Understanding pathways of social group disparity in child malnutrition in India: Evidences form 1992-2005

In India caste permeates in every realm of life and ranks society into hierarchical order in terms of benefits and welfares (Mishra, 2006). The caste based social stratification influences living condition, lifestyle, cultural practices, traditions, privileges and obligations of its members which also shape their perception about health, knowledge and utilisation of health care services (Uppal et al 2005). Schedule Tribes (ST) and Schedule caste (SC) are two distinct social groups that have faced discrimination and remained marginalized in Indian Hindu system for thousands of years (Dunn1993). As per Census 2011, the share of SC/ST population is around 25% (SC 16.7 % and ST 8.8%), but this one quarter population continues to suffer discrimination at various fronts resulting in their poor performance than rest of the population (Van de Poel E, 2009).

India's performance on social indicators is not very encouraging. It is home to the highest number of malnourished children[1] which in itself is a reason for various morbidities and mortality as it results in poor physical and cognitive development, reduced adult size and capacity to work (Grantham et al., 2007; Walker et al., 2007). The performance of SC/ST population on these indicators is further worse. Available evidences documents higher infant and adult mortality, undernutrition, poor utilization of maternal and child health care services etc. among this group of population (Babu et al. 2001, Wiley, 2002). Subramanyam et al 2010 estimated social disparity in undernutrition on pooled data of 1992-2005 and concluded that in India the social disparities has either widened or remained stagnated during the same time.

Despite substantial documentation of child malnutrition within social groups, there is virtual vacuum of studies that has attempted to quantify as well as decompose the health inequalities at national level. There is a dire need of identifying the gaps and estimating the proportional contribution of various socioeconomic factors that are creating between and within group inequalities. The social group inequalities in child malnutrition have not been analysed at length using multi rounds of data at the national level. The present study makes an attempt to fill this research gap by estimating and decomposing the inequalities in child malnutrition within and between social groups based on three rounds of Demographic Health Survey data from 1992-2006. This will help to fill the paucity of information and knowledge gap on disadvantageous position of ST/SC with respect to the nutritional status of child and at the same time aims to assist policy maker in their efforts to ameliorate malnutrition rate within social caste groups.

Data and Methodology

The present study analyzed data from three cross-sectional rounds of National Family Health Survey (NFHS) of India which is considered equivalent to Demographic and Health Surveys, the standard model questionnaires designed for developing countries [10]. The three rounds were held in 1992, 1998 and 2005 respectively. The present study is based on child population under

[1] 55 million children under age five in India are malnourished (UNICEF, 2008)

age three; information being collected from their mothers. The study adopted the following inclusion and exclusion criterion to ensure the consistency across the rounds.

- ✓ *Children in the age group 36-59 months were dropped*
- ✓ *Dead children were omitted from the sample*
- ✓ *Children belonging to the states of Sikkim and Tripura were dropped*
- ✓ *Twin children were also dropped from the analysis.*

The individual response rate for women was 96.1% in 1992, 95.5% in 1998 and 94.5% in 2005.

Definition of Variables

The outcome variable in the present study is child underweight (weight-for-age), defined as, the children in the age group 0-3 years whose weight-for-age is below minus two standard deviations from the median reference population. We used the US NCHS reference population because of the unavailability of new WHO reference population in NFHS-1 and NFHS-2 datasets (WHO Multicenter Growth Reference Study Group, 2006).

The issue of health inequalities revolves around the question whether all inequalities should be measured or only those that show some systematic association with the health variable. A host of studies have however suggested that the measurement of socioeconomic inequality should be based on those indicators that reflect some systematic association with the health variable (Gakidou et al., 2000; Wagstaff, 2002b; O'Donnell et al., 2008). Therefore, the following predictor variables were selected (i) Place of residence, (ii) Mother's age at birth, (iii) Child size at birth, (iv) birth order, (v) mother's education, (vi) father's education, (vii) wealth quintile (household economic status), (viii) place of delivery, (ix) mass media exposure, (x) antenatal check up, and (xi) Toilet facility.

Analysis Plan

The study carried out analysis in four stages. In the first stage, the study attempts to understand the disadvantageous position of SC/ST children as compared to other caste group children from 1992-2006 (Table 1). In the second stage, the effect of predictors on the dependant variable is assessed using logistic regression. In the third stage, the study attempts to understand the contribution of selected predictors in creating the health divide among SC/ST and other population sub groups using Fairlie Decomposition method. In the fourth stage, the interaction between caste and other socioeconomic factors is explored i.e. whether the effect of caste in health inequality remains constant across other factor. All the statistical analysis was carried out in STATA 10.0 and Microsoft Excel.

The Fairlie Decomposition method, an extension of Blinder-Oaxaca Decomposition technique, is used when the outcome variable (dependant variable) is a binary variable[2]. This method of decomposition is used for the non liner equations and is defined as (Fairlie, 1999; Fairlie, 2003):

[2] Accordingly, the predictor variables for the Fairlie decomposition analysis are dichotomized to indicate their advantageous and disadvantageous status and the dependant variable being child underweight.

$$Y_s - Y_o = \left[\sum_{i=1}^{N^s} F\left(\frac{X^s{}_i\,\beta^s}{N^s}\right) - \sum_{i=1}^{N^o} F\left(\frac{X^o{}_i\,\beta^s}{N^o}\right)\right] + \left[\sum_{i=1}^{N^o} F\left(\frac{X^o{}_i\,\beta^s}{N^o}\right) - \sum_{i=1}^{N^o} F\left(\frac{X^o{}_i\,\beta^o}{N^o}\right)\right]$$

Where Y_s = predicted probabilities of being underweight in SC/ST group.

Y_o = predicted probabilities of being underweight in other caste group

The equation is made up of two components; the first term represents the part of the health divide that could be explained by the group differences in distributions of *X* (independent variables), and the second term represents the part due to differences in the group processes determining levels of *Y* (underweight) which is not explained by the independent variables. The second term, therefore, represents the unexplained part which can be termed either as residual or error term. The above mentioned analysis helped us in understanding the factors responsible for creating the health divide among undernourished children.

Results

Table 1 shows differences in the key indicators of children (aged 0-35months) belonging to SC/ST and other caste groups in India. It depicted the poor performance of children from SC/STs caste groups on all the key indicators. For instance, 66 % of SC/ST children belonged to poor households compared to 45% children of other caste groups. Only 39% mothers of SC/ST children had at least four antenatal checkups and 76% delivered in non institutional setting while the corresponding figures for mothers of other caste group children were 51% and 61% respectively. Similarly, SC/ST children belonged to less educated parents and were less likely to have media exposure.

Table 2 presents the likelihood of being underweight by various socioeconomic characteristics. Children residing in the rural areas were 18 percent more likely to be underweight in comparison to those residing in urban areas; reflecting the disadvantageous position of rural areas. The results also reflects the weaker position of SC/ST children as there was 10 percent less likelihood of being underweight if a child belonged to other caste groups. The educational status of both parents and economic status of the household was significantly associated with nutritional status of a child. Therefore, improving the educational status and economic status of people can certainly help in combating the issue of malnourishment. The other variables such as ANC checkups, media exposure, place of delivery, sanitation facilities were showing significant negative association with the probability of being underweight. The table also reflected that over time, from 1992 to 2006 the likelihood of being underweight has declined; at the time of NFHS-II, 17 percent children were less likely to be malnourished which increased up to 31%. Overall, the results suggest that there are caste wise differentials and over time, malnourishment among children declined but it is still less than the required decline to meet the MDGs.

Table 3 reflects the interaction effect of mother's education, wealth status, access to improved toilet facilities and time and caste groups on the child underweight. The health divide between SC/ST and other caste group is initially not much (approx one point) when the mothers have completed their education up to primary level. This divide however increases up to two points

with the increase in the level of education. This reflects that now the efforts are required to increase the level of education of mothers beyond the primary level. The interaction effect of caste and wealth is also showing the pattern similar to mother's education. The health divide is not visible among the poor section of society which however becomes visible with the improvement in the economic status. The households with poor economic status have limited access to resources irrespective of his caste or creed and so there appears to be complete equality. The households that lack access to improved sanitation facilities have higher percentage of underweight children across the caste groups though the children belonging to other caste groups are at a better edge even when the households lack proper sanitation facilities. The table clearly reflects the effect of time as over the years the percentage of underweight children has declined from 54 to 43 for SC/ST caste group and 49 to 38 for other caste group. The health divide has also narrowed down from 1992 to 2006. Overall, the results show that at the initial level of education and economic status the health divide is not visible which becomes clearly visible with the improvement. This means that when there is limited access to resources the caste becomes dormant; but with the improvement in access to resources the caste emerges as an important factor. Even after being non-poor and education of mothers beyond primary levels the children belonging to SC/ST caste group are lacking in the nutrition as reflected by the higher percentage of underweight children.

Table 4 shows the contribution of selected predictors to differences in the proportion of underweight children between ST/SC and Other caste group obtained through fairlie decomposition analysis on pooled data of NFHS 1, 2 and 3 (1992-93, 1998-99 and 2005-06). Over all, the model explained 72% of the heath divides between SC/ STs and other caste group children. Results demonstrated that three predictors i.e. toilet facility, wealth status and mothers education explained about 70% of the inequalities during 1992-2006. However, among these predictors, toilet facility explained more than one third (32%) of the total health divide, followed by 25% contribution of economic status. Moreover, mother's education contributed to around 15% of total gap in malnutrition between SC/STs and other caste group children. Other predictors like media exposure, antenatal checkups and place of delivery significantly accounted for six to nine percent of total underweight inequality.

Table 5 demonstrated the proportional contribution of selected predictors to health inequalities among malnourished children across the caste groups for each round of the NFHS. The decomposition model explained 84% of inequalities for NFHS 1, 60% for NFHS 2 and 58% for NFHS 3 data. Results exhibited almost a similar pattern across all the three rounds of NFHS data in terms of major predictors, with variation in their relative contribution, to health inequalities across the caste groups. In 1992-93, toilet facility, wealth and education of mother cumulatively accounted for 69% of inequalities, whereas, in 1998-99 and 2005-06, these factors explained 72% and 80% of the gap among underweight children. Exposure to media exhibited declining trend in its contribution from 15% in NFHS-1 to 10% in NFHS-2 to -0.75 in NFHS-3. Negative contribution of media exposure in NFHS-3 demonstrates the narrowing of gap that contributes to inequalities between the caste groups owing to differentials in media exposure. Results also

demonstrated that contribution of mother's education declined from 17% to 6% from NFHS-1 to NFHS-2, while it again increased to 14% in NFHS-3. Contribution of toilet facility remained the highest in explaining the gap in first two rounds of NFHS i.e. 36 % in NFHS-1 and 44% in NFHS-2, but it declined by 29 % in NFHS-3 (16 %). However, contribution of wealth exhibited increasing trend in all the three rounds of NFHS. In NFHS-1 wealth accounted for less than one fifth (16%) of malnutrition differentials between the two caste categories which escalated to more than one fourth (23%) in NFHS-2 and half of the total contribution (50%) in NFHS-3. This result signifies the increasing wealth based inequality in child malnutrition between SC/STs and other caste group children. Moreover, cumulative contribution of predictors like antenatal checkups and institutional delivery remained 10% in both the rounds of NFHS, which increased to 16% in NFHS-3. Contribution of birth order of child varied around three to six percent in explaining the underweight gap across the three rounds of NFHS. However, no clear pattern was evident for the contribution of predictors like place of residence, sex of child and improved water facility in explaining the gap in child malnutrition between SC/STs and other caste group.

Conclusion

This study was undertaken to disaggregate the social group disparity in child undernutrition in India using three rounds of nationally representative survey data from 1992, 1998 and 2005. The findings of the study clearly demonstrated the health divide in child undernutrition among schedule caste/tribe population and rest of the population. It is worth noting that the prevalence of underweight children has always remained skewed towards SC/ST population for all the three rounds of survey. In consistency with the findings of Subramanya et al. 2010, the present study finds that though the prevalence of underweight children has declined over time between the groups, but social group disparity has widened over these years.

The results of Fairlie decomposition analysis revealed that that the average gap in child malnutrition is mainly attributed to the distribution of determinants between ST/SC and other caste groups. The major contributory factors for the inequality across the social groups have remained same from last 14 years with variations in their relative contribution. The three major factors are mother's education, wealth status and availability of toilet facilities which explains almost two third of nutritional disparity between the social groups. The results also find the support from the previous research work carried out on socio-economic inequality in child malnutrition such as Horta et al. 2013; Subramanyam et al 2010; Sonowal, C 2010.

Disaggregating social group disparity in child undernutrition is very essential to combat the issue of child undernutrition and health inequalities.Three important messages have emerged from our study. First, malnutrition remains disproportionately higher among disadvantageous ST/SC groups. Second, social group disparity in child malnutrition has not reduced since 1992. Third, wealth, maternal education and toilet facility are the three major factors that have contributed maximum for social group disparity. The consistent increase in the wealth based inequality demands effective implementation of poverty alleviation schemes and other welfare schemes. The Public Distribution System, world's largest food security programme for poor (PDS) and Integrated Child development Services (ICDS), world's largest child development programme have performed far below the expectation and have not offered much to celebrate (Gragnolati et

al., 2005, Das Gupta et al. 2005). The study necessitates the need of implementing the target specific policies and strategies to improve mother's education, access to basic amenities of life and economic status for the vulnerable population subgroup to eradicate the caste based disparities. Policies and programmes designed to benefit the SC/ST population need to promote their well-being in general but also target the specific needs of the most vulnerable indigenous groups. There is a need to enhance the capacity of the disadvantaged to equally take advantage of health opportunities.

References

Agarwal, S. (2011),"The state of urban health in India: Comparing the poorest quartile to the rest of the urban population in selected states and cities", *Environment and Urbanization,* Vol. 23**,** pp.13-28.

Grantham-Mcgregor, S., Cheung, Y. B., Cueto, S., Glewwe, P., Richter, L. and Strupp, B. (2007), "Developmental potential in the first 5 years for children in developing countries", *Lancet,* Vol. 369, pp. 60-70.

Hosseinpoor AR, Doorslaer V E, Speybroeck N, *et al*. (2006), "Decomposing socioeconomic inequality in infant mortality in Iran", *International Journal of Epidemiology,* Vol. 35, pp.1211–1219.

Subramanyam M and Subramanian S.V. (2011), "Research on social inequalities in health in India", *Indian Journal of Medical Research,* Vol.133, pp 461–463.

Subramanyam, M. A., Kawachi, I., Berkman, L. F. and Subramanian, S. V. (2010), "Socioeconomic inequalities in childhood undernutrition in India: Analyzing trends between 1992 and 2005", *Plos ONE,* Vol.5 No. 6, doi: 10.1371/journal.pone.0011392

World Health Organization Multicenter Growth Reference Study Group. (2006). *WHO child growth standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for age e methods and development,* Geneva: World Health Organization.

Table 1: Differences in selected background characteristics among children (0-35 months) across the Schedule Caste/Schedule Tribe and Other caste group, India, 1992-2006

	Schedule Caste/Schedule Tribe	Other Caste Groups	Total
Child of smaller size	23.89	21.31	22.01
Mothers with no education	67.73	49.48	54.49
Fathers with no education	40.65	26.21	30.17
Mothers risky age group	31.36	29.03	29.67
No Media Exposure	56.99	44.03	47.59
Not fully immunized	23.58	19.29	20.47
Atleast 4 ANC visits	39.43	51.63	48.3
Non institutional delivery	76.2	61.67	65.67
Urban place of residence	16.11	26.46	23.62
Poor household status	66.07	44.55	50.46
NFHS-1 (N)	7,181	21,282	28463
NFHS-2 (N)	8036	16198	24377
NFHS-3 (N)	8701	15661	25469

Table 2: Logistic regression model showing odds ratios and confidence intervals for children in the age group 12-35 months, Underweight, India, 1992-2006

Background Characteristics	Exp (B)	95% CI	
		Lower	Upper
Place of residence			
Urban®			
Rural	**1.118*** **	**1.063**	**1.176**
Caste			
SCs/STs			
Others	**0.903*** **	**0.865**	**0.943**
Maternal age at Birth			
Below 20 years®			
25-34 years	**0.869*** **	**0.829**	**0.913**
35-49 years	**0.795*** **	**0.716**	**0.884**
Sex of child			
Female®			
Male	**0.990^{ns}**	**0.954**	**1.029**
Child size at birth			
Below average®			
average	**0.711*** **	**0.679**	**0.746**
Above average	**0.601*** **	**0.565**	**0.640**
Birth Order			
1-2®			
3-4	**1.099*** **	**1.048**	**1.154**
5 <	**1.284** **	**1.198**	**1.378**
Mother's education			
No education®			
Primary	**0.941** **	**0.888**	**0.999**
Secondary	**0.803*** **	**0.757**	**0.852**
High school and above	**0.584*** **	**0.511**	**0.669**
Father's education			
No education®			
Primary	**0.992** **	**0.936**	**1.053**
Secondary	**0.928*** **	**0.881**	**0.978**
High school and above	**0.856*** **	**0.782**	**0.937**
Wealth quintile			
Poorest®			
poorer	**0.923*** **	**0.873**	**0.977**
Middle	**0.829*** **	**0.780**	**0.882**
Richer	**0.688*** **	**0.642**	**0.739**
Richest	**0.567*** **	**0.518**	**0.621**
Antenatal Checkups			
NO ANC®			
< 3 ANC	**0.922*** **	**0.874**	**0.975**
4+ ANC	**0.831*** **	**0.789**	**0.877**
Place of Delivery			
Non institutional®			
Institutional	**0.827*** **	**0.788**	**0.870**
Water			
Not improved®			
Improved	**1.017^{ns}**	**0.971**	**1.066**
Toilet			
Not improved®			
Improved	**0.795*** **	**0.753**	**0.841**
Media exposure			
No®			
Yes	**0.941** **	**0.898**	**0.987**
NFHS period			
1992-93®			
1998-99	**0.830*** **	**0.794**	**0.867**
2005-06	**0.693*** **	**0.659**	**0.729**

® Reference category, Levels of significance: *p<0.10; **p<0.05; ***p<0.01; ns, not significant

Table 3: Predicted values for underweight of children across the caste groups at various levels of socioeconomic variables obtained from logistic regression

Background characteristics	SC/STs	Others
Mother's Education		
No education	54.03	53.72
Primary	45.27	44.9
Secondary	34.91	32.86
High school and above	19.29	17.79
Wealth		
Poorest	54.28	55.04
Poorer	51.29	51.38
Middle	46.18	45.18
Richer	38.64	37.1
Richest	27.88	25.24
Toilet		
Not Improved	51.11	49.59
Improved	31.48	28.86
NFHS Period		
1992-93	54.37	49.28
1998-99	49.18	42.59
2005-2006	43.62	38.64

Table 4: Fairlie decomposition: Contribution of selected predictors to health divide between SC/ST and Other caste group children, India 1992-06.

Summary of Fairlie Decomposition		
Probability of being underweight among SC/ST population, 1992-2006		0.5283
Probability of being underweight among Others caste group, 1992-2006		0.4510
Difference between two subgroups of population		**0.0772**
Total difference explained by the selected predictors		**0.055**
Percentage of explained difference		**71.68**
Predictors	**% contribution**	**Standard Errors**
Place of residence	-4.73	0.0013
Mother's age at birth	0.33	0.0000
Child size at birth	3.25	0.0002
Birth order	4.32	0.0005
Mother 's education	14.81	0.0021
Father's education	3.66	0.0014
Wealth	25.43	0.0023
Place of Delivery	8.50	0.0017
Media exposure	6.35	0.0013
Antenatal Check up	6.44	0.0011
Toilet facility	31.81	0.0021

Table 5: Fairlie decomposition: Contribution of selected predictors to health divide between SC/ST and Other caste group children, India 1992-93, 1998-99, 2005-06.

Summary of Fairlie Decomposition	NFHS 1	NFHS 2	NFHS 3
Probability of being underweight among SC/ST population, 1992-2006	0.5691	0.0537	0.4863
Probability of being underweight among Others caste group, 1992-2006	0.5089	0.4346	0.3929
Difference between two subgroups of population	**0.6017**	**0.1031**	**0.0933**
Total difference explained by the selected predictors	**0.5042**	**0.0617**	**0.0541**
Percentage of explained difference	**83.78**	**59.87**	**58**
Predictors	**% contribution NFHS 1**	**% contribution NFHS 2**	**% contribution NFHS 3**
Place of residence	-5.45	-11.37	0.60
Mother's age at birth	1.77	0.81	-0.29
Child size at birth	3.01	3.67	2.76
Birth order	3.12	3.51	6.40
Mother 's education	17.25	6.05	14.47
Father's education	3.47	10.60	-5.81
Wealth	15.99	22.60	50.14
Place of Delivery	6.52	5.89	7.83
Media exposure	15.44	10.55	-0.75
Antenatal Check up	2.78	3.65	9.17
Toilet facility	36.16	43.93	15.52

Figure 1 Percent distribution of underweight children of (0-35 months) across SC/ST and Other caste group, India, 1992-2006