CHAPTER – 5

INEQUALITIES IN UTILIZATION OF HEALTH CARE SERVICES AND IMPACT OF SOCIOECONOMIC INEQUALITY ON CHILD MORTALITY

5.1 Introduction

One of the main objectives of National Health Policy (NHP) in India is to evolve a policy structure that reduces health inequities and allows the disadvantaged sections of the society a fair access to public health services (MOHFW, 2002). There is no doubt the overall health status of the population is improving with the developmental progress, but still now a high proportion of mother and child continue to suffer and die from infections, under-nutrition, and complications related to pregnancy and childbirth. At the same time, unequal access and utilization of health facility has resulted in large disparities. It indicates that several health care policies and programmes undertaken by the government are not properly benefiting the poorer section of the society who needs it most. The improvements in health services may not necessarily benefits or improve the condition of the poor, as it may be more accessible and utilized by the better off group (Gwatkin, 2005). Thus, privileged sections of the population may enjoy more benefit from health programmes or facilities; result in disparities among the population. This proposition gives support to the fact that inequalities in health are generally disadvantageous to the poor, varying largely across space and socio-economic inequalities in health seems to be widening rather than narrowing (Wagstaff, 2002). Generally, the above said disadvantaged group consists of people with lower than average socioeconomic status — implying low levels of literacy and standard of living, less access to health care facility and
thus low concerns about health care — resulting in under-usage of medical services and unhealthy lifestyles, including nutritional imbalance, poor personal hygiene. Within this disadvantaged group children are the worst sufferer. The burden of social inequality or in wider term poverty falls disproportionately on children and a significant proportion of deaths occur during childhood, which may be attributed to poor public health measures and lack of access to health care facilities. Many past studies show that children belonging to families with low socio-economic status experience higher mortality rates (Claeson et al., 2003; Poerwanto et al., 2003; Goldani et al., 2001; Wagstaff, 2000). Most of these deaths are from causes, which are preventable and are, therefore, unnecessary and inequitable (WHO & World Bank, 2002).

Inequalities in child health have been documented clearly in different rounds of National Family Health Surveys (NFHS) in India. As per latest NFHS–3 report, the under-five mortality rate (U5MR) was 74 (per thousand live births); lower than the NFHS-2 estimate of 95 and NFHS-1 estimate of 109. Unfortunately, this progress does not necessarily imply reduction in inequality in child health and survival. The child health inequalities are prominent in terms of its several dimensions. According to the above report, the U5MR was 94.7 per 1000 live births for illiterate mothers and it was only 29.7 for mothers with 12 years of education or more. The Infant and the child mortality rates were higher in the rural areas. In 2001-05, the infant mortality rate was 50 percent higher in the rural areas that in the urban areas (62 and 42 deaths per 1,000 live births respectively). Additionally, the children from the scheduled castes and tribes were at greater risk of dying than other children. Nationally, a girl child’s disadvantage with regard to survival is most evident in the under-five mortality rates. For example, 79 girls per 1,000 births die before their fifth birthday, compared with 70 boys per 1,000 births. By state, the infant mortality is the highest in Uttar Pradesh (73) and the lowest in both Kerala and Goa (15). Thus, there are ample evidences of child health inequalities in terms of its several dimensions like, mother’s educational level, caste, religion, sex, rural/urban residence, region, state
etc. In the case of child immunization in 2005-06, 71 percent children aged 12-23 months, belonging to households in the wealthiest quintile, received all basic vaccinations compared to only 26 percent in the lowest quintile. Anaemia and malnutrition are still widespread among children in India (IIPS & MAC. Int., 2007). Although specific intervention and preventive measures have been taken for many diseases but it is true that poor children are more likely to be exposed to many diseases than their richer peers, while having lower resistance to those risks and greater likelihood to fall ill. Disadvantaged groups are less likely to receive the childcare interventions that can prevent even the most common diseases (Victoria et al., 2003). Children from households with a low standard of living (SLI) are twice as likely to be undernourished as children from households with high standard of living.

Again, eight in ten children within low SLI aged 6 to 35 months are anaemic (IIPS & MAC. Int., 2007).

In India, average health condition improves substantially but, it does not necessarily mean that it percolates equally to all sections of people in the society. Also it cannot guarantee about the equal improvement in health conditions among and within different regions or states in the country. Thus, determination of average health status of the population and its covariates is important, but understanding inequalities in health and its magnitude (i.e., the gap in health condition between disadvantaged and better-off groups) is also an important task for health policy making in the country.

This inequality raises the question regarding its extent and its relation with the level of child mortality. Moreover, whether the inequality varies from one region to another and or from one state to another within the country are other questions that need answering. It is thus important to assess health differentials to understand whether national health policies are leading toward or away from greater social justice to child health. From this measure, the extent of inequality and also the causes behind inequality leading to deprivation can be obtained for constant monitoring and revision of different policy measures for reducing infant and child mortality in India.
Several past studies described inequality among different quintiles of population, constructed on the basis of socioeconomic status. These studies cover both methodology (Wagstaff, et al., 1991; Kakwani et al., 1997; Mackenbach et al., 1997) and empirical analyses (Mackenbach et al., 1997; Van Doorslaer et al., 1997; Whitehead, 2000). There are studies which correlate inequality with health outcome in the developing world (Wagstaff, 2000; Gwatkin et al., 2000; Wagstaff et al., 2000). Many other studies have correlated child or infant health with socioeconomic inequality and their determinants (Wagstaff et al., 2001; Mosley & Chen, 1984; Benefo & Schultz, 1996; Bhuiya et al., 2001; Ahmad R. H. et al., 2006; Szwarcwald et al., 2002; Yazbeck, 2009). In Indian context, however, studies (Yazbeck, 2009; Smith et al., 2003; Deaton & Dreze, 2002; Filmer & Pritchett, 2001; Gwatkin et al., 2000) that are available mainly to deal with utilization of health care services and nutritional status of children (based on height and weight measures of children), hardly attempted to measure the variation of it across the regions and the states, using inequality measures. The present chapter aims to diminish this information gap.

Given the above said background, the objective of the present chapter may be specified below.

The aim of present chapter is two folded.

(i) To find out the socio-economic and demographic determinants in utilization of maternal and child health care services that adversely affects differential in mortality during childhood.

(ii) To estimate the magnitude and dimensions of socio-economic inequality under child mortality.

Format of the present chapter is as follows. Section 5.2 devotes on methodology of the study. Sub-section 5.2.1 deals with the methodology for determination of factors which affect utilization of different maternal and child health care services. Again in, Sub-section 5.2.2, methodology for the estimation of magnitude and dimension of
inequality has been explained. Section 5.3 gives an analysis of the inequality determinants and comparison of different states in terms of the Concentration Index (CI) for infant and under-five mortality. Discussion and some concluding remarks are made in the final Section 5.5.

5.2 Data and Methodology

The present work is executed by utilizing the data from the third round of the National Family Health Survey (NFHS-3) in India for the children born during the last five years preceding the survey. It looks at the impact of different demographic and socio-economic characteristics on the access and utilization of reproductive and child health care services, which may reduce or enhance the health inequalities related to survival of children. Then, utilising infant and under five mortality data from NFHS-3 survey, ‘Concentration Indices’ have been constructed from different quintiles of ‘Wealth Index’ (WI) to get inter-regional and state variations of inequality in the country. This ‘Wealth Index’ represents the economic status of household and has been constructed using household asset data and housing characteristics, and available in the NFHS-3 data set (IIPS and Mac. Int., 2007). For the present analysis only the major states of India (covering 97% of India’s population according to Census of India, 2001) are included in the analysis along with their bifurcated states like, Chhattisgarh, Uttarakhand and Jharkhand. The data for these three new states are available separately in the NFHS – 3 data and thus considered here to observe the present scenario of inequality in child mortality also in those areas. The Methodologies are discussed in details below.

5.2.1 Determinants of inequality in utilization of child health care services

Research on the determinants of child mortality for developing a comprehensive framework to identify the significant proximate variables was initiated in mid 80’s.
The Mosley and Chen (Mosley & Chen, 1984) framework is based on the premise that all social and economic determinants of child mortality operate through proximate or intermediate variables to exert an impact on mortality. However, the mechanisms through which social, economic and cultural factors affect child health and eventually determine deaths are complex.

The importance of certain key factors as determinant of child mortality has been widely recognized. Because information on these factors is generally available from standard demographic surveys, they provide the basis for comparative approach. These determinants are mainly: maternal characteristics and reproductive health of mother at conception (e.g., age, parity, birth interval etc. and nutritional status), prenatal variables (e.g., antenatal checkup, consumption of iron-folic tablets, receiving of tetanus toxoid injection during pregnancy etc.), factors operating at delivery (e.g., medical assistance during child birth) and postnatal factors (e.g., birth weight and health status of the baby, immunization of child etc.).

Multivariate hazard analysis may be undertaken here to determine the effects of risk factors (proximate as well as socio economic) on various components of child mortality, gives the estimates for proximate and socioeconomic determinants (Pandey et al., 2004). Effects of socioeconomic variables through proximate determinants (taking interaction terms) can also be obtained. However, such analysis is cumbersome. Further, the surveys do not collect information on postnatal proximate determinants (like immunization, anaemia etc.) for children not alive at the time of survey. Therefore, the effects of these relevant and important factors cannot be determined using mortality data. But an assessment of impact of socioeconomic and cultural variables on proximate determinants may be undertaken with the aid of multivariate analysis. The objective is to understand how socioeconomic factors affect the child health through intermediate variables and generate differentials in health care utilization which in turn affects the mortality in childhood.

For identification of socioeconomic factors resulting inequality in utilization of health care services, the following demographic and health care indicators are selected on
the basis of their importance for child health and mortality (Mosley & Chen, 1984). The indicators are: (i) **Antenatal Care Indicators** – at least two doses of tetanus toxoid (TT) injection during pregnancy, consumption of adequate quantity of iron and folic tablets (IFA) during pregnancy; (ii) **Delivery care indicators** – institutional delivery and delivery assisted by the trained professional; (iii) **Demographic indicators** – preceding birth interval less than 24 months, mother’s age at birth less than 20 years; (iv) **Child health indicators** – small size of the baby at birth, completion of all basic immunization for child, existence of childhood anaemia, stunting among children. The inter-linkage between above said indicators and the socio-economic and the biodemographic variables has been examined initially by applying cross-tabulation analysis. However, such analysis fails to address health care utilization predictors completely because of ignoring other covariates. The reason is that the apparent effect of one variable may be confounded by the effects of one or more other variables, which are correlated, with the characteristic considered. To overcome such problem logistic regression technique has been utilized to control such potentially confounding variables for their effects. The multiple logistic regression analysis is performed here to identify different socio-cultural and developmental correlates of child health. Important health care indicator and demographic variables (e.g., TT immunization to pregnant women, IFA consumed during pregnancy, place of delivery, assistance at delivery, preceding birth interval less than 24 months etc) are used separately as dependent or explaining variable in logistic regression analysis to identify deprivation factors from different socio-economic and environmental covariates or predictor variables (e.g., mother’s age, education, caste & religion, birth order, wealth index, sex of the child etc). Each indicator or dependent variable has two values, if the response is ‘yes’ then the value is considered as ‘one’ and if it is ‘no’ then the value is ‘zero’. For example, if the delivery service provider is a health professional or if the mother received two doses of T.T. immunization at the time of pregnancy or if she delivered at institution then a value ‘one’ for this dichotomous
variable is assigned, otherwise value of the variable is ‘zero’. Nine important socio-economic and other predictor variables are included in the analyses which are categorical in nature on the basis of their importance in child health.

Certain restrictions are imposed in analysing the data. For example, in case of tetanus toxoid and IFA, only most recent births are considered as information on these variables have been collected in NFHS – 3 only for most recent births. For twin births, only the first twin has been considered for the analysis. Again, for preceding birth interval as indicator, first order births are excluded from the analysis. In case of child health indicators like, full immunization, anaemia in children aged 12-59 months and 6-59 months respectively have been considered for the analysis.

5.2.2 Estimation of magnitude and dimension of inequality

To measure the health inequality between the advantaged and the disadvantaged, and to determine the magnitude of inequality, a composite index namely, wealth index is used. This index reflects the economic status of a household and may be used to understand the economic differential in health outcome and health care utilization (Filmer et al., 2001; Victoria et al., 2003). The present study uses this index to reflect the socio-economic inequalities in health outcome namely, infant and under-five mortality.

The wealth index is computed in NFHS-3 from a set of consumer durables, land size, housing quality and water and, sanitation facilities of a household (IIPS and Mac. Int., 2007). Each household asset is assigned a weight (factor score) generated through principal components analysis (PCA) and the resulting asset scores are standardized in relation to a normal distribution with a mean of zero and standard deviation of one (Gwatkin et al., 2000). Every household is then assigned a score for each asset, and the scores are summed for each household. All individuals are ranked according to the score of the household in which they reside. The sample is then divided into quintiles i.e., five groups with an equal number of individuals in each. These five quintiles of population are namely, lowest, second, middle, fourth and...
highest. In NFHS-3, one wealth index has been developed for the whole sample and for the country as a whole. The health-outcome indicator, used in this study, is the mortality of children, meaning mainly the infant and the under-five mortality. Undoubtedly, the infant and the under-five mortality are key health indicators in their own right and have an important bearing on life expectancy at birth (Wagstaff, 2000). As complete fertility or birth histories are available from the NFHS data, mortality rates are estimated using the Kaplan-Meier method (Kaplan & Meier, 1958; Hill & Yazbeck, 1994) using data on children, according to different quintiles of wealth index for all the selected states of India. Utilising the infant or the under-five mortality data according to wealth index quintiles, concentration index is calculated for each of the selected states of India to compare the disparities among the states under study. According to Wagstaff, the concentration index meets the necessary requirements for the measurement of the inequalities i.e. (i) it reflects the socioeconomic dimension of inequalities in the health field; (ii) it uses information on the entire population, and (iii) it is sensitive to redistribution of the population among different social groups (Wagstaff et. al., 1991).

In Figure 5.1, the x-axis represents the cumulative proportions for the population, which are cumulative live births ranked by wealth index. The ordinate or y-axis

| Figure 5.1 | Mortality Concentration Curve |

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<table>
<thead>
<tr>
<th>Cumulative Infant Deaths</th>
<th>Cumulative Live Births Ranked by Wealth Index</th>
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<tbody>
<tr>
<td>6%</td>
<td>0%</td>
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<td>20%</td>
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represents, the cumulative proportions for the health variable being studied. For the present study it is cumulative infant deaths. For the construction of the concentration curve, the individuals or groups that make up the population are ordered by the health variable being studied, from the worst situation to the best situation. As the area between the curve and the diagonal increases, inequality also increases. Thus, in the concentration curve, x-axis shows, the cumulative percentage of the live births, ranked by wealth index, starting with the poorest. Similarly, on the y-axis the cumulative percentage of the infant (or under-five) death variable corresponding to each cumulative percentage of the distribution of the wealth index variable is plotted. This provides ranking of children born alive according to their households’ economic status (i.e., wealth index) and the sample is divided into five quintiles. Then infant or under-five mortality rates for each quintile are estimated. Mortality concentration curve is represented here as L(p), where, p represents the cumulative proportion of the study population. This curve shows the cumulative proportion of deaths on the y-axis against the cumulative proportion of children at risk on the x-axis, ranked by the wealth index and beginning with the most disadvantaged child. Here we are interested at the distribution of mortality across quintiles grouped by economic status. When L(p) coincides with the diagonal, all children enjoy equal mortality rates irrespective of their economic status. So, if L(p) lies above the diagonal, inequalities in mortality favour the better-off children. This type of inequality may be called “pro-rich”. When L(p) lies below the 45 degree line, it may be termed as “pro-poor” inequalities in mortality (Wagstaff, 2000). Moreover, when the curve L(p) lies above the diagonal, the greater the degree of inequality in mortality across wealth quintiles. The concentration index is defined as twice the area between the concentration curve, L(p), and the line of equality (the 45 degree line running from the bottom-left corner to the top-right). The concentration index takes values between −1 and + 1. Values are negative when the curve is above the diagonal line and positive when it is below the diagonal. Its negative values imply that a variable is concentrated among disadvantaged people while the opposite is true for its positive values. So, in the case
where there is no wealth-related inequality, the concentration index is zero. If the health variable is ‘child mortality’, a negative value of the concentration index means child mortality is higher among the poor. Conventionally, ‘Concentration Index’ is denoted by the term ‘C’. Let, \( n \) denote the sample size, ‘\( T \)’ is the number of socioeconomic groups, \( f_t \) the proportion of the sample in the \( t \)-th group, then \( C \) can be presented as (Wagstaff, 2000):

\[
C = \frac{2}{\mu} \sum_{t=1}^{T} f_t \mu R_t - 1 \quad \text{(Eq.1)}
\]

Where, \( \mu = \sum_{t=1}^{T} f_t \mu_t \) is the overall mean mortality rate and \( \mu_t \) the mean value of mortality rate amongst the \( t \)-th group. The term \( R_t \) is its relative rank in the \( t \)-th group and may be defined as,

\[
R_t = \sum_{i=1}^{t-1} f_i + \frac{1}{2} f_t \quad \text{(Eq.2)}
\]

This indicates the cumulative proportion of the population up to the midpoint of each group interval. The infant and the under-five mortality data in the present study being derived from the survey data; which are subjected to sampling variation. It therefore necessitates calculation of standard error for the concentration index ‘\( C \)’. The variance of ‘\( C \)’ is given by (Kakwani et al., 1997):

\[
\text{Var}(\hat{C}) = \frac{1}{n} \left[ \sum_{i=1}^{T} f_i a_i^2 - (1+c)^2 \right] + \frac{1}{n \mu^2} \sum_{i=1}^{T} f_i \sigma_i^2 (2 R_i - 1 - c)^2 \quad \text{(Eq.3)}
\]

Where, \( \sigma_i^2 \) is the variance of \( \mu_i \),

\[
a_i = \frac{\mu_i}{\mu} (2 R_i - 1 - c) + 2 - q_{i-1} - q_i \quad \text{(Eq.4)}
\]

\[
q_i = \frac{1}{\mu} \sum_{r=1}^{i} \mu_r f_{r} \quad \text{(Eq.5)}
\]
Which is the ordinate of \( L(p) \), \( q_0 = 0 \), and \( p_t = \sum_{y=1}^{t} f_y R_y \), is the cumulative percentage of the sample ranked by wealth index status in group ‘t’.

5.3 Findings

5.3.1 Findings on determinants of inequality in child health care utilization

The maternal and the child health programmes undertaken by the government are immensely important in a developing country like India, particularly with the deprived section of the society. This poses greater challenges at different levels of the health care system in the country. To understand the scenario of utilization of health care services for mother and child, different maternal and child health care indicators are presented in a bivariate table against important background characteristics. Table 5.1 shows the percentage distribution of different maternal and child health care characteristics, among the children born in last five years before the NFHS-3 survey. These indicators are judged according to important socio-economic and bio-demographic characteristics which are presented in different rows of the table.

The result shows that, increasing age of mother and birth order is negatively associated with use of antenatal and delivery care services. Particularly, mother aged greater than or equal to 35 years received tetanus (59.7%) and IFA (16.4%) in very poor percentages. This group also delivered less in an institutional set up (26.5%) and very few got assistance at delivery (32.8%) from health professionals. For child health indicators, receiving of full immunization shows lower percentages (44.8 and 31.7) and existence of stunting among children shows higher percentages (51.7 and 52.3), among the women having age group less than 20 years and above 34 years compared to middle age group women. Anaemia among the children is slightly higher whose mothers having age less than 20 years. For higher order births, prevalence of anaemia and stunting among children are observed to be high. For example, children of birth order four and above show 46 percent anaemia and 56.1 percent stunting, much higher than the other two categories.
Both economic and educational attainments of women are positively associated with use of health care facilities. For all the antenatal and delivery care indicators, educated women are more likely to avail the above said facilities during pregnancy, delivery and child health care than illiterate women. To understand the economic status of the household the present study utilises wealth index (WI). Wealth index always has strong positive relationship with maternal and child health care indicators. Enormous difference is observed between the poorest and the richest women in case of delivery care indicators. Only 11.8 percent women from ‘lowest’ wealth quintile have delivered in an institutional set up. But it is as high as 84.2 percent for the women who belong to ‘highest’ wealth quintile. Similar picture is observed for the women those who get assistance from health professional during delivery. Among all social groups, Schedule Tribe (S.T) women have higher inequality in getting access to different maternal and child health care services. Their children also have lower percentage of full immunization (35.9) and higher percentages of anaemia (51.1) and stunting (53.6).

It is obvious that the place of residence makes a significant difference in getting access and utilization of existing health care services. Women residing in rural areas are less likely than those in urban areas to have received tetanus and IFA, delivering at medical institution, and having assistance from health professional during delivery and full immunization of their children. Prevalence of anaemia and stunting is also higher in rural areas.

Among all the regions, central region ranks lowest in almost all aspects of maternal and child health care. Similarly, southern region has the highest utilization of child health care opportunities. For example, 27 percent and 79 percent live births have been observed institutionally in central and southern region respectively. Preceding birth interval of less than 24 months shows lower percentage of full immunization and higher percentages of anaemia and stunting among the children. Unfortunately our data do not confirm any significant inequality impact with respect to child health indicators on female child under study.
The results of the multiple logistic regression analyses are presented in Table 5.2 to identify different socio-cultural and developmental correlates of child health care. The odd ratios for different dependent maternal and child health care indicator variables against selected categorical independent variables are described in the table. Mothers having age greater than 34 years and higher order births (four and above), illiterate, belonging to schedule tribe family, belonging to lowest wealth quintile, having rural residence are less likely to receive at least two doses of tetanus injection during pregnancy. Apart from the above said variables, mothers with less than 25 years of age or belonging to SC community are less likely to consume iron and folic tablets. For both of these two ANC variables, all regions show significant positive responses except Central region.

The odds ratios demonstrate the aversive attitude in availing institutional care and professional assistance during delivery among mothers: with low socio-economic status (SC and ST), illiterate, having higher order births and the ones with rural residence. Muslim mothers are observed to receive less professional assistance at the time of delivery than other communities. Regional disparities are also noticed among different regions under study.

Children belong to ‘very small’ or ‘smaller than average’ categories are considered to have a higher than average risk of early childhood death (IIPS & MAC. Int., 2007). In the present analysis, child health indicator like ‘small size of baby at birth’ shows that, mothers in families with higher wealth index have lesser chance to give birth of low weight babies compared to the ones in the poorer section in our society. Again, mothers in the northern region give more births of small babies compared to the central region. Mothers aged less than 20 or greater than 34 years are found less attentive in regard to full immunization of their children. Reasons may be less access to mass media and traditional beliefs among women. Also, SC and Muslim mothers are less likely to immunize fully their children than ‘others’. Anaemia and stunting of children are found highly associated with lower mother’s education, lower female
age at childbirth, lower socio-economic status as reflected by wealth index, rural residence and preceding birth interval of less than 24 months.

5.3.2 Findings on magnitude and dimension of inequality

Our previous analysis shows different health care programme variables in explaining different socio-economic and demographic categorical characteristic, as important determinants which create inequality in child health care. However, in NFHS-3 report, one of the background characteristics used throughout the report, is an index of the economic status of households called the wealth index. This wealth index may be regarded as the composite index of most of the household characteristics under present consideration. The wealth index based on household asset data and housing characteristics has been developed and tested in a large number of countries in relation to inequalities in household income, use of health services, and health outcomes (Rutstein et al., 2000). It is an indicator of the level of wealth that is consistent with expenditure and income measures (Rutstein, 1999). It has already mentioned in section 5.3.2, that the present study utilizes wealth index to construct the concentration index, which in turn will help us to identify the magnitude and dimension of inequality based on infant and under five mortality data in different states of India.

Table 5.3 shows, wealth index, infant and under-five mortalities for the children belong to different quintiles based on NFHS-3 data. This table represents the extent of inequalities in infant and under-five mortality in Indian states. The table shows the child population below 10 years of age at the time of survey, segregated by wealth quintiles. The distribution of the child population across the wealth quintiles exhibits large variation across the states. More than 40 percent of the children belong to the lowest quintile in the states of Jharkhand, Orissa, Chhattisgarh and Madhya Pradesh. In Punjab and Kerala, however, more than 40 percent belong to the highest quintile.
Particularly in the states of central and eastern region, except Uttarakhand, less than 10 percent children belong to the highest quintile.

This table also shows the extent of inequality in infant and under-five mortality. In all the states, other than Punjab, there is a wide gap between the lowest and the highest quintile for under-five mortality rates. The poorest quintile experienced the highest infant and under-five mortality rates in the states of Rajasthan, Chhattisgarh, Uttar Pradesh, Bihar, Orissa, Assam, Gujarat and Maharashtra. One interesting thing to be observed in Punjab and Kerala is that, the infant and the under-five mortality rates are same in the lowest quintiles. This implies the role of morality beyond one-year of age and up to 5 years of age is negligible for these two states. Not only the first quintile (poorest), second quintile is (poorer) also contributing higher mortality rates in children relative to rest of the quintiles. Results indicate that both the infant and the under-five mortality data sharply decline from the poorest quintile to the richest quintile in majority of the states. This tendency is much more pronounced for the under-five rates. Infant and under-five rates for the lowest quintile is the highest in Gujarat (98.6) and Chhattisgarh (129.2) respectively. In Kerala, both the rates are the lowest in the highest quintile compare to other states. In general it can be said that survival prospect for the children, born in poor families, are worse compared to survival prospect of those born in better-off families in most of the states. Therefore, movement from the lower to the upper quintile along the scale of wealth index suggests steady decline in infant and the under-five mortality.

The data in Table 5.3 do not indicate which states have the greatest inequalities and which have the lowest. So we need comparison of concentration curves for all considered states, which are constructed utilising mortality rates and wealth indices. Difficulties in presenting and comparing the concentration curves for all the selected states of India have been overcome by finding out just the deviations of the mortality concentration curves from the 45-degree line, as presented in Figure 5.2, by different regions of India.
Initially, all the above said curves for both infant and under-five mortalities are constructed. But, the picture is clearer in the case of under-five mortality than infant mortality. Thus, for this reason only the under-five concentration curves are considered here.
Figure 5.2: Contd.
Along the horizontal axis, percentage of cumulative live births ranked by wealth index is measured. Along the vertical axis, percentage deviation of mortality concentration curve (CC) from diagonal (45 degree line) is measured. This is one kind of “dominance-checking exercise” as described by the Wagstaff (Wagstaff, 2000). Thus, all concentration curves lie above the 45-degree line (here it is above the horizontal axis), indicating pro-rich inequality (Wagstaff, 2000) in mortality exists in all the states.

Among the northern states, the concentration curves for Punjab and Himachal Pradesh lie furthest from the horizontal axis. The curve for all India also lies along with these two states. The curves for states like Rajasthan or Haryana lie much below than the above stated two states, indicating less inequality in the under-five mortality. The result is not clear for the state of Jammu-Kashmir. Among the central states in India, the curve for Uttarakhand does not intersect with any of the remaining concentration curves and hence shows highest inequality among all central states. The state like Uttar Pradesh has the lowest inequality compared to other central states, but initially it intersects with Madhya Pradesh. Overall, all the states have less inequality compared to all India except Uttarakhand. Among the eastern states, Bihar has the lowest inequality as indicated by the concentration curve. The states like Orissa and Jharkhand have comparatively higher inequality than West Bengal and Bihar. The western states of India show more or less same level of inequality. Similar picture is observed for the southern states. However, Andhra Pradesh has comparatively less inequality than the others. If the states are considered irrespective of all the regions, it can be said that inequalities are comparatively low in the states of Bihar, Uttar Pradesh, Haryana, and Rajasthan. On the other hand, it is high in the states of Tamil Nadu, Kerala, Uttarakhand, Maharashtra and Gujarat. Remaining states are in some kind of intermediate position.
5.3.2.1 Concentration Indices
The concentration curves described above give us an idea or gross estimation of inequality. Using these, we can compare the difference of inequality between two or more states. Table 5.4 shows the state wise estimates of the concentration indices separately for infant and under-five mortality along with its standard errors and corresponding t-statistics. It also gives ranking of the states with respect to the concentration index. These are obtained utilizing the Eq.1 as describe in the methodology section 5.3.2. Infant and under-five mortality concentration indices for different selected states of India are ranked according to their magnitude. In all the states, inequalities in under-five mortality are more prominent than inequalities in infant mortality. For example, in Haryana, Chhattisgarh and West Bengal the inequality indices for under-five mortality are statistically significant, but the indices for infant mortality are not. In all the states except in Jharkhand and Madhya Pradesh, the inequalities in under-five mortality are statistically significant. Inequalities in infant and under-five mortalities are the highest in Uttarakhand and Maharashtra and the lowest in Bihar.
The states on being arranged according to the decreasing level of concentration index exhibit substantial differences in levels of inequality. The states are divided into five groups. The states under first group with highest level of inequality are Maharashtra, Uttarakhand, Gujarat, Kerala and Tamil Nadu. The second group comprises of Karnataka, Assam, Punjab and Himachal Pradesh. The third groups of states are Orissa, Chhattisgarh, Andhra Pradesh and Jharkhand. The fourth group of states comprises of Madhya Pradesh, Haryana, West Bengal and Jammu & Kashmir. The fifth groups of states, having the lowest level of inequality, are Rajasthan, Uttar Pradesh and Bihar. A question, however, may be raised about the statistical significance of the differences in inequality from one state to the other. So a test of significance between concentration indices for infant and under-five mortality are done separately. Tables for these t-
tests are not presented here for their large volumes. However, the results are summarized using a **Hasse diagram in Figure 5.3**.

Here, broken lines indicate a lack of significant difference. Continuous lines are symbolizing significance. There are hardly any significant difference between the states within any particular group stated above, except for the states like Chhattisgarh and Orissa, Bihar and Rajasthan and, Bihar and Uttar Pradesh. So Bihar has the lowest inequality in distribution of under-five mortality by wealth status, followed by Rajasthan and Uttar Pradesh. Highest inequality in distribution is exhibited by the states namely, Maharashtra, Uttarakhand, Gujarat, Kerala and Tamil Nadu.

**Figure 5.3 :** Hasse diagram (major states, India, NFHS-3) for under-five mortality based on t-test of concentration index

Note: BH- Bihar; RJ- Rajasthan; UP- Uttar Pradesh; MP- Madhya Pradesh; HR- Haryana; WB- West Bengal; JK- Jammu & Kashmir; JH- Jharkhand; AP- Andhra Pradesh; Ch- Chhattisgarh; OR- Orissa; HP- Himachal Pradesh; KA- Karnataka; PJ- Punjab; AS- Assam; KE- Kerala; GJ- Gujarat; UT- Uttarakhand; MH- Maharashtra.

### 5.4 Summary and Conclusion

The first part of our study provides an insight in understanding the role of different demographic, socio-economic and geographic parameters for differentials in utilization of child and maternal care services, responsible for variations in child
mortality in India. It helps to identify the factors contributing to inequalities prevailing within the poor or disadvantaged children. To understand different socio-cultural and developmental correlates of inequalities related with infant and under five mortalities, both bivariate and multivariate analyses have been done. The analysis established different correlates of child mortality. The variables like, mother’s age of child birth in earlier ages (<20 years) or in higher ages (>34 years), higher order births, low level of literacy, belongingness to SC/ST families, falling in poorer or the poorest wealth quintiles, having rural residence, getting delivered by the untrained medical personnel in the non-institutional environment and birth intervals shorter than two years are major determinants of inequalities in child health. These socio-economic and demographic variables are operating through different antenatal, delivery and child health care indicators in explaining the causes behind the inequality among the disadvantaged children.

In the second part, utilizing the distribution of children according to wealth index quintiles, infant/under-five mortality rates for each quintile are calculated, and then magnitudes of inequality within different states of India have been determined. Using these measures, selected states may be classified into different groups according to the levels of inequality in infant and under-five mortalities. In the states of Maharashtra, Uttarakhand, Gujarat, Kerala and Tamil Nadu, inequality level is high compared to other selected states. Second group consists of Karnataka, Assam, Punjab and Himachal Pradesh. Third group of states are Madhya Pradesh, Haryana, West Bengal and Jammu & Kashmir. The lowest level of inequality exists in the states like Rajasthan, Uttar Pradesh and Bihar. So it may be argued that inequality in child mortality is more concentrated in the comparatively developed states than the poorer states. Overall developmental progress of the state does not ensure the reduction in inequality in mortality under childhood. Inequality is the reflection of unequal distribution of resources among the people which adversely affects the health of under-privileged population. In the developing country like India, poorer sections of the population are struggling with ill health due to impoverishment which
directly affects child survival and nutrition. The socially under-privileged are unable to access the healthcare due to geographical, social, and economic related disparities. For this reason magnitude of under-five mortality is much lower for the top quintile than for the bottom one.

This study may be improved by considering different dimensions of inequality. For example, instead of wealth index, literacy levels or religions and castes may be considered based on income distribution. We can also see the changes in inequality over time, by constructing composite index using time dependent variable to inequality. Region or state specific analysis is essential to reduce the disparities in use of health care services and to find out the reasons behind the variation in inequality across the states.

India is the nation where high levels of regional, social and economic inequalities are present. Inequality related with health and nutrition is also pervasive and persistent. Although India has achieved high level of economic growth and development, but it cannot give guarantee of egalitarian distribution and accessibility of beneficial social services to all population. Poverty level may show modest decline in line with earlier trends, but economic inequality along with other dimensions may increase substantially. So policies aimed at reducing health inequalities should expand the quality and availability of health services to all sections of population. Necessary measures are also essential to reduce inequality in income, accessibility of health services to poor and to remote places, and wide circulation of health specific knowledge. Special efforts and constant monitoring are needed to reach poorer section in our society to deliver affordable health care and allied services.
Table 5.1: Percentage distribution of different demographic, maternal and child health care variables according to important background characteristics for the children born in last five years preceding the NFHS-3 survey (2005-06), India.

<table>
<thead>
<tr>
<th>Variable Names &amp; Categories</th>
<th>Antenatal Care Indicators</th>
<th>Delivery Care Indicators</th>
<th>Demographic Indicators</th>
<th>Child Health Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At least two doses of TT received</td>
<td>IFA Received</td>
<td>Institutional delivery</td>
<td>Antenatal care by Health Professional</td>
</tr>
<tr>
<td>Mother’s Age (yrs.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 20 yrs.</td>
<td>80.5</td>
<td>22.1</td>
<td>40.8</td>
<td>51.6</td>
</tr>
<tr>
<td>20 yrs. to &lt; 35 yrs.</td>
<td>80.0</td>
<td>23.6</td>
<td>45.9</td>
<td>53.1</td>
</tr>
<tr>
<td>&gt;= 35 yrs.</td>
<td>59.7</td>
<td>16.4</td>
<td>26.5</td>
<td>32.3</td>
</tr>
<tr>
<td>Mother’s Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literate</td>
<td>64.8</td>
<td>12.0</td>
<td>20.1</td>
<td>28.1</td>
</tr>
<tr>
<td>Low &amp; Middle sch. Comp.</td>
<td>84.8</td>
<td>26.5</td>
<td>46.7</td>
<td>56.2</td>
</tr>
<tr>
<td>Middle sch. Complete</td>
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<td>34.4</td>
<td>60.1</td>
<td>69.1</td>
</tr>
<tr>
<td>Secondary &amp; above</td>
<td>84.2</td>
<td>54.5</td>
<td>82.3</td>
<td>87.9</td>
</tr>
<tr>
<td>Caste/Religion</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>36.3</td>
<td>45.1</td>
</tr>
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<td>17.9</td>
<td>25.4</td>
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<td>23.5</td>
<td>43.1</td>
<td>48.7</td>
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<td>Others</td>
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<td>33.2</td>
<td>51.9</td>
<td>60.3</td>
</tr>
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<td></td>
</tr>
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<td>62.6</td>
<td>70.5</td>
</tr>
<tr>
<td>Two &amp; Three</td>
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<td>44.9</td>
<td>53.3</td>
</tr>
<tr>
<td>four or above</td>
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<td>12.6</td>
<td>19.0</td>
<td>20.2</td>
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<td></td>
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<td></td>
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<tr>
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<td>19.8</td>
<td>11.8</td>
<td>19.1</td>
</tr>
<tr>
<td>Second</td>
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<td>14.6</td>
<td>23.2</td>
<td>32.4</td>
</tr>
<tr>
<td>Middle</td>
<td>79.4</td>
<td>22.9</td>
<td>39.7</td>
<td>49.3</td>
</tr>
<tr>
<td>Fourth</td>
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<td>32.8</td>
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<td>67.7</td>
</tr>
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<td>53.0</td>
<td>84.2</td>
<td>89.1</td>
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<td>Place of Residence</td>
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<td></td>
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<td>21.5</td>
<td>29.5</td>
<td>38.8</td>
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<td>38.2</td>
<td>69.1</td>
<td>74.1</td>
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<td>51.7</td>
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<td>17.0</td>
<td>27.2</td>
<td>36.1</td>
</tr>
<tr>
<td>Eastern</td>
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<td>22.7</td>
<td>33.0</td>
<td>40.8</td>
</tr>
<tr>
<td>Western</td>
<td>86.3</td>
<td>34.6</td>
<td>65.3</td>
<td>71.4</td>
</tr>
<tr>
<td>Southern</td>
<td>89.2</td>
<td>49.4</td>
<td>78.6</td>
<td>83.4</td>
</tr>
<tr>
<td>Preceding Birth Interval</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 24 months</td>
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<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>&gt; 24 months</td>
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<td>N.A.</td>
<td>N.A.</td>
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</tr>
<tr>
<td>Sex of the Child</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
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<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>Female</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>Total (%) (Unweighted)</td>
<td>79.1</td>
<td>27.8</td>
<td>44.0</td>
<td>51.6</td>
</tr>
<tr>
<td>Total (%) (Weighted)</td>
<td>83.1</td>
<td>59.8</td>
<td>73.3</td>
<td>84.3</td>
</tr>
<tr>
<td>Total (No.) (Unweighted)</td>
<td>22560</td>
<td>7567</td>
<td>17026</td>
<td>21140</td>
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</table>

NA: Not applicable.
### Table 5.2: Odds ratios of different demographic, maternal and child health care variables according to important background characteristics for the children born in last five years preceding the NFHS-3 survey (2005-06), India.

<table>
<thead>
<tr>
<th>Variable Names &amp; Categories</th>
<th>Antenatal Care Indicators</th>
<th>Delivery Care Indicators</th>
<th>Demographic Indicators</th>
<th>Child Health Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At least two doses of TT received</td>
<td>IFA Received</td>
<td>Institutional delivery</td>
<td>Antenatal care visits</td>
</tr>
<tr>
<td>Mother's Age (yrs.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 20 yrs</td>
<td>0.88 ***</td>
<td>0.65 ***</td>
<td>0.67 **</td>
<td>0.72 ***</td>
</tr>
<tr>
<td>20 yrs. to &lt; 35 yrs.</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>&gt; 35 yrs</td>
<td>0.74 ***</td>
<td>0.92</td>
<td>0.55 ***</td>
<td>0.06 **</td>
</tr>
<tr>
<td>Mother's Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literacy</td>
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<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Matric</td>
<td>1.90 ***</td>
<td>1.78 ***</td>
<td>1.85 ***</td>
<td>1.82 ***</td>
</tr>
<tr>
<td>Middle-School Complete</td>
<td>2.01 ***</td>
<td>2.18 ***</td>
<td>2.45 ***</td>
<td>2.40 ***</td>
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<tr>
<td>Secondary &amp; above</td>
<td>3.08 ***</td>
<td>3.76 ***</td>
<td>4.75 ***</td>
<td>4.70 ***</td>
</tr>
<tr>
<td>Caste/Religion</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Schedule caste</td>
<td>1.02</td>
<td>0.82 **</td>
<td>0.80 ***</td>
<td>0.80 **</td>
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<tr>
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<td>0.46 **</td>
<td>0.51 ***</td>
</tr>
<tr>
<td>Muslim</td>
<td>0.93</td>
<td>0.86 **</td>
<td>0.97</td>
<td>0.82 **</td>
</tr>
<tr>
<td>Others</td>
<td>1.00</td>
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<td>1.00</td>
</tr>
<tr>
<td>Birth Order</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>1.53 ***</td>
<td>1.33 ***</td>
<td>2.21 ***</td>
<td>2.15 ***</td>
</tr>
<tr>
<td>Two &amp; Three</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Four &amp; above</td>
<td>0.64 ***</td>
<td>0.67 ***</td>
<td>0.61 **</td>
<td>0.65 **</td>
</tr>
<tr>
<td>Wealth Index (W1)</td>
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<td></td>
</tr>
<tr>
<td>Lowest</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Second</td>
<td>1.27 ***</td>
<td>1.11 *</td>
<td>1.20 ***</td>
<td>1.18 ***</td>
</tr>
<tr>
<td>Middle</td>
<td>1.78 ***</td>
<td>1.51 ***</td>
<td>2.18 ***</td>
<td>1.97 ***</td>
</tr>
<tr>
<td>Fourth</td>
<td>2.58 ***</td>
<td>1.97 ***</td>
<td>3.52 ***</td>
<td>2.79 ***</td>
</tr>
<tr>
<td>Highest</td>
<td>3.55 ***</td>
<td>3.25 ***</td>
<td>7.74 ***</td>
<td>6.21 ***</td>
</tr>
<tr>
<td>Place of Residence</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Rural</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Urban</td>
<td>1.75 ***</td>
<td>1.69 ***</td>
<td>3.33 ***</td>
<td>2.63 ***</td>
</tr>
<tr>
<td>Geographical Region</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Northern</td>
<td>1.18 *</td>
<td>1.65 **</td>
<td>1.94 ***</td>
<td>1.79 **</td>
</tr>
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<td>Central</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Eastern</td>
<td>1.02 ***</td>
<td>1.88 **</td>
<td>1.77 ***</td>
<td>1.55 **</td>
</tr>
<tr>
<td>Western</td>
<td>1.63 ***</td>
<td>2.75 ***</td>
<td>3.97 ***</td>
<td>3.06 ***</td>
</tr>
<tr>
<td>Southern</td>
<td>2.34 ***</td>
<td>3.00 **</td>
<td>7.65 ***</td>
<td>4.64 ***</td>
</tr>
<tr>
<td>Preceding Birth Interval</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 24 months</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
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<tr>
<td>= 24 months</td>
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<td>N.A.</td>
<td>N.A.</td>
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<tr>
<td>Sex of the Child</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>Female</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

Note: *** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level; N.A. - Not applicable.
Table 5.3: Percentage distribution of children (aged below 10 years), Infant and under-five mortality rates, by quintile of Wealth Index in Major States of India (NFHS-III, 2005-06)

<table>
<thead>
<tr>
<th>States of India</th>
<th>Wealth Index (percent)</th>
<th>Infant Mortality (1q0)</th>
<th>Under-five Mortality (5q0)</th>
<th>No. of children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quintiles</td>
<td></td>
<td>Quintiles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Haryana</td>
<td>6.3</td>
<td>15.0</td>
<td>25.5</td>
<td>27.4</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>1.2</td>
<td>10.3</td>
<td>25.8</td>
<td>31.8</td>
</tr>
<tr>
<td>Jammu &amp; Kashmir</td>
<td>3.3</td>
<td>16.4</td>
<td>34.8</td>
<td>26.9</td>
</tr>
<tr>
<td>Punjab</td>
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<td>9.0</td>
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<td>Uttarakhand</td>
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<td>18.2</td>
<td>24.2</td>
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<td>7.0</td>
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<td>12.7</td>
<td>10.7</td>
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<td>26.7</td>
<td>19.4</td>
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<td>10.5</td>
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<td>15.5</td>
<td>10.5</td>
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<td>17.7</td>
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<td>21.7</td>
<td>26.7</td>
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<td>16.2</td>
<td>17.6</td>
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<td>24.6</td>
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<td>21.3</td>
<td>21.4</td>
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</table>

Note: Wealth Index quintiles: 1 – Lowest; 2 – Second; 3 – Middle; 4 – Fourth; 5 – Highest
Table 5.4 : Concentration Indices and ranks, standard errors and t - values for infant and under-five mortality for different states of India ( NFHS- III, 2004-05)

<table>
<thead>
<tr>
<th>STATES OF INDIA</th>
<th>Infant mortality</th>
<th></th>
<th></th>
<th>Under-five mortality</th>
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<tbody>
<tr>
<td></td>
<td>CI</td>
<td>RANK</td>
<td>SE (CI)</td>
<td>t (CI)</td>
<td>CI</td>
<td>RANK</td>
</tr>
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<td>0.066</td>
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<td>-0.112</td>
<td>15</td>
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<td>-6.60</td>
<td>-0.158</td>
<td>9</td>
</tr>
<tr>
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<td>9</td>
<td>0.066</td>
<td>-1.99</td>
<td>-0.109</td>
<td>17</td>
</tr>
<tr>
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<td>0.087</td>
<td>-1.50</td>
<td>-0.163</td>
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</tr>
<tr>
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<td>18</td>
<td>0.041</td>
<td>-1.67</td>
<td>-0.105</td>
<td>18</td>
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<td>-3.38</td>
<td>-0.220</td>
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<td>0.021</td>
<td>-1.82</td>
<td>-0.081</td>
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<tr>
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<td>-3.99</td>
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<td>-2.82</td>
<td>-0.179</td>
<td>0.054</td>
<td>-3.34</td>
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</table>

Note : CI – Concentration Index; SE(CI) – Std. Err. of CI; t(CI) - ’t’ test of significance of CI.