Infant Mortality trend in Andhra Pradesh

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I. Objectives:

The Infant Mortality Rate (IMR) is a sensitive indicator of infants health population health as well as socio-economic development. In addition, IMR is a sensitive indicator of the availability, utilisation and effectiveness of health care, particularly perinatal care (WHO,1981 p34). The state of Andhra Pradesh is making efforts to expedite human development and improve health status. Health and family welfare is an important aspect of the Government's vision to improve the quality of life in the state. The state envisages that by 2020, households will have smaller and better spaced families. The states Vision 2020 document emphasis IMR as one of the key health and development indicator. In this context the objectives of the study are:

1. To analyse the time trend of IMR in Andhra Pradesh from the available sources of data.
2. To analyse regional differences in IMR
3. To review evidence about socio-ecomoic status and IMR in AP.

II. Materials and Methods:

For Andhra Pradesh, as in rest of India the most regular and timely source of data for estimation of IMR is the Sample Registration System (SRS). The SRS estimates are timely and regular but the limitations of SRS are - small sample size not amenable to disaggregation. Another source is the Census. The population census of 1981 and 1991 provide district level estimates of fertility and child mortality indicators by canvassing questions on age at marriage, number of children surviving at present, the number of children ever born alive and any child born alive during the year prior to the census survey. District level estimates of child mortality have been made from census data, using indirect methods like the children ever born technique. An advantage of the census data is that district level estimates are feasible because of large sample size. The disadvantages of Census data are ; (a) the time location is not accurate in these indirect estimates and (b) intervals between successive estimates is long.

The National Family Health Survey (NFHS) collects data on children ever born from a sample of women in reproductive age group. This gives indirect estimate of IMR as in case of Census. One advantage of NFHS over Census data is the availability of estimates every five years. This would be useful source of information if continued once in five years. But its disadvantage is that the sample size is not large enough to allow diaaggregated estimates below state level. In addition time location is also not accurate, as these are indirect estimates.

The existing data sources do not allow small area estimation of IMR or stratification by socio-economic status. Recently attempts have been made in Andhra Pradesh to estimate IMR at the district and sub district level. A District Family and Health Survey (DFHS) was conducted to provide district and sub district level estimate of infant mortality, fertility and maternal mortality using indirect estimation techniques. Other sources include the Annual Vital statistics based on the Civil Registration System. Andhra Pradesh. These estimates are unreliable owing to the incompleteness of registration and differential registration of births and deaths.

III. Results:

A. Time trend:

The IMR of the state registered a consistent decline from 110-120 in 1970s to 66-70 in 1990s (figure-1). The All India (dark green line in fig-1) estimate of IMR was about 130 during the 1970s and declined to about 70-80 during the 1990s. The reduction of IMR in AP (red line in fig-1) has been keeping pace with the national trend. However performance of the state has been much less than that of the neighboring states. Kerala started with a lower level of IMR during the 1970s and has experienced consistent improvements over time. Tamil Nadu started with a level of IMR similar to AP. The decline of IMR in Tamil Nadu is higher than in AP. Both states started with similar levels of IMR in 1970s and improved the same more or less similarly during the 1980s. During 1990s, Tamil Nadu continued its improvements in IMR but Andhra Pradesh appears to have slowed down, resulting in a gap of about 10 infant deaths per 1000 live births between the two states. Orissa (light blue

line in fig-1) also shows decline in IMR from 149 in 1975 to 97 in 1999. In Madhya Pradesh (brown line in fig-1) there was an increase in IMR in 1975 but again declined in 90s to about 97 in 1999.

Figure-1: Infant mortality trend in AP and other neighbouring states
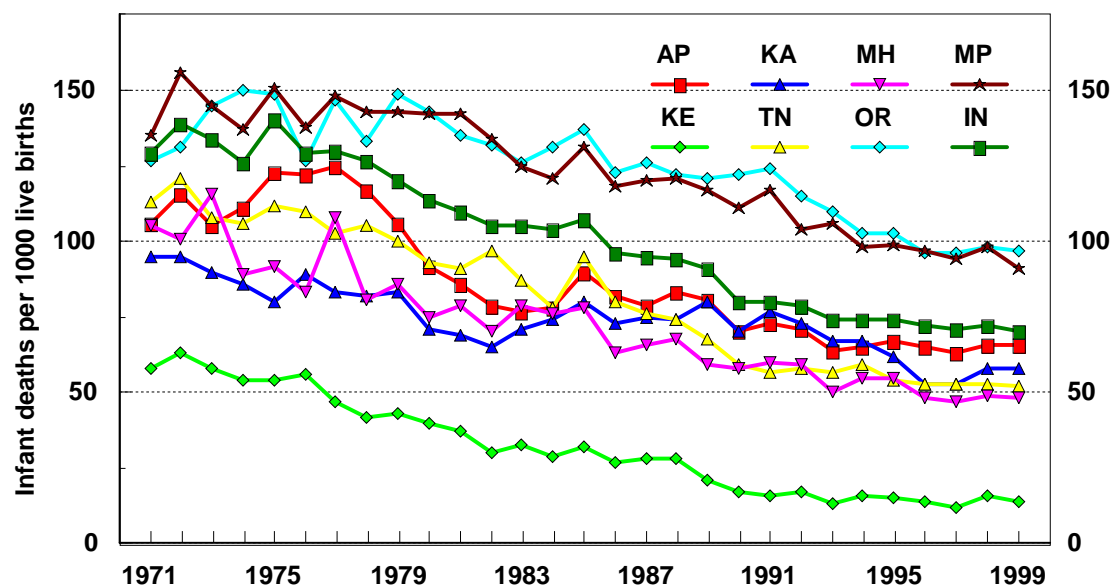

[1]Source: SRS Annual Reports. , 1971 - 1999.

Though AP has performed reasonably well in reducing IMR, it has definitely not been able to exploit the full potential available to it. Of particular concern is the slow down in reduction of IMR in the state, during the 1990s.

The NFHS surveys in 1992-93 and 1998-99 provide an independent estimate of IMR and its trend. The figure-2 shows IMR from the two NFHS surveys. The time trend and comparative position of AP vis a vis to other South Indian states is similar to the estimate from the SRS presented earlier in Figure-1. IMR in AP is slightly lower than the national average and is higher than other south Indian states. The decline in IMR between NFHS 1 and 2 is more marked for Kerala, Tamil Nadu, and Karnataka.

Infant mortality in AP declined from 85 deaths per 1000 live births during 1984-88 to 66 deaths per 1000 live births during 1994-99, an average rate of decline of nearly 2 infant deaths per 1000 live births per year. A comparison of the IMR for the period of NFHS-1 and NFHS-2 suggests a

similar rate of decline of 11 deaths per 1000 live births. NFHS-1 suggests a much slower decline of only 4 deaths per 1000 live births.

Figure-2: IMR trend in AP and other states according to NFHS-1&2
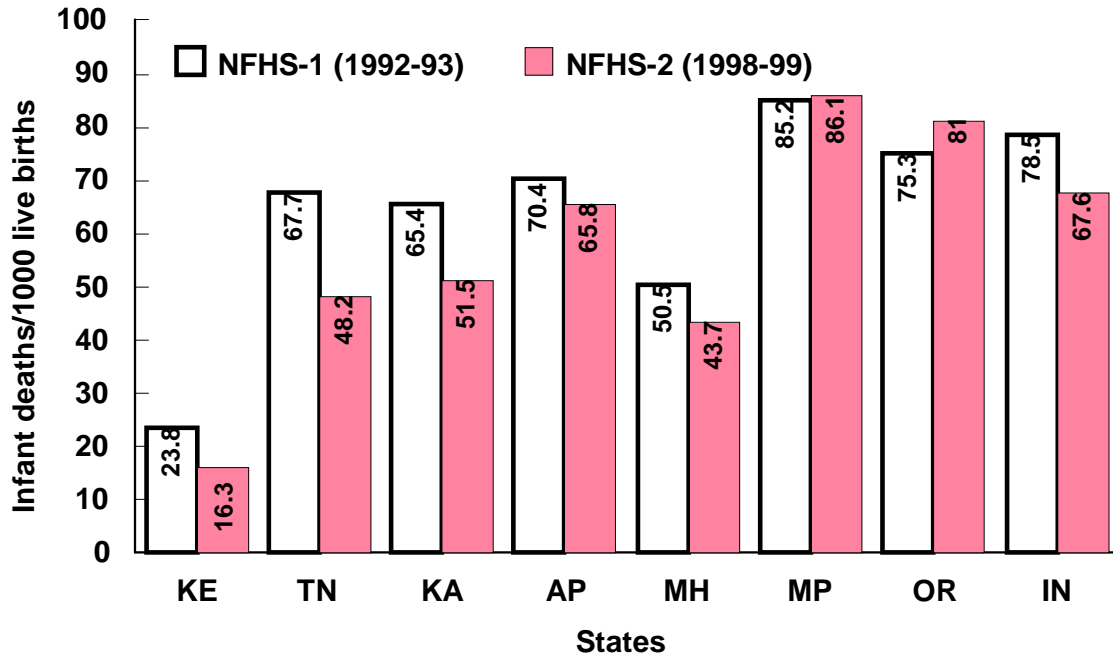

[1] Source: NFHS-1 data from IIPS(1995) Table-8.8 p221; NFHS-2 data from IIPS(2000) Table-6.6 p194

Despite the overall decline in infant and child mortality, 1 in every 15 children born during the mid 1990s i.e.., five years before NFHS-2 died within the first year of life. Clearly, child survival programmes in AP need to be intensified to achieve further reductions in infant mortality.

B. Rural Urban Difference in IMR:

In Andhra Pradesh rural infant mortality rates are considerably higher than urban mortality rates. Infant mortality in rural areas is almost double that of urban areas. There was a sharp decline in IMR during the 1970s both in the rural and urban areas. The decline in rural areas must have been greater since the rural urban gap has reduced from about 43 infant deaths per 1000 live births during the 1970s to about 15 infant deaths per 1000 live births in 1980s. However the trend of reducing rural urban gap in the 1980s appears to have been lost or probably reversed during the 1990s.

Figure-3: Infant Mortality Rate in Urban and Rural areas of Andhra Pradesh
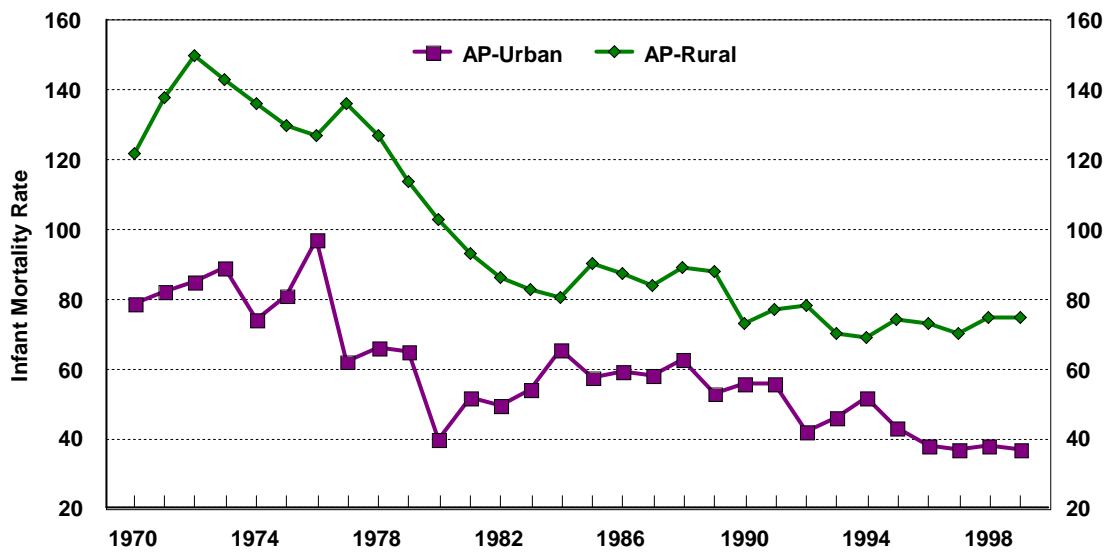
Figure-4 shows NFHS rural-urban differences in IMR. In NFHS 1 urban IMR was 62 where as rural IMR was around 77. The rural-urban difference in IMR rather increased by the time of NFHS 2. The urban IMR decreased to 46 but the rural IMR shows a increasing trend at 79.

Figure-4: Infant Mortality Rate in Urban and Rural areas of Andhra Pradesh, NFHS
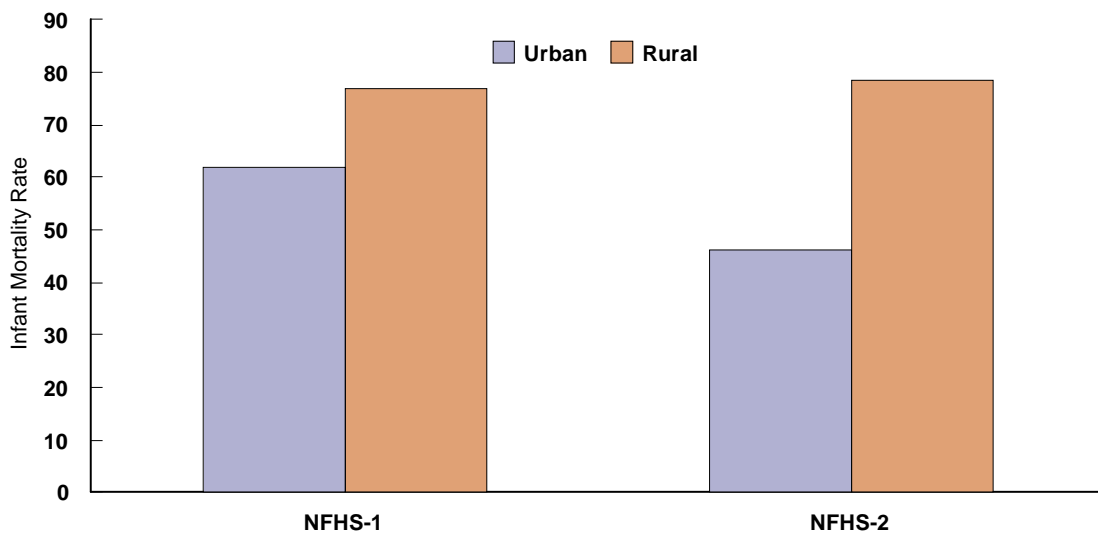
C. Regional difference by districts:

The district wise estimates of IMR based on 1981 and 1991 census data were available in October, 1997 (RGI, 1997). The population census of 1981 and 1991 provide district level indirect estimates of infant mortality. The 1991 Census in figure-5 shows that Vizianagaram, Srikakulam and

Mahaboobnagar districts had a high IMR (99, 77 and 77 respectively) and Hyderabad, Krishna and Karimnagar districts had a low IMR (22, 30 and 35 respectively).

Figure-5: District wise indirect estimates of IMR based on census data.
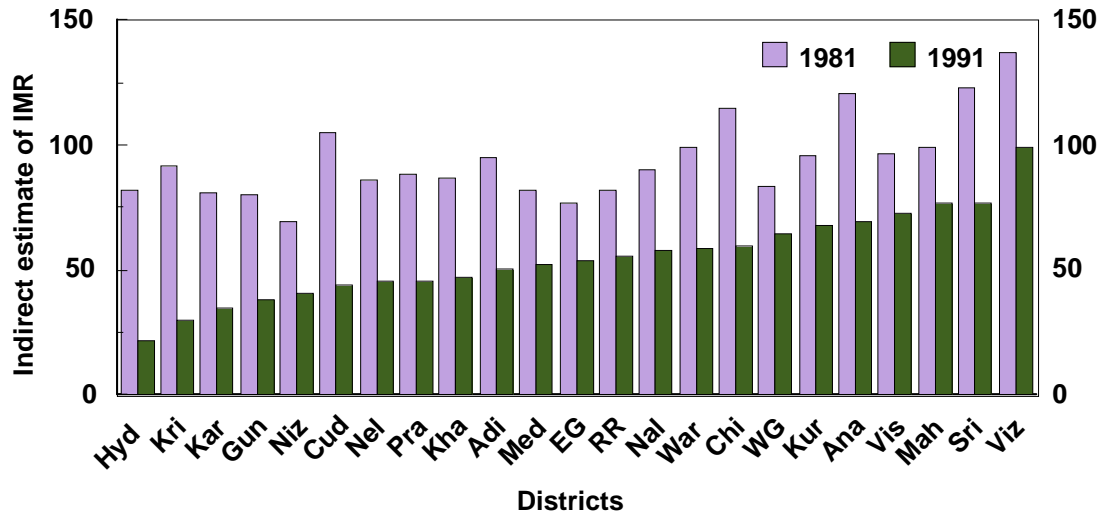
Estimates of Infant Mortality are also available from Vital registration data. Vital Statistics Division of the State Directorate of Health and Commissioner of Family Welfare does in fact compute these rates from vital registration data received by them. These computations are district wise. The very low IMR estimates in Table-1 is clearly consistent with massive under registration of infant deaths compared to registration of births. These estimates are unreliable owing to the incompleteness of registration and differential registration of births compared to deaths. Registration of births is usually less incomplete than registration of infant deaths. Improving completeness of registration of births and deaths, timely reporting and compilation of these statistics will be the most ideal and long term solution for reliable and valid estimates of mortality statistics.

Table-1: District wise IMR computations from vital registration data in AP

District	1995	1996	1997	1998	2001	2002
Srikakulam	8	6	6	9	10	19
Vizianagaram	6	6	5	4	12	13
Visakhapatnam	20	17	16	11	17	22
East Godavari	13	11	9	14	12	9
West Godavari	9	6	5	8	5	11
Krishna	10	14	10	10	4	6
Guntur	18	15	10	12	10	12
Prakasam	5	4	5	3	8	12
Nellore	2	6	3	2	3	4
Chitoor	16	13	12	12	11	16
Cuddapah	5	4	3	5	13	13
Anantapur	10	8	8	8	12	18
Kurnool	22	23	20	18	8	3
Mahaboobnagar	3	3	13	15	7	8
Rangareddy	0	1	0	0	1	1
Hyderabad	9	15	26	29	6	14
Medak	3	4	3	3	2	2
Nizamabad	4	11	9	8	6	7
Adilabad	13	3	14	11	9	5
Karimnagar	10	8	11	11	3	10
Warangal	21	19	13	13	0	1
Khammam	4	0	0	3	14	16
Nalgonda	6	5	5	5	5	20

[1] Source: Annual Vital Statistics for the years 1995 to 1998, Director of Health, AP and Commissioner Family Welfare , AP 2001 data is from Apr 2000-Mar 2001, 2001-2002 data is from Apr 2001-Jan 2002.
[2] These computations are from what ever events are reported through the vital registration system, but are not to be viewed as estimates of IMR, in view of differential under registration of births and deaths.

Small Area Analysis of IMR - Sub district level:

The DFHS (2000) conducted by Institute of Health Systems shows substantial regional variations in IMR.

The district and division level IMR estimates in Table-2 provide useful insights about differences in health status by geographical regions. Firstly, the direct estimates are quite low compared to the Indirect estimates. Most direct estimates are a little more than half of the indirect estimates. We believe the indirect estimates are more reliable since direct estimates from data in such surveys are known to suffer from differential under reporting of deaths. More over the indirect estimates are in the same range as other estimates from SRS and NFHS. The direct estimates do, however, follow the pattern of differences in level of IMR by district or division. Clearly the IMR is significantly higher in

Mahboobnagar district at 115 / 1000 live births as compared to 65 and 79 in Chittoor and Nellore respectively.

Table-2: District and divisional IMR with 95 % Confidence intervals.

District / division	Census estimates		This study - indirect est.		Direct est.
	1981	1991	IMR	(95 % CI)	
Nellore Dt.	86	46	79	(71 - 87)	32.71
Gudur Div.			92	(70 - 115)	26.67
Kavali Div.			58	(37 - 79)	37.96
Nellore Div.			81	(59 - 103)	34.32
Chittoor Dt.	115	60	65	(59 - 72)	36.79
Madanapally Div.			76	(60 - 92)	29.02
Chittoor Div.			67	(46 - 89)	27.8
Tirupati Div.			45	(27 - 62)	65.38
Mahbubnagar Dt.	99	77	115	(107 - 122)	41.23
Gadwal Div.			93	(60 - 127)	41.67
Mahbubnagar Div.			110	(91 - 128)	32.72
Narayanpet Div.			125	(102 - 147)	42.63
Wanaparthy Div.			62	(35 - 89)	23.06
Nagarkurnool Div.			140	(117 - 163)	58.29

The state level estimates of IMR in this period was between 70 to 80 (75 according to SRS 1999, and 72 according to NFHS, 1998). Our current estimates show that the infant mortality level in Nellore district is typical of the state. Chittoor has a slightly better situation with comparatively lower infant mortality. Mahboobnagar is clearly much worse compared to the state level IMR. Obviously there are important socio-economic and geographic differences in mortality experience of people in different parts of the state. Going down to the division level, the DFHS study found that four of the five divisions in Mahboobnagar district have IMR that is higher than the state average, and in only Wanaparthy division, the IMR is comparatively lower (DFHS, 2001).

D. Difference in IMR by Socio economic status:

Table-3 shows the infant mortality rates according to mothers background. Infant mortality declines substantially with increase in the household standard of living. In households with a high standard of living the

infant mortality rate is 43 deaths per 1000 live births and in households with a low standard of living the IMR is 97 deaths per 1000 live births (NFHS-2). The scheduled castes and scheduled tribes have higher rates of infant mortality compared to other backward classes and others.
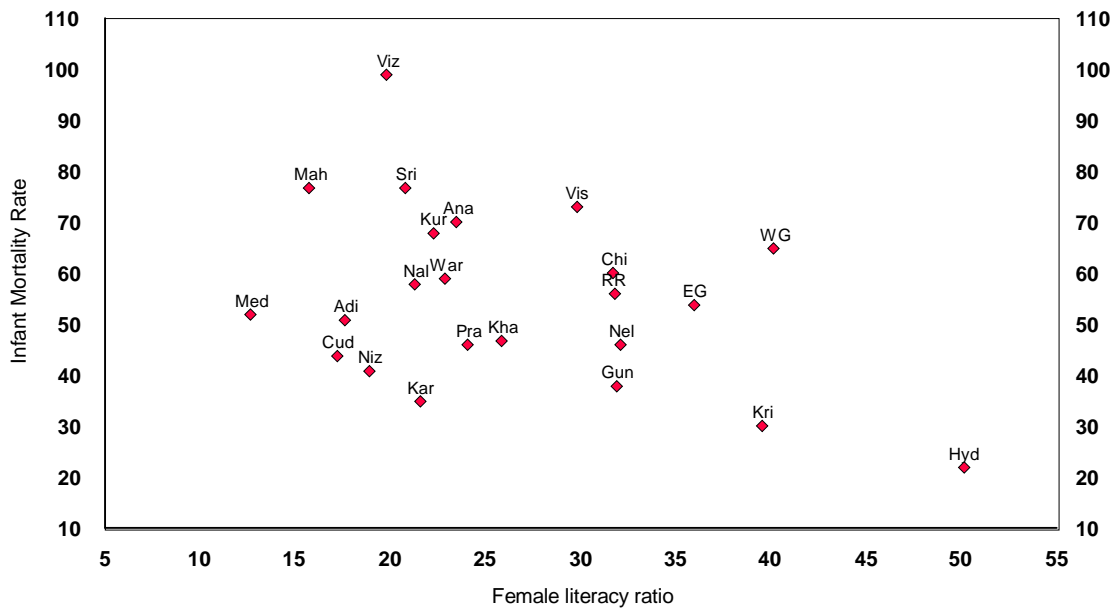
Table-3: Infant mortality by background characteristics

Background characteristics	Infant Mortality
Mother's education	
illiterate	82.4
<middle school complete	53
High school and above	48.9
Standard of living index	
low	97.1
Medium	56.8
High	42.5
Social status	
Scheduled caste	95.4
Scheduled tribe	103.6
Other backward classes	69.7
Other	47.1

[1] Source: NFHS-2 (Andhra Pradesh) p-120, tbl-6.3

The infant mortality rate declines sharply with increasing education of mothers, ranging from a high of 82 deaths per 1000 live births for illiterate mothers to a low of 49 deaths per 1000 live births for mothers who have at least completed high school. The NFHS estimates are based on stratification of sample households by literacy status. At the district level also there is good correlation between literacy and IMR. In Fig: 6 we have plotted female literacy ratio and IMR. As literacy rates increased the IMR also decreased in certain districts like Hyderabad, Krishna, Guntur Nellore etc. In districts like West Godavari and East Godavari, the female literacy rate is on the higher level and so is the IMR. In Medak district even though the literacy rate is low the IMR is almost similar to East Godavari. This shows the need for districts and divisional level estimates of IMR and its importance to know the exact determinants of IMR and to develop area specific interventions to reduce IMR.

Figure-6: District female literacy rate and IMR in AP, 1991

The CMIE infrastructure development index was plotted against IMR from 1991 census. The pattern is similar to the previous plot of female literacy rates and IMR. Districts like Hyderabad, Guntur that has high infrastructure development index has low IMR. Districts with low infrastructure development index like Mahboobnagar, Vizianagaram had high IMR.

Figure-7: District infrastructure index and IMR in AP.
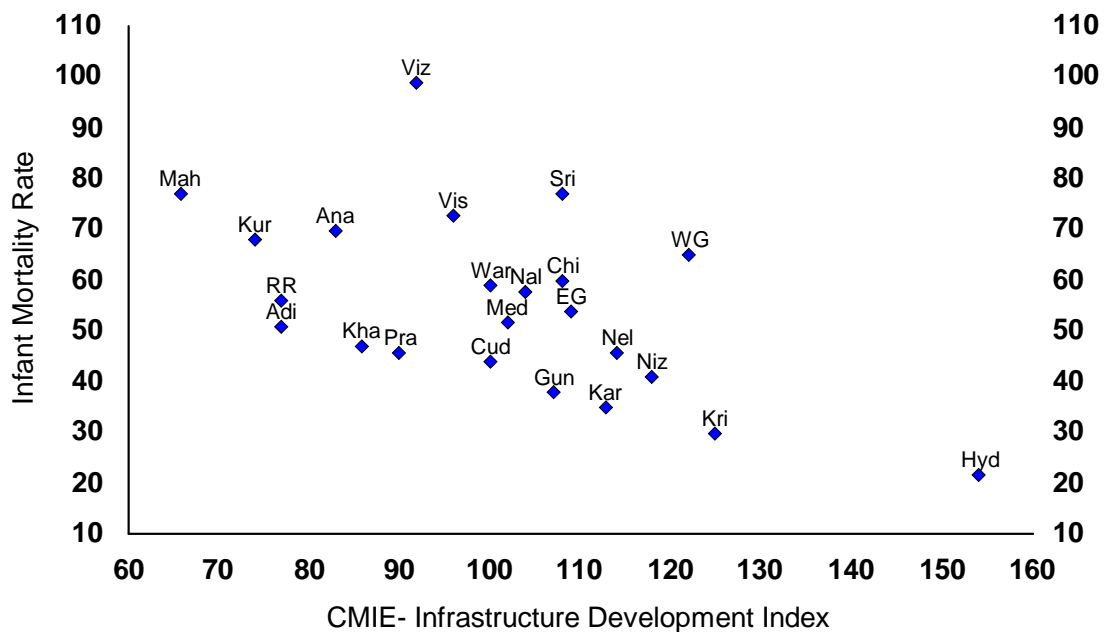
Age of the mother is an important risk factor for infant and child mortality. Children born to mothers under 20yrs of age are approximately 1.5 times more likely to die before their first birthday than children born to mothers in their 20s. Children born to young mothers are more likely to be premature, to have low birth weights, and to have delivery complications (Mc Devitt et.al. 1996). Children born to mothers over the age of 40 are also at higher risk of death for a number of reasons, including an increased likelihood of congenital abnormalities and an increased likelihood of closely spaced births.

Infant mortality is 40 percent higher among children born to mothers under the age of 20 than among the children whose mothers are age 20-29 (84 deaths compared with 60 per 1000 live births). IMR and MMR are high in the women who gave birth when they were between 15-19 years of age. The main contributing factor for this is their physiological growth which does not cater to the growing needs of the pregnancy. The low nutritional status also plays its part. As the age of marriage is increased the child bearing age also increases and hence will aid to lower the IMR and MMR.

Figure-8: IMR by Mother's age at birth in Andhra Pradesh for the year 1998
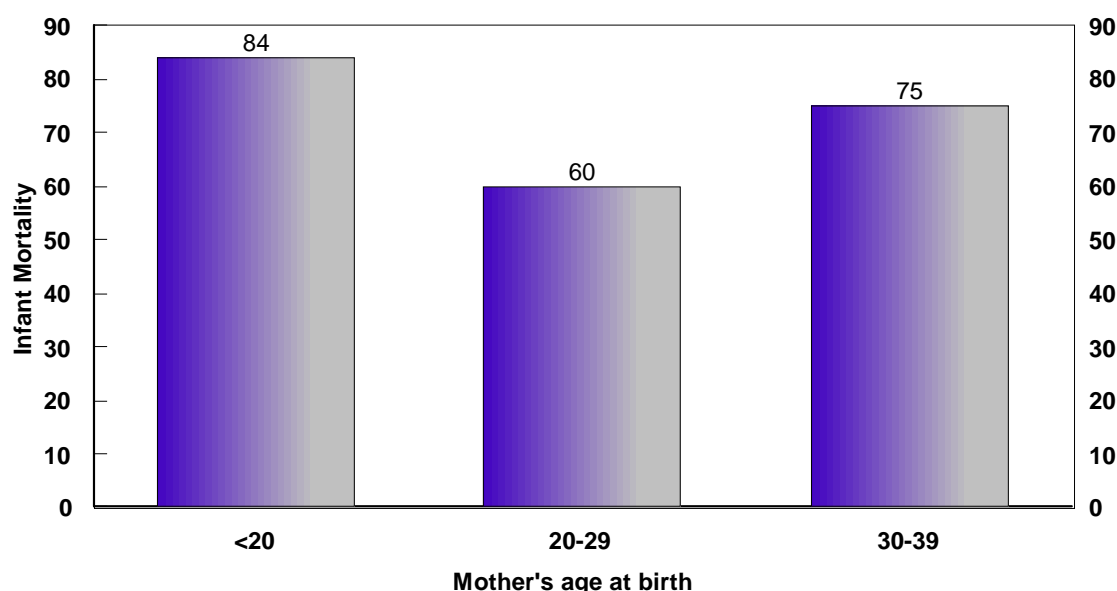
[1]Source: NFHS-2 (AP), p-121, tbl-6.4

Figure-9 shows the infant mortality rates according to previous birth interval. The timing of successive births has a powerful effect on the survival

chances of children in Andhra Pradesh. Infant and child mortality rates decrease as the length of the previous birth interval increases. When the birth intervals between births was 48 months and above the IMR is 33 and when the interval between births is less than 24 months the IMR increases more than three fold to 106 (NFHS-2).

Figure-9: Infant mortality by previous birth interval in Andhra Pradesh
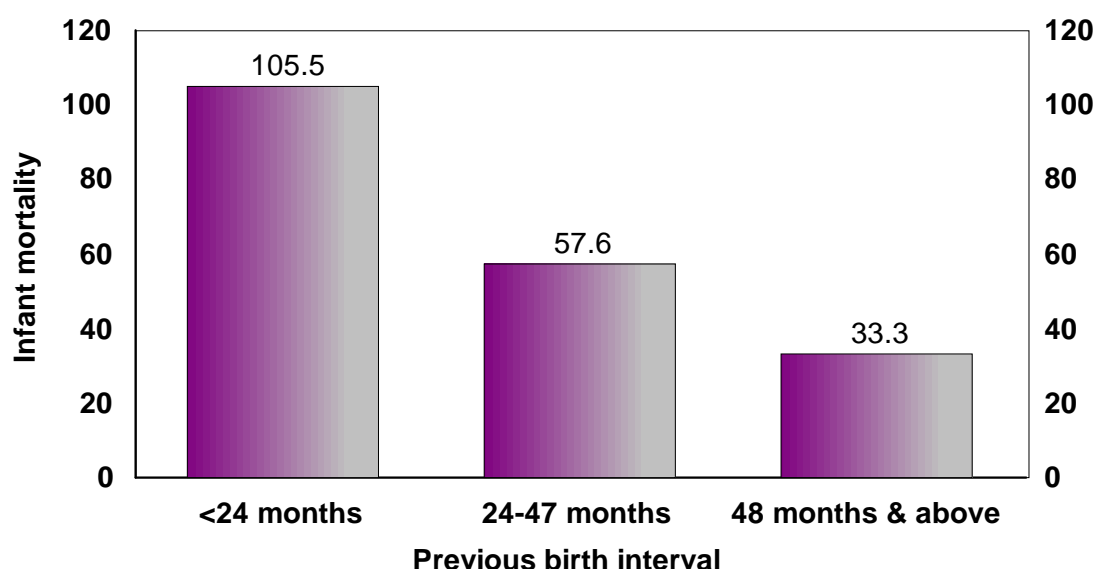
[1] Source: NFHS-2 (Andhra Pradesh) p-121, tbl-6.4

IV. Summary:

The estimates derived from the SRS are consistent with estimates from other surveys such as the Census, NFHS and other independent, one time surveys: indicating their reliability.

The IMR of the state registered a consistent decline from 110-120 in 1970s to 66-70 in 1990s. Andhra pradesh maintained its position of high IMR when compared with other south Indian states. Of particular concern is the slow down in reduction of IMR in the state, during the 1990s.

The AP rural infant mortality rates are considerably higher than urban mortality rates. A decline in IMR was sustained through the 1970s. During the 1980s decline in IMR slowed down. During the 1990s the declining trend of IMR in AP appears to have been lost or probably reversed.

District level estimates of IMR show significant variation in mortality experienced by people in different parts of the state. Divisional level estimates

within the Mahboobnagar district shows that one out of its five divisions has comparatively low IMR and the rest four divisions have high IMR. Further study of differences in public health facilities, socioeconomic and literacy differentials between the revenue divisions may provide additional insights.

Socio economic conditions clearly influences the IMR. Female literacy rate has a key role to play in reducing IMR. IMR substantially decreased as the mothers education increased. Increase in the household standard of living is associated with decreased Infant deaths. Better infrastructure development of an area appears to be associated with lower IMR.

Age of the mother is an important risk factor for infant and child mortality. Children born to mothers under 20yrs of age are approximately 1.5 times more likely to die before their 1st birthday than children born to mothers in their 20s. The timing of successive births has a powerful effect on the survival chances of children in Andhra Pradesh. Infant and child mortality rates decrease as the length of the previous birth interval increases.

V. Conclusion:

1. IMR shows a rapid decline in 70s, stagnation in 80s and increase in the 1990s.

2. There is wide regional variation in the IMR. Recent estimates in Mahaboobnagar district in AP is as high as 115, corresponding to the states average IMR about thirty years ago i.e. 113 in 1970 (SRS).

3. Data from AP corroborates that socio status, female literacy and economic development are correlated to IMR.

4. Data sources available do not allow to estimate IMR by small area and by socio economic status.

5. Clearly civil registration is not functional. Quality of estimations has to be improved.

6. Emphasis on education in general and education of girl child in particular has a strong potential to increase the health status and decrease IMR.

7. Over all socio economic conditions should be developed, and social reforms to reduce social barriers is important.

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