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Mortality in India : Trend and Prospects

RELIABLE data on mortality in India is rather scanty. Civil registration data is poor and is not good enough for any meaningful analysis. For any good and reasonable understanding of the mortality process, the only source is the data generated by the Sample Registration System, brought in operation during the late sixties. In this paper it is proposed, to process these data and analyse the pattern and level of the mortality changes that are taking place over this recent period of twenty years between 1970 to 1990. The annual data on crude death rate and infant mortality rate for the period are directly available from SRS. The Sample Registration System (SRS) has also generated life tables for each five year period between 1970 to 1985 and thus important comparative life table indices for this period are available. For the period after 1985 we have generated our own life table using the same methodology (Greville) as that of SRS for obtaining such indicators.

Level and Trend : All India Level

There has been an all round improvement in the level of mortality in India during the period between 1970 to 1990. All indicators of mortality at different time points over this period consistently indicate this declining trend in the whole country as well in its rural and urban population segments separately.

The trend in the crude death rate, the infant mortality rate and the expectation of life at birth during the 20 year period is shown in Table 1. The information is given for the country as a whole and also separately for rural and urban areas. The over all crude death rate has declined from around 15 in early seventies, to around 10 by 1990. The infant mortality rate dropped sharply from around 140 to 80 over the same period. The expectation of life at birth recorded an increase of roughly 8 years; from an estimated level of 49.7 years for the quinquennium 1970-75 it rose to 57.8 years for the four year period 1985-89.

The separate figures for both rural and urban areas again reveal declining mortality trend in line with the country as a whole. However, higher decline in the rural as compared to urban areas has resulted in somewhat reducing the rural urban gap. In rural areas, the crude death rate fell from around 17-18 in early seventies (1971-75) to 10-11 in late eighties (1985-90) as compared to corresponding decline from around 9-10 to 6-7 in urban areas. The decline recorded in infant mortality rate in rural areas during the same period was from around 140-150 to 85-105 as compared to from 75-85 to 55-65 in urban areas. Likewise the improvement revealed in expectation of life at birth was larger in rural areas (from 48 to 56) as compared to urban areas (from 59 to 64).

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TABLE 1 : TRENDS IN MORTALITY LEVEL, INDIA : 1971-90

Year	Rural			Urban			Combined		
	Crude Death Rate	Infant Mortality Rate	Expectation of Life at Birth	Crude Death Rate	Infant Mortality Rate	Expectation of Life at Birth	Crude Death Rate	Infant Mortality Rate	Expectation of Life at Birth
1971	16.4	138		9.7	82		14.9	129	
1972	18.9	150		10.3	85		16.9	139	
1973	17.0	143	48.0	9.6	89	58.9	15.5	134	49.7
1974	15.9	136		9.2	74		14.5	126	
1975	17.3	151		10.2	84		15.9	140	
1976	16.3	139		9.5	80		15.0	129	
1977	16.0	140		9.4	81		14.7	130	
1978	15.3	137	50.6	9.4	74	60.1	14.2	127	52.3
1979	14.1	130		8.1	72		13.0	120	
1980	13.7	124		7.9	65		12.6	114	
1981	13.7	119		7.8	62		12.5	110	
1982	13.1	114		7.4	65		11.9	105	
1983	13.1	114	53.7	7.9	66	62.8	11.9	105	55.5
1984	13.8	113		8.6	66		12.6	104	
1985	13.0	107		7.8	59		11.8	97	
1986	12.2	105		7.6	62		11.1	96	
1987	12.0	104		7.4	61		10.9	95	
1988	12.0	102	56.3	7.7	62	64.0	11.0	94	57.8
1989	11.1	98		7.2	58		10.3	91	
1990	10.4	86	N.A.	6.7	51	N.A.	9.6	80	N.A.

Trend in Different States

Mortality trend in each state and also in both urban and rural areas of each state is in line with the whole country and show a continued fall (Table 2a). The extent of fall, however, differed from state to state, it is generally steeper in states with initial higher levels of mortality. The decline in crude death rate over the period of twenty years varied between 8.1 points in Uttar Pradesh to 2.3 points in the state of Kerala. The fall in infant mortality rate varied between the highest 63 points again in Uttar Pradesh to no decline in Jammu and

Kashmir and 14 points in the states of Karnataka and 17 points in Orissa. The improvement in the life expectancy at birth during the period 1971-75 and 1981-85 for which the figures are available reveal the highest 9.6 points improvement in Andhra Pradesh, from 48.8 to 58.4, and the lowest 2.8 points in Haryana, from 57.5 to 60.3. The notable feature of changes in different states over the period is that the comparative position of states in respect of the level of mortality initially and at the end of the period remained materially unchanged. Kerala and Uttar Pradesh has the lowest and the highest levels of mortality amongst the spectrum of Indian states both at the beginning as well as at the close of this twenty year period from 1971 to 1991.

TABLE 2a: TRENDS IN MORTALITY LEVEL IN DIFFERENT STATES OF INDIA

	<i>Crude Death Rate</i>				<i>Infant Mortality Rate</i>				<i>Expectation of Life at Birth</i>			
	1977-75	75-80	81-85	86-90	1977-75	76-80	81-85	86-90	1977-75	76-80	57-55	86-90
Andhra Pradesh	15.5	13.2	10.7	9.6	112	112	80	79	48.8	53.1	58.4	NA
Karnataka	11.9	11.0	9.2	8.6	89	82	70	75	55.2	56.3	60.6	NA
Kerala	8.5	7.3	6.6	6.2	57	46	32	24	61.0	65.5	68.4	NA
Tamil Nadu	14.5	12.9	11.0	9.2	112	102	84	73	49.6	53.4	56.9	NA
Gujarat	15.1	13.6	11.4	10.0	139	128	107	90	48.8	51.4	57.6	NA
Maharashtra	12.3	11.0	9.1	8.2	101	87	74	63	53.8	56.3	60.6	NA
Madhya Pradesh	17.1	16.0	14.9	13.3	145	143	129	117	47.2	49.0	51.6	NA
Uttar Pradesh	21.5	18.5	16.1	13.4	183	169	150	120	43.0	46.2	50.0	NA
Bihar	15.3	13.5	14.1	12.4	NA	NA	106	93	NA	NA	51.8	NA
Rajasthan	15.7	14.3	13.5	11.5	134	127	109	98	48.4	51.4	53.5	NA
Orissa	17.4	15.1	13.4	11.5	140	140	131	123	45.7	49.1	53.0	NA
West Bengal	12.7	11.6	10.4	8.4	NA	NA	82	70	NA	NA	57.4	NA
Assam	17.1	10.3	11.7	11.2	138	113	102	96	45.5	51.1	51.9	NA
Haryana	11.7	11.3	9.9	8.9	97	107	94	83	57.5	54.8	60.3	NA
Himachal Pradesh	13.9	11.6	10.3	8.8	106	101	79	79	52.6	56.6	60.4	NA
Jammu & Kashmir	10.9	10.6	9.1	8.0	71	70	74	72	56.1	56.8	60.4	NA
Punjab	11.3	10.3	9.0	8.1	106	102	75	62	57.9	60.5	63.1	NA
India	15.5	13.9	11.1	10.6	134	124	104	91	49.7	52.3	55.5	57.8

TABLE 2b: TRENDS IN MORTALITY LEVEL IN URBAN AREAS OF DIFFERENT STATES : 1971-90

	<i>Crude Death Rate</i>				<i>Infant Mortality Rate</i>				<i>Expectation of Life at Birth</i>			
	1971-75	75-80	81-85	86-90	1971-75	76-80	81-85	86-90	1971-75	76-80	81-85	86-90
Andhra Pradesh	10.2	8.2	7.2	7.0	70	56	56	56	57.2	60.6	63.8	NA
Karnataka	7.6	7.3	6.3	6.5	60	56	43	45	64.2	64.0	67.1	NA
Kerala	7.5	6.8	6.6	6.3	44	35	26	20	63.5	65.7	67.6	NA
Tamil Nadu	8.9	9.2	7.9	7.0	76	70	54	47	59.7	59.7	62.5	NA
Gujarat	11.8	10.6	9.0	8.3	108	98	72	63	55.0	57.1	60.7	NA
Maharashtra	9.3	8.2	6.9	6.1	79	60	54	46	58.8	62.2	64.0	NA
Madhya Pradesh	10.6	9.5	9.1	8.5	96	84	78	77	56.6	58.3	60.3	NA
Uttar Pradesh	13.5	11.7	10.3	9.3	120	111	94	78	51.5	54.9	57.8	NA
Bihar	9.7	8.4	8.2	7.8	NA	NA	65	64	NA	NA	61.0	NA
Rajasthan	9.1	9.0	9.0	8.0	80	67	69	65	59.6	60.3	61.1	NA
Orissa	11.1	9.4	8.6	7.6	85	79	75	73	55.4	58.2	59.6	NA
West Bengal	9.9	7.9	6.9	6.6	NA	NA	49	47	NA	NA	64.9	NA
Assam	9.7	7.8	8.1	7.7	90	81	78	62	55.7	60.8	60.2	NA
Haryana	8.3	8.1	7.0	6.9	64	59	61	60	62.4	62.4	66.1	NA
Himachal Pradesh	7.0	8.1	5.7	6.1	63	57	45	40	62.1	65.9	68.2	NA
Jammu & Kashmir	6.5	6.4	6.7	6.4	45	40	45	53	63.7	64.4	62.4	NA
Punjab	8.9	8.4	6.7	6.7	73	74	52	53	61.1	63.0	68.1	NA
India	9.8	8.9	7.9	7.3	89	74	64	59	58.9	60.1	62.8	64.0

The separate figures for urban and rural areas of each state, again clearly show continued downward trend in mortality in both (Table 2b and 2c). The only exception may be the urban areas in the state of Jammu & Kashmir where the level of mortality did not register any improvement. Further as in the country as whole the declines has been higher in rural as compared to urban areas in almost all states resulting in reducing rural urban gap. Another notable feature revealed here is the levelling off the interstate differentials in the level of mortality in urban areas of different states. It is clear from Table 2b that the crude death rate in urban areas varied only marginally between 6.1 to 9.3 for different states in 1986- 90 as compared to the corresponding variation indicated by 6.5 to 13.5 in 1971-75.

TABLE-2c: TRENDS IN MORTALITY LEVEL IN RURAL AREAS OF DIFFERENT STATES : 1971-90

	<i>Crude Death Rate</i>				<i>Infant Mortality Rate</i>				<i>Expectation of Life at Birth</i>			
	1971-75	75-80	81-85	86-90	1971-75	76-80	81-85	86-90	1971-75	76-80	81-85	86-90
Andhra Pradesh	16.7	14.3	11.6	10.4	122	121	87	84	47.3	51.7	57.1	NA
Karnataka	13.5	12.4	10.3	9.4	97	90	78	84	52.6	53.9	58.7	NA
Kerala	8.7	7.3	6.5	6.1	59	48	33	25	61.7	65.5	68.5	NA
Tamil Nadu	16.9	14.4	12.6	10.4	127	144	97	85	46.2	51.0	54.6	NA
Gujarat	16.3	14.6	12.4	10.7	152	137	120	102	47.4	51.0	56.2	NA
Maharashtra	13.7	12.2	10.2	9.3	109	97	84	71	51.9	54.0	59.0	NA
Madhya Pradesh	18.2	17.2	16.2	14.5	153	152	138	125	45.7	47.6	50.0	NA
Uttar Pradesh	22.5	19.5	17.4	14.4	186	175	159	128	42.0	45.2	48.7	NA
Bihar	15.8	14.1	14.7	11.9	NA	NA	110	95	NA	NA	52.1	NA
Rajasthan	17.2	15.4	14.6	12.5	147	138	117	104	46.6	50.3	52.1	NA
Orissa	17.9	15.6	14.8	13.1	144	144	136	127	45.1	48.5	52.4	NA
West Bengal	NA	12.8	11.7	9.8	NA	NA	90	76	NA	NA	55.1	NA
Assam	17.9	13.0	13.1	11.5	141	115	103	98	44.9	50.4	51.2	NA
Haryana	12.4	13.2	10.6	9.4	99	115	101	88	56.4	53.6	58.9	NA
Himachal Pradesh	14.3	11.0	10.6	9.0	115	102	80	81	52.0	56.2	60.0	NA
Jammu & Kashmir	12.1	11.7	9.8	8.5	74	76	81	76	54.7	55.4	59.6	NA
Punjab	12.0	10.8	9.8	8.6	114	108	82	65	57.1	59.8	61.7	NA
India	17.1	15.1	13.3	11.5	142	135	113	101	48.0	50.6	53.7	56.3

Changes in Age Pattern of Mortality by Sex

Trend in expectation of life at various ages shows that mortality improvement occurred all over the life span continuously through the period 1970 to 1990 (Table 3a). The expectation of life at all prime ages gradually increased all over beginning from age 0 till the close of life span after the age of 70 years. The life expectancy at ages 10, 30 and 50 years of age from 54,37 and 20 years respectively at the beginning during the quinquennium 1970-75 improved to 58,40 and 23 years at the close during the four year period 1986-1989. The increase in life expectancy at age 70 and over during the same period was from 9 to 11 years.

TABLE 3a: TRENDS IN LEVEL AND AGE PATTERN OF MORTALITY IN INDIA—1970-89:
EXPECTATION OF LIFE AT VARIOUS LIFE STAGES BY RESIDENCE

<i>Residence</i>	<i>Period</i>	<i>Age in years</i>									
		<i>0</i>	<i>1</i>	<i>5</i>	<i>10</i>	<i>20</i>	<i>30</i>	<i>40</i>	<i>50</i>	<i>60</i>	<i>70</i>
Rural	1970-75	48.0	54.9	56.7	53.2	44.5	36.2	28.0	20.2	13.5	8.6
	1976-80	50.6	57.4	58.7	55.0	46.2	37.8	29.3	21.4	14.7	10.1
	1981-85	53.7	59.6	59.9	56.2	47.3	38.8	30.2	22.1	15.1	9.9
	1986-89	56.3	61.7	61.6	57.7	48.7	40.1	31.4	23.3	16.1	11.1
Urban	1970-75	58.9	63.3	61.7	57.5	48.3	39.3	30.7	22.6	15.7	10.8
	1976-80	60.1	64.0	62.7	58.3	49.0	40.0	31.2	23.0	16.2	11.0
	1981-85	62.8	66.0	64.1	59.7	50.4	41.3	32.3	24.0	16.9	11.6
	1986-89	64.0	67.2	64.4	59.9	50.5	41.5	32.4	23.9	16.8	11.4
Combined	1970-75	49.7	56.2	57.5	53.9	45.1	36.6	28.3	20.4	13.8	8.9
	1976-80	52.3	58.6	59.4	55.6	46.8	38.2	29.7	21.7	15.0	10.2
	1981-85	55.5	60.9	60.8	56.9	47.9	39.2	30.6	22.4	15.7	10.2
	1986-89	57.8	62.8	62.2	58.2	49.1	40.4	31.6	23.4	16.3	11.1

TABLE 3b: TRENDS IN LEVEL AND AGE PATTERN OF MORTALITY OF MALES IN INDIA— 1970-89:

EXPECTATION OF LIFE, AT VARIOUS LIFE STAGES BY RESIDENCE

<i>Residence</i>	<i>Period</i>	<i>Age in years</i>									
		<i>0</i>	<i>1</i>	<i>5</i>	<i>10</i>	<i>20</i>	<i>30</i>	<i>40</i>	<i>50</i>	<i>60</i>	<i>70</i>
Rural	1970-75	48.9	55.8	56.8	53.2	44.8	35.6	27.2	19.5	13.1	8.3
	1976-80	51.0	57.6	58.1	54.2	45.3	36.5	28.0	20.2	13.8	9.4
	1981-85	54.0	59.8	59.5	55.6	46.5	37.7	29.1	21.1	14.4	9.4
	1986-89	56.4	61.8	60.8	56.7	47.7	38.8	30.1	22.1	15.2	10.4
Urban	1970-75	58.8	63.1	60.9	56.6	47.4	38.2	29.5	21.6	15.1	10.5
	1976-80	59.6	63.4	61.7	57.2	47.9	38.7	29.9	22.0	15.4	10.6
	1981-85	61.6	64.9	62.6	58.1	48.8	39.6	30.7	22.6	15.8	10.8
	1986-89	62.7	65.9	62.7	58.1	48.7	39.5	30.6	22.3	15.4	10.3
Combined	1970-75	50.5	57.0	57.5	53.8	44.8	36.0	27.6	19.8	13.4	8.6
	1976-80	52.5	58.6	58.8	54.8	45.8	36.9	28.3	20.5	14.1	9.6
	1981-85	55.4	60.8	61.1	56.1	47.0	38.1	29.4	21.4	14.6	9.7
	1986-89	57.7	62.6	61.2	57.0	47.9	38.9	30.2	22.1	15.2	10.4

TABLE 3c: TRENDS IN LEVEL AND AGE PATTERN OF MORTALITY OF FEMALES IN INDIA—1970-89: EXPECTATION OF LIFE AT VARIOUS LIFE STAGES BY RESIDENCE

Residence	Period	Age in years									
		0	1	5	10	20	30	40	50	60	70
Rural	1970-75	47.1	54.1	56.7	53.3	44.8	36.9	28.8	20.8	13.9	8.8
	1976-80	50.3	57.3	59.4	55.9	47.2	39.2	30.9	22.7	15.7	10.8
	1981-85	53.6	59.4	60.5	56.8	48.1	39.9	31.5	23.2	15.9	10.4
	1986-89	56.3	61.6	62.5	58.7	50.0	41.6	33.0	24.5	17.1	11.8
Urban	1970-75	59.2	63.5	62.7	58.6	49.5	40.7	32.1	23.8	16.5	11.1
	1976-80	60.8	64.7	63.8	59.5	50.4	41.6	32.7	24.3	17.0	11.4
	1981-85	64.1	67.3	65.9	61.5	52.3	43.3	34.3	25.7	18.0	12.5
	1986-89	63.9	66.8	64.5	60.1	50.9	41.9	32.7	23.9	16.1	10.3
Combined	1970-75	49.0	55.6	57.7	54.2	45.6	37.5	29.3	21.3	14.3	9.2
	1976-80	52.1	58.8	60.2	56.6	47.8	39.6	31.2	23.0	15.9	10.9
	1981-85	55.7	61.1	61.8	58.0	49.2	40.7	32.1	23.8	16.4	11.0
	1986-89	57.9	62.9	63.1	59.2	50.4	41.9	33.2	24.7	17.3	11.9

In regard to trend in rural and urban areas separately, the picture generally is in line with the over all trend except that there is no marked change recorded in urban areas recently after 1985. A comparison of life expectancies at various ages in urban areas during 1980-85 and 1986-89 show only marginal differences; positive at some and negative at other life stages. However between the rural and urban areas it is notable that the improvement in life expectancies has been substantially larger in rural areas at all prime life stages. This has resulted in significantly lowering the rural urban gap.

In respect of trends in male and female mortality levels during this period the figures in Tables 3b and 3c show that there has been marked and continuous improvement in mortality level both among males and females and this has been so all over the life span in the whole country as well as in both in rural and urban areas separately. One exception to this general picture may however be noted viz., in urban areas the mortality recorded marginal decrease during 1986-89 over its level during immediate preceding quinquennium. This has been so in case of females all over the life span and for males after age 20. In case of rural areas however the increase in life expectancy has been consistent all through the period over the entire life span and both for males and females. Between the two sex it need be mentioned that the increase has been notably larger for females as compared to males.

Life Tables: 1986-89

As noted above we have used the recent SRS data on age specific death rates to construct abridged life tables for India for the period 1986-89. It may be mentioned that no attempt here have been made to smooth or graduate these data. The reasons has been two fold: Firstly

we wanted to keep comparability of our life tables with similar tables constructed for the earlier period by the Registrar General of India. Secondly it has been observed that the SRS rates are reasonably good. The age pattern of mortality revealed by these rates broadly confirm to the general *U* shaped curve. The slight deviation; somewhat lower age specific rates in the age groups 25-29 and for females even in age group 30-34 than in age group 20-24 in Tables 4a to 4c and 4g to 4i perhaps is the impact of maternal mortality. The maternal mortality being notably high during the age group 20-24 raises the comparative level of mortality for females and in turn the over all level in this group resulting in deviation from the normal pattern. The life tables are given in Tables 4a to 4i.

The expectation of life at birth for all India during 1986-89 is found to be 57.8 years. The respective figures of 64.0 and 56.3 years for urban and rural areas is indicative of the large urban rural differentials (Tables 4a to 4i). Between the two sexes, the overall results reveal a some what higher expectancy of life at birth for females (57.9) than males (57.7). However the sex differential separately in rural and urban areas do not fall in line with the over all picture. While the urban results of 62.7 and 63.9 years respectively for males and females life expectancy confirm to the national scene, the corresponding rural figures of 56.4 and 56.2 for the two sexes do not fall in line with the national pattern. The results show better life expectancy for males than females in rural areas.

The life expectancy is the highest at age 1 reflecting on a very high level of infant mortality and sharp decline afterwards. This is so in the country as a whole and both for

TABLE 4a : S. R. S. BASED ABRIDGED LIFE TABLE FOR INDIA (1986-1989)

	$M(x)$	$Q(x)$	$I(x)$	$D(x)$	$L(x)$	$T(x)$	$e(x)$
0	0.09428	0.09428	100000	9427	93175	5784180	57.84
1-4	0.01400	0.06778	90573	6139	438487	5691005	62.83
5-9	0.00315	0.01564	84434	1320	419107	5252518	62.21
10-14	0.00153	0.00760	83114	632	414105	4833411	58.15
15-19	0.00220	0.01094	82482	903	410318	4419306	53.58
20-24	0.00285	0.01416	81579	1155	405219	4008988	49.14
25-29	0.00278	0.01379	80424	1108	399552	3603769	44.81
30-34	0.00310	0.01539	79316	1221	393748	3204217	40.40
35-39	0.00390	0.01933	78095	1509	386972	2810469	35.99
40-44	0.00533	0.02630	76586	2014	378249	2423497	31.64
45-49	0.00765	0.03758	74572	2803	366333	2045248	27.43
50-54	0.01190	0.05789	71769	4155	349135	1678915	23.39
55-59	0.01778	0.08531	67614	5768	324520	1329780	19.67
60-64	0.02985	0.13937	61846	8619	288762	1005260	16.25
65-69	0.04348	0.19681	53227	10476	240959	716498	13.46
70+	0.08990	1.00000	42751	42751	475539	475539	11.12

TABLE 4b: S. R. S. BASED ABRIDGED LIFE TABLE FOR URBAN-INDIA (1986-1989)

	$M(x)$	$Q(x)$	$I(x)$	$D(x)$	$L(x)$	$T(x)$	$e(x)$
0	0.06058	0.06058	100000	6058	95614	6404259	64.04
1-4	0.00673	0.03311	93942	3110	462477	6308645	67.15
5-9	0.00163	0.00809	90832	735	452459	5846168	64.36
10-14	0.00093	0.00462	90097	416	449523	5393709	59.87
15-19	0.00150	0.00747	89681	670	446854	4944186	55.13
20-24	0.00208	0.01033	89011	919	442926	4497332	50.53
25-29	0.00200	0.00995	88092	877	438428	4054406	46.03
30-34	0.00230	0.01144	87215	998	433764	3615978	41.46
35-39	0.00308	0.01527	86217	1316	428035	3182214	36.91
40-44	0.00420	0.02080	84901	1766	420407	2754179	32.44
45-49	0.00675	0.03323	83135	2762	409251	2333772	28.07
50-54	0.01125	0.05481	80373	4405	391575	1924521	23.95
55-59	0.01785	0.08566	75968	6507	364549	1532946	20.18
60-64	0.02690	0.12644	69461	8783	326501	1 168397	16.82
65-69	0.04030	0.18375	60678	11150	276669	841896	13.88
70+	0.08763	1.00000	49528	49528	565227	565227	11.41

TABLE 4c : S. R. S. BASED ABRIDGED LIFE TABLE FOR RURAL-INDIA (1986-1989)

	$M(x)$	$Q(x)$	$I(x)$	$D(x)$	$L(x)$	$T(x)$	$e(x)$
0	0.10233	0.10233	100000	10233	92592	5629081	56.29
1-4	0.01598	0.07699	89767	6911	432625	5536489	61.68
5-9	0.00358	0.01773	82856	1469	410874	5103864	61.60
10-14	0.00168	0.00834	81387	679	405365	4692990	57.66
15-19	0.00240	0.01193	80708	963	401310	4287625	53.13
20-24	0.00310	0.01539	79745	1227	395881	3886315	48.73
25-29	0.00305	0.01514	78518	1189	389833	3490434	44.45
30-34	0.00338	0.01674	77329	1295	383642	3100601	40.10
35-39	0.00420	0.02080	76034	1581	376501	2716959	35.73
40-44	0.00568	0.02801	74453	2085	367418	2340458	31.44
45-49	0.00788	0.03867	72368	2798	355323	1973040	27.26
50-54	0.01213	0.05895	69570	4101	338261	1617717	23.25
55-59	0.01778	0.08531	65469	5585	314219	1279456	19.54
60-64	0.03058	0.14252	59884	8535	279135	965237	16.12
65-69	0.04425	0.19997	51349	10268	232051	686102	13.36
70+	0.09048	1.00000	41081	41081	454051	454051	11.05

TABLE 4d: S. R. S. BASED ABRIDGED LIFE TABLE FOR MALES—INDIA (1986-1989)

	$M(x)$	$Q(x)$	$I(x)$	$D(x)$	$L(x)$	$T(x)$	$e(x)$
0	0.09458	0.09458	100000	9458	93153	5765295	57.65
1-4	0.01158	0.05635	90542	5102	440791	5672142	62.65
5-9	0.00278	0.01379	85440	1178	424471	5231351	61.23
10-14	0.00148	0.00735	84262	619	419878	4806880	57.05
15-19	0.00185	0.00921	83643	770	416431	4387002	52.45
20-24	0.00233	0.01156	82873	958	412143	3970571	47.91
25-29	0.00245	0.01218	81915	998	407260	3558428	43.44
30-34	0.00303	0.01502	80917	1215	401765	3151168	38.94
35-39	0.00428	0.02116	79702	1687	394591	2749403	34.50
40-44	0.00613	0.03019	78015	2356	384595	2354812	30.18
45-49	0.00908	0.04443	75659	3362	370456	1970217	26.04
50-54	0.01393	0.06743	72297	4875	350071	1599761	22.13
55-59	0.02040	0.09732	67422	6562	321658	1249690	18.54
60-64	0.03405	0.15747	60860	9584	281460	928032	15.25
65-69	0.04835	0.21649	51276	11101	229594	646572	12.61
70+	0.09635	1.00000	40176	40176	416978	416978	10.38

TABLE 4e: S. R. S. BASED ABRIDGED LIFE TABLE FOR URBAN MALES—INDIA (1986-1989)

	$M(x)$	$Q(x)$	$I(x)$	$D(x)$	$L(x)$	$T(x)$	$e(x)$
0	0.06245	0.06245	100000	6245	95479	6269985	62.70
1-4	0.00563	0.02776	93755	2603	462726	6174506	65.86
5-9	0.00148	0.00735	91152	670	454210	571 1780	62.66
10-14	0.00088	0.00437	90482	395	451497	5257570	58.11
15-19	0.00130	0.00648	90087	584	449084	4806073	53.35
20-24	0.00185	0.00921	89503	824	445607	4356989	48.68
25-29	0.00200	0.00995	88679	883	441350	3911382	44.11
30-34	0.00263	0.01305	87796	1145	436326	3470032	39.52
35-39	0.00345	0.01711	86651	1483	429815	3033706	35.01
40-44	0.00503	0.02484	85168	2115	420927	2603891	30.57
45-49	0.00813	0.03987	83053	3311	407551	2182964	26.28
50-54	0.01345	0.06520	79742	5199	386539	1775413	22.27
55-59	0.02133	0.10152	74543	7568	354876	1388874	18.63
60-64	0.03170	0.14739	66975	9871	311395	1033998	15.44
65-69	0.04695	0.21089	57104	12042	256492	722603	11.65
70+	0.09668	1.00000	45062	45062	466111	466111	10.34

TABLE 4f: S. R. S. BASED ABRIDGED LIFE TABLE FOR RURAL MALES—INDIA (1986-1989)

	M(x)	Q(x)	I(x)	D(x)	L(x)	T(x)	e(x)
0	0.10208	0.10208	100000	10208	92610	5643486	56.44
1-4	0.01293	0.06273	89792	5632	435786	5550876	61.82
5-9	0.00323	0.01601	84160	1347	417676	5115090	60.78
10-14	0.00160	0.00797	82813	660	412536	4697414	56.72
15-19	0.00200	0.00995	82153	818	408870	4284878	52.16
20-24	0.00253	0.01255	81335	1021	404310	3876008	47.66
25-29	0.00263	0.01305	80314	1048	399143	3471698	43.23
30-34	0.00318	0.01576	79266	1249	393436	3072555	38.76
35-39	0.00450	0.02227	78017	1737	386053	2679119	34.34
40-44	0.00648	0.03189	76280	2433	375742	2293066	30.06
45-49	0.00945	0.04623	73847	3414	361274	1917324	25.96
50-54	0.01408	0.06813	70433	4799	340928	1556050	22.09
55-59	0.02015	0.09619	65634	6313	313309	1215122	18.51
60-64	0.03468	0.16013	59321	9499	273954	901813	15.20
65-69	0.04870	0.21789	49822	10855	222906	627859	12.60
70+	0.09623	1.00000	38967	38967	404953	404953	10.39

TABLE 4g: S. R. S. BASED ABRIDGED LIFE TABLE FOR FEMALES—INDIA (1986-1989)

	M(x)	Q(x)	I(x)	D(x)	L(x)	T(x)	e(x)
0	0.09410	0.09410	100000	9410	93187	5788657	57.89
1-4	0.01663	0.08000	90590	7248	435939	5695470	62.87
5-9	0.00370	0.01834	83342	1529	413166	5259531	63.11
10-14	0.00165	0.00822	81813	672	407512	4846365	59.24
15-19	0.00270	0.01342	81141	1089	403183	4438853	54.71
20-24	0.00338	0.01674	80052	1340	397155	4035670	50.41
25-29	0.00318	0.01576	78712	1240	390685	3638515	46.23
30-34	0.00328	0.01625	77472	1259	384440	3247830	41.92
35-39	0.00365	0.01810	76213	1379	377865	2863390	37.57
40-44	0.00455	0.02251	74834	1685	370257	2485525	33.21
45-49	0.00613	0.03019	73149	2209	360609	2115268	28.92
50-54	0.00985	0.04814	70940	3415	346734	1754659	24.73
55-59	0.01513	0.07304	67525	4932	326065	1407925	20.85
60-64	0.02583	0.12169	62593	7617	294942	1081860	17.28
65-69	0.03915	0.17898	54976	9839	251326	786918	14.31
70+	0.08428	1.00000	45137	45137	535592	535592	11.87

TABLE 4h: S. R. S. BASED ABRIDGED LIFE TABLE FOR INDIA—URBAN FEMALES (1986-1989)

	$M(x)$	$Q(x)$	$I(x)$	$D(x)$	$L(x)$	$T(x)$	$e(x)$
0	0.05845	0.05845	100000	5845	95768	6389166	63.89
1 [^]	0.00825	0.04047	94155	3811	461898	6293398	66.84
5-9	0.00178	0.00884	90344	798	449872	5831500	64.55
10-14	0.00100	0.00499	89546	447	446695	5381628	60.10
15-19	0.00175	0.00871	89099	776	443697	4934933	55.39
20-24	0.00235	0.01169	88323	1032	439221	4491236	50.85
25-29	0.00198	0.00983	87291	858	434465	4052015	46.42
30-34	0.00200	0.00995	86433	860	430169	3617550	41.85
35-39	0.00260	0.01292	85573	1106	425297	3187381	37.25
40-44	0.00328	0.01625	84467	1373	419148	2762084	32.70
45-49	0.00528	0.02606	83094	2165	410437	2342936	28.20
50-54	0.00863	0.04228	80929	3421	396670	1932499	23.88
55-59	0.01405	0.06801	77508	5272	375192	1535829	19.82
60-64	0.02225	0.10570	72236	7636	343168	1160637	16.07
65-69	0.04695	0.21089	64600	13623	290165	817469	12.65
70+	0.09668	1.00000	50977	50977	527304	527304	10.34

TABLE 4i: S. R. S. BASED ABRIDGED LIFE TABLE FOR INDIA—RURAL FEMALES (1986-1989)

	$M(x)$	$Q(x)$	$I(x)$	$D(x)$	$L(x)$	$T(x)$	$e(x)$
0	0.10260	0.10260	100000	10260	92572	5624956	56.25
1-4	0.01890	0.09048	89740	8119	429604	5532384	61.65
5-9	0.00395	0.01957	81621	1598	404395	5102780	62.52
10-14	0.00178	0.00884	80023	707	398477	4698385	58.71
15-19	0.00288	0.01428	79316	1133	393953	4299908	54.21
20-24	0.00368	0.01822	78183	1424	387611	3905955	49.96
25-29	0.00348	0.01724	76759	1323	380725	3518344	45.84
30-34	0.00353	0.01748	75436	1319	374119	3137619	41.59
35-39	0.00388	0.01920	74117	1423	367282	2763500	37.29
40-44	0.00483	0.02386	72694	1734	359441	2396218	32.70
45-49	0.00630	0.03105	70960	2203	349674	2036777	28.70
50-54	0.01010	0.04934	68757	3392	335867	1687103	24.54
55-59	0.01523	0.07350	65365	4805	315559	1351236	20.67
60-64	0.02658	0.12501	60560	7571	284873	1035677	17.10
65-69	0.04000	0.18251	52989	9671	241776	750804	14.17
70+	0.08510	1.00000	43318	43318	509028	509028	11.75

males and females in urban areas and males alone in rural areas. In case of females in rural areas however the expectation of life is highest at age 5 indicating continued high mortality and sharp declining trend for this group even in the age group 1-4.

A comparative study of life expectancies of males and females at various stages, over all as well as separately in rural and urban areas reveals to an interesting finding; females are less exposed risk of death all through life except in rural areas and that again only in early phase of life upto age 5. The life expectancies for females at all prime ages from age 0 to 70 years are found to be higher to corresponding figures for males in all cases. The only exception to this has been the early life period prior to 5 year of age where males are less exposed to death than females.

Discussion and Remarks

This comparative analysis of mortality data produced by the Sample Registration System for the recent period after 1970 reveals that generally there has been a steady and consistent all round decline in mortality level in India during the last two decades. The trend has been similar for males as well as females and both in rural and urban areas. However, female mortality in general and male mortality at ages of 20 years and above in urban areas during 1985-89 recorded a small decline as compared to the corresponding levels in the quinquennium immediately preceding. This has been an exception to the general behaviour.

The over all expectation of life at birth increased from 49.7 years during 1971-75 to 57.8 years during 1986-89. The corresponding increase was from 50.5 to 57.7 years for males and from 49.1 to 57.9 years for females. In the case of urban areas it improved from 58.9 to 64.0 years and in rural areas from 48.0 to 56.3 years. Over the same period the decline in infant mortality rate (IMR) was from around 135 to around 95. The corresponding decline in IMR in the urban and rural areas respectively was from around 85 to 60 and 145 to 100 respectively.

The analysis also reveals that rural-urban differentials in the levels of mortality narrowed substantially during 1971 to 1990. This has been due to comparative better pace of mortality improvement in rural areas. Likewise, a larger improvement in mortality level among females than males, particularly in rural areas resulting in removal of prevalent male-female gap is another important finding that emerges from this analysis.

There has been a shift in pattern of life expectancy at different stages of life in as far as one had the maximum life expectancy at age 5 initially in 1970-75 but at the close of the period in 1986-89 the maximum expected life span occurred at age 1. This suggests continued persistence of comparative very high level of infant mortality and a somewhat faster decline of mortality in age span of 1 to 5 years. In the earlier phase the decline is very high in early childhood mortality continued till age 5 but in the later phase the decline ceases earlier at the age of around one year and begins to increase thereafter.

States level analysis shows that mortality during this period recorded decline in almost all states with low as well as high initial levels, both in rural and urban areas. The decline, however, significantly varied from state to state and was generally larger in states with comparatively higher mortality at the beginning of the period. Although this resulted in reducing the interstate disparity in mortality levels somewhat, yet it remained markedly high

at the end of the period in 1986-89 as indicated by the average level of infant mortality of as low as 25 in the state of Kerala and as high as over 125 in the Hindi heartland states of Uttar Pradesh and Madhya Pradesh and in the state of Orissa.

Mortality in India has continued to steadily decline over the recent past. This trend has been well engrained in all segments of the population throughout the country. Although there is an evidence of divergence from this general behaviour in some urban population segments more recently it is not indicative of any firm trend that may recast in future. In all likelihood further decline in mortality would continue to occur in near future. There is no strong evidence to suggest reversal of declining trend. In spite of significant decline, the current mortality level is still high as compared to even several less developed regions of the world. Even within the country there are pockets where the mortality is markedly high as compared to several other areas. The current level of infant mortality in most of the states in India have yet to approach the already attained average level of 75 and 14 respectively in the less developed and developed countries of the world. The expectancy of life at birth in India during 1986-89 still remains far below the level attained in several countries of the less developed region in the world.

The pace of increase in the expectation of life at birth appears to have decreased somewhat more recently. The amount of average annual increase in the expectation of life at birth during the intervening period between 1976-80 to 1981-85 has been more than the corresponding increase earlier during 1971-75 to 1976-80 as well as later during 1980-85 to 1986-89. It is thus possible that this reduced pace of mortality improvement may further decrease in the short period to follow. However there appears nothing to suggest that a stage has come on the Indian mortality scene where no more improvement is possible.

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