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## RESEARCH ARTICLE

### CHILDHOOD MORTALITY AMONG SCHEDULE TRIBES AND SCHEDULE CASTES IN NORTHEAST STATES, INDIA: EVIDENCE FROM NATIONAL FAMILY HEALTH SURVEY 4 (2015-16)

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#### ABSTRACT

The present study to estimate the childhood mortality, i.e., neonatal mortality rate (NMR), infant mortality rate (IMR) and under-five mortality (U5M) among Schedule Castes, Schedule Tribes, Others Backward Classes and Others social group; and assess the Childhood mortality differential in social-religious stratification i.e., Schedule Tribes, Schedule Castes, Others Backward Classes and Others social group in northeast state, India. **Data & Methods:** Using data from National Family Health Surveys 4 (NFHS-4) conducted during the years 2015-2016, measures of mortality during infancy and childhood i.e., Neonatal mortality: the probability of dying in the first month of life, Infant mortality: the probability of dying before the first birthday and Under-five mortality: the probability of dying before the fifth birthday, were computed. All women age 15-49 year asked to provide a complete history of their births including for each live birth, sex, month and year of birth, survival status, and age at the time of the survey or age at death. Age at death was recorded in days for children dying in the first month of life, in months for other children dying before their second birthday, and in years for children dying at later ages. This information was used for computation of various mortality rates. The unit of analysis in this study is the child, considering more than one child may have the same mother. One aim of this study is to estimate the childhood mortality, i.e., neonatal mortality rate (NMR), infant mortality rate (IMR) and under-five mortality (U5MR) among Schedule Castes, Schedule Tribes, Others Backward Classes and Others social group; and investigate differential in childhood mortality by social status that is, Schedule Castes, Schedule Tribes, Other Backward Classes and Others social group. **Results and conclusion:** NMR, IMR and U5MR among schedule Castes were found to be 25.7, 39.1 and 47.5, among schedule Tribes were 17.1, 32.7 and 41.2. This study analysed childhood mortality differential in social-religious stratification i.e., Schedule Castes, Schedule Tribes, Other Backward Classes and Others social status. The findings highlight the need for addressing socio-cultural norms towards eliminating discrimination among schedule Castes and schedule Tribes and need-based programmes focus on delaying the age at first birth for younger women among others social group other than the schedule castes and schedule tribes in Northeast states. Results shows that children born to SC and ST families have lower risk of dying than those from non SC&ST in Northeastern states, India.

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## INTRODUCTION

Infant and child mortality rates reflect a country's level of socio-economic development and quality of life and are used for monitoring and evaluating population, health programs and policies. India's contribution to infant and under-five mortality is the highest particularly in low and middle-income countries. The burden of children dying under one year and five years of age are disproportionately carried by socially disadvantaged groups in India.

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Out of all the social groups, the most disadvantaged and deprived ones are the Scheduled Castes (SCs) and Scheduled Tribes (STs), historically marginalised and disadvantaged social groups. SC and ST are officially recognized and listed by the Indian Constitution and Other Backward Classes (OBCs) (Nayar, 2007) in some extent. Children born in socially disadvantaged group are facing the threat of poor health outcomes from high mortality to high malnutrition and morbidity. Childhood mortality indicator measures child survival and it also reflects the social, economic and environmental conditions in which child (and others in the society) live, including their health care. The study by Dommaraju and colleagues (2008) examines the effect of Castes on child mortality in rural India and concluded that

children belonging to lower Castes have higher risks of dying than children belonging to upper Castes. Children from the lower Castes groups are significantly more likely than better-off Castes children to die at a young age is also well documented (Ram *et al.*, 2017; Sahu *et al.*, 2015; Dommaraju *et al.*, 2008; Das *et al.*, 2010). The importance of understanding IMR and U5MR by social groups has increased in the era of Sustainable Development Goals (SDG), as these goals are inclusive to improve child health for marginalised and disadvantaged social groups.

**Rational and objectives:** The northeastern states of India comprised of eight small states namely, Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. The region is physically isolated from the rest of the country due to mountains terrain and inhabited by numerous schedule castes, schedule tribes and others ethnic groups, has diverse socio-cultural practices. Northeastern states are socially advanced in terms of literacy, women empowerment, women autonomy and exposure to mass media, but lack behind the other forward states in terms of infrastructure facilities, economic development and accessibility.

The lack of basic amenities and diverse sociocultural practices is also directly or indirectly responsible for affecting on the early life of childhood than the other demographic, environmental and genetic factors, etc. There is a high chance that most of the children within the same community and within the same family have the tendency of sharing common facilities in terms of household sanitation, educational, health care etc. As such, there is also need to study whether the child deaths are concentrated in the same communities. Thus, by taking the advantage of recent most NFHS 4 data having the clustering nature due to the sampling design, this study estimate the childhood mortality, i.e., neonatal mortality rate (NMR), infant mortality rate (IMR) and under-five mortality (U5M) among Schedule Castes, Schedule Tribes, Others Backward Classes and Others social group; and investigate differential in childhood mortality by social status that is, Schedule Castes, Schedule Tribes, Other Backward Classes and Others social group.

**MATERIALS AND METHODS**

The International Institute for Population Sciences and Macro International conducted the National Family Health Survey (NFHS-4), which is a nationally representative survey in India during 2015-16. The information provided NFHS-4 survey data is cross-sectional. Data for NFHS-4 were collected from a probability sample of 98,716 ever-married women age 15-49 who are usual member of the selected household or who spent the night before the survey in the selected 89,985 households in Northeastern states. The survey sample was selected using equal probability systematic selection with two-stage stratified cluster sampling (IIPS, 2017). All women age 15-49 year surveyed were asked to provide a complete birth history, including sex, date of birth, and survival status for each live birth, and age at the time of the survey or age at death. Age at death was collected for children who had died, recorded in days for children dying in the first month of life, in months for children dying after the first month but before their second birthday, and in years for children dying at later ages. A children’s data file for Northeastern states was created from the birth histories file after extracting from country birth

histories file. The unit of analysis in this study is the child, considering more than one child may have the same mother. Children from multiple births were excluded from the analysis. Neonatal mortality: The probability of dying in the first month of life; Post-neonatal mortality: The probability of dying after the first month of life but before the first birthday; Infant mortality: The probability of dying before the first birthday; Child mortality: The probability of dying between the first and fifth birthdays; Under-five mortality: The probability of dying before the fifth birthday. The mortality estimates were computed with synthetic cohort probabilities. This procedure is based on the procedure first developed by Somoza (1980) and modified by Rutstein (1984). Deaths and exposure in any calendar period are first tabulated for the age intervals, less than 1 month, 1-2, 3-5, 6-11, 12-23, 24-35, 36-47, and 48-59 months. Then age-interval-specific probabilities of survival are computed and probabilities of mortality for larger age segments are produced by multiplying the relevant age-interval survival probabilities together and subtracting the product from one:

$${}_nq_x = 1 - \prod_{i=x}^{i=x+n} (1 - q_i)$$

where  ${}_nq_x$  is the conventional probability of dying between ages  $x$  and  $x+n$  and  $q_i$  are the subinterval probabilities of dying. Data analysis is done using Stata version 13.1 (StataCorp, College Station, Texas 77845 USA) take into account the survey design (i.e. sampling weights with clustering and strata). Sample design is available in the report (India NFHS4, 2015-16). Child survival status data were exported into QGIS version 3.0 to visualize the childhood death. The cluster level child survival status was developed and visualized in QGIS software with 0 death, 1-2 death, 3-4 death and 5 + death. Heatmap is prepared using QGIS and it provides clear and accessible representations of dynamic processes, advancing understanding of the data and it shows the relative intensity of a value within an array.

**RESULTS AND DISCUSSION**

Fig. 1 shows that NFHS-4 surveyed 89,985 households in total in northeast states, 14,620 households in Arunachal Pradesh, 24,536 in Assam, 11,210 in Nagaland, 11,728 in Manipur, 11,391 in Mizoram, 4,508 in Tripura, 7,330 in Meghalaya and 4,662 in Sikkim, during 2015 and 2016. Table 1.1 shows data pertaining to 37,167 total single live births born in the five years preceding the survey 2015-16 in the representative areas of northeastern states, Arunachal Pradesh (4,966), Assam(10,309), Manipur(5,636), Meghalaya (4,409), Mizoram (4,905), Nagaland (4,607), Sikkim (1,005) and Tripura (1,330). During the last five years period preceding the surveys there are 1,406 child deaths have reported in total northeastern states, 127 child death in Arunachal Pradesh, 518 in Assam, 138 in Manipur, 156 in Meghalaya, 231 in Mizoram, 167 in Nagaland, 30 in Sikkim and 39 in Tripura, respectively. There were 87 child deaths in 2151 live birth among schedule Castes, 805 in 22,115 among schedule Tribes, 147 in 3,956 among other backward classes and 367 in 8,945 among others social groups respectively. There were 4,306 cluster in whole northeast states, 730 cluster in Arunachal Pradesh, 1161 in Assam, 556 in Manipur, 344 in Meghalaya, 545 in Mizoram, 540 in Nagaland, 215 each in Sikkim and Tripura. Figure 1. 2 shown the visualization of spatial distribution of childhood

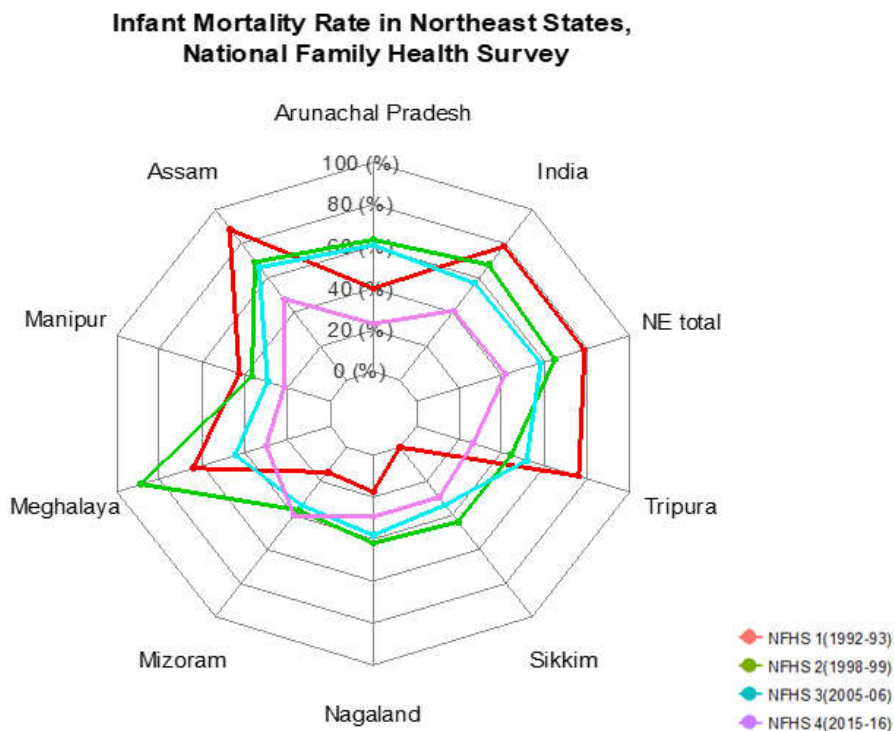


Figure 1.1 State-wise infant mortality rate in northeast states, India

	ARP	AS	MN	MG	MZ	NG	SK	TP	NE Total*	India
NFHS 1(1992-93)	40.0	88.7	42.4	64.2	14.6	17.2	NA	75.8	78.8	78.5
NFHS 2(1998-99)	63.1	69.5	37.0	89.0	37.0	42.1	43.9	44.2	64.6	67.6
NFHS 3(2005-06)	60.7	66.1	29.7	44.6	34.1	38.3	33.7	51.5	58.6	57.0
NFHS 4(2015-16)	22.9	47.6	21.7	29.9	40.1	29.5	29.5	26.7	41.7	40.7

Source : National Family Health Survey Report-1, 2, 3 & 4 ; \* Author's computation

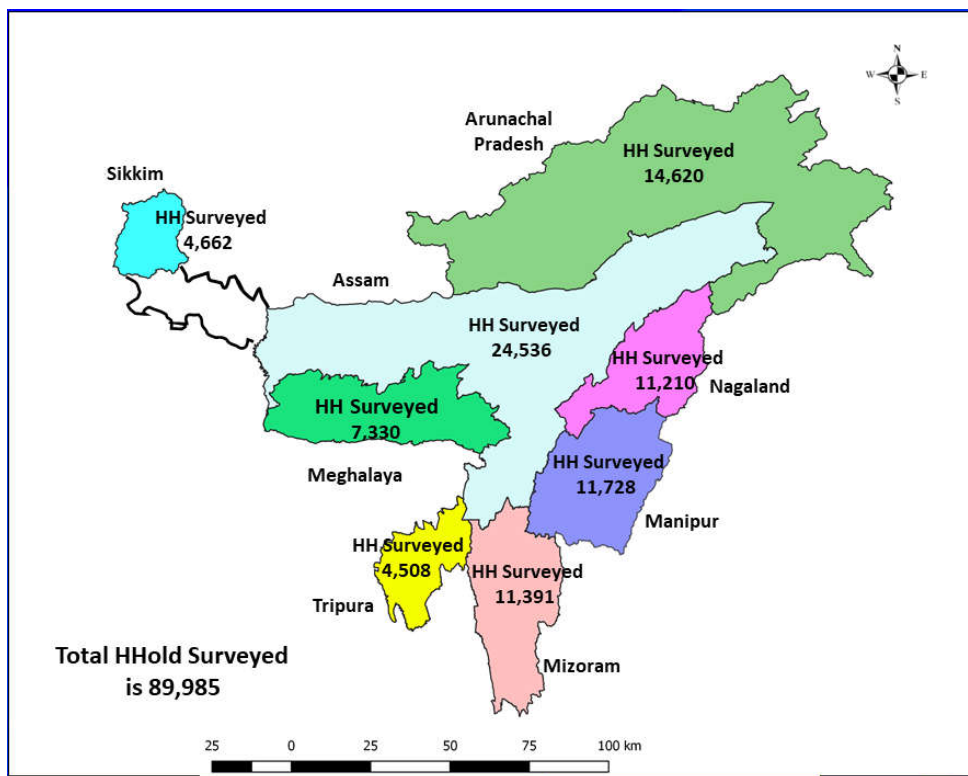


Figure 1.2. State-wise household surveyed in Northeast, India, NFHS-4

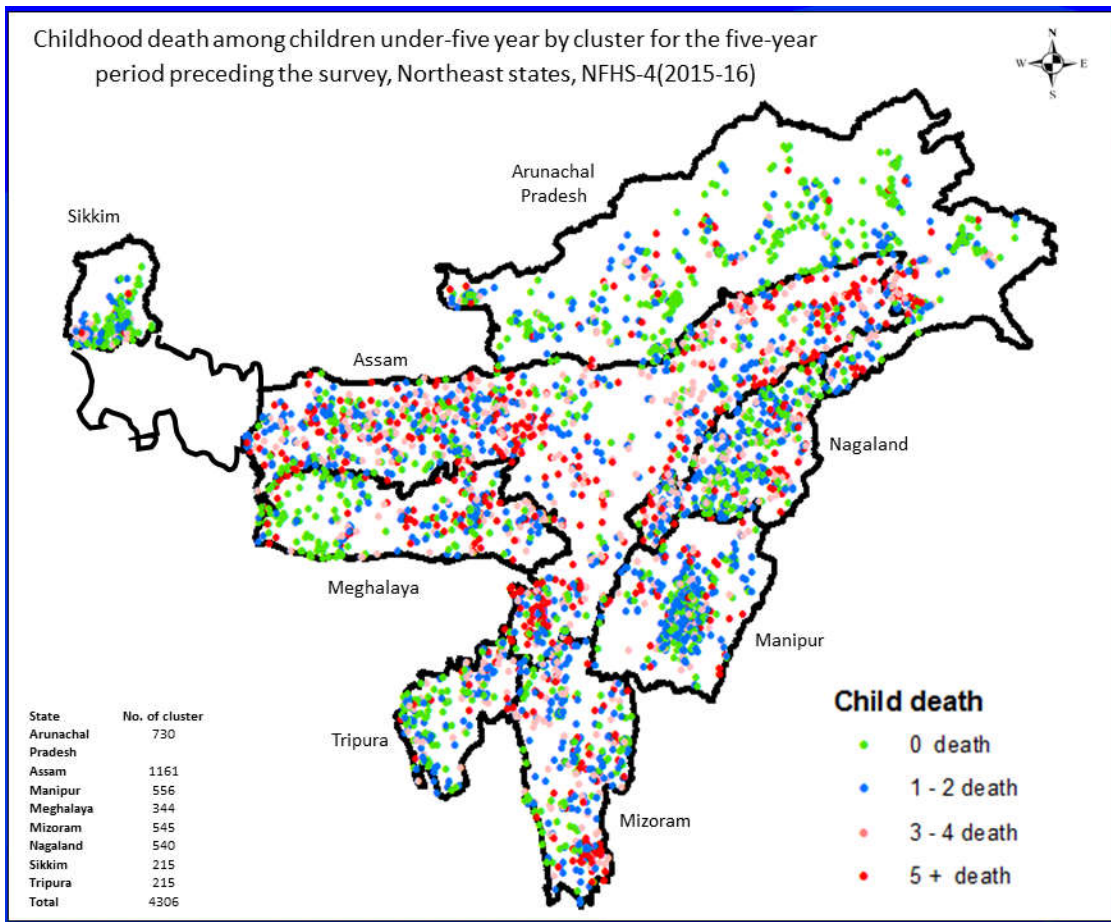


Figure 1.3. Spatial distribution of childhood death in Northeast states

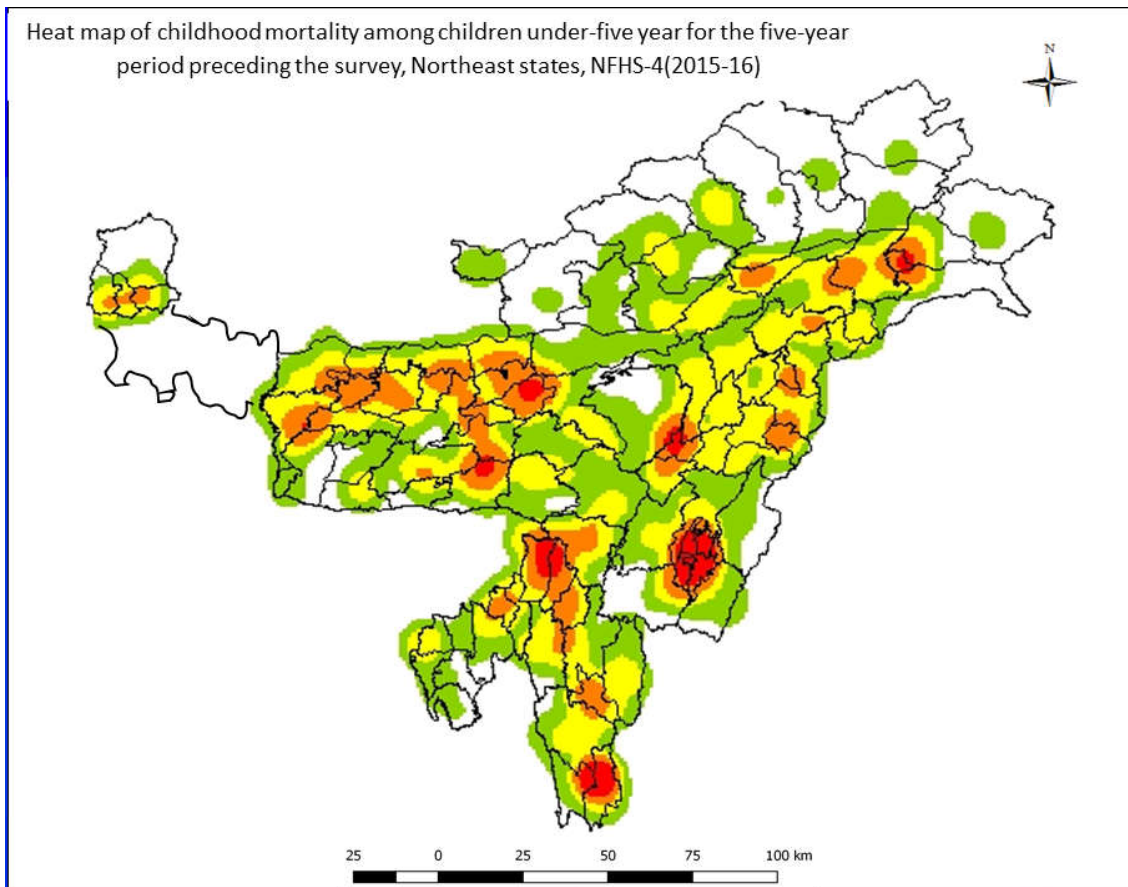


Figure 1.4. Heat map of childhood mortality in Northeast states

**Table 1.1 Percent distribution of live birth and deaths by social status in Northeastern states, India, NFHS 4**

		Schedule Castes	Schedule Tribes	Other Backward Classes	Others	Total
Arunachal Pradesh	Live birth	286 (5.76)	3848 (77.49)	222 (4.47)	610 (12.28)	4966
	Death	8 (6.30)	96 (75.59)	3 (2.36)	20 (15.75)	127
Assam	Live birth	940 (9.12)	1883 (18.27)	2286 (22.17)	5200 (50.44)	10309
	Death	42 (8.11)	92 (17.76)	110 (21.24)	274 (52.90)	518
Manipur	Live birth	354 (6.28)	2363 (41.93)	841 (14.92)	2078 (36.87)	5636
	Death	11 (7.97)	67 (48.55)	21 (15.22)	39 (28.26)	138
Meghalaya	Live birth	57 (1.29)	4124 (93.54)	16 (0.36)	212 (4.81)	4409
	Death	3 (1.92)	138 (88.46)	1 (0.64)	14 (8.97)	156
Mizoram	Live birth	40 (0.82)	4741 (96.66)	86 (1.75)	38 (0.77)	4905
	Death	0 (0.00)	230 (99.57)	0 (0.00)	1 (0.43)	231
Nagaland	Live birth	163 (3.54)	4253 (92.32)	12 (0.26)	179 (3.89)	4607
	Death	8 (4.79)	151 (90.42)	0 (0.00)	8 (4.79)	167
Sikkim	Live birth	53 (5.27)	421 (41.89)	273 (27.16)	258 (25.67)	1005
	Death	2 (6.67)	17 (56.67)	9 (30.00)	2 (6.67)	30
Tripura	Live birth	258 (19.40)	482 (36.24)	220 (16.54)	370 (27.82)	1330
	Death	13 (33.33)	14 (35.90)	3 (7.69)	9 (23.08)	39
All NE States	Live birth	2151 (5.79)	22115 (59.50)	3956 (10.64)	8945 (24.07)	37167
	Death	87 (6.19)	805 (75.25)	147 (10.46)	367 (26.10)	1406

**Table 1.2. Neonatal, infant and under-five mortality rates for the five-year period preceding the survey by social status NFHS 4 (2015-16)**

State	Rate	Schedule Castes	Schedule Tribes	Others Backward Class	Others	Total	
Arunachal Pradesh	NMR	*	9.81 [5.52-14.1]	*	20.7 [7.53-33.9]	11.8 [7.79 - 15.9]	
		IMR	*	21.1 [15.5-26.6]	*	33.5 [18.7-48.4]	22.9 [17.9 - 28.0]
	U5MR		*	31.2 [24.0-38.4]	*	43.5 [26.6-60.5]	32.9 [26.7 - 33.1]
		Assam	NMR	27.3 [15.7-39.0]	23.4 [17.0-29.7]	34.6 [26.8-42.5]	35.1 [30.3-40.0]
IMR	41.3 [25.8-56.8]			41.6 [31.7-51.5]	46 [37.9-54.1]	50.8 [44.5-57.0]	47.6 [43.5 - 51.8]
	U5MR		50.3 [31.9-68.7]	51.0 [39.3-62.7]	56.1 [46.5-65.7]	59.0 [52.8-65.2]	56.5 [51.7 - 61.3]
Manipur			NMR	21.1 [3.69-38.5]	19.2 [12.5-25.8]	14.1 [6.08-22.2]	12.4 [7.18-17.6]
	IMR			26.1 [8.02-44.1]	27.8 [20.1-35.4]	18.0 [9.12-26.9]	17.6 [11.2-23.9]
			U5MR	*	33.5 [25.5-41.5]	21.7 [12.6-30.8]	21.2 [14.5-27.9]
Meghalaya	NMR	*	14.2 [10.3-18.0]	*	*	18.3 [13.9-22.6]	
		IMR	*	26.8 [21.3-32.2]	*	*	29.9 [24.7-35.1]
	U5MR		*	37.5 [31.5-43.5]	*	*	39.6 [33.6-45.7]
		Mizoram	NMR	*	11.6 [6.43-16.7]	*	*
IMR	*			41.3 [32.8-49.8]	*	*	40.1 [32.3-48.0]
	U5MR		*	46.6 [38.0-55.3]	*	*	46.0 [38.2-53.8]
Nagaland			NMR	*	14.7 [10.7-18.8]	*	*
	IMR	*		28.1 [23.0-33.2]	*	*	29.5 [24.1-35.0]
		U5MR	*	36.1 [30.1-42.1]	*	*	37.4 [32.2-42.7]
	Sikkim		NMR	*	32.8 [11.9-53.8]	20.0 [2.82-37.8]	*
IMR		*		44.1 [20.7-67.6]	32.9 [13.4-52.5]	*	29.5 [18.7-40.4]
		U5MR	*	50.5 [26.4-74.6]	34.6 [15.2-53.9]	*	32.2 [20.9-43.5]
Tripura			NMR	20.3 [4.32-36.3]	14.1 [4.33-23.9]	*	12.0 [4.95-20.1]
	IMR	35.1 [13.6-56.7]		27.5 [12.3-42.8]	*	24.6 [12.5-39.7]	26.7 [18.5-34.8]
		U5MR	43.7 [19.3-68.0]	30.8 [16.0-45.7]	*	32.3 [14.4-50.3]	32.7 [23.1-42.2]
	Northeastern States Total		NMR	25.7 [17.4-34.0]	17.1 [14.6-19.7]	31.5 [25.0-38.0]	33.1 [28.5-37.6]
IMR		39.1 [27.8-50.5]		32.7 [29.2-36.1]	43.0 [35.0-50.0]	47.7 [42.3-53.1]	41.7 [38.6-44.9]
		U5MR	47.5 [36.0-59.1]	41.2 [37.5-44.9]	52.0 [43.7-60.3]	55.5 [50.4-60.7]	50.1 [46.5-53.7]

Source: Based on author's computation and figure given in the parenthesis are 95% confidence interval.

\* Rate not shown; based on fewer than 250 cases of children surviving to the beginning of the age interval.

death, that is, 0 death in green color, 1-2 death in blue, 3-4 death in light red and 5 or more death in red, among children under-five year by cluster for the five-year period preceding the survey. This spatial distribution map revealed that there are significant geographical variations between the states and within the state. In spatial distribution map, more number of cluster with 3-4 death and 5 or more death shown in Assam and fewer cluster were appeared in Sikkim and Arunachal Pradesh (Figure 1.2).

Heatmap provides clear and accessible representations of dynamic processes, advancing understanding of the data and it shows the relative intensity of a value within an array. Those cluster that are highest in their value – relative to the other present numbers – is given a “hot” color, red, while those that are lower in their value – again, relative to the other present numbers – is given a “cold” color, green. Figure 1.3 is the heat map, which is a graphical representation of data where the individual cluster values contained in a matrix are represented as colors, of childhood mortality among children under-five year for the five-year period preceding the survey. The color gradient sets the lowest value of child death in the heat map to green, the highest value to a red, and mid-range values to light red and yellow, with a corresponding transition. Table 1.2 shows that among the social status group, Schedule Tribes have the lowest rate of neonatal mortality 17.1[14.6-19.7], followed by Schedule Castes 25.7[17.4-34.0]. Other Backward Classes (OBCs) have relatively higher neonatal mortality than Scheduled Tribes and Scheduled Castes. Similar pattern is also observed for infant mortality ST 32.7[29.2-36.1], SC 39.1[27.8-50.5], OBCs 43.0[35.0-50.0] and Others 47.7[42.3-53.1]. The under-five mortality rate is lowest among Schedule Tribes 41.2[37.5-44.9] than other social status, SC 47.5[36.0-59.1], OBCs 52.0[43.7-60.3] and Others social group 55.5[50.4-60.7].

Overall in all northeastern states total, neonatal mortality rate is 27.6[25.0-30.2], infant mortality rate is 41.7[38.6-44.9], under-five mortality rate is 50.1[46.5-53.7]. In Arunachal Pradesh, NMR (9.81), IMR (21.1), U5MR (31.2) among Schedule Tribes is lower than the Others social groups, NMR (20.7), IMR (33.5) and U5MR (43.5); in Assam, NMR (23.4) among Schedule Tribes is the lower than SC (27.3), OBCs(34.6) and Others(35.1) social groups; IMR(41.6), U5MR(51.0) among ST shows a little bit higher than SC, IMR(41.3) and U5MR(50.3), but higher than OBCs IMR(46.0), U5MR(56.1) and Others social groups IMR(50.8) and U5MR(59.0).

In Manipur, Schedule Castes have the highest rate of NMR (21.1), followed by ST (19.2), OBCs(14.1) and Others (12.4), but Schedule Tribes shows the highest rate of infant mortality (27.8) and U5MR(33.5) than infant and under-five mortality among OBCs, IMR(18.0), U5MR(21.7) and Other social groups IMR(17.6) and U5MR(21.2). In Sikkim, NMR (32.8), IMR (44.1) and U5MR (50.5) among Schedule Tribes shows higher NMR (20.0), IMR (32.9) and U5MR (34.6) than among Other Backward Classes. In Tripura, NMR (20.3), IMR (35.1) and U5MR (43.7) among Schedule Caste shows higher NMR (14.1), NMR (12.0); IMR (27.5), IMR (24.6); and U5MR (30.8),U5MR (32.3) than among Schedule Tribes and Other Classes.

## Conclusion

For this study, the nationally representative data from the 2015-16 National Family Health Survey was used. The objective was to estimate the childhood mortality, i.e., neonatal mortality rate (NMR), infant mortality rate (IMR) and under-five mortality (U5MR) among Schedule Castes, Schedule Tribes, Others Backward Classes and Others social group; and investigate differential in childhood mortality by social status that is, Schedule Castes, Schedule Tribes, Other Backward Classes and Others social group in northeastern states. The results of this study revealed that there is a variation in the level of NMR, IMR and U5MR between states and within states by Schedule Castes, Schedule Tribes, Other Backwards Classes and Others social group. From the results of this present study, it can be concluded that children under-five, who born in scheduled Tribes families have a lower risk of death. The risk of a child dying before reaching five years of age is highest among non-SC & non-ST social group. The risk of a child dying before reaching first birthday is also observed similar pertain as children under-five years. Children born to ST families have lower risk of dying than children born to SC families, OBCs and Others. This study suggests that intervention programme for enhancement of life during childhood should be focus where the sub-sections of the population is high risk.

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