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DEMOGRAPHIC STUDIES IN RURAL EAST PAKISTAN

Third Year
May, 1968—April, 1969

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INTRODUCTION

The Pakistan-SEATO Cholera Research Laboratory, as a part of cholera vaccine field trials, has been maintaining a regular registration of births, deaths, and migrations, in a population of over 110,000 persons in 132 villages in Comilla district in rural East Pakistan since May 1966. Detailed analyses of the first year (May 1966-April 1967) and second year (May 1967-April 1968) of study have already been published separately.

This paper gives an analysis of the data obtained from the third year of registration (May 1968-April 1969) and in addition examines some of the trends that are appearing after 3 years of observation.

A description of the area and the methods and definitions were discussed in the previous reports. In this third year an expansion of the field trial to include 101 new villages resulted in a change in the definition of the "study area". This change only affects the definition of a migrant who is coming into or out of the "study area". As a result, however, the in and out migration rates in the third year are not directly comparable to the first 2 years reports in terms of total migration, however net migration patterns should not be affected significantly.

RESULTS

There were 111,748 persons in the 132 villages at the time the census was taken in April 1966. As illustrated in Table I, the population reached 116,909 by the middle of the 3rd year, giving an average rate of increase of 1.7%per year. This adjusted mid-year population for 1968-69 has been obtained by adding the live-births and immigrants and subtracting deaths and emigrants with adjustment of age for the two and one half year period of observation.

Table 2 summarizes the total live-birth, deaths, and migrations for three consecutive twelve month study periods. The crude bith-rate which fell from 47.1 per 1000 in 1st year to 45.4 in 2nd year again rose to 46.6 per 1000 in the 3rd year. The crude death rate increased from 15.0 to 16.6 per 1000 in 2nd year and decreased to 15.0 in 3rd year. There was a significant net outmigration in the first 2 years, however this trend was not seen in the third year. The average crude birth and death rates for the three consecutive years were 46.4 and 15.6 per 1000, respectively, which gave a crude rate of natural increase of 3.08 percent per year during the three year period.

MORTALITY

Figure 1 shows the weekly mortality for 3 consecutive years. This defines a seasonal pattern of deaths with a higher incidence during the months of October through January. The seasonal pattern was similar for all ages and for infants under one. The seasonal pattern

of infant deaths is in part a reflection of the high neonatal mortality since these are the months when the largest number of births are occurring.

Table 3 shows the classification of the 675 infant deaths recorded during the 3rd year by neonatal and post-neonatal period. More than half of the infants death occurred in the neonatal period.

Table 4 shows the infant and neonatal mortality rates for the three consecutive years. This indicates that, on the average, 7% of the newborns die in the 1st month of life and 12% die by the end of the first year. Males had a higher mortality than females in the neonatal period, reflecting a fundamental biologic characteristic seen in all populations. In the post-neonatal period, female mortality exceeded male mortality, apparently due to the cultural pattern of parents providing better care for male children.

Table 5 shows the distribution of deaths by age and sex for the 3rd year and the age specific death rates. The excess mortality in female children extends to the age group 1-4. This male female difference has been seen in preveious years.

The average age-sex specific mortality rates for the three consecutive years are presented in Figure 2. This shows the very high infant mortality, followed by a sharp fall in mortality in pre-school children, reaching a minimum at age 10-14. Thereafter the death rate rises slowly up to age 35-39. In the older population the death rate increases exponentially with age. Over the 3 years of observation the average infant mortality rate was 120 per 1000 livebirths for both sexes with an excess deaths among males. In the 1-4 year age group, the female mortality averaged 30% higher than the males. Again females had a higher mortality over males in the childbearing age group 10-39 years ; thereafter, male and female mortality remained about equal.

Abridged life tables were calculated for both sexes and for males and females from the averaged mortality data of the three consecutive years of observations. The conventional method was used for constructing the abridged life tables : the age specific death rates (${}_nm_x$) were converted to life table death rates (${}_nq_x$) by the Reed and Merrel standard Table. The results summarized in Table 6 indicate that expectation of life at birth in this population is 50.33 years. At age 5, expectation of life is 57.12 years. The life expectancy is slightly higher for males than for females.

FERTILITY

During the third twelve month period the field workers reported the termination of 5,991 pregnancies. Table 7 gives the outcome of the pregnancy and the age of mother. The 5,991 pregnancies resulted in 5,451 livebirths ; 2,772 were males and 2,554 were females giving a sex ratio at birth of 103.4 males per 100 females. Fifty-six pregnancies resulted in multiple births, giving a ratio of one multiple birth per 107 pregnancies. A still-birth has been

defined a child born dead in the seventh month of pregnancy or later as reported by the family. There were 208 stillbirths including twins ; 377 pregnancies were reported terminating at less than seven months. The actual frequency of miscarriages or abortions is unknown since early pregnancies are not identified.

Figure 3 shows the seasonal pattern of births over the 3 years of observation. There is a consistent seasonal trend with pregnancies terminating most frequently in the months of October through January. Over all, 45% of the pregnancies terminated during this period.

The age specific live-birth rates for the three consecutive years are given in Table 8. The general fertiliy rate and gross reproduction rate has fallen slightly during this three year period. On the average there were 170 livebirths per 1000 women ages 10-49. The maximum livebirths occurred in the age goroup 20-24 with a rate of 332 per 1000 women followed by 308 per 1000 at age 25-29.

Table 9 shows a calculation of gross and net reproduction rates and the intrinsic rate of natural increase, taking the average of three years data. The gross reproduction rate was 3.18. Taking into account the mortality experience of this population, the calculated net reproduction rate was 2.34. This indicates that an East Pakistani rural woman passing through her childbearing years could replace herself on the average by 2.34 similar women in the next generation. The average length of a generation comes to 26.90 years. With this net reproduction rate and mean length of generation the intrinsic rate of growth comes to 3.2% per year.

Migration

The migration rates by age and sex for 1968-69 are shown in Table 10. In the 3rd year the net out-migration of males was insignificant, even in the 15—34 year age group. This is a change from previous years where males showed a higher net out migration. Females age 10-19 show the highest in and out-migration, mainly due to marriage, without any significant net change.

In the 3rd year there was a fall in the over all out-migration. For the 1st and 2nd years the net rates for out-migration were 1.47% and 1.91% respectively, but only 0.16% in the third year. The reasons for this change are not apparent. In part it reflects a change in the definition of the "study area", however in part it may reflect a real decrease in migration to the cities due to the political and economic changes of the country during this third year of study.

FIGURE 1

DEATHS BY WEEK 1966 - 1969

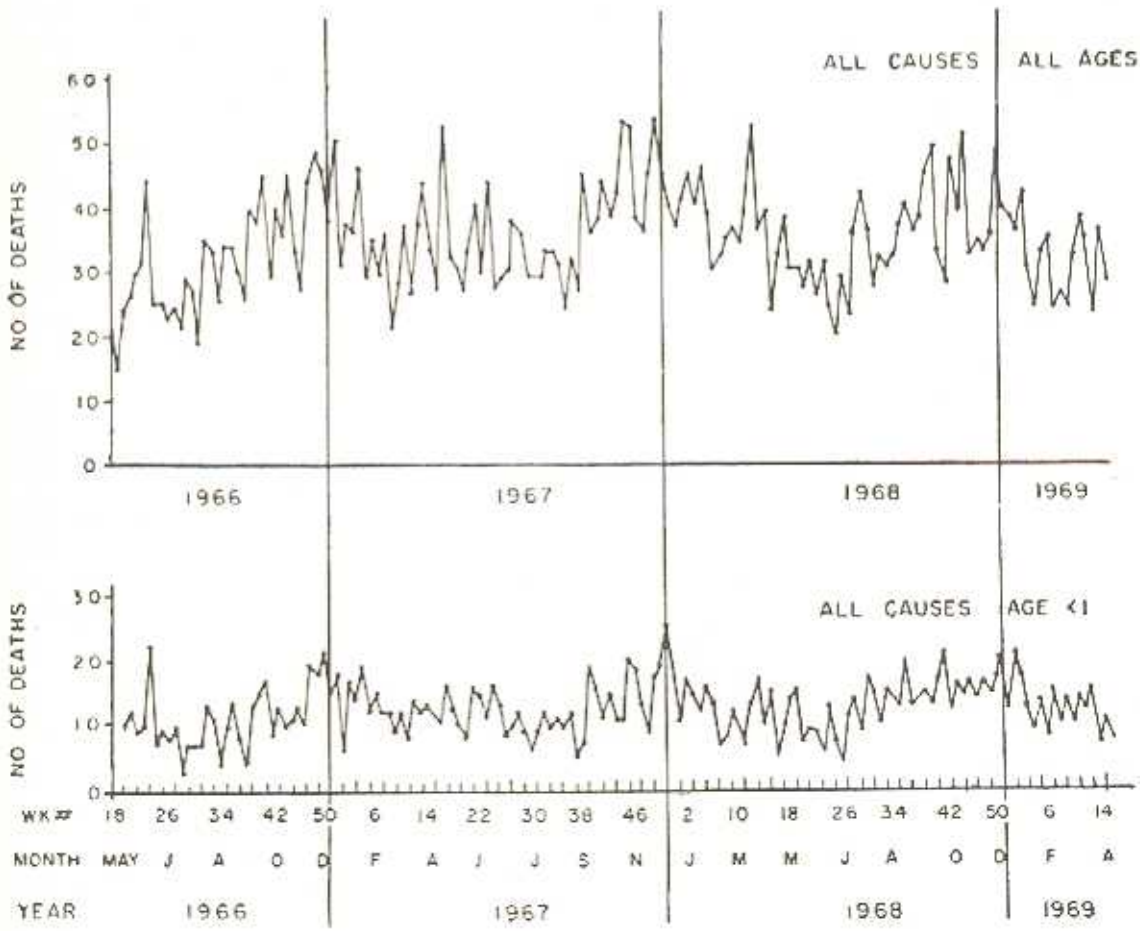

FIGURE 3

NUMBER OF BIRTHS BY MONTH

1966 - 1969

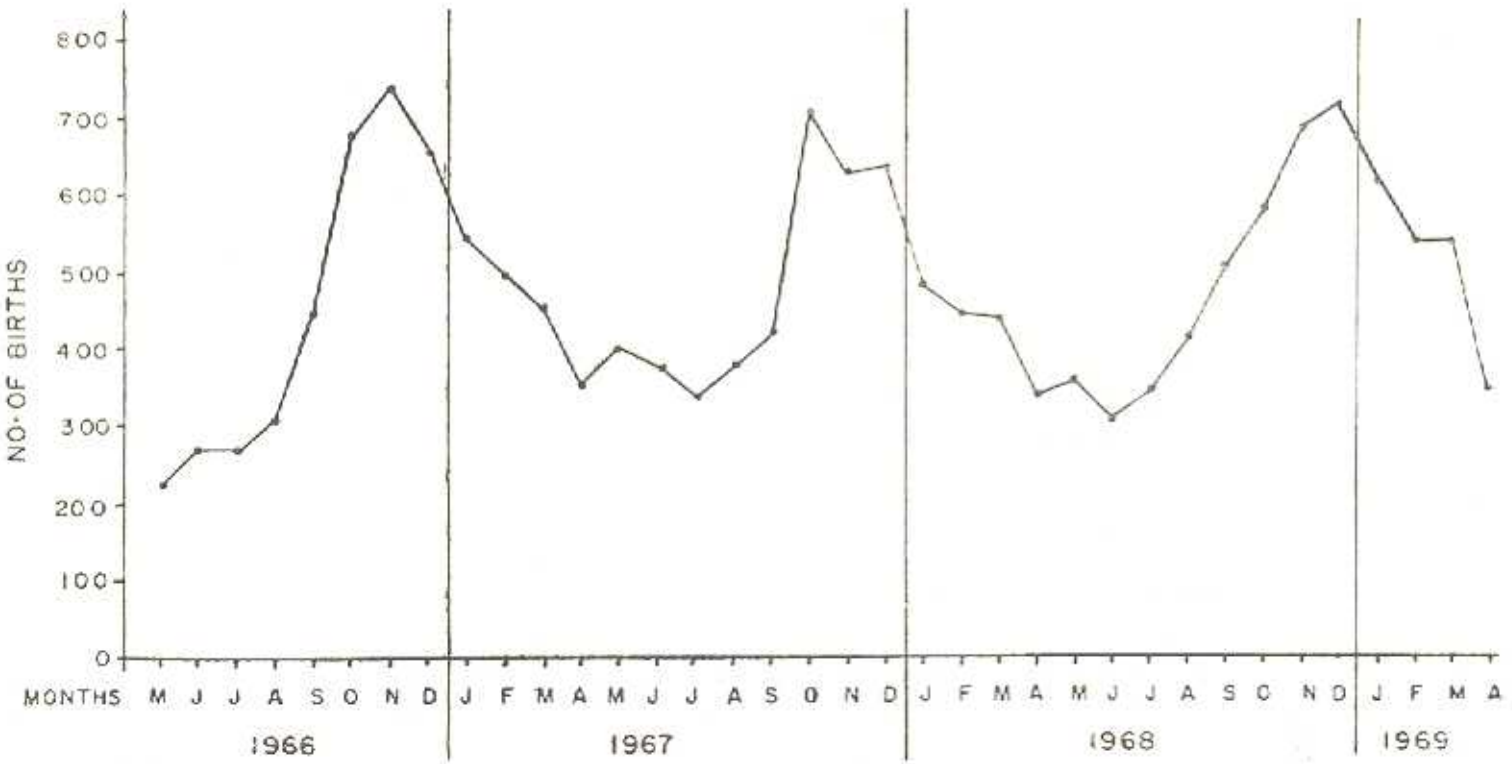

TABLE I

ADJUSTED MID-YEAR POPULATION
Year 1968-69

Age	Male	Female	Total	Sex ratio	Cumulative percent		
					Male	Female	Total
<1	2619	2535	5154	103.3	4.45	4.37	4.41
1—4	7434	7180	14614	103.5	17.06	16.76	16.91
5—9	10566	10154	20720	104.1	34.98	34.28	34.63
10—14	9123	8048	17171	113.4	50.45	48.17	49.32
15—19	4909	4344	9253	113.0	58.78	55.67	57.23
20—24	2999	4632	7631	64.7	63.87	63.66	63.76
25—29	2827	4814	7641	58.7	68.66	71.97	70.30
30—34	3395	4013	7408	84.6	74.42	78.89	76.63
35—39	3352	2982	6334	112.4	80.11	84.35	82.05
40—44	2833	2399	5232	118.1	84.91	88.17	86.53
45—49	2205	1691	3896	130.4	88.65	91.09	89.86
50—54	2075	1794	3869	115.7	92.17	94.19	93.17
55—59	1308	950	2258	137.7	94.39	95.83	95.10
60—64	1331	1160	2491	114.7	96.65	97.83	97.23
65—69	763	516	1279	147.9	97.94	98.72	98.33
70& over	1215	743	1958	163.5	100.00	100.00	100.00
All ages	58954	57955	116909	101.7			

TABLE 2

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

Events	Rate per 1000			
	1966-67	1967-68	1968-69	Average for three years
Livebirths	47.1	45.4	46.6	46.4
Deaths	15.0	16.6	15.0	15.6
Immigration	16.7	35.0	28.0	—
Emigration	31.4	47.3	29.6	—

TABLE 3

INFANT AND NEONATAL DEATHS FOR 1968–69

Age	Number of Deaths		
	Male	Female	Total
Neonatal			
(a) 0—7 days	159	112	271
(b) 8-29 days	99	82	181
Post Neonatal			
1 month-11 month	102	121	223
All Infant Deaths	360	315	675

TABLE 4

INFANT AND NEONATAL DEATH RATE PER THOUSAND LIVEBIRTHS FOR 3 CONSECUTIVE YEARS

Age	1966-67			1967-68			1968-69			Mean for 3 years		
	M	F	T	M	F	T	M	F	T	M	F	T
Neonatal												
(a) 0-7 days	37.9	29.1	33.5	44.9	41.5	43.2	57.5	41.8	49.8	46.8	37.5	42.3
(b) 8-29 days	27.6	24.5	26.0	28.3	20.8	24.6	35.8	30.7	33.3	30.7	25.4	28.0
Post Neonatal												
1 month-11 month	52.0	50.5	51.2	53.9	61.5	57.6	36.9	43.6	41.0	47.4	52.2	49.8
All Infant Deaths	117.5	104.1	110.7	127.1	123.8	125.4	130.2	117.8	124.1	124.9	115.1	120.1

TABLE 5

DISTRIBUTION OF PERSONS WHO DIED DURING MAY 1968-APRIL 1969 ACCORDING TO THEIR AGE AND SEX WITH AGE SPECIFIC DEATH RATE

Age	Number			Rate/1000		
	Male	Female	Total	Male	Female	Total
<1	360	315	675	130	118	124
1—4	167	181	348	23	25	24
5—9	42	38	80	4	4	4
10—14	15	15	30	2	2	2
15—19	8	14	22	2	3	2
20—24	8	18	26	3	4	3
25—29	8	23	31	3	5	4
30—34	11	19	30	3	5	4
35—39	13	14	27	4	5	4
40—44	13	14	27	5	6	5
45—49	19	18	37	9	11	9
50—54	32	33	65	15	18	17
55—59	23	19	42	18	20	19
60—64	34	40	74	26	34	30
65—69	32	27	59	42	52	46
70& over	104	78	182	86	105	93
Total	889	866	1755	15.1	14.9	15.0

TABLE 6

AVERAGE LIFE EXPECTANCY ($^{o}e_{x}$) AT SPECIFIED AGES BY SEX (BASED ON 1966-67, 1967-68, AND 1968-69 DEATH REPORTS)

Age	Both sexes	Male	Female
0	50.33	51.03	49.50
1	56.16	57.27	54.90
5	57.12	57.70	56.54
10	53.22	53.82	52.63
15	48.74	49.34	48.13
20	44.44	44.81	43.82
25	40.29	40.45	39.66
30	36.05	36.02	35.41
35	31.73	31.70	31.60
40	27.32	27.29	26.82
45	23.20	23.30	22.69
50	19.29	19.37	18.73
55	15.58	15.78	15.00
60	11.85	12.11	11.32
65	8.26	8.40	7.86
70	4.59	4.61	4.55

TABLE 7

DISTRIBUTION OF WOMEN WHO TERMINATED PREGNANCY FROM MAY 1968-APRIL 1969 ACCORDING TO THEIR AGE AND OUTCOME OF PREGNANCY

Age	Miscarriage (<7m)	Stillbirth	Twin Stillbirth	Livebirth male	Livebirth female	Twin livebirth male	Twin live birth female	Twin livebirth male & female	Twin-Male & stillbirth	Twin-female & stillbirth	Triplet-female & 2 stillbirth	Total
10-14	14	7	—	69	98	—	—	—	—	1	—	189
15-19	66	45	—	453	424	1	3	1	—	—	—	993
20-24	95	62	—	861	760	6	6	6	1	—	—	1797
25-29	85	41	1	693	692	2	1	7	1	1	—	1524
30-34	74	33	—	448	444	4	1	3	1	2	1	1011
35-39	30	14	1	153	144	1	1	—	1	—	—	345
40-44	11	3	—	34	58	—	—	2	—	—	—	108
45+	2	1	—	9	12	—	—	—	—	—	—	24
Total	377	206	2	2720	2632	14	12	19	4	4	1	5991

Male livebirths = 2771
Female livebirths = 2680

Total livebirths = 5451

Sex Ratio at birth = 103.4

TABLE 8

AGE SPECIFIC FERTILITY RATE FOR THREE CONSECUTIVE YEARS

Age	Rate per thousand			Mean
	1966-67	1967-68	1968-69	
10—14	8.6	8.6	13.8	10.5
15—19	238.6	232.3	203.9	224.4
20—24	331.4	333.6	330.9	332.0
25—29	306.9	297.3	319.1	307.9
30—34	248.8	204.3	225.3	225.5
35—39	135.8	127.9	120.1	128.6
40—44	50.0	44.2	41.8	45.1
45—49	15.4	19.3	14.2	16.3
General fertility rate (10-49)	177.6	166.9	165.6	169.9
Gross reproduction rate	3.29	3.122	3.126	3.178

TABLE 9

GROSS AND NET REPRODUCTION RATE WITH INTRINSIC RATE OF NATURAL INCREASE (CALCULATED FROM THE THREE YEARS DATA)

Age	Female population (3 years)	Live births female (3 years)	Daughters per 1,000	Pivotal age	Proportion surviving the Pivotal age	Women surviving to given age	Person years
10—14	21674	116	5.35	12.5	0.77298	4.14	51.75
15—19	12400	1341	108.15	17.5	0.76399	82.63	1446.02
20—24	13473	2170	161.06	22.5	0.75015	120.82	2718.45
25—29	14233	2186	153.57	27.5	0.73529	112.92	3105.30
30—34	11428	1264	110.61	32.5	0.71893	79.52	2584.40
35—39	8701	558	64.13	37.5	0.70290	45.08	1690.50
40—44	6990	170	24.32	42.5	0.68388	16.63	706.77
45—49	5091	44	8.64	47.5	0.65548	5.66	268.50
Total	93,990	7849	635.83			467.40	12571.69
5x Total			3179.15			2337.00	62858.45

Mean length of generation	=26.90 years
Gross reproduction rate	=3.18
Net reproduction rate	=2.34
Intrinsic rate of growth	=3.2% per year

TABLE 10

MIGRATION RATE FOR THE YEAR 1968-69 BY AGE AND SEX

Age	Male (%)		Female (%)		Total (%)	
	In	Out	In	Out	In	Out
0—4	1.76	2.07	2.05	2.07	1.90	2.07
5—9	1.41	1.80	1.48	1.59	1.42	1.69
10—14	2.26	3.37	3.60	5.47	2.89	4.35
15—19	4.38	6.93	9.76	7.41	6.91	7.15
20—24	7.67	9.74	3.04	3.63	4.86	6.03
25—29	8.89	6.40	1.89	1.97	4.48	3.61
30—34	4.98	3.36	1.70	1.47	3.20	2.34
35—39	3.61	2.17	1.24	1.07	2.49	1.78
40—44	3.42	2.08	0.75	0.88	2.20	1.50
45—49	1.72	1.63	1.24	0.53	1.51	1.16
50—54	2.02	2.16	1.06	1.17	1.58	1.71
55—59	1.30	0.84	1.47	0.32	1.37	0.62
60—64	1.65	0.82	1.64	1.47	1.65	1.12
65—69	1.44	0.92	1.35	1.36	1.41	1.09
70+	0.91	0.82	2.56	1.75	1.53	1.17
All	2.98	3.21	2.61	2.71	2.80	2.96