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INFANT MORTALITY IN GREATER BOMBAY

The study of infant mortality has a long history and the major determinants are well-known.[1] This article does not aim at revealing new factors influencing infant mortality but rather at indicating the most important ones in the case of the population of a large Indian city. It has been repeatedly pointed out that reduction of infant and child mortality is one of the necessary pre-conditions for acceptance of the idea of a small family, particularly in societies which for many reasons continue to attach major importance to male offspring and their survival to parents' old age.

Studies conducted in different parts of the world confirm that the average number of surviving children is higher among families who accepted contraception than among the general population.[2] Practice of birth control is generally lower among women who experienced death of previously born children.[3] On the other hand, the close interrelationship between fertility and infant and childhood mortality, well established in the history of countries with low mortality levels and in developing countries at the present time, indicates that large families with many children are a major obstacle to effective improvement of child health, prevention of disease and reduction of risk of premature death.

To compute infant mortality rates, registration of live births and of deaths before the first birthday is essential. In this respect, Indian data are, as is the case in many other developing countries, both incomplete and inaccurate. A few large cities with well organized health services and administration are probably the only exception. Even here, however, disturbing factors are operating ; due to inaccuracy in application of the international definitions of live-birth, stillbirth and infant death, omissions and misreportings are probably more frequent than in developed countries, particularly in cases of deliveries taking place outside hospitals and maternity homes, not attended by a medical doctor or trained nurse or midwife. Such deliveries, very frequent in rural India, constitute about 40 per cent of total deliveries in Indian larger towns (Table 1) but are relatively rare in Greater Bombay. During the later 1960's, almost 90 per cent of total reported births were hospitalized and it may be expected therefore that the reliability of records is better here than elsewhere in India.

Annual records and reports maintained by the Public Health Department of Greater Bambay give yearly data on registered live births and infant deaths, sub-dividing the latter into

'born in Greater Bombay' and 'born out side of Greater Bombay'. Infant mortality rates for the years 1960-1968, both adjusted ones for 'out-born' and unadjusted, show a relatively wide fluctuation without any well-marked significant tendency towards improvement (Table 2). In repsect of age, however, a very significant improvement of mortality rates during the later part of infancy (6-11 months) is traceable, whereas neo-natal rates (0-27 days) only fluctuated around approximately 45 deaths per 1000 live births throughout the period under review. Mortality during the earlier months of the post-neo-natal period (4 weeks to 5 months) seems to have taken a more favourable turn recently.

Greater Bambay is administratively sub-divided into three areas : City, Suburbs and Extended Suburbs, which differ from one another greatly in social, demographic and economic characteristics. The density of population is extremely high in the overcrowded City and relatively low in the Extended Suburbs which have, of late, become a housing centre and industrial area. During the intercensal period 1951-1961 the average annual rates of growth for the City, Suburbs and Extended Suburbs were 1.7, 6.8 and 7.6 respectively.[4] Differentials between the areas in demographic characteristics are seen from table 3. Sex ratio according to the 1961 census was the highest in the City (1,507 males per 1,000 females) and somewhat smaller in Suburbs (1,358) and Extended Suburbs (1,300). Literacy is higher in Bombay than in Maharashtra State as well as in India, and again higher in the City than in Suburbs (Table 3-A).. Overall work participation rates for males are somewhat higher in the City (63.1) than in Suburbs (58.6). The industrial composition of workers reveals only a slight difference between the City and Suburbs, particularly in the dominance of the tertiary sector in the City (Table 3-B).

Housing conditions are somewhat better in suburban areas than in the City. The average number of persons per household was, according to the 1961 census, 5.6 in the City and 4.7 in suburban areas; the averge number of persons per room was 4.1 and 3.3 respectively. However, it may be pointed out that 72.9 per cent of households in the City lived in one room with the average number of persons per household being 5.4. Conditions were somewhat better in suburban areas where corresponding rates were 71.3 and 4.3.[5] According to an expert committee on low-cost housing set up by the Government of India, the estimated shortage of'pucca' residential buildings in Greater Bombay in 1970 was 568,000.[6] According to a survey carried out in 1969 by the Bombay Municipal Corporation, over 108,000 huts accommodated about 632,000 persons, giving an average of 6.3 persons per hut. Only 1,333 W.C's and 432 water taps were available for the inhabitants of the hutment colonies.[7] Probably 15 per cent of the total Bombay population consisted of hutmen, slum dwellers or houseless persons. There is no evidence available to show the distribution of this group between the City and suburban areas.[8]

Overcrowding, insanitary housing and environmental conditions are well-known factors contributing to the spread of diseases, particularly infections. In this respect differential infant mortality rates (Table 4) seem to reflect the impact of the conditions mentioned in the previous paragraph. Differences in IMRs between the three areas may not be fully genuine, the error partly originating

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almost equal in 1968 (141.5 and 144.0 per 100,000 population respectively). In the Extended Suburbs, however, the incidence rate was only 97.7 per 100,000 papulation.[9] Tuberculosis and hepatitis had significantly higher incidence rates in the City and Suburbs as well.

Infant mortality rates have a distinctive seasonal variation. In Greater Bombay the peak of mortality falls in the monsoon period (Table 5). Contrary to experience of low infant mortality countries, the early neo-natal and neo-natal mortality rates (0-6 days and 0-27 days) have a marked seasonal variation as well. From July through September the mortality rates exceed the average by 10 to 23 per cent with a wellmarked peak in August. Post-neo-natal mortality rates (28-363 days) have a much larger period of increased levels, extending from April through August with a peak in July, excess mortality ranging from 7 to 29 per cent of annual average.

From the available data it is not possible to find out the extent to which particular diseases contributed to the increased mortality of infants during the monsoon period. It may, however, be presumed that respiratory diseases (pneumonia) and diseases of the digestive system (diarrhoea, enteritis, dysentery) are more frequently a cause of death during that period of the year.[10] Annual reports of the Health Department of the Municipal Corporation of Greater Bombay give a broad classification of the causes of infant deaths on the basis of which we can at least establish three categories: *infections* (smallpox, measles, diarrhoea, enteritis, dysentery, diseases of respiratory system, convulsions, poliomyelitis); *congenital malformations* (which also include diseases of early infancy)[11]; and *others.* With all the limitations of such a broad classification, data for two 'normal' years 1966 and 1968, and for two years of increased infant mortality, 1965 and 1967, can be compared (Table 6-A).

Neo-natal deaths accounted for almost 56 per cent of total infant deaths during the two 'normal' years and for 51 per cent during the two years of increased mortality. Out of 100 early neo-natal deaths, 9-10 were due to infections and 69-77, to congenital malformations and diseases of early infancy. The structure of causes of deaths changes rapidly with infant's age. In the latter part of the neo-natal period infections were responsible for approximately one third of deaths and, in the post-neo-natal period, two thirds of total deaths were recorded as due to infective diseases. Characteristically enough, the proportion of deaths caused by infections is high even in the neo-natal period of life, a phenomenon which coincides with the housing, sanitary and other environmental conditions described in the preceding paragraphs and at the same time explains the existence of such a wellmarked seasonal variation in neo-natal mortality.[12]

In fantmortality rates by leading infective causes of death during 1962-1968 demonstrate the susceptibility of the population to attacks of epidemics. The years 1965-1967 show an outbreak of smallpox and measles epidemics among infants, but also increased mortality from respiratory diseases (Table 6-B). No data are available to show the interrelationship between malnutrition, undernutrition and infant mortality. However, a study conducted by UPS in Greater Bombay in 1965 on the pattern of feeding of infants [13] gives some important indications) about the nutritional situation. According to the findings, nearly 50 per cent of the mothers started weaning by the time the child was three months old and 75 per cent by the time the child was six months old. Nearly 83 per cent of the mothers gave as the main reason for weaning that they had insufficient milk. On the other hand, nearly 26 per cent of mothers continued to nurse their children beyond one year of age (with supplementary food). Generally an early introduction of supplementary protein-rich diet in child's nutrition is recommended. The implementation, however, depends on the availability of such food, awareness of the mother and willingness

to change the traditional methods of nursing and feeding - in other words, on the education of the public and mothers in particular. The Protein Foods Association of India conducts campaigns in urban areas where the protein-rich foods are comparatively easier to obtain in the market. A study conducted by this organisation in Gujarat and Maharashtra on the caloric and protein intake by pre-school childern (six months to five years) estimated the need of 1,31 1 calories and protein requirment as 23.4 grammes per child per day. The actual intake was found to be 709 and 552 calories, protein intake was estimated at 12.8 and 10.7 grammes in Gujarat and Maharastra respectively. The report also mentioned that the deficiency was not completely wiped out in the families with higher household incomes. [14]

As an indirect indicator of impact of malnutrition on infant mortality, the incidence of diarrhoea may be used. Incidence rates of mortality are not available; however, the death rates in Table 6-B indicate that at least 10 per cent of total infant mortality is due to or associated with malnutrition, and, most probably, with lack of elementary food hygiene as well. Many of these deaths are preventable - the major obstacle probably being not lack of supplementary food but neglect, ignorance of mothers of the elementary principles of child feeding and of prevention of gross faecal contamination. Incidence of measles and smallpox indicates that even in a city with relatively very good health facilities and maternal and child welfare services easily accessible and entirely free of charge, immunization programmes have not achieved complete coverage of the population.

Graeter Bombay statistics of infant deaths give no details which would enable a study of differential mortality with respect to social, economic and cultural characteristics of the families or to age and parity characteristics of the mothers.[15] Data of this type have to be collected by special sample surveys. One of the possible sources of such information may be sought in the surveys primarily oriented to study fertility levels. History of pregnancies is recorded as a routine and frequently the survival of live-born childern is followed up with age at death recorded for those who died in the past. If proper attention is given to such surveys and the reference period is restricted to a few years preceding the interview, extent of 'recall lapse' and other deficiencies may be reduced substantially. The major disadvantage of this particular source of information from the point of view of infant mortality analysis is the limited scope of data restricting the possibility of cross-tabulation with respect to several influencing factors. Vague delimitation of infant's age at death will most probably be a very common feature and, therefore, interpretations of the terms 'neo-natal' and 'post-neo-natal' cannot be made with absolute accuracy.

A study of fertility in Greater Bombay was conducted during 1966 by the UPS[16] ir which a sample of 1872 married women was interviewed. Results of the survey are used in the following paragraphs to study some of the social, economic, cultural and biological determinants of infant mortality. To reduce the impact of possible recall lapse, the sample was restricted tc 4466 women who reported a termination of pregnancy during the years 1960-1965. During thi period, 7779 pregnancies (1.74 per woman) had terminated as follows :

7166 (= 92.1 percent) by single live birth,
439 (= 6.1 per cent) by abortion
109 (= 1.4 per cent) by strillbirth
65 (= 0.4 per cent) by twin births, out of which in 62 pregnancies both children were born alive and in the remaining three on child was liveborn and one, stillborn.

Abortion rates and stillbirth ratios established by this study were undoubtedly on the low side. This is partly due to the methodology of surveys of this type: automatically excluded from the sample are all women who died at the time of delivery or during the period reviewed. It may be assumed that in the case of maternal death, probabilities of stillbirth and for that matter, chances of infant's death as well, are higher than in the general population. It is not, however, possible to estimate the extent of this omission and its impact on stillbirth ratios and infant mortality rates.[17] Major omissions are undodtedly due to non-reporting of abortions and possibly also to concealment of stillbirth. The age and parity specific ratios (Tables 7&8) do not deviate from a generally observed pattern; the higest rates are found with the youngest mothers and towards the end of the child-bearing period. Somewhat irregular is the trend in respect of the order of pregnancy, though every high orders show a distinctive increase of both abortion rates and stillbirth ratios. No further analysis was conducted because of the strong suspicion of under-reporting.

Infant mortality rates calculated on the basis of survey data are somewhat different from the usual ones, being birth-cohort mortality rates rather than conventional infant mortality rates. Consequently the calendar year of death may be year of birth or the following year. Similar definitions apply to neo-natal and post-neo-natal mortality rates.

Probabilities of infant death are rather consistent with IMRs found for Greater Bombay, considering the size of the sample involved. The annual average for the period was 73.6 infant deaths per 1000 children born alive during 1960-1964 with 49.3 per cent of neo-natal deaths (Table 9). With respect to biological determinants, the picture is also consistent with well known tendencies. The youngest and oldest mothers experienced the highest infant mortality in both its components, i.e. neo-natal and post-neo-natal. Age and pregancy order being closely interrelated, the highest infant and neo-natal mortality rates were found in the first pregnancy, whereas the lowest ones were for the fifth and sixth pregnancies. For post-neo-natal mortality, the rates were somewhat higher than average throughout the first to fourth pregnancies. The total number of infant deaths being rather small, not much significance is to be attached to the variations of the rates. The calculations were carried out to examine whether the findings agree with known results of other investigations rather than to establish representative rates for Greater Bombay.

The main aim of the analysis of results of 'Greater Bombay Fertility Survey' in respect of infant mortality was to study the impact of its cultural, socio-economic and environmental determinants in the metropolitan population. Because similar surveys are conducted by IIPS in rural areas of India, it may be possible in due time to compare differentials between rural and urban (metropolitan) results. Owing to the limited number of observations (444 infant deaths) the analysis was carried out by using different sub-groups of population. Total infant mortality rates for the period 1960-4 were used, specific by age of mother, as the standard. Age structures of women 'exposed' were known for different strata (by religion, social class, education, place of origin). Theoretical (expected) numbers of infant deaths were then calculated for each sub-group under the hypothesis that the social (cultural, etc.) characteristic does not bear any effect on infant mortality level. By comparing observed and expected numbers of infant deaths, a standardized ratio was obtained as follows :

$$\text{SMR} = \frac{\text{observed number of infant deaths in sub-group}}{\text{expected number of infant deaths in sub-group}} \cdot 100$$

The value of SMR exceeded 100 in cases of increased mortality in the particular sub-group of population and was less than 100 in the opposite case. A simple test of significance with 5 per cent level of significance was applied throughout the study. A similar procedure was followed for the analysis of neo-nata! and post-neo-natal mortality.

Infant Mortality by Educational Level of Mother : Educational level was found to be the strongest, most effective single factor determining the level of infant, neo-natal and post-neo-natal mortality (Table 13). Illiterate women had the highest rates, exceeding the overall infant mortality by 27 per cent (post-neo-natal mortality by almost 35 per cent). The lowest rates were found for women with education higher than elementary, and, as expected, with strongest effect in the post-neo-natal period (actual rates being only about 30 per cent of the post-neonatal mortality of the total sample).

Infant Mortality by Religion of Mother : **Out** of the three main groups (the fourth group-others, comprises mostly Parsis and non-specified) the lowest rates were found, as expected, for Christians, The highest rates for Muslim women were close to the accepted level of significance. Contrary to expectation there was no significant differences in the post-neo-natal mortality (Table 12). One of the reasons for conspicuous differences, of IMRs among different religious groups may be sought in educational differences among them.

Social and Economic Status of the Family : Education affects the economic and social position of a person in a society, determining his occupation, earning, way and style of living, housing etc., and in both positive and negative ways, it has an impact on his health as well as his family's wellbeing.[19] It may, therefore, be expected that differentials in infant mortality by social stratification will have trends similar to those found in the educational pattern. Economic and social status of the family interviewed were decided by investigators on the basis of several criteria. The orientation was more toward actual standards of living rather than to evaluation of income alone. Sub-division into three broad categories was necessitated by the small size of our sample (Table 14). Even then the highest social class has only 565 women and experienced 10 infant deaths (out of it 3 in neo-natal age). The impact of social status was evidently high on infant mortality rates in general and on post-neo-natal mortality in particular. Here again the results may be interpreted in terms of knowledge, awareness of child care, and availability of such care. With MCH facilities of a city, access to medical help need not be obstructed by economic hindrances, services being available free of charge. The increased Infant Mortality Rates in the lower strata of society can probably be attributed not to lack of health services, but to lack of knowledge, negligence, and reluctance of low status mothers to approach public health facilities.

Mother's Place of Origin : A major part of Bombay's population (64 per cent in the 1961 Census) was born outside the city.[20] It was expected that IMRs would be higher among women who migrated to Bombay from rural areas or from other urban areas in India, because the social and educational level of the large part of the immigrants is lower than that of the 'resident' pupulation. The differential IMRs were as anticipated in the case of women who migrated from rural areas : 81.9 per 1000 live births. For the other two groups, the differences were negligible (65.3 and 66.0 for those born in Bombay and in other urban areas respectively). None of the differences was, however, statistically significant. Similarly no significant differences were found between IMRs for the city and suburbs.

During the period 1960-1964 the interviewed women gave birth to 110 twins. Out of them, 30 died during infancy (IMR=273 per 1,000 livebirths) ; neo-natal mortality rate was 191 per 1,000 live-born. In 11 out of 55 deliveries of twins both children died during infancy.

The Fertility Survey had not as its aim a study of infant mortality. However, even within the limited scope, its results may be used for such purpose since the data were collected with care and subjected to proper check-up. Delimitations of the timing of events reported may be defective, as is most probably the case of still-births and live-births of infants who died shortly after birth. Neo-natal age may not be accurately discerned from post-neo-natal period; even deaths of children somewhat older than one year may be reported as infant deaths. However, it may be assumed that such defects are not too many and do not seriously affect the wellmarked differences among sub-groups of population under study. It is the trend of such differences we are interested in, revealing the 'exposed to risk' sub-groups of population rather than accurate levels of the mortality rates. Health planning and preventive programmes have to be oriented to 'groups at risk' to be fully effective. Under conditions of scarcity of relevant data, any source of possible supplementary information may contribute to this knowledge in spite of the limitations.

Table 1: Births according to place of delivery and assistance at delivery
(NSS, Round XVIII, 1963-1964)

Place of delivery	Assistance at delivery (per 100 deliveries)					
	Doctor	Nurse	Mid-wife trained 'dai'	Untrained 'dai'	Relatives	None
Towns with 50 thousand inhabitants and more	21.7	20.4	16.9	27.3	11.2	2.5
Towns with less than 50 thousand inhabitants	9.8	9.5	13.0	45.0	20.5	2.2
Rural areas	4.7	1.8	3.7	52.2	33.6	4.0

Table 2 : Stillbirth Ratios and Infant Mortality Rates by Age of Infants. Greater Bombay 1960-1968

Year	Stillbirth Ratio	Infant Mortality	0-6 days	0-27 days	4 weeks 5 months	6 months -11 months
	per 1000 live births					
1960	36.7	95.2 (87.2)	29.6	44.3	26.0	24.9
1961	36.7	95.8 (89.4)	29.9	43.7	27.3	24.8
1962	33.6	84.0 (78.4)	28.0	42.6	22.9	18.6
1963	33.8	81.0 (77.2)	28.1	43.9	21.0	16.1
1964	35.6	85.6 (79.8)	29.8	45.6	23.2	16.8
1965	37.8	96.2 (84.0)	30.9	47.2	27.7	21.3
1966	37.2	85.5 (78.6)	31.5	47.7	21.6	16.2
1967	35.6	92.1 (85.1)	30.0	47.0	25.4	19,8
1968	34.7	80.3 (72.7)	29.5	44.8	20.8	14.7

Rates in brackets adjusted with respect to mothers non-resident in Greater Bombay

Table 3: Greater Bombay : basic demographic data (1961)

Index	Bombay City	Suburbs	Extended Suburbs	Greater Bombay
Area (km^2)	67.78	175.08	194.00	436.86
Population (estimate 1.7.1968) in thousand	3,584	1,340	444	5,368
Density per km^2	43,083	6,900	2090	10,387
Number of live births	81,880	55,489	19,511	156,880
Birth Rate (per 1000 population)	22.7	41,4	43.9	29.2
Number of deaths	30,697	15,616	4,126	50,439
Death Rate (per 1000 population)	8.6	11.7	9.3	9.4
Number of Infant deaths	7,063	4,425	1,114 -	12,602
Infant Mortality Rate (per 1000 live births)	86.3	79.7	57.1	80.3
Stillbirths	2,873	3,053	520	5,446
Stillbirths Rate (per 1000 live births)	35.1	37.0	26.7	34.7
Maternal Mortality Rate (per 1000 total births)	0.9	0.8	0.6	0.8

Table 3-A—Literacy Rates 1961 (in per cent of total population)

State	Males	Females
India	34.4	12.9
Maharashtra	42.0	16.8
Greater Bombay	65.1	48.5

Source: Times of India Directory, 1969, pp.46-48

Table 3-B—Percentage Distribution of Working Population in Bombay City and Suburbs (1961) by Economic Sectors

Males QA^ tr\r			Females	
	City	Suburbs	City	Suburbs
Primary	0.3	4.8	1.6	7.9
Secondary	43.5	47.6	30.7	30.6
Tertiary	56,2	47.6	67.7	61.5

Computed from B-II workers and non-workers classified by sex and broad age groups. **Census of India, 1961, VoI.X, Maharasthra,** Greater Bombay Census Tables, pp, 176-179.

Table 4 : Stillbirths Ratios and Infant Mortality Rates in Greater Bombay 1960-1968

Year	Stillbirth Ratio			Infant Mortality		
	per 1000 live births					
	Bombay City	Suburbs	Extended Suburbs	Bombay City	Suburbs	Extended Suburbs
1960	41.7	27.2	26.3	109.1	70.2	60.5
1961	41.4	27.8	30.1	113.1	68.0	53.7
1962	37.9	27.1	25.0	95.8	67.3	55.3
1963	36.3	30.1	29.2	87.0	74.6	62.6
1965	39.7	37.6	27 6	106.7	92.9	48.9
1966	38.5	37.3	30.3	89.7	87.3	569
1967	35.8	37.1	29.0	98.4	91.5	60.9
1968	35.1	37.0	26,7	86.3	79.7	57.1

Data for 1964 are not available by parts of town.

Table 5-Seasonal Movement of Infant Mortality by Age of Infant-Greater Bombay 1963-1967

Month	Infants deceased at the age of			
	0-6 days	0-27 days	28-365 days	0-365 days
	Seasonal Index (monthly average)= 100.0			
January	106.3	93.6	86.3	89.7
February	97.2	97.1	84.1	87.7
March	91.7	92.9	98.2	87.6
April	94.5	97.9	114.1	99.4
May	102.3	101.0	109.5	99.0
June	96.9	97.5	107.1	98.2
July	110.7	116.0	129.1	117.9
August	123.2	122.6	114.6	110.2
September	117.2	117.0	99.5	117.7
October	98.2	96.6	85.0	103.0
November	87.4	88.8	77.1	90,8
December	74.5	78.9	95.3	98.8

Table 6-A—Structure of the Causes of Infant Deaths in Greater Bombay

Age of Infants	Out of 100 deaths were due to					
	Infections		Congenital Malformations and Diseases of Early Infancy		Others	
	1966 1968	1965 1967	1966 1968	1965 1967	1966 1968	1965 1967
0 - 6 days	10.0	8.8	69.3	77.1	20.7	14.1
7 - 2 7 days	33.5	36.4	48.3	47.5	18.2	16.1
28 days-5 months	62.7	69.2	20.6	17.2	16.7	13.6
6 months 11- months	68.8	73.7	8.8	7.6	22.4	18.7

Table 6-B—Infant Mortality, Greater Bombay 1962-1968. Selected Causes of Death

Cause of death	Death Rates per 100.000 live born in the year						
	1962	1963	1964	1965	1966	1967	1968
Small pox	7.4	15.9	30.2	160.4	21.0	113.6	5.1
Measles	23.9	15.9	47.5	137.3	26.4	89.4	14.0
Diarrhorea Enteritis Dysentery	854.9	853.4	883.9	1145.8	1119.0	1069.6	1029.4
Disease of respiratory system	1913.4	1623.3	1828.2	2907.2	2132.6	2725.9	2001.5

Table 7-Greater Bombay Fertility Survey 1960-1965 : Stillbirths and Abortions, by I Age of Mother

	Age of mother at termination of pregnancy				
	less than 20	20-24	25-29	30-34	35-39
Abortions per 100 terminated pregnancies	85.4	53.5	52.3	66.1	69.2
Stillbirth ratio per 1000 total birth	19.6	14.9	11.6	15.6	22.7

The number of terminated pregnancies a(age 40 and over was only 93 and therefore no rates were calculated.

Table 8- Greater Bombay Fertility Survey, 1960-65. Abortions and Stillbirths by order of pregnancy

Order of Pregnancy	1	2	3	4	5	6	7
Abortion Rate*	56.7	53.8	56.7	57.4	64.3	71.8	85.6
Still birth Ratio*	17.6	13.4	11.7	13.8	13.1	26.5	12.4

*Rates were denned as in Table 7

Table 9-Greater Bombay Fertility Survey 1960-1965-Infant Mortality Rates (Total and by age of infants) by cohorts of births

Birth cohort	Infant Mortality	Neona tal Mortality	Postneonatal Mortality
	per 1000 live birth		
1960	74.2	36.7	37.5
1961	87.1	44.0	43.1
1962	82.8	40.6	42.2
1963	55.4	28.5	26.9
1964	67.1	29.5	37.6
1965	—	24.7	=

Table 10—Infant Mortality Rates by Age of Mother Greater Bombay Fertility Survey 1960-64

Age of mother at the termination of pregnancy	Out of 1000 live born children during 1960-64 there died during		
	Infancy	neonatal period (0-27 days)	postneonatal period (28-365 days)
19	127.9	68.0	59.9
20-24	82.5	35.8	46.7
25-29	52.3	27.0	25,3
30-34	46.5	25.6	20.9
35-39	74.3	40.2	34.1
Total	73.6	36.3	37.3
Number of Dethas	444	219	225

Table 11—Infant Mortality Rates by Pregnancy Order Greater Bombay Fertility Survey, 1960-64

Deaths per 1000 live born children during	.Order of Pregnancy						
1960-1964	1	2	3	4	5	6	7
In infancy	89.4	73.6	70.9	71.4	58.6	64.1	66.4
0-27 days	49.9	36.0	32.0	30.8	24.9	33.3	31.0
28-365 days 39.5		37.6	38.8	40.6	33.7	30.8	35.4

Table 12—Infant Mortality Rates and SMR's by Religion (Greater Bombay Fertility Survey 1960-1964)

Deaths per 1000 live born children during 1960-1964	Hindus	Muslims	Christians	Others
In infancy	75.2 (102.6)	97.4 (120.7)	45.7 (69.6)	59.9 (78.8)
0-27 days	39.8 (97.8)	57.0 (142.8)	24.8 (74,7)	28.9 (81.9)
28-365 days	35.4 (107.2)	40.4 (98.0)	29.9 (63.2)	31.0 (80.6)

Number in brackets are SMR's = $\frac{\text{'actual' number of deaths}}{\text{'expected' number of deaths}} = 100$

Rates *underlined* are statistically significant at 5 per cent level

Table 13—Infant Mortality Rates by Educational Levels of Mother (Greater Bombay Fertility Survey 1960-64)

Deaths per 1000 live births (cohort born during 1960-1964)	Illiterate and without formal educational	Completed elementary education	Higher than elementary education
Infancy	*95.7 (121.5)*	*51.9 (71.2)*	35.7 *(53.6)*
0-28 days	*44.6 (120.1)*	27.3 (75.2)	25.5 (75.5)
28-365 days	*51.1 (134.9)*	*24.6 (66.1)*	*102 (29.7)*

Table 14—Infant Mortality Rates according to Social Status of the Family (Greater Bombay Fertility Survey 1960-1964)

Deaths per 1000 live born children (cohort born during 1960-1964)	SOCIAL STATUS		
	Lower and Lower Middle	Upper Middle	Upper
In infancy	*90.3* (116.1)	*54.1* (80.0)	*17.7* (26.5)
0-27 days	43.5 (113.6)	32.5 (97.4)	—
28-365 days	*46.8* (118.5)	*21. 6* (65.3)	—

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4. K.C. Zachariah, *Migrant in Greater Bombay.* Asia Publishing House, Bombay 1968, table 1.4.
5. *Census of India 1961,* Vol. X. *Maharashtra.* Census Tables for Greater Bombay, E-I and E-V.
6. M. Khandekar, *A Report on the Situation of Children and Youth in Greater Bombay.* Tata Institute of Social Sciences, Bombay 1970.
7. Ibid, P. 4-5.
8. 1961 Census data reveal, however, some information on houseless population (pavement dwellers) in Greater Bombay. In Bombay City 1.9 per cent of total population belonged to this category, whereas in Western and Eastern suburbs the percentage was 0.8. Maximum concentration of houseless population in City itself is in Ward A (southern part of the Bombay Island) with 7.2 pavement dwellers per 100 population (P. Rama-chandran, *Pavement Dwellers in Bombay City.* Tata Institute of Social Sciences, Bombay 1970) .
9. Administrative Report of the Executive Health Officer for the Year 1968. *Administrative Report of the Municipal Commissioner for Greater Bombay for the year 1968-69,* Bombay 1969.
10. V.B. Mathankar, V.S. Rao, C.P. Vasudeva, *Differential Mortality in Greater Bombay.* DTRC, Bombay, June 1968.
11. The grouping together of congenital malformations and diseases of early infancy is rather unhappy ; each group is different in nature. The way data are published renders it impossible to find out incidence for each group separately.
12. Another factor undoubtedly contributing to high neo-natal mortality is prematurity as reflected by birth weights. It has been observed in two studies on birth weights of infants in Greater Bombay that beside the age of mother, parity and duration of pregnancy, social and cultural characteristics such as religion and occupation have a significant effect on the incidence of infants of 'lo w birth weight'. See : K.G. Basavarajappa, V.A. Deshpande, K.V. Ramachandran, Effect of Sex, Maternal Age, Birth Order, and Socio-Economic Status on the Birth Weight of Live Born Infants. *Indian Journal of Public Health,* January 1962, Pp. 18-27. C. John, P.M. Joseph, *A Study of Birth Weights of Infants Born in a Hospital in Bombay City.* DTRC, Bombay, May 1970.
13. M. Karkal, *Pattern of Feeding of Infants in Greater Bombay.* UPS Bombay 1968.'
14. M. Khandekar (1970) *op. cit.* p. 38.
15. An interesting attempt to base analysis of social differentials in infant mortality on deaths only has been made by K.V. Ramachandran and J. Meerding in Infant Mortality according to Social Status in Greater Bombay. *Journal of the Indian Medical Association,* 38 (1962), 9.
16. J.R. Rele, and Tara Patankar (1969) *op. cit.* p.2.
17. Meternal mortality in Greater Bombay fluctuated during 1960-65 between 1.9 (1961 and 1962) and 1.0 (1954) per 1000 births. Taking the number of terminated pregnancies reported by the interviewed women in our sample, it may be vaguely assumed that fewer than 20 women were 'lost' due to maternal mortality.
18. Standard deviation of SMR equals approximately to - $\frac{\text{SMR}}{\text{expected number of deaths}}$ SMR + M2 stand, dev. established the 95 per cent confidence limits. G. M. Howe, *National Atlas of Disease Mortality in the United Kingdom* Th. Nelson & Sons, London 1963, p.6.
19. A simple inter-relationship between education and social status, occupation and health, need not, however, be markedly strong in a traditional society, where neglecting health may be due to other hindrances than economic ones.
20. K.C. Zachariah, *op. cit.* p. 45.