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Research Article

Regional, Residence, Social Class and Gender Inequalities in Child Mortality in Gujarat, India

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Abstract

This paper analyses inequalities in child mortality in Gujarat, India in terms of the probability of death during the first 15 years of life. The analysis is based on the data available through the 2011 population census. We calculate the probability of death in the first 15 years of life for 12 mutually exclusive population subgroups for the state and for each of its 26 districts. The analysis reveals that child mortality varies widely within the state across districts and within districts across mutually exclusive population subgroups. An application of subgroup decomposition method suggests that around 60 per cent of the variation in child mortality within the state is attributed to inter-district variation while around 40 per cent of the variation is attributed to the within-district variation across the mutually exclusive population subgroups in child mortality. The analysis also reveals that the difference in child mortality between districts is due to both the risk of death and the proportionate distribution of live births. The analysis suggests that reducing within state inequality in child mortality can contribute substantially towards reducing child mortality in the state and suggests that the state should adopt a decentralized district-based approach of reducing inequalities in child mortality inequalities in the state. The paper recommends that a state specific child survival policy may be a beginning in this direction.

Introduction

Child mortality continues to be recognised as a priority development agenda globally as well as nationally. The 2030 Agenda for Sustainable Development: Transforming our World adopted by the United Nations General Assembly targets for ending preventable deaths of new born and children below five years of age by 2030 by reducing the under-five mortality rate to at least as low as 25 under-five deaths for every 1000 live births and reducing inequalities in child mortality within countries as part of the Sustainable Development Goal 3 - ensure healthy lives and promote well-being for all at all ages (United Nations, 2015). Similarly, India's latest National Health Policy 2017 aims at reducing the under-five mortality rate to 23 under-five deaths for every 1000 live births by 2025; reducing infant mortality rate to 28 infant deaths for every 1000 live births by the year 2019; and reducing neonatal mortality rate to 16 neonatal deaths for every 1000 live births by 2025 (Government of India, 2017). Concerns for reducing child mortality in India are all the more important as India is one of those countries of the world which have not been able to achieve the Millennium Development Goal 4 - reduce by two-third, between 1990 and 2015, the under-five mortality rate - of the United Nations Millennium Development Agenda (United Nations, 2000). According to the estimates prepared by the United Nations Inter-Agency Group on Child Mortality Estimation (UNIGME), the under-five mortality rate in India decreased by around 60 per cent between 1990 and 2015 which is slower than the targeted decrease of 66 per cent (Chaurasia, 2017).

A major challenge in the quest towards improving child survival in India is the within country inequality in the risk of death during childhood which is very sharp and which has persisted over time (Chaurasia, 2005). India's official sample registration system suggests that the under-five mortality rate in India varied from a low of 11 under-five deaths for every 1000 live births in Kerala to 55 under-five deaths for every 1000 live births in Madhya Pradesh in the year 2016 (Government of

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India, *no date*). There are only nine states in the country where the under-five mortality rate is estimated to be less than 30 under-five deaths for every 1000 live births whereas in three states, the under-five mortality rate is still at least 50 under-five deaths for every 1000 live births. It has also been observed that, although, child mortality in the country is decreasing, yet, the within country inequality in child mortality continues to persist (Behl, 2013). It is argued that reducing the inequality in child mortality may contribute significantly towards hastening the pace of decrease in child mortality in the country. However, there are few studies that focused on analysing the inequalities in child mortality in India (Chaurasia, 2005; Bhattacharya and Chickwama, 2011). Chaurasia (2005) has analysed the inter-state inequality in child mortality in the country during the period 1981 through 2000 and observed that inter-state child mortality inequality has decreased but the decrease has been confined to the rural areas only. Bhattacharya and Chickwama (2011), on the other hand, concluded on the basis of the district level analysis that child mortality inequality in the country has increased between 1981 through 2001. A major limitation of the current understanding about child mortality inequality within India is that virtually little is known about child mortality inequality within states - across districts and across residence, social class and gender within districts. In the absence of the knowledge about within state, district level residence, social class and gender inequalities in child mortality, it is difficult to imbibe the local context in efforts to reduce child mortality. At the same time, even this limited understanding confined to inequality in the risk of death in the first five years of life whereas according to the National Policy on Children 2013, a child is a person who has not reached its 18th birthday (Government of India, 2013). The life tables prepared by the Registrar General of India, on the basis of the sample registration system provides estimates of the probability of death in age groups 5-9 and 10-14 years but there is little knowledge about the mortality experience of children aged 5-17 years. A detailed understanding of the risk of death during childhood including regional, residence, social class and gender differentials in this risk is obviously a prerequisite for ensuring accelerated reduction in child mortality.

In the above context, this paper analyses inter-district, residence, social class and gender differentials in child mortality in Gujarat where the prevailing levels of the risk of death during childhood appears to be a cause of concern and a major development challenge. According to the sample registration system, the under-five mortality rate in Gujarat in 2016 was 33 under-five deaths for every 1000 live births which is only marginally lower than the national average of 39 under-five deaths for every 1000 live births (Government of India, 2018). Among the 22 states of the country for which estimates of under-five mortality rate are available from the sample registration system, Gujarat ranks a poor 10. The National Family Health Survey 2015-16 also suggests that the under-five mortality rate in the state is 43 compared to the national average of 50 under-five deaths for every 1000 live births (International Institute for Population Sciences, *no date*). Moreover, both the sample registration system and the National Family Health Survey 2015-16 suggest that there are substantial rural-urban differentials in under-five mortality rate in the state. The under-five mortality rate in Gujarat is almost the same as that in Jharkhand which is one of the least developed states of India. The per capita income during 2015-16 is estimated to be about Rs 123 thousand in Gujarat compared to only Rs 51 thousand in Jharkhand at 2011-12 prices (Government of India, 2017). Among the major states of the country, Gujarat is the second most urbanised state, next only to Tamil Nadu, with more than 42 per cent of the state population living in the urban areas as defined at the time of the 2011 population census. However, the distribution inequality in the state appears to be quite substantial as more than 27 per cent of the state population was living below the poverty line in 2011-12. This proportion was 31 per cent in the rural areas (Government of India, 2014). It appears that the prevailing levels of under-five mortality rate in Gujarat are at odds with the average income level and economic development in the state.

Very little is however known about child mortality inequalities within Gujarat. Estimates of under-five mortality rate and infant mortality rate for the districts of the state are available through the District Level Rapid Household Survey conducted by the Government of Gujarat in 2011 (Government of Gujarat, 2012). These estimates suggest that under-five mortality rate in Gujarat varies from a low of around 39 under-five deaths 1000 live births in district Anand to a high of more than 85 under-five deaths per 1000 live births in district Dahod. However, there is little information about how child mortality varies by residence, social class and gender within the districts. On the other hand, no information is available about the risk of death during childhood (0-17 years) and regional, residence, social class and gender differentials in this risk.

This paper has three objectives. The first is to prepare estimates the risk r the probability of death during childhood (0-17 years) for 312 mutually exclusive sub-groups of the population as they existed at the 2011 population census to highlight child mortality differentials across districts and by residence, social class and gender within districts. The second objective, on the other hand, is to analyse the disparity or the inequality in child mortality across the 312 mutually exclusive population sub-groups and decompose this inequality or disparity into between districts and within district inequality or disparity. Lastly, the paper also analyses residence, social class and gender effects on child mortality in the state.

The rest of the paper is organised as follows. The next section presents the analytical framework while the third section describes the data used in the analysis. An overview of child mortality in Gujarat along with variation across 312 mutually exclusive population groups is presented in section four. Section five decomposes child mortality inequality in the state in between-districts and within-district inequality. Section six analyses how child mortality in a population subgroup contributes to the child mortality in the district and the state. Findings of the analysis are discussed in section seven while the last section summarises main findings and their policy implications.

Analytical Framework

The analytical strategy adopted in the present analysis comprises of two parts. The first is the estimation of child mortality for 312 mutually exclusive population subgroups in the state. This is done by adopting the indirect method of child mortality estimation pioneered by Brass and Coale (1968). This method is based on reports from mothers about the survivorship of their children and has revolutionised estimation of child mortality in populations where direct estimation of child mortality is not possible because of the lack of necessary data. Although, this approach has some limitations (Preston et al, 2003), yet, it has been found to be fairly reliable for the estimation of the risk of death during childhood and trends over a period of around 10 years (Hill, 1991). The rationale of the method and the detailed step-by-step procedure of estimation are described elsewhere (United Nations, 1983; Preston et al, 2003; Moultrie et al, 2013). Actual calculations have been carried out using the worksheet developed by Moultrie et al (2013). The method requires selection of a family of model life tables and the South-Asian family of the United Nations Model Life Table System (United Nations, 1982) has been adopted for the purpose. Using, the estimates of child mortality for each of the 312 mutually exclusive population subgroups, estimates of child mortality for the districts have been obtained as the weighted average. Let the population of the district is divided into k mutually exclusive subgroups and q_i, $i=1,2,...k$ denotes the probability of death during childhood in population subgroup i and w_i, $i=1,2,...k$ denotes the proportion of the live births in population subgroup i to total live births in the district. Then, the child mortality in district j, q_j, may be obtained as

$$q_j = \sum_{i=1}^{k} q_{ij} w_{ij} \qquad (1)$$

Where $\sum_{i=1}^{k} w_{ij} = 1$

Equation (1) suggests that child mortality in a district depends upon both child mortality in different mutually exclusive population subgroups within the district and the proportionate distribution of live births across different mutually exclusive population subgroups. This means that the difference in child mortality between two districts is the result of both difference in child mortality in different mutually exclusive population subgroups in the two districts and the difference in the proportionate distribution of live births across different mutually exclusive population subgroups. In other words

$$q_a - q_b = \sum_{i=1}^{k} q_{ia} w_{ia} - \sum_{i=1}^{k} q_{ib} w_{ib} = \sum_{i=1}^{k} (q_{ia} w_{ia} - q_{ib} w_{ib}) \qquad (2)$$

Here q_a denotes the child mortality in district A and q_b denotes the child mortality in district B. Now, following Kitagawa (1955), the difference q_a - q_b can be decomposed as follows

$$q_a - q_b = \sum_{i=1}^{k}(q_{ia} - q_{ib})\frac{w_{ia}+w_{ib}}{2} + \sum_{i=1}^{k}(w_{ia} - wq_{ib})\frac{q_{ia}+q_{ib}}{2} \quad (3)$$

The first term on the right of equation (3) is the contribution of the difference in child mortality in different population subgroups and may be termed as the level component whereas the second term is the contribution of the difference in the proportionate distribution of live births across the mutually exclusive population subgroups and may be termed as the structure component. It is obvious that equation (3) may also be used with appropriate changes to analyse the change in child mortality over time in the district in terms of the change in child mortality in different mutually exclusive population subgroups within the district.

Finally, the child mortality in the state can be estimated as the weighted average of the child mortality in the districts obtained in conjunction with equation (1) with weights being equal to the proportionate share of the total live births in the state to the district. Moreover, the change in child mortality in the state may also be decomposed in the same manner as the change in the child mortality in the district is decomposed. Thus, the child mortality in the state as a whole, q, can be estimated as

$$q = \sum_{j=1}^{n} q_j w_j \quad (4)$$

Where $\sum_{j=1}^{n} w_j = 1$

The only thing that now remains is to define the childhood. In demographic and health related research, childhood is usually defined as the first five years of life. However, the United Nations Convention on the Rights of the Child, to which India is also a signatory, classifies a person as child if she or he is below 18 years of age (United Nations, 1989). India's National Policy on Children 2013 also defines a person as child if she or he is below 18 years of age (Government of India, 2013). This means that child mortality should be measured in terms of the probability of death during the first 17 years of life (${}_{18}q_0$). Estimates of ${}_{18}q_0$ for selected states of India can be derived by expanding the abridged life tables prepared by the Registrar General of India on the basis of age-specific death rates available through the sample registration system. However, estimates of ${}_{18}q_0$ at the district level are not available from any source in the country. It may be noticed that

$(1-{}_{18}q_0) = (1-{}_{1}q_0)*(1-{}_{4}q_1)*(1-{}_{5}q_5)*(1-{}_{5}q_{10})*(1-{}_{3}q_{15})$.

In other words, ${}_{18}q_0$ can be estimated if ${}_{1}q_0$, ${}_{4}q_1$, ${}_{5}q_5$, ${}_{5}q_{10}$ and ${}_{3}q_{15}$ are known. It is possible to obtain estimates of ${}_{1}q_0$, ${}_{4}q_1$, ${}_{5}q_5$ and ${}_{5}q_{10}$ on the basis of children ever born and children surviving data but estimation of ${}_{3}q_{15}$ is not possible. As such, child mortality is measured in this paper in terms of the probability death during the first 15 years of life(${}_{15}q_0$) which can be written as$(1-{}_{15}q_0) = (1-{}_{1}q_0)*(1-{}_{4}q_1)*(1-{}_{5}q_5)*(1-{}_{5}q_{10})$.

Data Source

Data for the present analysis come from the 2011 population census. At the 2011 population census, two questions were asked, one related to children ever born alive and the other related to children surviving from all ever-married women. The total number of children ever born alive to the woman included both living and dead daughters and sons. The number of daughters and sons ever born alive to the woman also include children born to her out of her earlier marriage(s) also. However, children that her husband had from his earlier marriage(s) and adopted daughter(s) or son(s) are not counted for the purpose of this question. Similarly, the number of children surviving at the time of enumeration include the number of daughters and sons not staying with the household at the time of enumeration. The daughters and sons surviving at the time of enumeration also include all daughters and sons surviving from the time she first got married, if married more than once, but exclude adopted children and the children her husband had from his earlier marriage(s) (Government of India, 2011).These data are available by the age of the ever married women grouped as: 1) less than 15 years; 2) 15-19 years; 3) 20-24 years; 4) 25-29 years; 5) 30-34 years; 6) 35-39 years; 7) 40-44 years; 8) 45-49 years; and 9) 50 years and above for every district of the country as it existed at the time of 2011 population census. For the state and for every district of the state, these data are also available for all social classes and separately for Scheduled Castes and Scheduled Tribes so that data for non-

Scheduled Castes/Tribes can be obtained. For each social class, the data are available separately for rural and urban areas and within rural or urban areas separately for male and female children. This means that the data related to children ever born and children surviving at the or at the district level can be divided into the following 12 mutually exclusive population subgroups:

1. Rural Scheduled Castes male
2. Rural Scheduled Castes female
3. Rural Scheduled Tribes male
4. Rural Scheduled Tribes female
5. Rural Other Castes male
6. Rural Other Castes female
7. Urban Scheduled Castes male
8. Urban Scheduled Castes female
9. Urban Scheduled Tribes male
10. Urban Scheduled Tribes female
11. Urban Other Castes male
12. Urban Other Castes female

Ever married women with missing data on the number of children ever born alive or the number of children surviving or both, have been excluded from the estimation as recommended by Hill (2013).

Child Mortality in Gujarat

Estimates of ${}_{15}q_0$ in the state and in its constituent districts are presented in table 1 along with the estimates of ${}_{1}q_0$, ${}_{5}q_0$ and ${}_{10}q_0$ for the combined population and separately for rural and urban areas. For Gujarat, ${}_{15}q_0$ is estimated to be 0.078 circa 2005. According to the abridged life tables prepared by the Registrar General of India on the basis of the sample registration system, ${}_{15}q_0$ in Gujarat is estimated to be around 0.079 (Government of India) which shows that ${}_{15}q_0$ estimated on the basis of the data available through the 2011 population census is very similar to the estimate of ${}_{15}q_0$ based on the sample registration system. This similarity justifies using the data from the population census for analysing child mortality differentials. Table 1 also highlights the fact that ${}_{15}q_0$ varies widely across the districts of the state and the gap between the district with the lowest ${}_{15}q_0$ and the district with the highest ${}_{15}q_0$ is quite wide. Obviously, reduction in the inter-district variation can contribute significantly towards accelerating the pace of reduction in child mortality in the state.

Table 2 presents estimates of ${}_{15}q_0$ for the 12 mutually exclusive population subgroups. In the state as a whole, ${}_{15}q_0$ is estimated to be relatively the highest in male Scheduled Tribes children living in the rural areas (0.092) but relatively the lowest in male Other Castes children living in the urban areas (0.069). It may also be noticed from the table that in all population subgroups in the rural areas, ${}_{15}q_0$ is higher than the state average but in the urban areas, ${}_{15}q_0$ is higher than the state average only in female Scheduled Castes children. In the districts also, ${}_{15}q_0$ varies widely across the 12 mutually exclusive population subgroups, although the degree of variability varies from district to district. Taking together both variation across districts and variation across mutually exclusive population subgroups within each district, ${}_{15}q_0$ is estimated to be the highest in the male Scheduled Tribes children in the urban areas of district The Dangs (0.267) but the lowest in the female Scheduled Castes children in the urban areas of district Tapi (0.012) according to the data available through the 2011 population census.

The residence effects of ${}_{15}q_0$ are very strong in the state. The rural ${}_{15}q_0$ is higher than the urban ${}_{15}q_0$ irrespective of social class and gender. The rural-urban difference in ${}_{15}q_0$ is relatively the widest in Scheduled Tribes children but relatively the lowest in Scheduled Castes male children and Other Castes female children. On the other hand, ${}_{15}q_0$ is higher in female than in male children in Scheduled Castes and in Other Castes in both rural or in urban areas but higher in male than female children in Scheduled Tribes. In the urban areas, female ${}_{15}q_0$ is substantially higher than male ${}_{15}q_0$ in Other Castes. However, $15q_0$ is not invariably higher in rural than in urban areas in all districts of the state.

In case of male Scheduled Castes children, ${}_{15}q_0$ is higher in urban than in rural areas in 12 districts whereas in case of female Scheduled Castes children, this number is 10. In Scheduled Tribes, ${}_{15}q_0$ is higher in urban than in rural areas in 7 districts in case of male children and in 9 districts in case of female children whereas in Other Castes, ${}_{15}q_0$ is higher in urban than in rural areas in 11 districts. Similarly, ${}_{15}q_0$ is not invariably higher in female than in male children and in Scheduled Tribes compared to other social classes.

Decomposition of the Variation in Child Mortality

The observed variation in ${}_{15}q_0$ across 312 mutually exclusive population subgroups - 26 districts and 12 mutually exclusive population subgroups in each district - can be decomposed into within-district variation across population subgroups and between-districts variation through the technique of subgroup decomposition. Subgroup decomposition can be done in two ways. One is the age-old technique of the analysis of variance while the other is to estimate an inequality index which has the decomposition property such as entropy class inequality indexes popularised by Theil (1967; 1972) and explored in detail by Bounguignon (1979), Shorrocks (1980; 1984; 1988), Cowell and Jenkins (1995) and Foster and Shneyerov (2000). In the present paper, the mean logarithmic deviation (MLD) has been used to decompose the variation in ${}_{15}q_0$ into within district and between-districts components. MLD is a special case of the single parameter entropy family of inequality indexes (Shorrocks and Wan, 2005) which can be defined as

$$E(Y) = \frac{1}{n}\sum_i \sum_j \ln\left(\frac{\mu}{y_{ij}}\right)$$

where μ is the child mortality for the state as a whole and y_{ij} is the child mortality in subgroup i of district j. It can be shown that $E(Y)$ can be decomposed as follows (Shorrocks and Wan, 2005):

$$E(Y) = \sum_j \sum_i \nu_k E(Y_i) + \sum_j \nu_k \, ln\left(\frac{\mu}{\mu_k}\right) = W + B \tag{5}$$

where ν_k is the proportion of the live births in the district to the total live births in the state. Here, W is the weighted average of MLD within the district and is commonly referred to as the 'within-district' component of the variation or inequality in child mortality across the mutually exclusive population subgroups whereas B may be referred to as the 'between-districts' component of the variation or inequality in child mortality across the mutually exclusive population sub-groups.

Application of equation (5) to table 2 suggests that around 39 per cent of the variation or inequality in ${}_{15}q_0$ across 312 mutually exclusive population subgroups in the state may be attributed to within-district variation or inequality in ${}_{15}q_0$ across the 12 mutually exclusive population subgroups whereas around 61 per cent of the variation or inequality in ${}_{15}q_0$ may be attributed to the variation or inequality in ${}_{15}q_0$ between districts. This means that inter-district inequality in child mortality is quite strong in Gujarat, although within-district variation in child mortality by residence, social class and gender is also quite substantial.

The decomposition exercise suggests that reduction in both inter-district inequality in ${}_{15}q_0$ and within district inequality in ${}_{15}q_0$ across the 12 mutually exclusive population subgroups is necessary for hastening the pace of decline in child mortality in the state. The factors that are responsible for the variation in child mortality across the districts are essentially different from the factors that are responsible for the variation in child mortality across different population subgroups within the same district. Inter-district inequality in child mortality may primarily be attributed to the inter-district variation in the level of social and economic development as reflected through the degree of urbanisation, level of literacy, etc. and inter-district variation in the social class composition of the population. On the other hand, within-district variation or inequality in child mortality by residence, social class and gender may be attributed primarily to the administrative capacity and organisational efficiency of child survival efforts in the district.

Relative Contribution of Child Mortality of Different Subgroups

The relative contribution of child mortality in a population subgroup to the child mortality in the population depends upon both the level of child mortality and the proportionate share of the live births in the subgroup (Equation 1). Table 3 shows the proportionate contribution of ${}_{15}q_0$ in different population subgroups to ${}_{15}q_0$ in the state and in the districts of the state. For the state as a whole, out of every 1000 child deaths, almost 226 deaths are male children of Other Castes living in the rural areas; 197 are female children of Other Castes living in the rural areas; 164 are male children of Other Castes living in the urban areas; and 142 are female children of Other Castes living in the urban areas of the state. In other words, almost 73 per cent of the child mortality in the state is confined to children of Other Castes, about 6 per cent to children of Scheduled Castes and about 21 per cent to children of Scheduled Tribes. Similarly, around 53 per cent of the child mortality is confined to male children while around 47 per cent of the child mortality is confined to the female children. Finally, around two third of the child mortality in the state is confined to the rural population while around 34 per cent is confined to the urban population.

The relative contribution of male and female children or rural or urban populations or different social classes to the child mortality in the districts of the state is different from the state average. In district The Dangs, more than 95 per cent of the child mortality is confined to children of Scheduled Tribes. Similarly, in Dahod, Narmada and Tapi districts, 80-90 per cent of the child mortality is confined to children of Scheduled Tribes whereas more than 15 per cent of the child mortality in district Kachchh is confined to children of Scheduled Castes. On the other hand, more than 90 per cent of the child mortality is confined to Other Castes in 7 districts of the state. Similarly, more than 90 per cent of the child mortality in districts Dahod, Narmada, The Dangs and Tapi is confined to the rural population whereas almost 80 per cent of the child mortality in district Surat and more than 75 per cent of the child mortality in district Ahmedabad is confined to the urban population. Finally, male child mortality accounts for more than 50 per cent of the child mortality in all but one district of the state. Ahmedabad is the only district where more than 50 per cent of the child mortality is accounted by female children. Table 3 emphasises that the strategic focus of child survival efforts should be different in different districts. In other words, a decentralised, district-based approach towards child survival should be adopted so as to address the local context of child mortality.

Components of the Difference in Child Mortality

The difference between ${}_{15}q_0$ in a district and ${}_{15}q_0$ in the state can be decomposed into the difference attributed to the difference ${}_{15}q_0$ in the 12 mutually exclusive population subgroups and the difference attributed to the proportionate distribution of live births in conjunction with equation (3). Results of the application of equation (3) are presented in table 4. There is no district in the state where ${}_{15}q_0$ in the district is higher than ${}_{15}q_0$ in the state (the difference is positive) in all the 12 mutually exclusive population subgroups but there is only one district - Valsad - where ${}_{15}q_0$ in the district is lower than ${}_{15}q_0$ in the state (the difference is negative) in all the 12 mutually exclusive population subgroups. In district Kheda, ${}_{15}q_0$ is higher than the state average in 11 of the 12 mutually exclusive population subgroups whereas in Patan, Dahod and Vadodara districts, ${}_{15}q_0$ is higher than the state average in 10 of the 12 mutually exclusive population subgroups. The situation is however different in rural and urban areas of the state. In the rural areas, there are six districts where ${}_{15}q_0$ in the district is lower than ${}_{15}q_0$ in the state in all the six mutually exclusive population subgroups but in the urban areas, there is only one district where ${}_{15}q_0$ in the district is lower than ${}_{15}q_0$ in the state in all the six mutually exclusive population subgroups. Table 4 suggests that there are factors specific to different population subgroups that influence ${}_{15}q_0$ in the district and these factors are different in different districts. An understanding of these factors may be useful in planning and programming district specific child survival efforts that may contribute towards reducing within district inequality in child mortality.

Table 4 also shows that the relative contribution of the level component and the structure component of the difference in ${}_{15}q_0$ of a district from that of the state average is different in different districts. In majority of districts, it is the level component that accounts for most of the difference between ${}_{15}q_0$ of the district from the state average. There are however at least three districts where the structure component is the primary contributor of this difference. In district The Dangs, the level component accounts for only about 4 per cent of the difference in ${}_{15}q_0$ but the structure component accounts for almost 96 per cent of the difference. In 12 districts, both level and structure components tend to increase the difference between the ${}_{15}q_0$ in the district and ${}_{15}q_0$ in the state whereas in four districts, both components tend to decrease this difference. In the remaining districts, level and structure components contribute to the difference in ${}_{15}q_0$ between the district and the state in opposite directions thereby narrowing down the difference between district and state ${}_{15}q_0$. There are at least six districts where the difference in the structure component plays a dominating role in deciding the difference between district and state ${}_{15}q_0$. The structure component is essentially exogenous to the interventions directed towards reducing child mortality. An important dimension of this component is the variation in the level of fertility across different population subgroups and across districts.

District and Subgroup Effects of Child Mortality

The effect of the district and the effect of a population subgroup on child mortality can be quantified through the application of the mean polish technique (Selvin, 2004) which is the same as the median polish technique (Tukey, 1977) with median replaced by mean. Mean or median polish is an exploratory data analysis technique for examining the significance of various factors in a multi-factor model. It is a robust method for the additive decomposition of a two-way table Z having r rows and c columns such that $Z_{ij} = \mu + x_i + y_j + R_{ij}$ for all i and j.

Here μ is the grand mean, x_i is the row effect, y_j is the column effect and R_{ij} is the table of residuals. The mean or median polish technique makes no assumption about the distribution or the structure of the data and the decomposition remains effective even when the tabulated data are rates or counts. Median is preferred over mean when there are outliers and extreme values in the data. In the present analysis, we have used mean instead of median as there was no outlier or extreme value in the data set.

Results of the application of the mean polish technique are presented in table 5. The mean of ${}_{15}q_0$ across the 26 districts and across the 12 mutually exclusive population subgroups is 0.0785. The quantity by which ${}_{15}q_0$ is higher or lower from this grand mean in different population subgroups is shown in the second row of table 5 which reflects the subgroup effect on child mortality. The quantity by which ${}_{15}q_0$ is higher or lower from the grand mean in different districts is shown in the second column of the table which reflects the district effect on ${}_{15}q_0$. Finally, the residual matrix R_{ij} is shown in italics in the table. Residuals reflect the effect of those factors which influence child mortality but which have not been included in the two-factor model. The population subgroup effect is found to be positive in 6 population subgroups but negative in the remaining 6 population subgroups. A positive effect means that the child mortality in the population subgroup is higher than the grand mean whereas a negative effect means that it is lower than the grand mean. For example, the subgroup effect of male Other Castes children in the urban areas is -0.0050 which implies that the child mortality in this population subgroup is 0.0765 = 0.0785+(0.0050). Similarly, the subgroup effect of male Scheduled Tribes children in the rural areas is 0.0088 which means that child mortality in this population subgroup is 0.0873 = 0.0785+0.0088. By the same argument, the district effect on child mortality also varies from district to district. In 12 districts, the district effect on child mortality is positive whereas in 14 districts, the district effect is negative indicating that district effects are quite substantial in the state.

Table 6 shows how ${}_{15}q_0$ in a population subgroup of a district may be obtained just by adding the corresponding subgroup effect, district effect and the residual effect to the grand mean. This decomposition also permits analysing the difference in ${}_{15}q_0$ in a given population subgroup of a district from that in another population subgroup of another district in terms of the difference in the subgroup effect, difference in the district effect and difference in the residual effect as the grand mean remains the same. For example, $15q_0$ is the highest in the male Scheduled Castes children in the urban areas of district The Dangs but the lowest in female Scheduled Castes children in the urban areas of district Tapi. The difference, as shown in table 6, is primarily due to the difference in residual effects which means that the factors that are responsible for the difference in the highest and the lowest child mortality are different from district effects, residence effects, social class effects and gender effects. This observation again emphasises the need of adopting a decentralised approach of planning and implementing efforts directed towards reduction in child mortality.

Conclusions

The present analysis is probably and so obviously the first comprehensive analysis of child mortality differentials within Gujarat. The analysis shows that child mortality differentials within Gujarat are quite pervasive and addressing these differentials is necessary to reducing the risk or the probability of death in children of the state. The analysis emphasises that the current, heavily centralised, planning and programming for child survival activities in the state should be replaced by a decentralised institutional setup which can effectively address the local context of child mortality and which is likely to provide better opportunities of participation of the people in child survival activities. Such a shift in the approach towards child survival, however, requires significant improvement in the administrative capacity and organisational efficiency of the public health care delivery system along with the reduction in residence and social class inequalities in the quality of life. There is a need of a long-term vision, strong political commitment and a long term child survival policy which is currently missing in the state.

The analysis also reveals substantial within-district inequality in child mortality. This inequality reflects both inequality in living standards and disproportionate use of health care services such as immunisation against vaccine preventable diseases and oral rehydration therapy to preventing deaths from dehydration during diarrhoea. It appears that the reach of child survival efforts is not the same in different population subgroups even in the same district which indicates that the needs-effectiveness and capacity-efficiency of the child survival efforts are far from satisfactory. At present, very little is known about the needs-effectiveness and the capacity-efficiency of child survival efforts, especially at the local level. A data revolution is needed to generate the data necessary for analysing determinants of child mortality at the local level.

The variation in child mortality across the districts may also be attributed in part to the variation in the proportionate distribution of live births by mutually exclusive population subgroups as a result of the variation in the level of fertility and the proportionate distribution of the population. This observation calls for addressing population subgroup variability in fertility as an integral component of any strategy towards reducing child mortality differentials. However, the fertility dimension of child mortality has generally been neglected in the efforts directed towards reducing child mortality in India. Probably and so obviously, Gujarat needs a policy on children to address child mortality differentials that are so pervasive. Such a policy can address regional, social class, residence and gender differentials in child mortality. The state endorses the National Policy on Children (Government of India, 2013) which is however silent about the need of addressing the regional, social class, residence and gender inequalities in child mortality. Gujarat can accelerate the pace of reduction in child mortality significantly just by suitably reorienting its child survival services delivery system to address inter-district, social class, residence and gender inequalities in child mortality. A state specific policy on children may be the beginning in this direction.

References

Brass W, Coale AJ (1968) Methods and analysis and estimation. In W Brass, AJ Coale, P Demeny, DF Heisel, Lorimer F, Romaniuk A, Van De Walle E (eds) *The Demography of Tropical Africa*. Princeton NJ, Princeton University Press, 88-139.

Behl, A.S. (2013). Trends in child mortality in India. *Indian Pediatrics*, 50, 143-147.

Bhattacharya, P. C., &Chikwama, C. (2011). Inequalities in child mortality in India: A district-level analysis. *Asian Population Studies*, *7*(3), 243-261.

Bourguignon, F., &Morrisson, C. (2002). Inequality among world citizens: 1820-1992. *American economic review*, *92*(4), 727-744.

Chaurasia, A. R. (2005). Inter-state inequality in infant mortality in India 1981-2000. *Journal of Health and Population in Developing Countries*, 32.

Chaurasia, A. R. (2017). Progress towards child survival in India: 1971-2014. *Paper accepted for presentation at the IUSSP International Population Conference 2017, Cape Town*.

Cowell, F. A., & Jenkins, S. P. (1995). How much inequality can we explain? A methodology and an application to the United States. *The Economic Journal*, 421-430.

Foster, J. E., &Shneyerov, A. A. (2000). Path independent inequality measures. *Journal of Economic Theory*, *91*(2), 199-222.

Government of Gujarat (2012). *Evaluation of MCH Services in Gujarat: District Level Rapid Household Survey (DLRHS-1) 2011*. Gandhinagar, Government of Gujarat, Gujarat Social Infrastructure Development Board Society.

Government of India (2009). *District Level Estimates of Child Mortality in India Based on the 2001 Census Data*. New Delhi, Ministry of Home Affairs, Office of the Registrar General.

Government of India (2011). *Census of India 2011. Meta Data*. New Delhi, Ministry of Home Affairs, Office of the Registrar General and Census Commissioner.

Government of India (2013). *The National Policy for Children 2013*. New Delhi, Ministry of Women and Child Development.

Government of India (2014). *Report of the Expert Group to Review the Methodology for Measurement of Poverty*. New Delhi, Planning Commission.

Government of India (2012). *SRS Based Abridged Life Tables 2003-07 to 2006-10*. New Delhi, Registrar General India. SRS Analytical Studies, Report No. 1 of 2012.

Government of India (2017). *National Health Policy 2017*. New Delhi, Ministry of Health and Family Welfare.

Government of India (*no date*). *Sample Registration System Statistical Report 2016*. New Delhi, Ministry of Home Affairs, Office of the Registrar General and Census Commissioner, India.

Hill, K. (1991). Approaches to the measurement of childhood mortality: a comparative review. *Population Index*, 368-382.

Hill, K. (2013). Indirect estimation of child mortality. *Tools for demographic estimation*, 148-164..

International Institute for Population Sciences (*no date*). *National Family Health Survey-4 2015-16. State Fact Sheet Gujarat*. Mumbai, International Institute for Population Sciences.

Kitagawa, E. M. (1955). Components of a difference between two rates. *Journal of the american statistical association*, *50*(272), 1168-1194.

Moultrie, T. A., Dorrington, R. E., Hill, A. G., Hill, K., Timæus, I. M., &Zaba, B. (2013). *Tools for demographic estimation*. International Union for the Scientific Study of Population.

Preston, S., Heuveline, P., & Guillot, M. (2000). *Demography: measuring and modeling population processes*. Oxford, Blackwell Publishers.

Selvin, S. (2004). *Statistical analysis of epidemiologic data*. Oxford University Press.

Shorrocks, A. F. (1980). The class of additively decomposable inequality measures. *Econometrica: Journal of the Econometric Society*, 613-625.

Shorrocks, A. F. (1984). Inequality decomposition by population subgroups. *Econometrica: Journal of the Econometric Society*, 1369-1385.

Shorrocks, A. F. (1988). Aggregation issues in inequality measurement. In *Measurement in economics* (pp. 429-451). Physica, Heidelberg.

Shorrocks, A., & Wan, G. (2005). Spatial decomposition of inequality. *Journal of Economic Geography*, *5*(1), 59-81.

Theil, T.H. (1967). *Economics and Information Theory*. Amsterdam, North Holland Publishing Company.

Theil, T.H. (1972). *Statistical Decomposition Analysis*. Amsterdam, North Holland Publishing Company.

Tukey, J.W. (1977). *Exploratory Data Analysis*. Boston, Massachusetts, Addison-Wesley Publishing Company.

United Nations (1982). *Model Life Tables for Developing Countries.* New York, United Nations, Department of International Economic and Social Affairs. Population Studies No. 77.

United Nations (1983). *Manual X. Indirect Techniques for Demographic Estimation*. New York, Department of International Economic and Social Affairs. Population Studies No. 81.

United Nations (1989). *United Nations Convention on the Rights of the Child*. New York, United Nations.
United Nations (2000). *Millennium Development Goals.* New York, United Nations.
United Nations (2015). *Transforming the World: the 2030 Agenda for Sustainable Development*. New York, United Nations.

Table 1 Probability of death during childhood in Gujarat

State/District	Combined				Rural				Urban			
	${}_{1}q_{0}$	${}_{5}q_{0}$	${}_{10}q_{0}$	${}_{15}q_{0}$	${}_{1}q_{0}$	${}_{5}q_{0}$	${}_{10}q_{0}$	${}_{15}q_{0}$	${}_{1}q_{0}$	${}_{5}q_{0}$	${}_{10}q_{0}$	${}_{15}q_{0}$
Gujarat	0.0457	0.0698	0.0750	0.0773	0.0484	0.0738	0.0793	0.0817	0.0416	0.0636	0.0685	0.0706
Kachchh	0.0439	0.0672	0.0722	0.0745	0.0444	0.0678	0.0729	0.0751	0.0431	0.0659	0.0708	0.0730
Banas Kantha	0.0446	0.0681	0.0732	0.0755	0.0445	0.0680	0.0731	0.0754	0.0451	0.0690	0.0742	0.0764
Patan	0.0495	0.0754	0.0811	0.0835	0.0500	0.0762	0.0818	0.0843	0.0474	0.0723	0.0777	0.0801
Mahesana	0.0503	0.0767	0.0824	0.0849	0.0516	0.0785	0.0844	0.0869	0.0462	0.0705	0.0758	0.0782
Sabar Kantha	0.0511	0.0778	0.0836	0.0861	0.0519	0.0789	0.0848	0.0874	0.0460	0.0703	0.0755	0.0779
Gandhinagar	0.0499	0.0760	0.0817	0.0842	0.0533	0.0811	0.0871	0.0898	0.0448	0.0685	0.0736	0.0759
Ahmedabad	0.0425	0.0650	0.0699	0.0721	0.0556	0.0845	0.0908	0.0935	0.0395	0.0605	0.0650	0.0671
Surendranagar	0.0364	0.0558	0.0601	0.0620	0.0358	0.0549	0.0591	0.0610	0.0383	0.0588	0.0632	0.0652
Rajkot	0.0439	0.0672	0.0722	0.0745	0.0450	0.0688	0.0740	0.0762	0.0431	0.0660	0.0709	0.0731
Jamnagar	0.0410	0.0628	0.0676	0.0697	0.0370	0.0567	0.0610	0.0629	0.0466	0.0712	0.0765	0.0789
Porbandar	0.0422	0.0646	0.0694	0.0716	0.0421	0.0644	0.0693	0.0714	0.0423	0.0648	0.0696	0.0718
Junagadh	0.0427	0.0653	0.0702	0.0724	0.0436	0.0666	0.0716	0.0739	0.0407	0.0623	0.0670	0.0691
Amreli	0.0417	0.0638	0.0686	0.0707	0.0417	0.0638	0.0686	0.0708	0.0416	0.0637	0.0685	0.0706
Bhavnagar	0.0372	0.0570	0.0614	0.0633	0.0355	0.0545	0.0587	0.0605	0.0400	0.0612	0.0659	0.0679
Anand	0.0563	0.0854	0.0917	0.0945	0.0588	0.0891	0.0957	0.0986	0.0495	0.0755	0.0811	0.0836
Kheda	0.0572	0.0868	0.0932	0.0960	0.0574	0.0871	0.0935	0.0964	0.0565	0.0857	0.0921	0.0948
Panch Mahals	0.0518	0.0788	0.0847	0.0873	0.0524	0.0798	0.0857	0.0883	0.0474	0.0723	0.0778	0.0801
Dahod	0.0596	0.0903	0.0969	0.0998	0.0604	0.0915	0.0982	0.1011	0.0496	0.0756	0.0812	0.0837
Vadodara	0.0505	0.0770	0.0827	0.0852	0.0563	0.0855	0.0918	0.0945	0.0433	0.0663	0.0713	0.0735
Narmada	0.0526	0.0801	0.0860	0.0886	0.0538	0.0817	0.0878	0.0905	0.0407	0.0623	0.0670	0.0691
Bharuch	0.0501	0.0764	0.0820	0.0845	0.0509	0.0775	0.0833	0.0858	0.0485	0.0740	0.0795	0.0819
The Dangs	0.0490	0.0747	0.0803	0.0827	0.0494	0.0753	0.0809	0.0833	0.0446	0.0682	0.0734	0.0756
Navsari	0.0430	0.0658	0.0708	0.0730	0.0438	0.0669	0.0720	0.0742	0.0413	0.0633	0.0681	0.0702
Valsad	0.0385	0.0590	0.0635	0.0654	0.0415	0.0635	0.0683	0.0704	0.0330	0.0508	0.0547	0.0564
Surat	0.0382	0.0586	0.0631	0.0651	0.0404	0.0619	0.0666	0.0687	0.0377	0.0578	0.0622	0.0642
Tapi	0.0473	0.0721	0.0775	0.0799	0.0472	0.0721	0.0775	0.0799	0.0473	0.0721	0.0775	0.0799

Source: Author’s calculations

Table 2: The probability of death during the first 15 years of life ($_{15}q_0$) in Gujarat and districts, 2005

State/District	All population sub-groups	Rural						Urban					
		Scheduled Castes		Scheduled Tribes		Other Castes		Scheduled Castes		Scheduled Tribes		Other Castes	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Gujarat	0.0776	0.0825	0.0854	0.0919	0.0877	0.0785	0.0786	0.0727	0.0780	0.0770	0.0735	0.0685	0.0718
Kachchh	0.0743	0.0876	0.0883	0.0824	0.0668	0.0718	0.0743	0.0714	0.0835	0.0810	0.1113	0.0720	0.0718
Banas Kantha	0.0759	0.0826	0.0929	0.0900	0.0922	0.0698	0.0732	0.0767	0.0747	0.1243	0.0966	0.0749	0.0754
Patan	0.0834	0.0901	0.1092	0.0919	0.0766	0.0805	0.0852	0.1215	0.0807	0.0758	0.0787	0.0748	0.0812
Mahesana	0.0851	0.0984	0.0766	0.0907	0.0806	0.0960	0.0764	0.0616	0.0666	0.0520	0.0557	0.0828	0.0763
Sabar Kantha	0.0866	0.0882	0.0792	0.0994	0.0868	0.0869	0.0832	0.1023	0.0893	0.0995	0.0592	0.0807	0.0703
Gandhinagar	0.0844	0.0616	0.0731	0.0965	0.0426	0.0872	0.0954	0.0738	0.0913	0.0559	0.0926	0.0751	0.0756
Ahmedabad	0.0719	0.0902	0.1166	0.0757	0.1096	0.0838	0.1024	0.0691	0.0805	0.0707	0.0774	0.0609	0.0722
Surendranagar	0.0618	0.0765	0.0754	0.0787	0.0835	0.0566	0.0615	0.0679	0.0851	0.0919	0.0945	0.0642	0.0631
Rajkot	0.0745	0.0743	0.0815	0.0470	0.0834	0.0736	0.0790	0.0713	0.0723	0.0988	0.0447	0.0778	0.0678
Jamnagar	0.0696	0.0677	0.0763	0.0626	0.0592	0.0618	0.0625	0.0777	0.0625	0.0777	0.0472	0.0840	0.0750
Porbandar	0.0715	0.0604	0.0655	0.0543	0.0605	0.0775	0.0681	0.0811	0.0783	0.0270	0.0457	0.0743	0.0684
Junagadh	0.0724	0.0758	0.0698	0.0716	0.0579	0.0771	0.0711	0.0763	0.0800	0.0565	0.0435	0.0705	0.0670
Amreli	0.0707	0.0725	0.0821	0.1213	0.1489	0.0665	0.0728	0.0747	0.0889	0.1362	0.0940	0.0740	0.0641
Bhavnagar	0.0632	0.0595	0.0738	0.1375	0.1268	0.0552	0.0653	0.0810	0.0928	0.0300	0.1334	0.0648	0.0688
Anand	0.0945	0.1015	0.0950	0.0989	0.0741	0.0994	0.0978	0.0617	0.0555	0.0725	0.0626	0.0855	0.0848
Kheda	0.0961	0.1090	0.1109	0.0994	0.0780	0.0967	0.0950	0.1039	0.1126	0.0861	0.0920	0.0982	0.0898
Panch Mahals	0.0873	0.0975	0.0804	0.0877	0.0850	0.0914	0.0872	0.0853	0.0771	0.0829	0.0675	0.0864	0.0738
Dahod	0.1001	0.0961	0.0977	0.1023	0.1056	0.0929	0.0833	0.0719	0.0724	0.0858	0.0767	0.0868	0.0856
Vadodara	0.0855	0.0931	0.0897	0.1000	0.0982	0.0918	0.0858	0.0581	0.0750	0.0779	0.0872	0.0730	0.0739
Narmada	0.0886	0.1472	0.1308	0.0936	0.0839	0.1058	0.0960	0.1705	0.1291	0.0813	0.0679	0.0688	0.0498
Bharuch	0.0846	0.0923	0.0935	0.0942	0.0827	0.0905	0.0746	0.1074	0.0585	0.0980	0.0719	0.0835	0.0788
The Dangs	0.0829	0.0000	0.0000	0.0884	0.0784	0.0710	0.0787	0.2672	0.1128	0.0544	0.0719	0.0995	0.0733
Navsari	0.0732	0.0659	0.0958	0.0882	0.0756	0.0635	0.0519	0.0520	0.0574	0.0723	0.0620	0.0701	0.0735
Valsad	0.0665	0.0575	0.0493	0.0759	0.0740	0.0564	0.0546	0.0514	0.0678	0.0688	0.0600	0.0476	0.0625
Surat	0.0649	0.0714	0.0538	0.0775	0.0686	0.0630	0.0621	0.0727	0.0671	0.0703	0.0761	0.0587	0.0697
Tapi	0.0800	0.0296	0.0983	0.0842	0.0768	0.0651	0.0851	0.0579	0.0120	0.0827	0.0860	0.0723	0.0896

Source: Author's calculations

Table 3: Relative contribution of child mortality in different population subgroups to the mortality in all population subgroups combined

State/District	All population sub-groups	Rural						Urban					
		Scheduled Castes		Scheduled Tribes		Other Castes		Scheduled Castes		Scheduled Tribes		Other Castes	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Gujarat	1000	21	19	102	91	226	197	13	12	7	6	163	142
Kachchh	1000	55	51	5	4	303	286	20	21	3	4	131	118
Banas Kantha	1000	55	56	74	72	331	303	6	4	4	2	49	42
Patan	1000	38	43	3	2	389	359	13	7	2	2	73	67
Mahesana	1000	31	22	1	1	443	292	8	7	1	1	113	80
Sabar Kantha	1000	29	23	179	145	280	234	5	5	5	3	52	40
Gandhinagar	1000	10	10	1	1	323	299	20	20	3	5	165	143
Ahmedabad	1000	10	12	2	3	104	111	44	45	6	5	329	329
Surendranagar	1000	44	37	8	8	334	314	14	16	1	1	121	102
Rajkot	1000	23	21	1	2	208	191	18	17	3	1	300	214
Jamnagar	1000	26	29	5	5	247	217	19	12	3	1	247	189
Porbandar	1000	20	26	11	10	275	207	19	17	1	3	222	189
Junagadh	1000	42	35	10	7	336	269	11	11	4	2	150	124
Amreli	1000	45	43	4	5	340	312	7	7	3	2	137	95
Bhavnagar	1000	15	17	2	1	274	284	13	15	0	2	198	180
Anand	1000	16	15	3	2	393	336	4	4	4	3	118	103
Kheda	1000	19	18	7	5	402	353	6	5	3	3	102	78
Panch Mahals	1000	17	11	174	163	283	244	3	2	5	4	54	40
Dahod	1000	7	7	409	389	71	58	1	1	12	9	20	16
Vadodara	1000	9	8	188	170	145	111	11	11	12	12	178	145
Narmada	1000	6	6	444	384	57	41	3	2	13	9	20	15
Bharuch	1000	10	11	182	147	197	151	10	5	21	13	141	111
The Dangs	1000	0	0	493	425	7	7	6	1	14	20	15	11
Navsari	1000	5	6	292	230	103	74	5	4	24	21	128	109
Valsad	1000	4	4	321	298	57	48	4	4	30	25	96	110
Surat	1000	3	2	69	58	40	35	12	9	16	16	386	354
Tapi	1000	1	3	447	377	34	39	1	0	13	13	34	38

Source: Author's calculations

Table 4: Components of the difference between child mortality in the district and the state average

District	Absolute difference			Proportionate difference		
	Total	Level component	Structure component	Total	Level component	Structure component
Kachchh	-0.0033	-0.0031	-0.0002	100.0	94.6	5.4
Banas Kantha	-0.0017	-0.0020	0.0004	100.0	122.0	-22.0
Patan	0.0058	0.0053	0.0005	100.0	90.7	9.3
Mahesana	0.0075	0.0069	0.0006	100.0	91.8	8.2
Sabar Kantha	0.0090	0.0057	0.0034	100.0	62.7	37.3
Gandhinagar	0.0067	0.0060	0.0007	100.0	89.3	10.7
Ahmedabad	-0.0057	0.0026	-0.0083	100.0	-45.7	145.7
Surendranagar	-0.0159	-0.0136	-0.0022	100.0	85.9	14.1
Rajkot	-0.0031	-0.0021	-0.0010	100.0	66.9	33.1
Jamnagar	-0.0080	-0.0075	-0.0005	100.0	94.3	5.7
Porbandar	-0.0061	-0.0062	0.0001	100.0	100.9	-0.9
Junagadh	-0.0052	-0.0056	0.0004	100.0	107.2	-7.2
Amreli	-0.0070	-0.0012	-0.0058	100.0	17.2	82.8
Bhavnagar	-0.0144	-0.0073	-0.0071	100.0	50.7	49.3
Anand	0.0169	0.0155	0.0014	100.0	91.5	8.5
Kheda	0.0185	0.0181	0.0004	100.0	98.0	2.0
Panch Mahals	0.0097	0.0068	0.0029	100.0	70.3	29.7
Dahod	0.0225	0.0128	0.0097	100.0	57.0	43.0
Vadodara	0.0079	0.0070	0.0009	100.0	88.5	11.5
Narmada	0.0110	0.0056	0.0054	100.0	51.1	48.9
Bharuch	0.0070	0.0055	0.0015	100.0	79.0	21.0
The Dangs	0.0053	-0.0013	0.0066	100.0	-23.7	123.7
Navsari	-0.0044	-0.0092	0.0048	100.0	208.6	-108.6
Valsad	-0.0111	-0.0175	0.0064	100.0	157.4	-57.4
Surat	-0.0127	-0.0104	-0.0023	100.0	81.9	18.1
Tapi	0.0024	-0.0044	0.0067	100.0	-185.4	285.4

Source: Author's calculations

Table 5: District and population subgroup effects of child mortality in Gujarat

Grand mean	0.0785	Population subgroup effects											
		Rural						Urban					
		Scheduled Castes		Scheduled Tribes		Other Castes		Scheduled Castes		Scheduled Tribes		Other Castes	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
		0.0044	0.0072	0.0088	0.0081	-0.0002	0.0008	-0.0011	-0.0014	0.0010	-0.0014	-0.0050	-0.0050
District	Effect	Residuals											
Kachchh	-0.0046	*0.0093*	*0.0071*	*-0.0003*	*-0.0152*	*-0.0019*	*-0.0004*	*-0.0014*	*0.0110*	*0.0062*	*0.0388*	*0.0031*	*0.0030*
Banas Kantha	-0.0012	*0.0011*	*0.0085*	*0.0040*	*0.0069*	*-0.0072*	*-0.0047*	*0.0006*	*-0.0010*	*0.0461*	*0.0209*	*0.0027*	*0.0033*
Patan	0.0039	*0.0034*	*0.0196*	*0.0007*	*-0.0139*	*-0.0017*	*0.0021*	*0.0403*	*-0.0003*	*-0.0076*	*-0.0022*	*-0.0026*	*0.0039*
Mahesana	0.0048	*0.0107*	*-0.0139*	*-0.0014*	*-0.0107*	*0.0129*	*-0.0077*	*-0.0205*	*-0.0153*	*-0.0323*	*-0.0261*	*0.0044*	*-0.0020*
Sabar Kantha	0.0051	*0.0002*	*-0.0116*	*0.0070*	*-0.0048*	*0.0035*	*-0.0012*	*0.0198*	*0.0071*	*0.0150*	*-0.0230*	*0.0020*	*-0.0082*
Gandhinagar	0.0025	*-0.0237*	*-0.0151*	*0.0068*	*-0.0464*	*0.0065*	*0.0138*	*-0.0060*	*0.0118*	*-0.0260*	*0.0131*	*-0.0009*	*-0.0003*
Ahmedabad	0.0046	*0.0027*	*0.0263*	*-0.0162*	*0.0185*	*0.0009*	*0.0185*	*-0.0128*	*-0.0011*	*-0.0133*	*-0.0042*	*-0.0173*	*-0.0058*
Surendranagar	-0.0127	*0.0064*	*0.0024*	*0.0041*	*0.0097*	*-0.0090*	*-0.0050*	*0.0033*	*0.0208*	*0.0252*	*0.0302*	*0.0034*	*0.0024*
Rajkot	-0.0053	*-0.0032*	*0.0011*	*-0.0350*	*0.0022*	*0.0006*	*0.0051*	*-0.0007*	*0.0005*	*0.0246*	*-0.0270*	*0.0096*	*-0.0003*
Jamnagar	-0.0099	*-0.0053*	*0.0006*	*-0.0148*	*-0.0174*	*-0.0066*	*-0.0069*	*0.0103*	*-0.0046*	*0.0082*	*-0.0199*	*0.0204*	*0.0115*
Porbandar	-0.0092	*-0.0132*	*-0.0110*	*-0.0238*	*-0.0168*	*0.0084*	*-0.0020*	*0.0130*	*0.0104*	*-0.0433*	*-0.0221*	*0.0100*	*0.0042*
Junagadh	-0.0078	*0.0008*	*-0.0081*	*-0.0078*	*-0.0208*	*0.0066*	*-0.0003*	*0.0068*	*0.0108*	*-0.0151*	*-0.0257*	*0.0048*	*0.0014*
Amreli	0.0031	*-0.0134*	*-0.0066*	*0.0309*	*0.0593*	*-0.0149*	*-0.0095*	*-0.0057*	*0.0088*	*0.0537*	*0.0140*	*-0.0026*	*-0.0124*
Bhavnagar	-0.0030	*-0.0203*	*-0.0088*	*0.0533*	*0.0433*	*-0.0200*	*-0.0108*	*0.0068*	*0.0188*	*-0.0464*	*0.0594*	*-0.0057*	*-0.0015*
Anand	0.0122	*0.0065*	*-0.0029*	*-0.0006*	*-0.0246*	*0.0089*	*0.0064*	*-0.0278*	*-0.0338*	*-0.0191*	*-0.0266*	*-0.0002*	*-0.0008*
Kheda	0.0165	*0.0096*	*0.0087*	*-0.0044*	*-0.0250*	*0.0019*	*-0.0007*	*0.0101*	*0.0191*	*-0.0099*	*-0.0015*	*0.0081*	*-0.0002*
Panch Mahals	0.0071	*0.0076*	*-0.0124*	*-0.0067*	*-0.0086*	*0.0060*	*0.0009*	*0.0009*	*-0.0070*	*-0.0036*	*-0.0166*	*0.0058*	*-0.0067*
Dahod	0.0116	*0.0017*	*0.0004*	*0.0035*	*0.0075*	*0.0030*	*-0.0075*	*-0.0171*	*-0.0162*	*-0.0053*	*-0.0119*	*0.0017*	*0.0005*
Vadodara	0.0064	*0.0039*	*-0.0024*	*0.0064*	*0.0053*	*0.0071*	*0.0002*	*-0.0255*	*-0.0084*	*-0.0079*	*0.0038*	*-0.0068*	*-0.0058*
Narmada	0.0092	*0.0552*	*0.0359*	*-0.0028*	*-0.0118*	*0.0183*	*0.0076*	*0.0840*	*0.0429*	*-0.0073*	*-0.0183*	*-0.0139*	*-0.0328*
Bharuch	0.0054	*0.0040*	*0.0025*	*0.0015*	*-0.0092*	*0.0068*	*-0.0100*	*0.0247*	*-0.0239*	*0.0132*	*-0.0105*	*0.0046*	*-0.0000*
The Dangs	0.0022	*-0.0850*	*-0.0879*	*-0.0010*	*-0.0104*	*-0.0095*	*-0.0028*	*0.1876*	*0.0335*	*-0.0272*	*-0.0074*	*0.0238*	*-0.0023*
Navsari	-0.0109	*-0.0060*	*0.0211*	*0.0118*	*0.0000*	*-0.0039*	*-0.0164*	*-0.0144*	*-0.0087*	*0.0038*	*-0.0041*	*0.0075*	*0.0110*
Valsad	-0.0199	*-0.0054*	*-0.0164*	*0.0085*	*0.0074*	*-0.0020*	*-0.0047*	*-0.0060*	*0.0107*	*0.0093*	*0.0029*	*-0.0060*	*0.0090*
Surat	-0.0134	*0.0020*	*-0.0185*	*0.0036*	*-0.0045*	*-0.0019*	*-0.0037*	*0.0087*	*0.0034*	*0.0042*	*0.0125*	*-0.0015*	*0.0097*
Tapi	-0.0024	*-0.0508*	*0.0150*	*-0.0007*	*-0.0074*	*-0.0108*	*0.0083*	*-0.0170*	*-0.0627*	*0.0057*	*0.0113*	*0.0012*	*0.0185*

Source: Author's calculations

Table 6: Decomposition of the difference between highest child mortality and lowest child mortality across districts and across different population subgroups in Gujarat

Population subgroup	$_{15}q_{0}$	Grand mean	District effect	Subgroup effect	Residual
Male Scheduled Castes children in urban areas in district The Dangs (Highest child mortality in Gujarat)	0.2672	0.0785	0.0022	-0.0011	0.1876
Female Scheduled Castes children in district Tapi (Lowest child mortality in Gujarat)	0.0120	0.0785	-0.0024	-0.0014	-0.0627
Difference	0.2552	0	0.0046	0.0003	0.2503

Source: Author's calculations