Infant and child mortality estimates and its determining factors for social subgroups: A district level analysis

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Introduction:

Schedule castes (SC) and schedule tribes (ST) represent the most backward and disadvantaged group in the highly stratified caste ridden Indian society (Das et. al. 2000). The welfare of these vulnerable population groups has always featured prominently in India's plans and policies (Article: 15, 16, 330, 332 constitution of India). In fact, these concerns are woven into the very fabric of the country's constitution and are contained in the Directive Principles of the State Policy laid down in article 46 which calls for the promotion of the educational and economic interests of the weaker sections of the people, and in particular, of the scheduled castes and scheduled tribes and to protect them from social injustice and all forms of exploitation (Dubey 1973). According to 2001 census, SC constitutes 16 percent and ST accounts 8 percent of the total population. It is observed that while the SC population is scattered in almost all the states in varying proportions, a majority of the ST population (83 percent) is concentrated in the so-called central tribal belt running through the hilly terrain of Maharashtra, Gujarat, Rajasthan, Madhya Pradesh, Bihar, West Bengal, Orissa and Andhra Pradesh (Ghosh & Chakraborty 1999). At the same time development of these disadvantaged groups and their assimilation with the larger society has been a matter of great concern for the government and other public bodies, both at centre and in the states.

While India has managed to reduce its infant mortality rate significantly over the last three decades, its performance on infant mortality reduction pales in comparison to that of many other countries in South, Southeast and East Asia. It is rather meaningless to talk about an average infant mortality rate for India since prevailing extreme inter-state variations- ranging from a low of 13 infant deaths per 1000 live births in Kerala to a high of 72 deaths in Madhya Pradesh (SRS Bulletin 2008). As the state level analysis conceals large variations across districts within a state therefore, it is important to identify levels and determinants of infant and child mortality at district level. Existing heterogeneity in India can be facilitated by the preparation of regional or district level estimates of infant and child mortality within each state for understanding these variations.

In the developing countries like India where the coverage and completeness of civil registration system is poor and information from these systems are not reliable to assess fertility and mortality estimates. Sample Registration System which is a reliable source for these estimates provides information only at state level. In such circumstances to assess vital rates at district level, the only way is to use information provided by census and then to apply some indirect techniques to get the estimates of vital rates at district level. Indirect techniques have been proved to be very useful in developing countries. Though there are studies which have attempted to analyse infant and child mortality at district level for general population, however, there are paucity of studies on deprived sections of the country like schedule castes

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and schedule tribes population who deserves more attention for the development purpose. Yet no estimates are available at district level for SCs and STs based on 2001 census. So, estimates from this study are expected to help in understanding the levels and differentials of the IMR and CMR to some extent in the districts where sizeable proportion of schedule castes and schedule tribes are living. An attempt is also made to study the determining factors of IMR and CMR among these sub populations at district level.

Data and Methods:

The population census of India, conducted every ten years, is the most comprehensive source of information on the size, distribution, living conditions and demographic characteristics of the population. For estimation of infant and child mortality at district level census 2001 is used and in order to study the determining factors census 2001 and RCH-RHS conducted during 1998-99 is used. The RCH-RHS was conducted in each districts of India for providing estimates on reproductive and child health indicators at the district level. In the present study, only those districts are selected where at least 15 percent SC and 8 percent ST population exist for selected states in India. Estimates are obtained for all the selected districts from major states in India for better focus in the study the discussion is made sometime only to states of Rajasthan, Orissa, Madhya Pradesh, Maharashtra, Andhra Pradesh and Karnataka. These states are been focused in view of representing all the regions of India in some way or other.

There are two basic ways of obtaining infant and child mortality rates: direct method and indirect method. The direct method is based either on vital registration or on dated vital events from retrospective birth histories, and the indirect method uses number of children ever born and the proportion dead classified by five-year age groups of mothers. Indirect methods of estimation remain an important tool for gaining an understanding of infant and child mortality conditions in areas with limited, deficient or poor vital registration systems.

The widely used Brass method estimates of mortality from reports of children ever born and children deceased are used in this study. MORTPAK4 package which is based on technique of children ever born and surviving given by Brass and others is used. After reviewing all the possible life table models suitable for India it was selected based on the SRS estimates average for three years nearer to the estimates given by other three model life table i.e west, south and south-Asian pattern of model life table. It is found that at all India level the estimate laying nearer to the south-Asian pattern estimates, so this has been used throughout this study assuming that this will capture the variations at district level too. Estimates are obtained separately for SC, ST and for non-SC/ST population in the selected districts. The underlying factors which may cause the differences at district level are identified from RCH-1(1998-99) survey and census. As census does not provide much information about the determining factors so it was necessary to depend on some survey data. RCH-1 (1998-99) is selected because the time period of this survey is lying nearest to the year of census estimates. The indicators constructed at district level are:

1. Probability of newborn child dying before age one (IMR).
2. Probability of dying between first and fifth birthday (CMR).
3. Female literacy rate.
4. Female work participation rate.

5. Percentage of household with safe drinking water.
6. Percentage of children in birth order 3 and above.
7. Percentage of female urban.
8. Percentage of children received full immunization.
9. Percentage of women with safe delivery.
10. Percentage of women with any antenatal check up (ANC).
11. Percentage of women who has done colostrums feeding to their child.
12. Percentage of women with adequate practice in case of diarrhoea.
13. Percentage of women who has exclusively breastfed their child.

Indicators taken from census are estimated IMR, CMR, female literacy, female work participation, safe drinking water, birth order 3 and above and urban female rest of them i.e. full immunization, safe delivery, ANC, colostrums feeding, adequate practice in diarrhoea and exclusive breastfeeding are calculated from RCH data.

The correlation matrix of these selected indicators is seen, and then, they are further selected for multiple regression analysis. As all the selected variables are significantly correlated so it has not been discussed in the analysis. Multiple regression technique is used to check the determining factors.

Levels of Infant and Child mortality for schedule castes population:

As it is strongly felt that district level estimates are highly required for local level interventions, estimates are obtained for districts as per the selection criterion of schedule caste population. Geographical proximity and the estimated level are shown in figure 1 and figure 2 for schedule caste population. From the figure there is clear clustering of cases in the central part of India where most of it are from Madhya Pradesh and Uttar Pradesh and few from Rajasthan and Orissa. The districts having highest level of infant and child mortality is Panna (136 infant deaths and 98 child death) of Madhya Pradesh and lowest is of Karimnagar (49 infant deaths and 17 child deaths) of Andhra Pradesh.

When we consider inter-district variation in the selected states we find that there are many districts that continue to have higher infant and child mortality in some states. For example, in Madhya Pradesh - Panna (136 infant deaths, 98 child deaths), Orissa: Kandhamal (114 infants, 72 child deaths), in Rajasthan - Pali (112 infants and 69 child deaths), in Karnataka - Bellary (84 infants and 43 child deaths), in Andhra Pradesh - Mahbubnagar (82 infants and 41 child deaths) and in Maharashtra - Bhandara (72 infants and 33 child deaths). As mentioned before the estimates have also been obtained for non schedule caste and tribe population in these districts which is used mainly to see the differentials in respect of these districts so; it has not been highlighted here.

Levels of Infant and Child Mortality for schedule tribe population:

Estimates obtained for schedule tribe population in selected districts also show a pattern of high level of IMR and CMR belt running from Rajasthan, Madhya Pradesh, Chhattisgarh, Orissa and Andhra Pradesh(Figure 3 and 4). Looking by states shows that most of the areas are occupied by the districts from Madhya Pradesh followed by one district of Orissa in this belt. In detail result shows that the highest level of infant and child mortality is

found for Shivpuri district of Madhya Pradesh (150 infant and 114 child deaths) and lowest is Kodagu district of Karnataka (40 infant and 13 child deaths). Though the difference in the share of schedule tribe population in these two districts is not high (11 and 8 percent) but the great difference is found in literacy level (19.7 and 34.6 percent) which could be a leading reason for this large variation in the estimates.

Now, if we look for the districts with highest level of infant and child mortality within each state then results are as follows; Madhya Pradesh: Shivpuri (150 infants and 114 child deaths), Orissa: Baudh (132 infants and 93 child deaths), Rajasthan: Chittaurgarh (119 infants and 77 child deaths), Andhra Pradesh: Vizianagaram (101 infants and 59 child deaths), Maharashtra: Chandrapur (89 infants and 48 child deaths), Karnataka: Bellary (86 infants and 44 child deaths).

Differentials in schedule castes' IMR and CMR to non schedule castes/tribes:

In order to understand how the levels of infant and child mortality are different for SC and ST population as compared to the Non-SC/ST population we have computed simple ratios of mortality levels of SC/ST population to that of the general population by simply dividing them. For clearer picture of differentials in estimates of schedule caste/tribes to non-schedule caste/tribes the districts are further classified according to gaps as revealed by these ratios. Differentials in IMR levels (Table 1) for schedule castes population from the non-schedule castes/tribes shows that districts in the lowest range are from Orissa and Karnataka each. This clearly gives indications that in other districts of the state and outside the state there is prominent existence of differentials. On the other side the districts with wider differentials are mostly from Madhya Pradesh followed by Andhra Pradesh, Orissa and Rajasthan. Major districts are lying at 10-20 percent of differentials.

Table 1: Districts classified according to the ratios of IMR for SC to IMR of Non-SC/ST and further classification of the districts into the state it belongs.

Ratios	No. of districts	Number of districts in the state
0.9-1.0	2	1-Orissa,1-Karnataka
1.0-1.1	13	4- Karnataka, 4-Maharashtra,3-Orissa, 2-Rajasthan
1.1-1.2	49	11-Rajasthan, 10-Orissa, 9-Madhya Pradesh, 8- Karnataka, 7-Andhra Pradesh, 4-Maharashtra
1.2-1.3	36	11-Madhya Pradesh, 10-Rajasthan, 6-Andhra Pradesh, 5-Orissa, 4-Karnataka
1.3-1.5	11	6-Madhya Pradesh, 3-Andhra Pradesh, 1-Orissa, 1-Rajasthan

In case of child mortality (Table 2) distribution of districts are same for lowest range of differentials as in infant mortality. This indicates that in these districts the condition of schedule caste population are not deprived and the discrimination is less. Ratios in terms of differentials have definitely increased for child mortality therefore the upper class of interval for these differentials has also increased to more than 60 percent. There are six districts among the selected states that have 60 percent or more mortality for SC/ST than the general population. Distributions of these districts among states are shown in table 2. Around 87 districts are recorded with differential of 10 to 50 percent. The results shows that differentials are higher where levels are also high but district from west and south are also not lagging

behind in terms of differentials like few districts from Maharashtra, Karnataka and Andhra Pradesh are found with differentials more than 50 percent. Despite their higher level of development the discrimination in terms of health and socio-economic conditions for schedule caste population are being neglected.

Table 2: Districts classified according to the ratios of CMR for SC to CMR of Non-SC/ST and further classification of the districts into the state it belongs.

Ratios	No. of districts	Number of districts in the state
<1.0	2	1- Orissa, 1-Karnataka
1.0-1.1	6	3-Karnataka, 2-Orissa, 1-Maharashtra.
1.1-1.2	15	4-Rajasthan, 4-Maharashtra, 3-Karnataka, 2-Orissa, 1-Andhra Pradesh, 1-Madhya Pradesh.
1.2-1.3	24	6-Rajasthan, 5-Orissa, 4-Karnataka, 3-Madhya Pradesh, 3-Maharashtra, 3-Andhra Pradesh.
1.3-1.4	26	9-Madhya Pradesh, 5-Orissa, 4-Andhra Pradesh, 4-Karnataka, 4-Rajasthan.
1.4-1.5	22	8-Rajasthan, 5- Madhya Pradesh, 4-Andhra Pradesh, 4-Orissa, 1-Karnataka.
1.5-1.6	10	5-Madhya Pradesh, 3-Andhra Pradesh, 1-Karnataka,1-Rajasthan.
>=1.6	6	3-Madhya Pradesh, 1-Andhra Pradesh, 1-Orissa, 1-Rajasthan.

Differentials in schedule tribes' IMR and CMR to non schedule castes/tribes:

Results of differentials in infant mortality (table 3) for schedule tribe shows that only one district named Baleshwar in Orissa is with better off situation for schedule tribe population than non schedule castes and tribes. Districts where differentials are found more prominent (greater than or equal to 50 percent) are from Madhya Pradesh, Andhra Pradesh, Maharashtra and Orissa. Among schedule tribes also Madhya Pradesh is the states with high discrimination. Mostly the districts are found with differentials of 10 to 40 percent. This reveals that there is strong discrimination against health care for schedule tribe population. Though measures are been taken for reducing the infant and child mortality rates but the focus has not been driven to these disadvantageous groups.

Table 3: Districts classified according to the ratios of IMR for ST to IMR of Non-SC/ST and further classification of the districts into the state it belongs.

Ratios	No. of districts	Number of districts in the state
<1.0	1	1-Orissa.
1.0-1.1	7	3-Karnataka, 2- Rajasthan, 2-Orissa.
1.1-1.2	27	7-Rajasthan, 6-Orissa, 5-Karnataka, 4-Maharashtra, 4-Madhya Pradesh, 1- Andhra Pradesh.
1.2-1.3	30	10-Madhya Pradesh, 7-Maharashtra, 5-Rajasthan, 5-Orissa, 3-Karnataka.
1.3-1.4	17	9-Madhya Pradesh, 4-Orissa, 2-Andhra Pradesh, 1-Rajasthan, 1-Maharashtra.
1.4-1.5	14	5-Madhya Pradesh, 3-Maharashtra, 2-Orissa, 2-Rajasthan, 2-Andhra Pradesh.
>=1.5	8	4-Madhya Pradesh, 2-Andhra Pradesh, 1-Maharashtra, 1-Orissa.

Similarly, child mortality differentials are explained through table 4 which shows that distribution of districts for lowest range of differentials are same as infant mortality for schedule tribes. It again clearly indicates that in these districts the discrimination is not only in case of infant mortality but also in case of child mortality. Among schedule tribes also the level of differentials has increased and around 34 districts are found with more than 60 percent (highest interval) of differentials. In this range major role is played by districts from Madhya Pradesh followed by Orissa, Andhra Pradesh, Maharashtra and Rajasthan. It is clearly found that despite of tribal dominated states the other states are from west (Maharashtra) and south (Andhra Pradesh). It again point outs towards the discrimination against schedule tribe population prevailing in the south and west.

Table 4: Districts classified according to the ratios of ST's CMR to Non-SC/ST's CMR and further classification of the districts into the state it belongs.

Ratios	No. of districts	Number of districts in the state
<1.0	1	1-Orissa.
1.0-1.1	1	1-Rajasthan.
1.1-1.2	5	4-Karnataka, 1-Rajasthan.
1.2-1.3	16	5-Rajasthan, 4-Orissa, 3-Karnataka, 2-Madhya Pradesh, 1-Maharashtra, 1-Andhra Pradesh.
1.3-1.4	14	3- Karnataka, 3-Maharashtra, 3-Madhya Pradesh, 3-Rajasthan, 2-Orissa.
1.4-1.5	14	5-Madhya Pradesh, 4-Orissa, 2-Rajasthan, 2-Maharashtra, 1-Karnataka.
1.5-1.6	17	6-Madhya Pradesh, 5-Maharashtra, 3-Rajasthan, 2-Orissa, 1-Andhra Pradesh.
>=1.6	34	16-Madhya Pradesh, 6-Orissa, 5-Andhra Pradesh, 5-Maharashtra, 2-Rajasthan.

Determinants of Infant and child mortality for schedule caste population:

The indicators constructed at district level from census and RCH are tested through multiple regression technique. As number of districts satisfying our selection criteria in the selected states is less in number so, all the districts satisfying the selection criteria in major states of India are considered for the multiple regressions analysis. Two models have been used for explaining the variations in the infant and child mortality among schedule castes. In the first model, ten indicators are used excluding the variable women with adequate practice of diarrhoea. The aim of keeping this particular variable out of model is to keep the sample size fixed to 211 districts. In this model interaction effect is found between female literacy and women with any antenatal check up. Variables showing significant effect in infant mortality for schedule castes as in first model are children in the birth order three and above, percentage of urban female, percentage of women who have done exclusive breast feeding to the child and interaction effect of female literacy and women with any antenatal check up. Variable acting in same direction is percentage of children in birth order three and above, other variables are acting in negative direction.

In the second model when women with adequate practice of diarrhoea is included then the sample size reduces to 72 as this information is not available for all districts due to estimates based on less number of cases. Since, 72 is a good number of observations and

thus, allow us to carry out a meaningful analysis. Variables showing significant effect are female literacy, female work participation rate, percentage of household with safe drinking water, percentage of women with adequate practice of diarrhoea and the interaction effect of children with full immunization and percent of female urban. None of the variables are effecting in positive direction all are showing negative sign this implies that with increase in female literacy, female work participation, safe drinking water, women with adequate practice of diarrhoea the level of infant mortality will reduce. Children with full immunization is showing significant effect only after certain level of female urban i.e. in urban areas effect of full immunization is more in order to reduce infant mortality.

Table 5: Result of multiple regression with effect of different district level indicators on infant mortality for schedule caste population in selected districts of India.

	Model 1	**Model 2**
Indicators	**B**	**B**
Constant	29.960**	131.475***
Female literacy	0.557***	-0.373*
Female work participation rate	0.030	-0.254***
Percentage of household with safe drinking water.	-0.089	-0.271***
Percentage of children in the birth order 3+	1.034***	0.453
Percentage of children full immunized	-0.021	0.453***
Percentage of urban female	-0.264***	0.277
Percentage of women with safe delivery	-0.098	-0.086
Percentage of women done colostrums feeding	0.050	-0.098
Percentage of women with exclusive breast feeding the child.	-0.140***	-0.068
Percentage of women with any ANC	0.214**	-0.078
Interaction effect 1= female literacy*any ANC	-0.006**	----
Percentage of women with adequate practice of diarrhoea.	----	-0.301***
Interaction effect 2=Immunization*percent female urban	----	-0.013**
Adjusted R^2	0.569	0.672
Number of districts	N=211	N=72

*** p<.01, ** p<.05, * p<.10

As in case of infant mortality same variables are used for child mortality to see the effect. In this case also two models are used with the same criterion above. In first model, percentage of women with adequate practice of diarrhoea is not taken. The variables showing significant effect are percentage of household with safe drinking water, percentage of children in the birth order three and above, percentage of urban female, percentage of women with practice of exclusive breast feeding and interaction effect of female literacy and any antenatal check up. All significant variables are showing negative direction except percentage of children in the birth order three and above which is positively affecting that means children in the higher birth order have more risk of child mortality than lower order births. When in second model percentages of women with adequate practice of diarrhoea are included then some variables are showing significant effect and some significant variables become insignificant. In the second model the variables showing significant effect are female literacy, female work participation rate, percentage of household with safe drinking water, percentage of women with adequate practice of diarrhoea and interaction effect of full

immunization and percent of female urban. In case of child mortality also certain level of urbanization is needed among women to have effect of full immunization in order to reduce child mortality. All the significant variables are behaving in negative direction that means with increase in female literacy, female work participation, household with safe drinking water, women with adequate practice of diarrhoea there will be decline in child mortality. Second model is considered better because after including the variable of diarrhoea it is showing significant effect and the adjusted R square has also increased from 54 percent to 65 percent. The model shows that any individual variable is not responsible for reducing the child mortality rather it is the developmental indicators which are more needed to reduce child mortality along with program factors. Full immunization which is a program factor, is behaving through certain level of urbanization among women i.e. knowledge and awareness towards available program factors are more important to make the effect of program variables than simply concentrating on provision of facilities.

Table 6: Result of multiple regression with effect of different district level indicators on child mortality for schedule caste population in selected districts of India.

Indicators	**Model 1** **B**	**Model 2** **B**
Constant	-3.968	90.062***
Female literacy	0.483***	-0.347*
Female work participation rate	0.029	-0.236***
Percentage of household with safe drinking water.	-0.091*	-0.242**
Percentage of children in the birth order 3+	0.921***	0.372
Percentage of children full immunized	-0.005	0.407***
Percentage of urban female	-0.245***	0.221
Percentage of women with safe delivery	-0.056	-0.017
Percentage of women done colostrums feeding	0.033	-0.097
Percentage of women with practice of exclusive breast feeding the child.	-0.115***	-0.037
Percentage of women with any ANC	0.171*	-0.090
Interaction effect 1= female literacy*any ANC	-0.005**	---
Percentage of women with adequate practice of diarrhoea.	----	-0.300***
Interaction effect 2=Immunization*percent female urban	----	-0.012*
Adjusted R^2	0.538	0.646
Number of districts	N=211	N=72

*** p<.01, ** p<.05, * p<.10

Determinants of Infant and child mortality for schedule tribe population:

As it is seen that schedule tribe population are more vulnerable condition than other two groups of population (i.e. schedule caste and non-schedule caste/tribes) so, focus has also been made to identify the determining factors for schedule tribe population. In table 7 the attempt has been made to see the effect of selected set of indicators on infant and child mortality for schedule tribe population. In case of schedule tribe population, women with adequate practice of diarrhoea do not show statistically significant effect and hence have been dropped from the model in order to maintain the sample size. Two models are used one for infant mortality and another for child mortality. The variables showing significant effect in infant mortality among schedule tribe population are female literacy, percentage of children

in birth order three and above, percentage of female urban and percentage of women with safe delivery. All these variables are acting negatively except children in the birth order three and above. This makes clear that among schedule tribes also higher order births are at more risk of infant mortality. One interesting result which is observed in this case of infant mortality is that along with developmental factors like female literacy, percent of female urban one program variable that is safe delivery which is also playing significant role. It is well known that among schedule tribe population home delivery is more prominent than institutional delivery so, what matters is the assistance during the delivery. This indicates that if trained personnel are available at the time of delivery then infant mortality can be reduced to certain level but this does not mean that other factors are not important. Development is also needed to make them more aware of the programs and the facilities provided to them.

Model for child mortality is not showing much different result than infant mortality, the variables showing significant effect are more or less same except safe delivery and percent of urban female. For child mortality only two variables are showing significant effect that is female literacy and percentage of children in the birth order three and above. With increase in female literacy the level of child mortality can be reduced. Here also children in the birth order three and above are showing positive effect i.e. with increase in birth order child mortality also increases probably due to the negligence towards child with higher birth order.

Table 7: Result of multiple regression with effect of different district level indicators on infant and child mortality for schedule tribe population in selected districts of India.

	IMR	**CMR**
Indicators	B	B
Constant	43.732*	10.568
Female literacy	-0.411***	-0.392***
Female work participation rate	0.109	0.083
Percentage of household with safe drinking water	0.129	0.131
Percentage of children in the birth order 3+	1.067***	0.945***
Percentage of children full immunized	0.055	0.057
Percentage of urban female	0.511*	0.439
Percentage of women with safe delivery	-0.331*	-0.286
Percentage of women with any ANC	-0.117	-0.136
Percentage of women done colostrums feeding	-0.125	-0.106
Percentage of women with the practice of exclusive breast feeding the child.	-0.016	-0.011
Adjusted R^2	0.491	0.472
N	98	98

*** p<.01, ** p<.05, * p<.10

Determinants of Infant and child mortality for non- schedule caste/tribe population:

Table 8 is devoted to the regression results of non schedule caste/tribes. Two models are used one for infant mortality and another for child mortality. In these two models also variable of women with adequate practice of diarrhoea is excluded as it was not showing significant effect in both. The variables showing significant effect in the model of infant mortality are percentage of children in the birth order three and above, percentage of women

with safe delivery, percentage of women with practice of exclusive breast feeding the child and interaction effect of female literacy with any antenatal check up. Variable acting in the positive direction is children in the birth order three and above i.e. with increase in birth order infant mortality also increases. Percentage of women with safe delivery and practice of exclusive breast feeding the child are showing negative direction that means with percent increase in women with safe delivery and practice of exclusive breast feeding the child, there will be decrease in infant mortality. This indicates that through these two program factors the infant mortality can be reduced among non schedule caste/tribe population. Practice of exclusive breast feeding which is a very important variable for infant mortality is showing its effect only among non schedule caste/tribe population that means only this section of the society is getting benefited by this program factor. Antenatal check up for women is affecting to reduce infant mortality only after certain level of literacy among women. This again focuses on literacy which brings many important factors along with it like better awareness is one among them for infant mortality.

Scenario is not any different in case of child mortality rather it is only interaction effect which has changed. In case of child mortality full immunization is showing its effect only after certain level of female literacy. This means for full immunization coverage certain level of literacy among women is needed to reduce child mortality. With increase in the practice of exclusive breast feeding the child and safe delivery the chances of child mortality reduces. Exclusive breast feeding the child makes the immune system strong for the child so it may be possible that the chances of child survival increase against infectious diseases. Safe delivery is also showing significant effect this means if delivery is safe then it might be institutional so, better care is provided to the child and mother is able to take care of the child more efficiently with the help of more awareness and knowledge from trained health personnel.

Table 8: Result of multiple regression with effect of different district level indicators on infant and child mortality for Non-schedule caste/tribe in selected districts of India.

	IMR	**CMR**
Indicators	**B**	**B**
Constant	32.882**	-1.705
Female literacy	0.321*	0.328**
Female work participation rate	0.028	0.034
Percent of household with safe drinking water	-0.008	-0.012
Percent of children in the birth order 3+	0.708***	0.557***
Percentage of children full immunized	0.048	0.348***
Percentage of urban female	0.001	0.008
Percentage of women with safe delivery	-0.210***	-0.140***
Percentage of women with any ANC	0.317**	0.046
Percentage of women done colostrums feeding	-0.049	-0.044
Percentage of women with the practice of exclusive breast feeding the child.	-0.127***	-0.094***
Interaction 1 (Female literacy * any ANC)	-0.005*	
Interaction 2 (Female literacy * Full Immunization)		-0.006***
Adjusted R^2	0.487	0.469
N	319	319

*** p<.01, ** p<.05, * p<.10

Summary and Conclusions:

Estimates of schedule castes population shows that districts from Madhya Pradesh and Uttar Pradesh are in worse condition than other states. On the other hand among schedule tribe population districts from Madhya Pradesh and Orissa are in pathetic condition more than other states' districts. Among selected states, Madhya Pradesh has shown the highest level of infant mortality for schedule castes as well as schedule tribes. Differentials are wide where levels are also high but district from south and west are also not far behind in terms of differentials. It is clear from the findings that there are variations in the levels of infant and child mortality within states for all the sections of the society. States in the Southern and western region have exhibited lower IMR and CMR level for all the sub groups of population and subsequently central, eastern and northern regions are estimated with higher level. This implies that the states under central, eastern and northern regions are in poor state as far as the levels of infant and child mortality are concerned. There is decline in the level of infant and child mortality with the increase in the level of development among both the sub groups of population. This implies that certain level of development is needed to reduce the levels in infant and child mortality.

The factors affecting the infant and child mortality for schedule caste population are female literacy, female work participation, household with safe drinking water, women with adequate practice of diarrhoea and interaction effect of full immunization and percent of urban female. This means certain level of development coupled with literacy among women, female autonomy in terms of work participation, access to safe drinking water, proper practices during diarrhoea among children is needed to reduce infant and child mortality among this group of people. Full immunization is effective only after a certain level of urbanization among female. Among schedule tribe the factors affecting infant mortality are female literacy, children in the birth order 3 and above, percent of female urban and safe delivery this implies that by increasing the safe delivery and female literacy the infant mortality will reduce but along with higher order births and percent of urban female the infant mortality also increases. The result of higher birth order supports the saying that the children of higher order are neglected more so they experience more mortality but the increase in percent urban female leads to more infant mortality shows that they are not in any better condition even in urban areas due to their low socioeconomic profile and low paid jobs. In case of child mortality the factors which are affecting are female literacy and birth order which is not a new finding but shows how important these variables are even among schedule tribe population.

Factors affecting infant mortality for non schedule castes and tribe population are birth order, safe delivery, and practice of exclusive breast feeding and the interaction effect of any antenatal check up through female literacy. The variable explaining the risks of child mortality among this group of population are birth order, safe delivery, practice of exclusive breast feeding and the interaction effect of full immunization through female literacy. From this analysis it is clear that program factors are mostly explaining the risks of mortality in non schedule caste and tribe population. Program factors are showing its effect in the schedule caste population after certain level of development. Safe delivery among schedule tribe

women explains only the infant mortality risks so; emphasis should be given to this factor along with other developmental factors for women.

The factors which are explaining the risk of mortality among infants and children may not have bearing in the other population so; this suggests that intervention programs for further enhancement of life during infancy and early childhood should be different for different sub groups of the population. The foregoing analyses of the schedule castes and schedule tribes population highlight that there have been improvements in the socio-economic conditions among them over time but such improvements, however, are not adequate to offset the marginalisation of these two disadvantaged groups, for their assimilation with the community at large.

References:

Chakraborty G. and P.K. Ghosh, (2000), "Human Development Profile of Scheduled Castes and Tribes in Selected States**"**, A Bench Mark Survey, Report No.4, New Delhi, National Council of Applied Economic Research

Das N. P., Saroj B. and Rajnikant P. (2000), "The Growth and Development of Scheduled Caste and Scheduled Tribe Population in Gujarat and Future Prospects", Population research centre, department of statistics, Baroda

Dubey S.N. (1973), "Administration of Social Welfare Programmes in India", Bombay. Somaiya Publications Pvt. Ltd.

Sample Registration System Bulletin (2008), Registrar General of India, vol. 43 no: 1

Reproductive and Child Health-Rapid Household Survey (1998-1999), Phase I & II India report, International Institute for Population Sciences, Mumbai

Fig 1: Infant Mortality Rate for Schedule Castes in selected districts of India

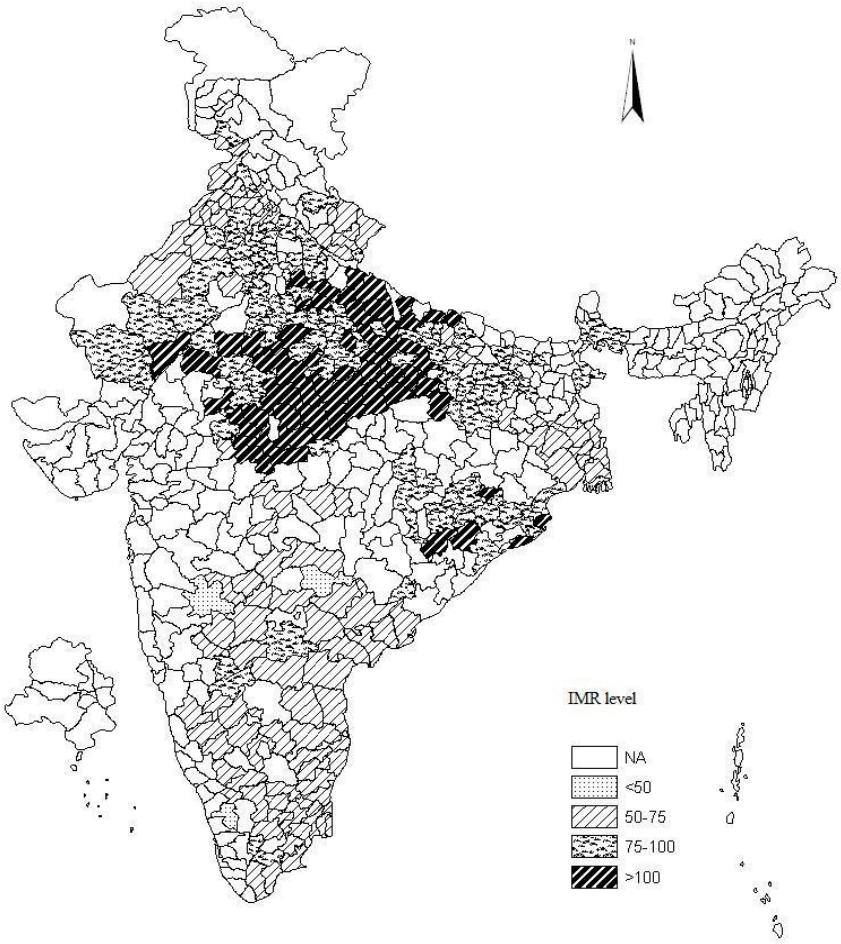

Fig 2: Child Mortality Rate for Schedule Castes in selected districts of India

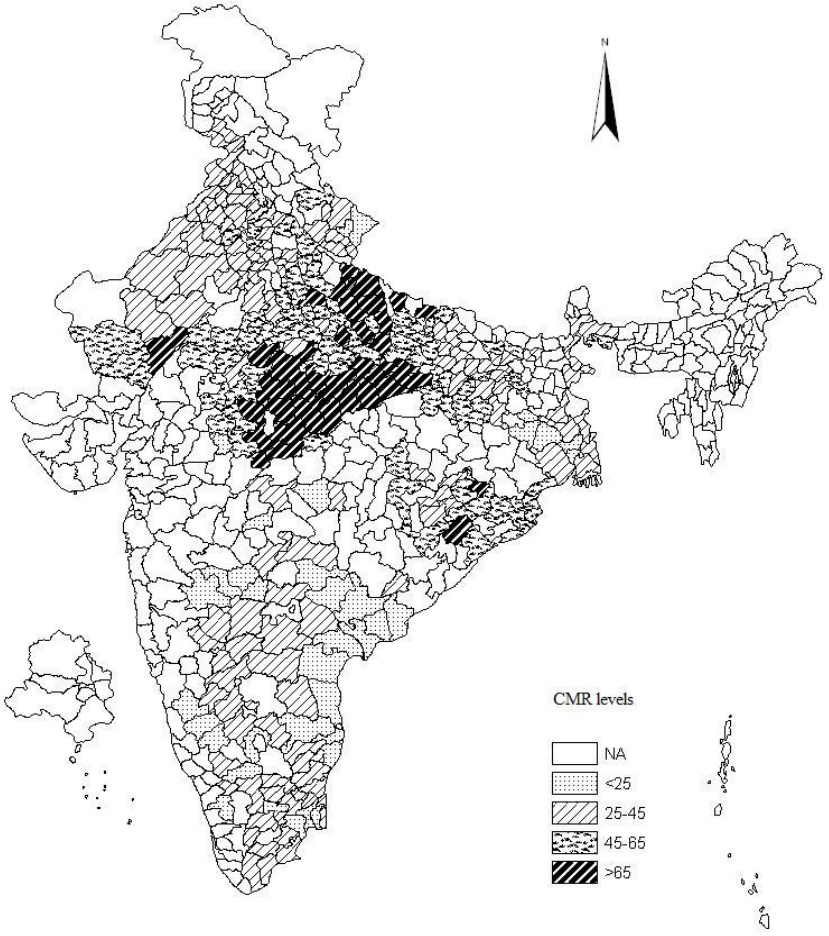

Fig 3: Infant Mortality Rate for Schedule tribes in selected districts of India

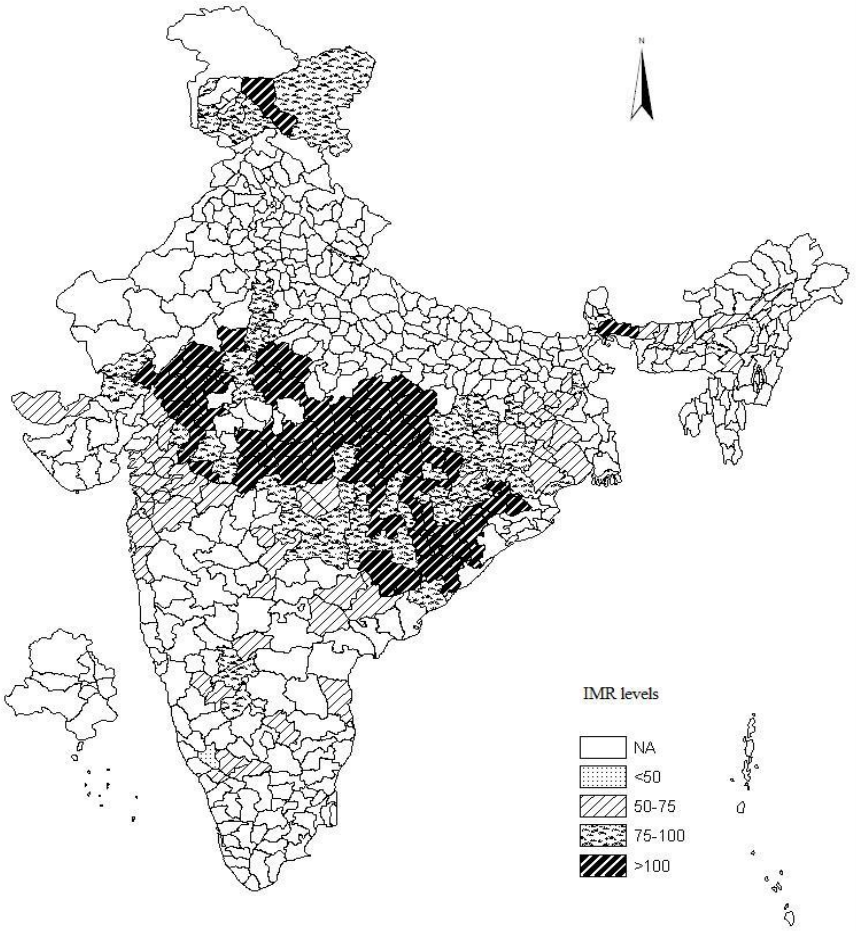

Fig 4: Child Mortality Rate for Schedule Tribess in selected districts of India