries were the most common symptoms associated with deaths among children 1-14 years of age. Respiratory diseases are also seen frequently in all age groups. Drowning was the main cause of accidental deaths in this area, particularly among young children, and it occurs mainly in the monsoon season when the dwellings are surrounded by water and the children of this age who remain unattended face a high risk of drowning. Deaths occurring to infants <1 year of age are mainly attributed to the influence of 'evil spirits' (*Tākuriā*) by the villagers. In Table 7, deaths from this cause is shown under 'unknown'.

TABLE 3

INFANT AND NEONATAL DEATH FOR 1969 - 1970

Age	Number of Deaths		
	Male	Female	Total
Neonatal			
0 - 7 days	158	115	273
8 -29 days	110	94	204
Post-neonatal			
1 month - 11 months	115	103	218
All Infant deaths	383	312	695

TABLE 4

INFANT AND NEONATAL DEATH RATE PER 1000 LIVE-BIRTHS FOR FOUR CONSECUTIVE YEARS

Age	1966-67			1967-68			1968-69			1969-70			Mean for 4 years		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
Neonatal															
0-7 days	37.9	29.1	33.5	44.9	41.5	43.2	57.5	41.8	49.8	56.6	43.3	50.1	49.2	38.9	44.2
8-29 days	27.6	24.5	26.0	28.3	20.8	24.6	35.8	30.7	33.3	39.4	35.4	37.4	32.8	27.8	30.3
Post-neonatal															
1-11 months	52.0	50.5	51.2	53.9	61.5	57.6	36.9	43.6	41.0	41.2	38.8	40.0	46.0	48.6	47.5
All infant deaths	117.5	104.1	110.7	127.1	123.8	125.4	130.2	117.8	124.1	137.2	117.4	127.6	128.0	115.8	122.0

TABLE 5

DISTRIBUTION OF PERSONS WHO DIED DURING MAY 1969 - APRIL 1970
ACCORDING TO THEIR AGE AND SEX WITH AGE SPECIFIC DEATH RATE

Age	N u m b e r			Rate/1000		
	Male	Female	Total	Male	Female	Total
<1	383	312	695	137.2	117.4	127.6
1 - 4	149	213	362	19.3	29.1	24.1
5 - 9	31	36	67	2.9	3.5	3.2
10 - 14	7	11	18	0.7	1.3	1.0
15 - 19	3	17	20	0.5	3.3	1.8
20 - 24	7	8	15	2.3	1.9	2.1
25 - 29	8	21	29	2.9	4.3	3.8
30 - 34	7	12	19	2.1	2.9	2.6
35 - 39	23	21	44	6.5	6.4	6.5
40 - 44	31	17	48	10.7	6.9	9.0
45 - 49	20	15	35	9.0	8.8	8.9
50 - 54	29	33	62	13.7	18.4	15.9
55 - 59	29	25	54	19.4	22.1	20.5
60 - 64	42	37	79	34.6	35.8	35.1
65 & above	144	105	249	69.3	78.4	72.8
Total	913	883	1796	15.1	14.9	15.0

TABLE 6

DISTRIBUTION OF PERSONS WHO DIED FROM MAY 1969 TO APRIL 1970
BY FOUR WEEK PERIOD AND AGE

Month	Week No.	Age and Percentage								Total	%
		<1	%	1-4	%	5-39	%	40+	%		
May 1 - May 28	1-4	34	4.9	22	6.1	15	7.1	29	5.5	100	5.5
May 29 - June 25	5-8	31	4.5	33	9.1	10	4.7	25	4.7	99	5.5
June 26 - July 23	9-12	58	8.3	27	7.5	18	8.5	33	6.3	136	7.6
July 24 - Aug. 20	13-16	47	6.8	24	6.6	20	9.4	43	8.2	134	7.5
Aug. 21-Sept. 17	17-20	67	9.6	35	9.7	15	7.1	36	6.8	153	8.4
Sept. 18-Oct. 15	21-24	71	10.2	25	6.9	15	7.1	29	5.5	140	7.8
Oct. 16-Nov. 12	25-28	72	10.4	32	8.8	22	10.4	57	10.8	183	10.2
Nov. 13-Dec. 10	29-32	73	10.5	26	7.2	17	8.0	62	11.8	178	9.9
Dec. 11-Jan. 7	33-36	78	11.2	34	9.4	21	9.9	55	10.4	188	10.5
Jan. 8 - Feb. 4	37-40	50	7.2	25	6.9	18	8.5	34	6.5	127	7.1
Feb. 5 - March 4	41-44	40	5.8	26	7.2	20	9.4	39	7.4	125	7.0
March 5 - Apr. 1	45-48	41	5.9	25	6.9	9	4.2	41	7.8	116	6.5
Apr. 2 - Apr. 30	49-52	33	4.7	28	7.7	12	5.7	44	8.3	117	6.5
Total		695	100.0	362	100.0	212	100.0	527	100.0	1796	100.0
Percent			38.7		20.2		11.8		29.3		

TABLE 7

DISTRIBUTION OF PERSONS WHO DIED DURING ONE YEAR PERIOD ACCORDING
TO THEIR AGES AND REPORTED CAUSES OF DEATH DURING 1969-70

Causes of Death	Age and Percentage										Total	%
	<1	%	1-4	%	5-14	%	15-39	%	40+	%		
Fever	41	5.9	63	17.4	20	23.5	20	15.7	53	10.1	197	11.0
Acute Diarrhoea	1	0.1	5	1.4	-	-	2	1.6	3	0.6	11	0.6
Gastrointestinal Diseases (Other than cholera)	16	2.3	91	25.1	20	23.5	9	7.1	71	13.5	207	11.5
Respiratory Diseases	68	9.8	65	18.0	12	14.1	15	11.8	85	16.1	245	13.6
Measles & Smallpox	2	0.3	22	6.1	-	-	-	-	2	0.4	26	1.4
Accidents	3	0.4	45	12.4	13	15.3	25	19.7	12	2.2	98	5.5
Unknown	542	78.0	25	6.9	3	3.5	7	5.5	11	2.1	588	32.7
Others	22	3.2	46	12.7	17	20.0	49	38.6	290	55.0	424	23.6
Total	695	100.0	362	100.0	85	100.0	127	100.0	527	100.0	1796	100.0

Abridged life tables were calculated for both sexes and for males and females from the mortality data of May 1969 - April 1970. These life tables are presented in tables 8, 9 and 10. The conventional method was used for their construction. The age specific death rates (n^m_x) were converted to life table probabilities (n^q_x) by the Reed and Merrel standard table except q_0 (Appendix B). The result indicates that expectation of life at birth in this population was 49.9 years. The life expectancy was slightly higher for males than for females.

FERTILITY

During the fourth year the field workers reported the termination of 5,938 pregnancies which are shown in Table 11. Of all the pregnancies, 2,791 resulted in male live-births and 2,658 in female live-births, thus yielding a sex ratio of 105 males per hundred female births. Sixty-three pregnancies resulted in multiple births, giving a ratio of one multiple birth per 94 pregnancies. Among all the pregnancy terminations reported 6% were miscarriages and 3.1% stillbirth.

Table 12 shows the age specific birth rates. Irrespective of their marital status, there were 5,449 live-births among 34,110 women in the age group 10-49. Thus there were 159.7 live-births for every 1,000 women of the reproductive age. The peak of births occurred in the 20-24 year age group, giving a fertility rate of 332.4 per 1000 women.

Table 13 shows the gross reproduction rate, net reproduction rate and the intrinsic rate of natural increase. The gross reproduction rate was 3.00 and the net reproduction rate 2.24. This indicates that a Bangladeshi rural woman having a mean length of a generation of 26.3 years replaces herself with 2.24 female children. With this net reproduction rate and mean length of generation, the intrinsic rate of natural increase was 3.12% per year.

MIGRATION

The pattern of migration by age and sex is summarized in Table 14. The 10-39 age group had 68% of the total in-migrants with the highest peak in the 15-19 age group. In the age group 15-19 years the young girls get married and leave their homes to join their in-law's household. The in-migration rate was highest for females in the 10-24 age group and for males in the 15-39 age group. The out-migration pattern indicates that in the age group 10-29 both males and females moved out of their respective villages frequently. The males moved out to find earning opportunities in the urban areas and the young females moved out to join their respective husbands or in-laws.

TABLE 8

ABRIDGED LIFE TABLE, MALES
(Based on 1969-70 Death Reports)

x	n^q_x	n^p_x	n^d_x	l_x	n^L_x	T_x	e_{o_x}
0	0.13723	0.86277	13723	100000	90394	5070721	50.7
1	0.07452	0.92548	6429	86277	332250	4980327	57.7
5	0.01459	0.98541	1165	79848	396327	4648077	58.2
10	0.00365	0.99635	287	78683	392697	4251750	54.0
15	0.00260	0.99740	204	78396	391470	3859053	49.2
20	0.01158	0.98842	905	78192	388697	3467583	44.3
25	0.01425	0.98575	1101	77287	383682	3078886	39.8
30	0.01059	0.98941	807	76186	378912	2695204	35.4
35	0.03198	0.96802	2411	75379	370867	2316292	30.7
40	0.05234	0.94766	3819	72968	355292	1945425	26.7
45	0.04382	0.95618	3030	69149	338170	1590133	23.0
50	0.06647	0.93353	4395	66119	319607	1251963	18.9
55	0.09247	0.90753	5708	61724	294350	932356	15.1
60	0.15910	0.84090	8912	56016	257800	638006	11.4
65	0.21189	0.78811	9981	47104	210567	380206	8.1
70	1.00000	-	37123	37123	169639	169639	4.6

TABLE 9

ABRIDGED LIFE TABLE, FEMALES
(Based on 1969-70 Death Reports)

X	q_x n_x	p_x n_x	d_x n_x	l_x	L_x n_x	T_x	e_{o_x}
0	0.11738	0.88262	11738	100000	91783	4917848	49.2
1	0.11007	0.88993	9715	88262	333618	4826065	54.7
5	0.01740	0.98260	1367	78547	389317	4492447	57.2
10	0.00653	0.99347	504	77180	384640	4103130	53.2
15	0.01627	0.98373	1248	76676	380260	3718490	48.5
20	0.00960	0.99040	724	75428	375330	3338230	44.3
25	0.02142	0.97858	1600	74704	369520	2962900	39.7
30	0.01435	0.98565	1049	73104	362897	2593380	35.5
35	0.03174	0.96826	2287	72055	354557	2230483	31.0
40	0.03416	0.96584	2383	69768	342882	1875926	26.9
45	0.04329	0.95671	2917	67385	329632	1533044	22.8
50	0.08814	0.91186	5682	64468	308135	1203412	18.7
55	0.10449	0.89551	6143	58786	278572	895277	15.2
60	0.16438	0.83562	8653	52643	241582	616705	11.7
65	0.14793	0.85207	6507	43990	203682	375123	8.5
70	1.00000	0	37483	37483	171441	171441	4.6

TABLE 10

ABRIDGED LIFE TABLES, BOTH
(Based on 1969 - 70 Death Reports)

x	n^q_x	n^p_x	n^d_x	l_x	n^L_x	T_x	e_{o_x}
0	0.12755	0.87245	12755	100000	91071	4992349	49.9
1	0.09200	0.90800	8027	87245	332926	4901278	56.2
5	0.01597	0.98403	1265	79218	392927	4568352	57.7
10	0.00499	0.99501	389	77953	388792	4175425	53.6
15	0.00911	0.99089	707	77564	386052	3786633	48.8
20	0.01045	0.98955	803	76857	382277	3400581	44.2
25	0.01882	0.98118	1431	76054	376692	3018304	39.7
30	0.01272	0.98728	949	74623	370742	2641612	35.4
35	0.03184	0.96816	2346	73674	362505	2270870	30.8
40	0.04401	0.95599	3139	71328	348792	1908365	26.7
45	0.04358	0.95642	2972	68189	333515	1559573	22.9
50	0.07646	0.92354	4986	65217	313620	1226058	18.9
55	0.09764	0.90236	5881	60231	286452	912438	15.2
60	0.16151	0.83849	8778	54350	249805	625986	11.5
65	0.18598	0.81402	8475	45572	206672	376181	8.2
70	1.00000	0	37097	37097	169509	169509	4.6

APPENDIX B

Method for Construction of Abridged Life Tables

The conventional method has been used for constructing the abridged life tables. The computed n^M_x 's were converted to n^q_x , life table death rates, from the standard tables computed by Reed and Merrell. The value of m_0 (which is D_0/B , where D_0 was the number of deaths under age 1 and B was the number of total births) was transcribed for q_0 . It was assumed that l_0 was 100,000 persons.

Other notations and derivations are as follows:

x : Exact age in years.

n : Age interval between two exact ages in years.

n^q_x : It is the probability of dying between age x to $x+n$

n^p_x : It is the probability of surviving from age x to $x+n$

n^d_x : It is the number of deaths which occur in age interval of n years i.e. between age x to $x+n$. $n^d_x = l_x \cdot n^q_x$

l_x : It is the number of survivors from an initial cohort of 100,000 births, l_0 to exact age x . $l_{x+n} = l_x \cdot n^p_x$

n^L_x : It is the number of persons in the stationary population, or in other words, it is the number of years lived by the life table cohort between age x and $x+n$.

$$n^L_x = \frac{n(l_x + l_{x+n})}{2}$$

$$L_0 = 0.3l_0 + 0.7l_1$$

$$L_{70+} = (l_{70+}) \cdot \text{Log}(l_{70+}) \quad \vdots \quad (\text{assumed})$$

T_x : It is the total number of years lived by the life table cohort after age x (all higher ages).

$$T_x = \sum_{70+}^x n^L_x$$

e_{0x} = It is the average number of years remaining to survivors at age x , or the expectation of life at age x

$$e_{0x} = \frac{T_x}{l_x}$$

DISTRIBUTION OF WOMEN WHO TERMINATED PREGNANCY DURING MAY 1969 - APRIL 1970
ACCORDING TO THEIR AGE AND OUTCOME OF PREGNANCY

[illegible]

TABLE 12

AGE SPECIFIC FERTILITY RATE FOR 1969 - 1970

Age of Mother (corrected)	Number of Women	Male Live Birth	Female Live Birth	Total Live Birth	Rate/1000 Women
10 - 14	8397	116	93	209	24.9
15 - 19	5180	528	528	1056	203.9
20 - 24	4137	696	679	1375	332.4
25 - 29	4846	778	742	1520	313.7
30 - 34	4150	435	386	821	197.8
35 - 39	3258	194	179	373	114.5
40 - 44	2447	33	44	77	31.5
45 - 49	1695	11	7	18	10.6
All child- bearing ages (10-49)	34110	2791	2658	5449	159.7

TABLE 13

CALCULATION OF GROSS REPRODUCTION RATE, NET REPRODUCTION RATE
AND INTRINSIC RATE OF NATURAL INCREASE 1969-70

Age	Female Popula- tion	Female Live Birth	Daugh- ters per 1000	Pivotal Age	Proportion Surviving the Pivotal Age	Women Surviving at given Age	Person Years
10-14	8397	93	11.08	12.5	0.77180	8.55	106.88
15-19	5180	528	101.93	17.5	0.76676	78.16	1367.80
20-24	4137	679	164.13	22.5	0.75428	123.80	2785.50
25-29	4846	742	153.12	27.5	0.74704	114.39	3145.72
30-34	4150	386	93.01	32.5	0.73104	67.99	2209.67
35-39	3258	179	54.94	37.5	0.72055	39.59	1484.62
40-44	2447	44	17.98	42.5	0.69768	12.54	532.95
45-49	1695	7	4.13	47.5	0.67385	2.78	132.05
Total			600.32			447.80	11765.19
5X total			3001.16			2239.00	58825.95

Gross Reproduction Rate	3.00
Net Reproduction Rate	2.24
Mean Length of Generation	26.27
Intrinsic Rate of Natural Increase	3.12%

TABLE 14

DISTRIBUTION OF PERSONS WHO MIGRATED INTO AND OUT OF THE STUDY AREA
DURING MAY 1969 - APRIL 1970 BY AGE¹SEX

Age	Migration-out						Migration-in					
	Male	*	Female	*	Total	*	Male	*	Female	*	Total	*
0-4	235	2.3	271	2.8	506	2.5	186	1.8	202	2.1	388	1.9
5-9	197	1.9	166	1.6	363	1.7	170	1.6	151	1.5	321	1.5
10-14	270	2.8	469	5.6	739	4.1	195	2.0	257	3.1	452	2.5
15-19	344	6.0	442	8.5	786	7.2	196	3.4	465	9.0	661	6.1
20-24	210	7.0	175	4.2	385	5.4	192	6.4	158	3.8	350	4.9
25-29	166	5.9	116	2.4	282	3.7	199	7.1	95	2.0	294	3.8
30-34	113	3.4	74	1.8	187	2.5	130	4.0	59	1.4	189	2.5
35-39	88	2.5	48	1.5	136	2.0	116	3.3	39	1.2	155	2.3
40-44	59	2.0	24	1.0	83	1.6	73	2.5	13	0.5	86	1.6
45-49	45	2.0	17	1.0	62	1.6	43	1.9	15	0.9	58	1.5
50-54	31	1.5	16	0.9	47	1.2	38	1.8	15	0.8	53	1.4
55-59	9	0.6	9	0.8	18	0.7	24	1.6	6	0.5	30	1.1
60-64	17	1.4	24	2.3	41	1.8	13	1.1	15	1.5	28	1.2
65 & above	11	0.5	18	1.3	29	0.8	14	0.7	21	1.6	35	1.0
Total	1795	3.0	1869	3.1	3664	3.1	1589	2.6	1511	2.5	3100	2.6

* Rate per 1,000 population.

REFERENCES

1. Mosley WH, Chowdhury AKMA, Aziz KMA, Islam S, Fahimuddin M. Demographic studies in rural East Pakistan. Dacca: Cholera Research Laboratory, 1968.
2. Shryock HS, Siegel JS. The methods and materials of demography. Washington, U.S. Bureau of the Census, 1973;2:699-700, 736-738, 875-878.

ICDDR,B publications can be obtained from Head, Library and Publication Branch, International Centre for Diarrhoeal Disease Research, Bangladesh, G.P.O. Box 128, Dacca 2, Bangladesh.

A. CRL Annual Report 1976.

CRL Annual Report 1977.

CRL Annual Report 1978.

ICDDR,B Annual Report 1979.

B. Working Paper:

No. 1. The influence of drinking tubewell water on diarrhoea rates in Matlab Thana, Bangladesh by George T. Curlin, K.M.A. Aziz, M.R. Khan. June 1977 (2nd Rep. Sept 1980). 21 p.

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, George T. Curlin. Dec 1977 (Rep. Mar 1980). 27 p.

No. 3. Recent trends in fertility and mortality in rural Bangladesh 1966-1975 by A.K.M. Alauddin Chowdhury, George T. Curlin. Jan 1978 (Rep. Oct 1979). 14 p.

No. 4. Assessment of the Matlab contraceptive distribution project - implications for program strategy by T. Osteria, Makhlisur Rahman, R. Langsten, Atiqur R. Khan, Douglas H. Huber, W. Henry Mosley. Apr 1978 (Rep. Feb 1981). 25 p.

No. 5. A study of the field worker performance in the Matlab contraceptive distribution project by Makhlisur Rahman, T. Osteria, J. Chakraborty, Douglas H. Huber, W. Henry Mosley. Jul 1978 (Rep. Feb 1981). 17 p.

No. 6. Constraints on use and impact of contraceptives in rural Bangladesh: Some preliminary speculations by R. Langsten, J. Chakraborty. Aug 1978 (Rep. Feb 1981). 23 p.

No. 7. The demographic impact of the contraceptive distribution project by T. Osteria, W.H. Mosley, A.I. Chowdhury. Sept 1978. 17 p.

No. 8. Development of milk teeth in rural Meheran children of Bangladesh by Moslemuddin Khan, George T. Curlin. Sept 1978. 23 p.

No. 9. A follow-up survey of sterilization acceptors in Matlab, Bangladesh by Makhlisur Rahman, Douglas Huber, J. Chakraborty. Oct 1978 (Rep. Jul 1980). 31 p.

No. 10. The demographic impact of sterilization in the Matlab village - based MCH-FP program by T. Osteria, S. Bhatia, J. Chakraborty, A.I. Chowdhury. Nov 1978 (Rep. June 1980). 23 p.

No. 11. Parental dependency on children in Matlab, Bangladesh by Makhlisur Rahman. Dec 1978. 28 p.

No. 12. An areal analysis of family planning program performance in rural Bangladesh by T. Osteria, S. Bhatia, A.S.G. Faruque, J. Chakraborty. May 1979. 19 p.

No. 13. The people of Teknaf: births, deaths and migrations (1976-1977) by Mizanur Rahman, M. Mujibur Rahaman, K.M.S. Aziz, Yakub Patwari, M.H. Munshi, M. Shafiqul Islam. May 1979. 46 p.

No. 14. Pilot study of the calendar rhythm method in the Matlab area of Bangladesh by Stan Becker, Rasheda Akhter. Nov 1980. 23 p.

No. 15. Comparison of measures of childbearing: patterns by age and parity in Matlab, Bangladesh by Stan Becker, Helen Hiltabidle. Mar 1981. 29 p.

C. Scientific Report:

- No. 1. Double round survey on pregnancy and estimate of traditional fertility rates by A.K.M. Alauddin Chowdhury. Jul 1977 (Rep. May 1978). 28 p.
- No. 2. Pattern of medical care for diarrheal patients in Dacca urban area by Moslemuddin Khan, George T. Curlin, Md. Shahidullah. Aug 1977 (Rep. June 1978). 20 p.
- No. 3. The effects of nutrition on natural fertility by W. Henry Mosley. Aug 1977 (2nd Rep. Dec 1980). 25 p.
- No. 4. Early childhood survivorship related to the subsequent interpregnancy interval and outcome of the subsequent pregnancy by Ingrid Swenson. Aug 1977 (Rep. Apr 1979). 18 p.
- No. 5. Household distribution of contraceptives in Bangladesh - the rural experience by Atiqur R. Khan, Douglas H. Huber, Makhlisur Rahman. Sept 1977 (Rep. Dec 1979). 19 p.
- No. 6. The role of water supply in improving health in poor countries (with special reference to Bangladesh) by John Eriscoe. Sept 1977 (Rep. Feb 1979). 37 p.
- No. 7. Urban cholera study, 1974 and 1975, Dacca by Moslemuddin Khan, George T. Curlin. Dec 1977 (Rep. May 1980). 24 p.
- No. 8. Immunological aspects of a cholera toxoid field trial in Bangladesh by George T. Curlin, Richard J. Levine, Ansaruddin Ahmed, K.M.A. Aziz, A.S.M. Mizanur Rahman, Willard F. Verwey. Mar 1978. 16 p.
- No. 9. Demographic Surveillance System - Matlab. Volume One. Methods and procedures. Mar 1976. 28 p.
- No. 10. Demographic Surveillance System - Matlab. Volume Two. Census 1974 by Lado T. Ruzicka, A.K.M. Alauddin Chowdhury. Mar 1978. 48 p.
- No. 11. Demographic Surveillance System - Matlab. Volume Three. Vital events and migration, 1975 by Lado T. Ruzicka, A.K.M. Alauddin Chowdhury. Mar 1978. 45 p.
- No. 12. Demographic Surveillance System - Matlab. Volume Four. Vital events and migration, 1975 by Lado T. Ruzicka, A.K.M. Alauddin Chowdhury. Mar 1978. 48 p.
- No. 13. Demographic Surveillance System - Matlab. Volume Five. Vital events, migration and marriages - 1976 by Lado T. Ruzicka, A.K.M. Alauddin Chowdhury. Mar 1978. 55 p.
- No. 14. Ten years review of the age and sex of cholera patients by Moslemuddin Khan, A.K.M. Jamiul Alam, A.S.M. Mizanur Rahman. May 1978. 18 p.
- No. 15. A study of selected intestinal bacteria from adult pilgrims by M.I. Huq, G. Kibriya. Aug 1978 (Rep. Feb 1980). 15 p.
- No. 16. Water sources and the incidence of cholera in rural Bangladesh by Moslemuddin Khan, W. Henry Mosley, J. Chakraborty, A. Majid Sarder, M.R. Khan. Dec 1978. 19 p.

- No. 17. Principles and prospects in the treatment of cholera and related dehydrating diarrheas by William B. Greenough, III. Jan 1979. 20 p.
- No. 18. Demographic Surveillance System - Matlab. Volume Six. Vital events and migration 1977 by Aporn Samad, Kashem Sheikh, A.M. Sarder, Stanley Becker and Lincoln C. Chen. Feb 1979. 65 p.
- No. 19. A follow-up survey of sterilization acceptors in the modified contraceptive distribution projects by Shushum Bhatia, Trinidad Osteria, J. Chakraborty, and A.S.G. Faruque. Feb 1979. 25 p.
- No. 20. Cholera due to the El Tor biotype equals the classical biotype in severity and attack rates by Moslemuddin Khan and Md. Shahidullah. Mar 1979. 20 p.
- No. 21. An estimation of response bias of literacy in a census of rural Bangladesh by M. Shafiqul Islam, George T. Curlin and K.M.A. Aziz. Mar 1979. 26 p.
- No. 22. *Vibrio cholerae* by William B. Greenough, III. Apr 1979. 43 p.
- No. 23. M.R. Clients in a village based family planning programme by Shushum Bhatia and Lado T. Ruzicka. Apr 1979. 26 p.
- No. 24. Passive hemagglutination assays for quantitation of cholera antitoxin: gluteraldehyde and chromium chloride used as coupling reagents to sensitize human erythrocytes with purified choleragen by Ansaruddin Ahmed, Kh. Abdullah Al Mahmud, George T. Curlin. June 1979. 25 p.
- No. 25. Investigation of outbreak of dysentery due to *Shigella sonnei* in a small community in Dacca by M.I. Huq. June 1979. 21 p.
- No. 26. Indigenous birth practices in rural Bangladesh and their implications for a maternal and child health programme by Shushum Bhatia, J. Chakraborty, A.S.G. Faruque. July 1979. 24 p.
- No. 27. Isolation, purification and characterization of a *Shigella* phage by M.I. Huq, M.A. Salek. July 1979. 18 p.
- No. 28. Growth and development studies: Meheran by Moslemuddin Khan, George T. Curlin, J. Chakraborty. July 1979. 33 p.
- No. 29. Report on reactigenicity and immunogenicity of Wellcome Cholera Toxoids in Bangladeshi volunteers by Robert E. Black, Md. Yunus, Abu Eusof, Ansaruddin Ahmed, M.R. Khan, David A. Sack. July 1979. 55 p.
- No. 30. *Strongyloides Stercoralis* Larvae recovered from patients with diarrhoea and dysentery by G.H. Rabbani, Robert H. Gillman, Asam Islam. July 1979. 18 p.
- No. 31. The condom in rural Bangladesh - A special efforts is needed by Douglas Buber, Makhlisur Rahman, J. Chakraborty. Aug 1979. 14 p.
- No. 32. The Matlab contraceptive distribution project by Makhlisur Rahman, W.H. Mosley, Atiqur Rahman Khan, A.I. Chowdhury, J. Chakraborty. Dec 1979. 119 p.
- No. 33. Epidemiologic study of dysentery cases of Dacca Urban Area by Moslemuddin Khan, Md. Shahidullah. Jan 1980. 30 p.
- No. 34. The gut as an immune organ by A.M. Molla. Feb 1980. 51 p.

- No. 35. Microbiological surveillance of intra-neighbourhood El Tor cholera transmission in rural Bangladesh by W.M. Spira, Y.A. Saeed, M.U. Khan, M.A. Sattar. Mar 1980. 39 p.
- No. 36. Lobon-gur (common salt and brown sugar) oral rehydration solution in the diarrhoea of adults by M.R. Islam, W.B. Greenough III, M.M. Rahaman, A.K. Azad Chowdhury, D.A. Sack. Apr 1980. 19 p.
- No. 37. Utilisation of a diarrhoea clinic in rural Bangladesh: Influence of distance, age and sex on attendance and diarrhoeal mortality by M. Mujibur Rahaman, K.M.S. Aziz, M.H. Munshi, Yakub Patwari, Mizanur Rahman. June 1980. 22 p.
- No. 38. Birth care practice and neonatal tetanus in a rural area of Bangladesh by M. Shafiqul Islam, M. Mujibur Rahaman, K.M.S. Aziz, M.H. Munshi, Mizanur Rahman, Yakub Patwari. Jul 1980. 19 p.
- No. 39. Hours of onset of cholera classical and El Tor and diarrhoea by Moslemuddin Khan. Aug 1980. 18 p.
- No. 40. Socio-economic differentials in mortality in a rural area of Bangladesh by Stan D'Souza, Abbas Bhuiya, Mizanur Rahman. Nov 1980. 31 p.
- No. 41. Reduction of neonatal mortality by immunization of non-pregnant women and women during pregnancy with aluminum adsorbed tetanus toxoid by Makhlisur Rahman, Lincoln C. Chen, J. Chakraborty, Md. Yunus, A.I. Chowdhury, A.M. Sarder, Shushum Bhatia, George T. Curlin. Jan 1981. 25 p.
- No. 42. Are there barefoot doctors in Bangladesh: A study of non-government rural health practitioners by A.M. Sarder, Lincoln C. Chen. Jan 1981. 28 p.
- No. 43. Factors related to acceptance of tetanus toxoid immunization among pregnant women in a maternal-child health programme in rural Bangladesh by Makhlisur Rahman, Lincoln C. Chen, J. Chakraborty, Md. Yunus, A.S.G. Faruque, A.I. Chowdhury. Jan 1981. 33 p.

D. Special Publication:

- No. 1. Management of cholera and other acute diarrhoeas in adults and children - World Health Organization. Sept 1977 (2nd Rep. Nov 1980). 26 p.
- No. 2. Index to CRL publications and scientific presentations 1960-1976 by Susan Fuller Alamgir, M. Shamsul Islam Khan, H.A. Spira. Aug 1978. 70 p.
- No. 3. Working manual for *E. coli* enterotoxin assay and Elisa assay for rota virus antigen by M.I. Huq, D.A. Sack, R.E. Black. Apr 1979. 32 p.
- No. 4. Index to CRL publications and scientific presentations 1977-1978 and addenda for 1962, 1964-1976 by M. Shamsul Islam Khan. Jan 1980. 69 p.
- No. 5. ICDDR,B Progress report 1979-1980. Apr 1980. 60 p.
- No. 6. The treatment of acute diarrhoea in children: an historical and physiological perspective by Norbert Hirschhorn. May 1980. 68 p.
- No. 7. Campylobacter Fetus SSP Jejuni: a laboratory manual by Martin J. Blaser. June 1980. 40 p.
- No. 8. Standing orders for evaluation and treatment of patients with diarrhoea symptoms who come to the Travellers Clinic at ICDDR,B. Sept 1980. 11 p.
- No. 9. Proceedings of the National Workshop on Oral Rehydration. Oct 1980. 32 p.
- No. 10. Proceedings of the Consultative Group meeting of the International Centre for Diarrhoeal Disease Research, Bangladesh. Nov 1980. 58 p.
- No. 11. A review of findings on the impact of health intervention programme in two rural areas of Bangladesh by Makhlisur Rahman, Stan D'Souza. Nov 1980. 30 p.
- No. 12. Training manual on treatment and prevention of diarrhoea-instruction to trainers. Dec 1980. 20 p.

E. Monograph Series:

- No. 1. Kinship in Bangladesh by K.M. Ashraful Aziz. May 1979. 250 p.
(Price Tk. 85.00/£5.00/US \$ 10.00).

F. Thesis and Dissertation:

- No. 1. Chlorpromazine as a therapeutic antisecretory agent in cholera and related diarrhoeas by G.H. Rabbani. Dec 1980. 73 p.
- No. 2. Village practitioners of Bangladesh: their characteristics and role in an oral rehydration programme by A.S.M. Mizanur. Feb 1981. 72 p.

G. GLIMPSE: ICDDR,B Monthly Newsletter. Vol. 1, No. 1, Jan 1979-

