Demography India Vol. 28, No. 1 (1999), pp. 239-256

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Household Amenities and Regional Variations in Infant and Childhood Mortality in Maharashtra

Introduction and Review of Literature

MOST of the countries in the world have experienced drastic improvement in the general health status of their populations. The life expectancy has improved more during the past forty years than it has in the entire previous span of human history (Jamison, 1993). Between 1950-90, life expectancy in developing countries rose from 40 years to 63 years with a constant increase in the incidence of non-communicable diseases of the adults and elderly population (Feachem *et al.*, 1992). Among various social factors responsible for decline in mortality in the industrialized countries, improvement in nutrition, housing and clothing, sanitation, water supply, cleanliness and individual hygiene practices played an important role (Me Keown and Brown, 1955; Me Keown and Record, 1962; Me Keown *et al.*, 1972; Me Keown, 1976;Razzel, 1974). Nag (1983) found that the lower levels of mortality in Kerala were mainly due to the higher social development (in terms of education, health, transport etc.) and partly due to its favourable environment and hygienic conditions.

Despite remarkable increase in the life expectancy, there are enormous health problems in developing countries today which are very different from that of the developed nations, both in terms of their incidence and nature. It has been observed that the infectious diseases, which can easily be prevented, are very common in the poor nations (WB, 1993). Diarrhoeal diseases remain one of the most important public health problems in the world today as it is the major contributors to illness and death; particularly in children of developing countries (Black, 1984; Feachem *et al.*, 1983).

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Poor environmental sanitation, that includes unsafe and insufficient water supply, lack of safe means of human waste disposal, inadequate personal and household hygiene including poor food handling, is a critical link in the chain of diarrhoeal diseases (UN, 1954; UNICEF, 1989). Further, the prevalence of rate of diarrhoea varies by level of socio-economic conditions (Freij and Wall, 1979; Black *et al.,* 1983; Caldwell, 1979;
Caldwell and McDonald, 1982). It is found that the risk of diarrhoeal morbidity and mortality are greater among families of lower socio-economic status and in conditions of poor personal and domestic hygiene (Marlines *et al.,* 1993).

In India, tetanus, Pneumonia, dysentery along with typhoid account for a very high proportion of deaths among children upto 3 years of age in both rural and urban areas which are associated with sanitary conditions and availability of health care (Padmanabha, 1982). Jain (1982) from his analysis found that the persistence of exogenic causes arising from environmental and nutrition conditions are the two most important factors responsible for high infant mortality in India. The diseases associated with poor households environment occur mainly in developing countries (WB, 1993) and housing quality, which include physical shelter, infrastructure, adequacy of living space etc., is child's immediate environment and has strong influence on child's risk of exposure to infectious diseases and to injury (Moore *et al.,* 1965; Puffer and Serrano, 1973; Tekce and Shorter, 1984;
UN, 1954). D'Souza and Bhuiya (1982) found that the children living in smaller houses and in the families not using latrines had significantly higher risk of dying. DaVanza (1984) found that in developing countries, availability of sanitation and piped water was strongly associated with the infant and child mortality. Living in one room house (Stanton and Clemens, 1987), living in house with earthen floor (Bertrand and Walmus, 1983) and unclean living conditions (UN, 1954; Bertrand and Walmus, 1983; Huttley *et al.,* 1987; Taylor *etal.,* 1986) have all been associated with increased risk of diarrhoeal morbidity and mortality.

A review of 67 studies from 28 countries by Esrey *et al.* (1985) showed that the improvement in water supply and sanitation resulted in a medium reduction of 22 and 21 per cent respectively in diarrhoeal morbidity and mortality. The World Bank (1992, p. 5) has estimated that across the world over, 2 million deaths among children could be prevented if adequate sanitation and clean water were made available to all those who lack it. Review of about 100 studies on impact of water supply and sanitation by Esrey *et al.* (1990) reveal that the effect of these interventions (quality or availability of water or in the disposal of excreta) are large, with median reductions ranging from 22 per cent for diarrhoea to 76 per cent for guinea worm. It also showed that the environmental improvements have greater impact on mortality than illness; with median reduction of 60 per cent deaths due to diarrhoeal diseases. Perhaps the most promising intervention of all would be household environment and the immediate risk to which child is exposed (Black *et al.,* 1983).

In addition to the sanitation and clean water, for hundreds of millions of world's poor citizens, indoor smoke and fuel from the use of firewood, charcoal, dung etc. poses

greater health risks than any other out door pollution to the people in general and to women and children in particular (WB, 1992, p. 5). Infact the World Development Report, 1992 has identified indoor pollution as one of the four most critical global environmental problems as it exposes more people worldwide (particularly women and children) to many of the hazardous air pollutants than pollutants in the outdoor air. Indoor air pollution contributes to Acute Respiratory Infections (ARI) in young children, chronic lung diseases and cancer in adults and adverse pregnancy outcomes for women H exposed during pregnancy.

In 1992, ARI caused a loss of about 1.56 million DALYs per year (Disably-Adjusted Life Years, that combines healthy life years lost due to premature death and those loss as a result of disability) accounting for about 9 per cent of the total burden of diseases I in Maharashtra (Pendse, 1996). The DALYs lost per one thousand population in I Maharashtra works out to be 225 (little higher in rural areas—262 as compared to the urban areas— 167). Further, his analysis indicates that of the total 18.17 million DALYs lost in Maharashtra in 1992, around 58 per cent were due to the diseases in Group-1 (consisting of Tuberculosis, HIV, Diarrhoea, VPD, Helminthes, ARI, Perinatal and Nutritional). The most burdensome diseases according to him in Maharashtra are:

Cardiovascular diseases (9.3%), Perinatal conditions (8.9%), ARI (8.6%), Tuberculosis (6.3%), Diarrhoeal Diseases (6.0%) etc.

Data from some of the countries revealed that reducing indoor air pollution from very high to low levels alone could potentially halve the incidence of pneumonia (WB, 1993). In the rural India, most of the cooking is done in poorly ventilated and overcrowded houses with the help of traditional 'Chulhas'. Further, traditional sources of fuel such as wood, charcoal, cow-dung etc., are the most widely used; all of which leading to high smoke levels leading to higher concentration of indoor air pollutants and has greater adverse impact on the health of the inmates in general and that of the women and children in particular (TERI, 1995).

An analysis of the data for twenty six countries by UN (1954) for the period 1930-50 reveals that in the countries with share of overcrowding dwelling units of more than 10 per cent, IMR was below 50 per 1000 live births whereas in those countries where proportion of overcrowded dwelling units exceeded 30 per cent, IMR was above 100 infant deaths per 1000 live births. Overcrowding in the houses, which is usually linked with poverty, is associated with increased airborne infections and personal violence (WB, 1993; UN, 1954) and also facilitates spread of communicable diseases (UN, 1954) as it not only imposes extreme difficulties in the isolation of infectious cases and the curbing of epidemics but also complicates the treatment and delays the recovery of the patients. To quote from Robertson (1919): 'No single condition in the lives of the masses has such a damaging effect on health, or does harm in so many ways, as bad housing'. Most serious result of overcrowding is caused in terms of stagnation of air and the spread of spray of infections from mouth, nose and loud talking by the reason of proximity of the dwellers to one another.

The review of the literature clearly indicates the role of household environment and availability of basic amenities in improving the health conditions of the population in general and that of the infants and children in particular. It may be mentioned that these conditions (variables) form a major part of the proximate determinants of the child survival proposed by Moosley and Chen (1984). It is believed that the low levels of infant and child mortality as well as morbidity cannot be achieved unless good primary health care is accompanied by improved household environment and availability of basic amenities.

Objectives

In view of the above background, in the present paper we attempt to examine the relationship between basic household amenities and the level and differentials in infant and childhood mortality at the district level in Maharashtra. The specific objectives of' the present paper are as follows:

1. To study the regional variations in the infant and childhood mortality in Maharashtra for the period 1991.
2. To study rural-urban differentials in infant and child mortality in the Maharashtra
3. To examine the extent of availability of selected basic household amenities in the districts of Maharashtra by place of residence.
4. To examine the relationship between availability of basic household menities variables and infant and child mortality at the district level in 1991.

Data and Methodology

The data for the present paper is primarily taken from the 1991 census of Maharashtra The infant and child mortality rates for 1991 have been taken from Ram and Annamma. (1997). Following variables have been selected for the analysis:

A: Dependent Variables:

1. Infant Mortality Rate (^o)
2. Child Mortality Rate (4^1)

B: Independent Variables and Expected Direction a/Relationship with the Dependent Variables:

1. Percent of the households living in pucca houses (HPUCCA); Negative.
2. Percent of the households living in overcrowded houses (HOVCRD); Positive
3. Percent of the households having access to safe drinking water (HSD\ Negative.
4. Percent of the households having toilet facility (HTLT); Negative.
5. Percent of the households having electricity (HELCT); Negative.

6. Percent of the households using modem means (gas or electricity) of cooking (HMMCK); Negative.
7. Percent of the households having all the three facilities (i.e. safe drinking water, toilet and electricity) (HALL3F); Negative.
8. Percent of the households having safe drinking water and toilet facility (HSDWTLT); Negative.
9. Percent of the households not having any of the three facility (HNFAC); Positive.

In order to calculate over-crowding the categories of (l) households not having any exclusive living room (2) households with three or more persons living in one room (3) households with six or more persons living in two and/or three rooms (4) households with nine or more persons living in four rooms have been clubbed together to get the numerator.

Limitations of the Data

1. As per the United Nation's definition all the households where number of persons per living room exceeds two are called over-crowded households (UN, 1954). For our analysis it was however not possible to follow this definition strictly owing to the data problem. In 1991 census, data on the classification of all households by number of living room is done for the household size of 1-2, 3-5, 6-8 and 9+. In case of those living in 2 rooms, it would have been ideal to include those households with 5 or more persons whereas in case of households living in 3 rooms it would have been ideal to include those households with 7 or more persons, but data did not allow this.
2. As per the census definition, only those households receiving drinking water either from tap or hand-pump are included in the category of 'households having access to safe drinking water'. However, there may be households receiving water from the 'well' which may be covered property and may be maintained clean by all means but this has not been considered as safe source of drinking water due to the non-availability of the information concerning the status on whether these wells were covered or not. This point becomes very important in the analysis as in the districts in Konkan region of Maharashtra 'well' is major source of drinking water for majority of the households. For example, as high as 78 per cent of the total households in Sindhdurg have reportedly been receiving water from well in 1991. The proportion of such households is 58 in Ratnagiri, 46 in Raigarh and about 25 in Thane. Thus, while interpreting the relationship between mortality and safe drinking water, this fact has to be kept in mind.
3. For the present analysis, we have taken the average value of the estimated ${}_1q_0$ and ${}_4q_1$ obtained based on the first three age groups (that is, 15-19, 20-24 and

25-29). However, in case of Raigarh district, the estimates of ${}_4q_1$ used in the analysis are that based on the first age group (15-19). This is done in view of the fact that the value of the average ${}_4q_1$ for Raigarh based on the three age groups for total areas is higher than the corresponding values for rural and urban areas.

Regional Variations in Infant and Child Mortality

Table 1 gives the estimated IMR and CMR for the districts of Maharashtra for the year 1991 by place of residence. The data has been presented by the four geographic regions of the state along with their Mean and Standard Deviation (SD). In case of the Western region, the Mean and SD are calculated excluding Greater Bombay for obvious reasons.

It may be observed from the Table 1 that in 1991, on an average, districts in Vidarbha region, had higher IMR (mean = 75.33 and SD = 11.88) followed by districts in Marathwada region (mean = 56 43 and SD = 6.43). The IMR, on the other hand, was lowest in the districts in Konkan region (mean = 41.75 and SD = 6.85) whereas in Western region it was moderate (mean = 47.67 and SD = 11.87). The level of IMR was particularly high for districts like Gadchiroli, Yavatmal, Chandrapur and Bhandara (all from Vidarbha region). The patterns of regional variations in IMR across rural-urban residence are more or less same as what was observed for total areas.

There were as many as 17 districts in 1991 having higher IMR than the state average. All the 9 districts in Vidarbha region and all but Bid and Latur in Marathwada region have higher IMR than the state average. Further, Nashik, Dhule, and Jalgaon districts in Western region also have higher IMR as compared to the state average.

As was the case with IMR, once again the levels of CMR too is higher among districts in Vidarbha (mean = 38.44 and SD = 12.52) and Marathwada regions (mean = 23.14andSD = 4.49). On the other hand, the districts in Konkan (mean = 17.00 and SD = 3.56) and Western regions (mean = 18.44 and SD = 6.77) had relatively lower levels of CMR. Like IMR, here too, the levels of CMR were unusually high in districts of Gadchiroli, Yavatmal, Chandrapur and Bhandara (all from Vidarbha region, with CMR ranging between 40 to 58), Similar observations may be made in case of rural and urban areas as well. Further, for the combined areas, all the 9 districts of Vidarbha region had higher CMR than the state average. In case of rural areas, this is true for all the districts except Wardha in Vidarbha region. Nashik and Dhule from Western region and Thane from Konkan region had higher CMR than the state average. On the other hand, in urban areas, in all, there were 22 districts where CMR was higher than the corresponding level for the state as a whole (all 9 in Vidarbha region, 4 from Marathwada, 6 from Western and 3 from the Konkan regions).

TABLE 1 : INFANT (^o) AND CHILD MORTALITY RATES (4^) FOR DISTRICTS OF MAHARASHTRA, 1991

Region/Dist	*IMR* ($_1q_0$)			*CMR* ($_4q_1$)		
	Rural	*Urban*	*Comb*	*Rural*	*Urban*	*Comb*
		KONKAN	*(N=4}*			
Thane	58	32	39	31	11	19
Raigarh	56	36	52	18	11	17
Ratnagiri	39	32	38	13	8	12
Sindhdurg	38	37	38	21	11	20
MEAN	47.75	34.25	41.75	20.75	10.25	17.00
SD	10.72	2.63	6.85	7.59	1.50	3.56
		WESTERN	*(N* = 10)			
G. Bombay	—	32	32	-	12	12
Nashik	67	47	60	30	21	27
Dhule	71	46	67	31	16	28
Jalgaon	67	45	61	29	16	25
Ahmadnagar	47	32	45	16	8	16
Pune	45	32	37	18	11	13
Satara	38	33	38	12	10	14
Sangli	40	32	37	12	8	10
Solapur	50	38	46	22	14	20
Kolhapur	41	32	38	13	9	13
MEAN*	51.78	37.44	47.67	20.33	12.56	18.44
SD*	12.99	6.71	11.87	7.92	4.48	6.77
			MARATHWADA *(N* = 7)			
Aurangabad	67	37	57	28	10	20
Parbhani	69	47	65	32	13	28
Bid	52	39	45	21	9	17
Jalna	61	40	58	28	16	26
Nanded	67	36	61	22	13	28
Osmanabad	59	41	57	26	11	24
Latur	54	32	52	22	8	19
MEAN	61.29	38.86	56.43	25.53	11.43	23.14
SD	6.70	4.67	6.43	4.08	2.76	4.49
			VIDARBHA *(N* = 9)			
Buldana	75	44	69	35	16	33
Akola	72	42	64	45	13	34
Amravati	80	46	70	44	24	33
Yavatmal	95	56	89	65	19	58
Wardha	77	45	70	29	11	26
Nagpur	79	45	59	30	16	22
Bhandara	85	46	81	42	15	40
Chandrapur	91	53	81	53	26	43
Gadchiroli	98	74	95	60	37	57
MEAN	83.56	50.11	75.33	44.78	19.67	38.44
SD	9.22	10.02	11.88	12.65	8.12	12.52
Maharashtra	63	35	53	29	10	21

*Excluding G. Bombay *(N* = 9).

Rural-urban Differentials in Infant and Child Mortality

In order to study the rural-urban differentials, we have calculated the ratio of rural IMR to that of Urban IMR. Similar ratios have been calculated in case of CMR too and the results are presented in Table 2. At the state level, the levels of IMR in rural areas are almost double that of the urban areas whereas in case of CMR the gap between the two areas further widened to almost three folds.

A very distinct feature emerging from Table 2 is that irrespective of geographic region or district or whether it is IMR or CMR, the value of the ratios for rural to urban areas has always exceeded one indicating that the levels of mortality in terms of either IMR or CMR are always higher in rural areas as compared to the urban areas for all the four geographic region as well as in all the 30 districts. At the outset, it may be mentioned that on an average, IMR in the rural areas of the districts in Vidarbha and Marathwada regions is higher by nearly 58 and 67 per cent respectively as compared to that of the urban areas. In case of the districts in Western and Konkan regions, it is by about 38-39 per cent. In case of CMR, it is noted that on an average, the rural CMR is higher by approximately 128 and 124 per cent than that in the urban areas in the districts in Vidarbha and Marathwada regions respectively. Unlike IMR, the CMR in the rural areas of the districts in Konkan region is more than double than that of the urban areas, indicating that the gaps between rural urban child mortality in the Konkan region are much wider than that of the IMR. In Western region, the rural IMR on the whole is higher by about 62 per cent as compared to the urban IMR. The analysis further suggests that there exist significant variations across districts in term of urban-rural gaps in IMR and CMR. For example, the ratios of rural-urban IMR were as high as 1.81 to 1.86 in the districts of Thane, Aurangabad, Nanded and Bhandara indicating that the levels of rural IMR are as much as about twice the level of urban areas.

There were many districts in 1991 where rural IMR was higher by well over 50 to 75 per cent as compared to that of the urban areas. Sindhdurg was the only district where rural-urban IMR were more or less same (the ratio being 1.03). On the whole, the rural-urban gaps in terms of IMR seem to be relatively narrower in the districts in the Western region and to some extent in the Konkan region whereas they are more prominent in the districts in the Vidarbha followed by Marathwada region.

A very distinct feature of the Table 2 pertaining to the rural-urban differentials in CMR is that with the exception ofNashik and Nanded, in all the 27 districts (excluding G. Bombay), rural-urban gaps in CMR are much wider than what was observed in case of IMR. In case ofNashik, the gap between rural and urban areas both in terms of IMR and CMR are same (ratio being 1.43). Once again, the rural-urban gaps in CMR were widest in the districts of Vidarbha and Marathwada regions. In Akola and Yavatmal (both from Vidarbha region) the ratio of rural and urban CMR exceeded 3 (3.46 and 3.42 respectively). This indicates the prevalence of exceptionally wider gaps across the rural-

urban areas in both the districts in terms of level of CMR in 1991. Beside this, there are few districts, where these gaps were more than three folds. For example, the value of ratios was between 2 to 3 for as many as 11 districts. Of these 4 are from Vidarbha while 5 are from Marathwada regions. The remaining two districts are Thane from Konkan and Ahmadnagar from Western region.

TABLE 2 : RATIO OF RURAL TO URBAN IMR ($_1Q_0$) AND CMR ($_4Q_1$) FOR DISTRICTS OF MAHARASHTRA, 1991

Region/District	IMR($_1Q_0$)	CMR($_4Q_1$)
	KONKAN	
Thane	1.81	2.82
Raigarh	1.56	1.64
Ratnagiri	1.22	1.63
Sindhdugarh	1.03	1.91
	WESTERN	
G. Bombay	-	-
Nashik	1.43	1.43
Dhule	1.54	1.94
Jalgaon	1.49	1.81
Ahmadnagar	1.47	2.00
Pune	1.41	1.64
Satara	1.15	1.20
Sangli	1.25	1.50
Solapur	1.32	1.57
Kolhapur	1.28	1.44
	MARATHWADA	
Aurangabad	1.81	2.80
Parbhani	1.47	2.46
Bid	1.33	2.33
Jalna	1.53	1.75
Nanded	1.86	1.69
Osmanabad	1.44	2.36
Latur	1.69	2.75
	VIDARBHA	
Buldana	1.70	2.19
Akola	1.71	3.46
Amravati	1.74	1.83
Yavatmal	1.70	3.42
Wardha	1.71	2.64
Nagpur	1.76	1.88
Bhandara	1.85	2.80
Chandrapur	1.72	2.04
Gadchiroli	1.32	1.62
Maharashtra	1.80	2.90

Availability of Household Amenities at the District Level

Table 3 gives the Mean and the Standard Deviations of the each selected independent variables for total, rural and urban areas respectively. It may be observed from the Table 3 that on an average, every second households in the state as well as in the districts in Western and Marathwada regions live in pucca houses whereas this is the case for about every 3 and 4 out of ten households in the districts in Vidarbha and Konkan regions. Overcrowding in the houses seems to be very common in the state as about two-third of the households in 1991 were found to be living in over crowded houses. The extent of over crowding was even larger in the districts in Western region (well over 70 per cent of them living in such houses). Over two-third of the households in the state and in the districts belonging to Western and Marathwada regions have access to safe sources of drinking water whereas the rest of them did not have it. The problem of safe drinking water was acute in the districts in Vidarbha region as on an average only about half of the households in the region have access to safe sources of drinking water. Though electricity is available to majority of the households in the state and in different regions of the state (ranging between around 70 per cent in the state and Western region to as high as above 83 per cent in Konkan region), a sizeable proportion of them did not have it; particularly in the districts in Marathwada region.

TABLE 3: MEAN OF THE PER CENT HOUSEHOLD HAVING VARIOUS AMENITIES IN FOUR GEOGRAPHIC REGIONS OF MAHARASHTRA (for Combined Areas), 1991

Variables	*Konkan*	*Western**	*M'hwada*	*Vidarbha*	*M' shtra*
Combined					
	39.94	54.75	48.55	28.56	52.20
HPUCCA	(22.52)	(20.40)	(08.56)	(07.27)	
	59.27	71.40	61.99	63.21	66.65
HOVCRD	(04.66)	(07.74)	(08.45)	(06.11)	
	40.12	70.85	73.70	50.47	68.49
HSDW	(22.01)	(07.81)	(05.82)	(10.33)	
	24.10	18.92	12.29	18.67	29.56
HTLT	(13.08)	(08.64)	(05.05)	(10.08)	
	83.42	67.64	53.65	59.25	69.40
HELCT	(02.94)	(09.73)	(08.11)	(13.81)	
	13.82	12.24	04.06	08.87	16.50
HMMCK	(08.86)	(05.65)	(02.14)	(06.78)	
	17.07	16.54	10.66	13.23	25.82
HALL3F	(14.74)	(08.23)	(04.73)	(07.84)	
	17.28	14.11	11.11	13.79	26.59
HSDWTLT	(14.93)	(08.49)	(04.83)	(08.08)	
	11.80	13.20	14.60	23.15	13.42

HNFAC	(0.99)	(4.22)	(4.02)	(10.79)	
Rural					
HPUCCA	28.77	49.92	42.73	18.79	35.37
	(15.62)	(19.47)	(10.29)	(04.57)	
HOVCRD	60.85	74.33	62.86	66.39	68.86
	(06.42)	(08.57)	(11.01)	(06.19)	
HSDW	27.29	62.70	69.60	42.29	54.02
	(10.38)	(11.46)	(07.80)	(10.42)	
HTLT	11.32	06.47	2.81	07.34	06.64
	(00.59)	(02.46)	(0.86)	(03.04)	
HELCT	76.62	61.42	47.81	53.54	58.45
	(12.49)	(11.91)	(07.37)	(14.01)	
HMMCK	5.88	3.78	0.63	1.92	02.99
	(2.07)	(1.37)	(0.24)	(0.86)	
HALL3F	5.09	4.94	1.99	3.87	04.17
	(1.94)	(1.99)	(0.59)	(1.96)	
HSDWTLT	5.21	5.22	2.77	4.18	04.45
	(1.99)	(2.00)	(0.66)	(2.09)	
HNFAC	17.97	17.73	17.38	27.95	20.64
	(8.89)	(6.49)	(4.85)	(11.43)	
Urban					
HPUCCA	65.91	68.64	71.15	58.51	77.81
	(19.82)	(08.21)	(06.56)	(04.98)	
HOVCRD	54.46	63.69	59.79	54.44	60.11
	(06.03)	(05.75)	(03.12)	(08.28)	
HSDW	69.77	89.73	89.39	78.10	90.50
	(21.73)	(03.47)	(03.02)	(07.15)	
HTLT	61.88	49.47	48.76	49.93	64.45
	(04.61)	(08.64)	(09.58)	(08.39)	
HELCT	93.15	83.67	77.69	79.72	86.07
	(02.97)	(04.45)	(05.43)	(04.04)	
HMMCK	40.28	34.49	17.17	26.43	37.08
	(04.02)	(7.19)	(04.69)	(08.57)	
HALL3F	45.36	44.64	43.80	39.69	58.77
	(11.32)	(08.95)	(09.39)	(06.33)	
HSDWTLT	45.72	45.75	44.86	40.90	60.28
	(11.48)	(09.50)	(09.73)	(06.81)	
HNFAC	2.30	2.41	3.39	5.78	02.43
	(0.71)	(0.77)	(1.51)	(2.68)	

- Excluding G. Bombay.

Note: Figures in parenthesis are corresponding Standard Deviations.

Coming to the availability of the toilet facility, it may be observed from the Table 3 that the situation is not encouraging at all as majority of the households in the state were deprived of this facility (this statement also holds true for each of the four geographic regions separately). On an average, 8 out of the every 10 households in the

districts in Konkan, Western, and Vidarbha regions did not have any toilet facility whereas in case of districts in Marathwada, this was true for 9 out of every 10 households. A substantially larger proportion of the households in the state (also true for all 4 geographic regions) continue to depend on the traditional means of fuel (wood, charcoal, cow dung cakes etc.) for cooking since very few of them reported using either domestic gas or electricity for this purpose.

When all the three facilities (Safe Drinking Water, Electricity and Toilet Facility) are considered together, it was found that only about a quarter of the households in the state enjoyed all of them whereas about 13 per cent of them were deprived of all these facilities. In case of the four geographic regions, it was noted that, on an average, the districts in Vidarbha and to some extent in Marathwada regions were worst affected in this respect as very few households in these regions enjoyed all the facilities whereas a relatively larger proportion of them were deprived of these basic facilities.

Somewhat similar observations may be made for the rural and urban areas as well. However, when the comparison is made between rural and urban areas, it may be noted that on the whole the rural parts of the state as well as that of the four geographic regions have performed extremely poor as compared to the urban areas with respect to each of the selected explanatory variables; more evidently with respect to households having toilet facility and those using modern means of cooking. For example, close to two-third of the urban households in the state as well in the districts in Konkan region and about half of them in remaining three geographic regions in urban areas have toilet facility. On the other hand, a mere 6-7 per cent of them in rural areas of the state and Western and Vidarbha regions have toilet facility. The proportion of such households in rural areas of districts in Marathwada region was only 2.81 per cent. Likewise, there were huge gaps across rural-urban areas in the use of modern means of cooking in the different geographic regions of the state. To our surprise it was noticed that the per cent of households living in over crowded houses was higher in rural areas as against that in urban areas indicating higher prevalence of inadequate housing space for the people in rural areas.

Household Amenities and Infant and Child Mortality

Table 4 gives the Correlation Matrix for the selected dependent and independent variables separately for rural and urban areas. It may be observed from the Table 4 that the correlation between the both the dependent variables and independent variables is in the expected direction. This is true for rural and urban areas as well. However, the values of correlation coefficients vary from one variable to another and also by rural-urban residence. For the total areas, share of pucca houses *(r* = -0.6304 with IMR and -0.6077 with CMR), percentages of the households not having any of the three basic amenities (r = 0.5657 with IMR and 0.6778 with CMR) and percentage household having

electricity (r = -0.4269 with IMR and -0.4970 with CMR) are found to be highly correlated with the level of infant and childhood mortality. Beside this, percentages of household using modem means of cooking also appear to be important (*r* = -0.3696 with IMR and -0.3583 with CMR).

In case of urban areas, most of the selected variables have significant value of the correlation coefficient with IMR whereas with CMR, it is only two variables (namely, per cent of household not having any of the three facility and households with modern means of cooking facility) which have shown significant association. In rural areas however, all the variables except per cent households living in over-crowded houses (both IMR and CMR), households having toilet facility (CMR only) and households having all the three facility (CMR only) all the other variables are found to be significantly correlated with the levels of infant and child mortality.

In order to find out the important variables that explain the variations in infant and child mortality, step-wise regression analysis has been carried out separately for rural, urban and combined areas. The results of stepwise regression (given in Tables 5a and 5b) clearly indicate the fact that the non-availability of three basic amenities (safe drinking water, electricity and toilet) and the access to safe drinking water explain about 72 and 74 per cent (including G. Bombay) and 71 and 76 per cent (excluding G. Bombay) of the inter-district variations in IMR and CMR in Maharashtra.

In case of rural and urban the analysis reveal that the households living in pucca houses and those having electricity explain around 60 per cent of the inter district variation in IMR. On the other hand, households not having any of the three basic amenities, living in pucca houses and having access to safe drinking water explain nearly 72 per cent of the inter-district variation in CMR. Per cent households not having any of the three facility and per cent living in pucca houses explain 58 per cent of the inter-district variation in IMR in urban areas (including G. Bombay) whereas in case of CMR it is only one variable which appear to be important (per cent households not having any of the three basic amenity, explaining 46 per cent of the variation across districts).

It may be noted that in rural areas, variables like pucca houses and availability of electricity play greater role in explaining the variation in IMR and CMR. It is quite obvious that in rural areas, indicators of household environment and sanitation do not come out to be important factors that determine child survival. This may be due to the fact that the level of households in rural areas having access to such facilities is very low level (virtually negligible). Also rural settlement too may play some role in this. In urban areas, household environment and sanitation seem to have direct effect on Child survival.

Concluding Remarks

From the above analysis it may be observed that though, on the whole, the levels of infant and childhood mortality in Maharashtra are lower as compared to that at the

TABLE 4: CORRELATION MATRIX BETWEEN INDEPENDENT AND DEPENDENT VARIABLES

	IMR	*CMR*	*HPUCCA*	*HOVCRD*	*HTLT*	*HSDW*	*HELCT*	*HMMCK*	*HNFAC*	*HALL3F*	*HSDWTLT*
						A: RURAL AREAS					
IMR	1.0000	0.9248**	−0.6304**	0.0435	−0.1775	−0.1929	−0.4269*	−0.3696*	0.5657**	−0.2261	−0.2124
CMR		1.0000	−0.6077**	0.3220	−0.1092	−0.2933	−0.4970**	−0.3583	0.6778**	−0.2375	−0.2184
HPUCCA			1.0000	0.0995	−0.1857	0.4780**	−0.0324	0.1248	−0.2661	0.1658	0.1626
HOVCRD				1.0000	−0.0422	0.2067	0.0031	0.2295	−0.0169	0.1948	0.2078
HTLT					1.0000	−0.4253*	0.6677**	0.6382**	−0.2055	0.8136**	0.8065**
HSDW						1.0000	−0.2258	−0.3243	−0.4839**	0.0054	0.0374
HELCT							1.0000	0.5636**	−0.6713**	0.5362**	0.5012**
HMMCK								1.0000	−0.1145	0.6643**	0.6338**
HNFAC									1.0000	−0.2732	−0.2694
HALL3F										1.0000	0.9972**
HSDWTLT											1.0000
						B: URBAN AREAS					
IMR	1.0000	0.8934**	−0.4296*	−0.4358*	−0.4076*	−0.2643	0.4047*	−0.5091**	0.7009**	−0.4491*	−0.4377*
CMR		1.0000	−0.3436	−0.3521	−0.2744	−0.2423	−0.3132	−0.3640*	0.6818**	−0.3031	−0.2898
HPUCCA			1.0000	0.2899	0.1724	0.6454**	−0.0288	0.1417	−0.1887	0.5844**	0.5736**
HOVCRD				1.0000	0.0795	0.6216**	0.0216	0.1628	−0.6008**	0.3758	0.3934
HTLT					1.0000	−0.0983	0.5940**	0.6099**	−0.4164*	0.7877**	0.7828**
HSDW						1.0000	−0.3456	−0.0623	−0.3531	0.5093**	0.5217**
HELCT							1.0000	0.7090**	−0.4615*	0.3120	0.2715
HMMCK								1.0000	−0.4110*	0.4829**	0.4575*
HNFAC									1.0000	−0.4642**	−0.4621*
HALL3F										1.0000	0.9975**
HSDWTLT											1.0000
						C: COMBINED AREAS					
IMR	1.0000	0.9417**	−0.6581**	−0.0312	−0.4016*	−0.3345	−0.5545**	−0.4590*	0.7093**	−0.4120*	−0.4094*
CMR		1.0000	−0.6258**	−0.0383	−0.3337	−0.3957*	−0.5756**	−0.4050*	0.7885**	−0.3471	−0.3437
HPUCCA			1.0000	0.1871	0.5523**	0.6924**	0.2327	0.5874**	−0.4882*	0.6458**	0.6452**
HOVCRD				1.0000	0.1178	0.3479	0.0624	0.1664	−0.1608	0.1802	0.1850
HTLT					1.0000	0.3654*	0.5651**	0.9658**	−0.4532*	0.9836**	0.9832**
HSDW						1.0000	−0.0283	−0.3743*	−0.5149**	0.4819**	0.4860**
HELCT							1.0000	0.6314**	−0.7351**	0.4905**	0.4808**
HMMCK								1.0000	−0.4923**	0.9567**	0.9539**
HNFAC									1.0000	−0.4434*	−0.4398*
HALL3F										1.0000	0.9998**
HSDWTLT											1.0000

** and * : Correlation is significant at the 0.01 and 0.05 level respectively.

TABLE 5a : RESULTS OF STEP-WISEREGRESSION INCLUDING GREATER BOMBAY

Dependent Variable: HPUCCA, HOVCRD, HSDW, HTLT, HELCT, HMMCK, HALL3F, HSDWTLT AND HNFAC

	R^2 (%)	SE
A: **Combined** (*N* = 30)		
IMR = 37.97 + 1.1795 HNFAC - 0.5754 HPUCCA + 0.4015 HSDW	72	9.22
CMR ° 1.01 + 9.915 HNFAC - 3.131 HPUCCA + 2.070 HSDW	74	6.46
B: Rural (*N* = 29)		
IMR = 114.42 - 0.6304 HPUCCA - 0.5152 HELECT	60	11.49
CMR = 1.27 + 9.421 HNFAC - 4.425 HPUCCA + 2.297 HSDW	72	7.74
C: Urban (*N* = 30)		
IMR = 47.67 + 2.5639 HNFAC - 0.2393 HPUCCA	58	6.18
CMR = 7.41 + 1.859 HNFAC	46	4.70

TABLE 5b : RESULTS OF STEP-WISE REGRESSION EXCLUDING GREATERBOMBAY (*N* = 29)

Dependent Variable: HPUCCA, HOVCRD, HSDW, HTLT, HELCT, HMMCK, HALL3F, HSDWTLT AND HNFAC

	R^2(%)	SE
***A:* Combined**		
IMR = 38.89 + 1.2003 HNFAC - 0.6094 HPUCCA + 0.4004 HSDW	71	9.29
CMR = 1.14 + 1.022 HNFAC - 3.62 HPUCCA + 2.054 HSDW	76	4.77
B: Urban		
IMR = 48.78 + 2.5949 HNFAC - 0.2594 HPUCCA	57	6.27
CMR = 7.21 + 1.892 HNFAC	47	4.77

national level, they vary considerably from one district to another and from rural areas to urban areas. It appears that the district in Konkan and Western regions at large have achieved relatively lower levels of infant and childhood mortality. On the other hand, mortality has remained at rather higher levels for a number of the districts in Marathwada and Vidarbha regions. The rural-urban gaps in both IMR and CMR are also prominent in majority of the districts in Vidarbha and Marathwada regions. Districts like Yavatmal, Gadchiroli, Chandrapur and Bhandara are far behind than the rest of the districts as the estimated levels of infant and child mortality in these districts are particularly high. Beside this, the analysis reveals that the differentials in the rural-urban child mortality in the districts of Akola, Yavatmal, Bhandara and Wardha from 'Vidarbha and Aurangabad and Latur from Marathwada and Thane from Konkan regions are too wide (rural CMR is 2 to 3 times higher than that of the urban CMR).

The analysis of the availability of the basic amenities to the households reveals that

in general, that they too are at low levels in the districts of Vidarbha and Marathwada regions. As has been noted, the availability of safe drinking water, toilet and sanitation and adequacy of housing space as well as the quality of housing (measured in terms of per cent share of pucca houses) and modem means of cooking is relatively poorer in the districts of Vidarbha and Marathwada regions.

The results of correlation and step-wise regression reveal that the availability of these facilities in the form of deprivation from the three minimum basic household amenities such as safe drinking water, electricity' and toilet facility, pucca house, use of modern means of cooking (particularly in case of CMR) have strong association with the levels of IMR and CMR. The selected variables are able to explain about more than 70 per cent of the total inter-district variation across districts and thus play an important role in determining the level of IMR and CMR at the district level. It may however be emphasized here that without incorporating issues concerning the provision of these basic amenities that would ensure certain level of household hygiene to its inmates (including personal hygiene) as the top priority in planning for health along with various intervention programmes, it would be difficult to bring down the levels of infant and childhood mortality. In addition to the availability of such amenities, it may be equally important to plan suitable health education programme in order to promote practices of personal and household hygiene. To bring in the favourable behavioural changes in the attitudes in the society at large and as well as among individuals, it is necessary to have health educational programmes focussing on these issues with the help of community participation especially that of the women in planning and management.

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