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Original Research Article

Decomposing Socio-Economic Inequalities in Nutritional Status among Siblings in High and Low Fertility States of India

Tarique Anwar[1], Paramita Debnath[2], Balhasan Ali[3]

[1]PhD. Scholar, Department of Mathematical Demography & Statistics, International Institute for Population Studies, Mumbai, 400088, India,
[2]PhD. Scholar, Department of Fertility studies, International Institute for Population Studies, Mumbai, 400088, India,
[3]PhD. Scholar, Department of Mathematical Demography & Statistics, International Institute for Population Studies, Mumbai, 400088, India,

Corresponding Author: Paramita Debnath

ABSTRACT

Child malnutrition is a persistent global health problem with significant consequences on infant and young child mortality, morbidity, and reduced life span. In India, over-population and poverty are continual and causing population vulnerability, particularly malnutrition among women and children. Poor diet and infectious diseases interact to cause growth failure in children, physiological damage, especially of the immune system. Using secondary data from the National Family Health Survey (NFHS-4), this study quantifies the extent of the relative contribution of socio-economic factors to the inequality in stunting, wasting, and underweight in India. This study applied Wagstaff decomposition analysis, and CI estimates to quantify the extent of inequality. The findings show that the rate of stunting and underweight is increasing with the increase in age and birth order. However, child malnutrition is decreasing with the mother's educational status, higher utilization of maternal health services, and mother's BMI more than 24.9.Further, CI estimates show a substantial inequality in stunting (CI=-0.156), wasting (CI=-0.060), and underweight (CI=0.160) in India, which is pro-poor inequality concentrated among the poor. The findings of decomposition analysis reveal that mothers with secondary and higher education, BMI of (18.5-24.9), and high utilization of maternal health services were contributing more to the inequality in child malnutrition. This study suggests that promotion of nutrients rich food intake is essential for children at an early age to attain their developmental potential and along with improvement in mother's education and health as it has a substantial contribution in child health.

Keywords: Stunting, Wasting, Underweight, Inequality, Decomposition, India.

INTRODUCTION

Health status of children is the mirror of progress and development of a society and nation. In many developing countries, child malnutrition is a significant cause of death among children. Improving the health of children and women is not only a matter of human right imperative but is also a foundation for a better future. Impressive progress has been made in improving the survival rates and health of children, even in some of the poorest countries, since the 1990s. However, achieving Millennium Development Goal 4 (MDG 4), which postulates to reduce the global under-five mortality rates by two-

thirds between 1990 and 2015, will require additional effort for most developing countries, including India. According to the USAID report on "basic support for institutionalizing child survival (BASICS, 1996)", about 70 percent of all childhood mortality in developing countries is due to five major morbidities: diarrheal diseases, acute lower respiratory tract infection (ARI), malaria, measles, and malnutrition.

Malnutrition refers to a wide range of clinical condition which occurs when the individual's nutrients intake is inadequate to support the body's normal physiological activities including growth, tissues repair, prevention of and recovery from the diseases, regulatory of body function and reproduction. [(1)] It arises from both the lack of availability of food and unequal distribution of food and complimentary food within families. The research on sibling composition is over a century old, Dumont in 1980, in his "social capillary theory" explained "dilution" of parental inputs meaning parental resources are finite, and as the number of children in the family increases, the resources accrued by any one child necessarily decline.

At the same time, scholarly attention directed to another parameter of family structure, sibling configuration- also referred to as sibling composition. Among the components of the sibling structure that may shape children's status is birth order, differences in age between siblings (sibling density), number of children in the household (sibling size) and the relative number of boys and girls (sex composition). [(2-3)] The effects of the sibling structure speak to both intra-familial and interfamilial inequality.

Malnutrition among children is often by the synergistic effect of inadequate or improper food intake and repeated episodes of childhood diseases such as diarrhoea and improper care during illness. [(4)] Mwagome and his colleague mentioned that globally, malnutrition stays a factor in 60% of 11 million deaths among children aged less than five years each year. Till date, several interventions to reduce the malnutrition have been advocated and enforced in different parts of the world. There is a lack of evaluation of such intervention to provide a corrective course of action.

India is a fastest growing country in terms of population and economy, with about 1.21 billion population (2011 census) and according to World Bank report its population has been growing at a rate of 10-14 % annually, India's GDP growth was 9.0 % from 2007 to 2008. Despite this recent achievement in economic growth, the fruit of development has failed to secure a better nutritional status of children in India. [(5-6)] Exhibiting sluggish declining trend over the past decade and a half, prevalence, however, become unimpressive with the average levels marked by wide inequality in childhood malnutrition across the states and various socio-economic groups. [(6,7)]

In developing countries like India, various form of malnutrition affects a large segment of the child population. [(8)] According to NFHS 3 2005-06, in India, around 48 percent of children are stunted below the age of five 19.8 percent are wasted, and 42.5 percent are underweight. [(9)] Many of these children are severely malnourished. The prevalence of malnutrition varies across the states, with Uttar Pradesh recording the highest stunting (56.8 percent) children followed by Bihar (55.6 percent) and Kerala among the lowest (24.5 percent) followed by Goa (25.6 percent). [(9)] Growing pieces of evidence suggest [(6)] that in India, the gap in the prevalence of underweight children among the rich and poor households is increasing over the years with wide regional differentials. Data shows that undernutrition remains a leading problem in most of India, but it is more pronounced in the northern state of India such as Uttar Pradesh, Bihar, Rajasthan, and Madhya Pradesh. In these states, more than half of the children are underweight and stunted. Nearly 50% of the children in Orissa, Maharashtra and West Bengal are underweight, while 50% of the children in Assam and Haryana are stunted.

States with the lowest percentage of underweight or stunted children are Goa, Kerala and all the small northern-eastern states except Tripura and Meghalaya. [10-12] The reduction of child malnutrition is one of the most desirable components of the development, as it is strongly associated with increased child mortality and morbidity. There is now enough evidence that inadequate nutrition that childhood hinders long term physical development reduces the development of cognitive skills, and, as a consequence, in the later years, it negatively affects the schooling and several other outcomes such as lack of productivity, the likelihood of development of chronic diseases and mortality. [13-15]

At a household level, the common causes of undernutrition include inadequate access to food, poor sanitation, insufficient health care, and childcare. [16] The economic status of a household is an important indicator of access to adequate food supplies, use of health services, which are prime determinants of child and maternal nutritional status. [17] A study conducted in local parts of Ethiopia showed that the higher the level of the economic status of the household, the lower the level of child stunting. [18]

Education is an important resource that enables women to provide proper care for their children, which act as a determinant of children's growth and development. [19] Maternal education influences the duration and quality of breastfeeding [20] and mother's education has a direct effect on stunting. [21] Generally, children whose mothers had secondary or higher education are better nourished than children whose mothers had less education. [22] The level of mother's education is vital, as educated mothers usually follow instructions about feeding and caring for children and also use curative and preventative health services more often than women with little or no education. Sometimes, educated mothers also have an economic advantage over less educated mothers making their children better nourished and less susceptible to infection according to a study on the significance of mother's occupation in Malawi. [23]

A report on child nutrition in India shows that people belonging to both Hindus or Muslims religion have almost the same prevalence of stunting, also a comparatively higher prevalence of stunting than children belonging to other religion. Similarly, scheduled castes or scheduled tribe children have a significantly higher incidence of stunting than others. The prevalence of stunting by geographic region shows that both the unadjusted and adjusted prevalence of stunting is highest in the north-central region and lowest in the south, [21] confirming pieces of evidence from other studies showing age and sex of a child and socio-economic characteristics as an important determinant of under-nutrition. [24,17]

In India, culturally bound psychological notion plays a contagious role even in determining the preferences given to specific siblings for distribution of food in the family, in some places son preference is also responsible for the development of such biases, which further plays a significant role in determining the healthy growth of the children. Often these gender biases are profound among infant and children leading to the prevalence of stunting, wasting, and underweight. [25] Birth order of the child is one of the demographic variables explaining the neglects in nutrition and health care access. Results based on birth order shows that more siblings in a household can increase competition for household's limited resources, can have a negative impact on children's nutritional status in these households. [26] The higher birth order children are considerably more likely to be stunted than are children of lower birth orders. [21] Studies revealed that children having same-sex siblings have a higher probability of dying, and this is worse for girls than boys in India. [25,27] Study based on NFHS shows that the boys are less likely than girls to be stunted when all older living siblings are girls and more likely than girls

to be stunted when all older siblings are boys. This pattern is also observed at birth order 4+ in NFHS-1, but not in NFHS-2. [28]

The literature indicates that previous concerns were mostly on the impact of ethnicity, regional variation and socio-economic status on the nutritional status and heath outcome of the child and in India numerous studies have been conducted on the effect of son preference over daughter as a reason for biases toward a male child having better nutritional status and child health care utilization for years. [29,30] However, research on the nutritional status by number and sex composition of a sibling in the Indian context is scarce and. Thus, firstly, the present study will examine the association of sibling composition and gender differentials on under-five malnutrition in high fertility and low fertility states in India. Secondly, the paper assesses the in inequality in nutritional status among siblings in selected high and low fertility states in India.

DATA SOURCE AND METHODOLOGY

Data Source

This study used data from national family health (NFHS-4) survey conducted in 2015-16 in India.It is a large-scale, multi-round survey conducted in a representative sample of households throughout the country. The survey is cross-sectional in design and follows a multistage stratified random sampling designby rural and urban areas. The sample sizes for the present study were 99,935 children for high fertility states and 20,007 children for low fertility states, women in the 2015–16 survey (ICF and IIPS, 2017). [31]

High Fertility States: Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan and Uttarakhand.

Low Fertility States: Andhra Pradesh, Kerala, Karnataka, Tamil Nadu and Kerala.

The levels of fertility of the states have been determined by the replacement level fertility.

Outcome variable

WHO Child Growth Standard, Classification of SD

Stunting: According to WHO "the children whose height for age is below minus two SD from the median height for age of the standard reference population are considered as stunted."

Wasting: According to the WHO "the children whose weight for height is below minus two SD from the median weight for height of standard reference population are considered as wasted."

Underweight: According to the WHO "the children whose weight for age is below minus two SD from the median weight for age of standard reference population are considered as underweight."

Exploratory variables

The predictor variables are: Child's age in months (<1, 1-2, 2–3, 3-4,4-5); Sex of child (Male, Female); Birth order of child (1, 2, 3, 4 and above); Residence (Urban, Rural); Mother's education (No education, Primary, Secondary, Higher); Religion (Hindu, Muslim, other); Caste/tribe (SC/ST, OBC, other). For Wagstaff decomposition analysis, we generate dummy for each Explanatory variable, and take first category as a reference variable. Using the information on the number of boys and girls at home and elsewhere the index of sex sibling composition is classified in below 6 categories-

Male composition

1. Male with 1 brother and 1 sister
2. Male with 2 brothers and 2 sisters
3. Male with than 2 brothers and 2 sisters

Female composition

1. Female with 1 brother and 1 sister
2. Female with 2 brothers and 2 sisters
3. Female with more than 2 brothers and 2 sisters

METHODOLOGY

To achieve the objectives of the study bivariate and multivariate analysis is carried out. Bivariate analysis (Cross tabulation) has been carried out to compare the nutritional status among sibling in high

and low fertility states of India. To create the sibling composition, information on the number of boys and girls at home and elsewhere the total number of children was calculated, and the several categories were created. To understand the gender differential in nutritional status among sibling in high and low fertility states, Bivariate analysis has been carried out. For decomposition of concentration index, we have used, [(32)] method which demonstrate that the health concentration index can be decomposed into the contributions of individual factors to income-related health inequality, in which each contribution is the product of the sensitivity of heath with respect to that factor and the degree of income-related inequality in that factor. For any linear regression model, linking the health variable of interest, y, to a set of k health determinants, X_{ki}:

$$y_i = \alpha + \sum \beta_k \bar{x}_k + \varepsilon_i \quad \ldots\ldots\ldots\ldots\ldots (1)$$

Where ε is an error term, given the relationship between y_i and X_{ki} in equation, the concentration index for y (C) can be written as:

$$C = \sum \left(\frac{\beta_k \bar{x}_k}{\mu}\right) C_k + \frac{GC\varepsilon}{\mu} / \mu \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where μ is the mean of *y*, $\bar{x}_k$ is the mean of x_k, C_k is the concentration index for x_k (defined an alogously to *C*), and GC_ε is the generalized concentration index for the error term(ε).

Equation (2) shows that C is made up of two components: deterministic or 'explained' component, equal to a weighted sum of the CI_s of the regressors, where the weights are simply the elasticities an elasticity is a unit free measure of (partial association), i.e. the percentage change in the dependent variable associated with the percentage change in the explanatory variables. The second is a residual or 'unexplained' component. This reflects the inequality in health that cannot be explained by systematic variation in the x_k across socioeconomic groups. [(32-33)]

Ethics:

The authors assert that all procedures contributing to this work comply with the ethical standards of the National Family Health Survey. NFHS-4 has been conducted under the scientific and administrative supervision of the International Institute for Population Sciences (IIPS), Mumbai, India which is associated with the Ministry of Health and Family Welfare (MoHFW), Government of India (GOI). The institute conducted an independent ethical review of NFHS protocol.

RESULTS

Table 1 shows the nutritional status among children with different sibling composition in high and low fertility states. It can be observed that boys and girls having 4 siblings (2 brothers and 2 sisters) were highly stunted, compared to those having 2 siblings (1 brother and 1 sister), but, it is noted to be highest in case of children having only one sibling (either male or female). Wasting was similar when children had 4 siblings and 1 sibling, but highest when children had 2 siblings. The percentage of underweight children is high when they have only one sibling (either male or female) compared to children who had other two types of sibling compositions. The overall percentage of stunting (44.8 and 45.2 percent), wasting (19.7 and 21.6 percent) and underweight (40.7 and 40.7 percent) children were lower when the first child is female compared to when the first child is male respectively. The table also shows a regional variation in the nutritional status of children according to the different sibling composition. As expected, in high fertility states, the percentage of children with stunting, wasting and underweight are high compared to low fertility states.

Literate and Illiterate and Poor and non-poor disparities in nutritional status

Table 2 shows the nutritional status among children by educational and economic status of mothers in high fertility states and low fertility states. If we see the significance of mother's education on children nutritional status, it shows that the percentage of male and female children stunted, wasted and underweight are found

to be low among mothers who are literate compared to illiterate mothers, as expected, supporting the previous literature in both high and low fertility states. Also, the percentage of stunted and underweight male children were high when they had a sibling composition of 4 sibling which was just the opposite in low fertility states whereas wasting was the high among children with 2 siblings in both high and low fertility states. This pattern was a bit different in case of female children where a high percentage were stunted and underweight when they had only 1 sibling (either female or male) and wasting was high among children with 2 siblings in high fertility states whereas in low fertility states children with 4 siblings were highly stunted, female with 2 siblings were highly underweight and wasted.

The table also presents the effect of mother's economic status (categorized into poor and non-poor) on nutritional status of children. It indicates that the nutritional status of children of non-poor mothers is way better compared to children of poor mothers, also indicating a huge intra group inequality in low fertility states than in high fertility states. Even when the children (both male and female) have sibling composition is of 4 siblings and 2 siblings and 1 sibling either (male or female) in every combination, percentage of stunted, wasted and underweight children are less among the non-poor women may be because of unbiased, easier and equal allocation of household resources or distribution of food among every child in high and low fertility states.

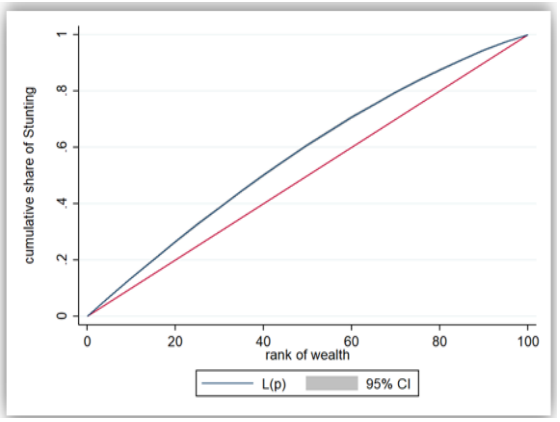

Fig.1. concentration Curve for stunting in selected states of India

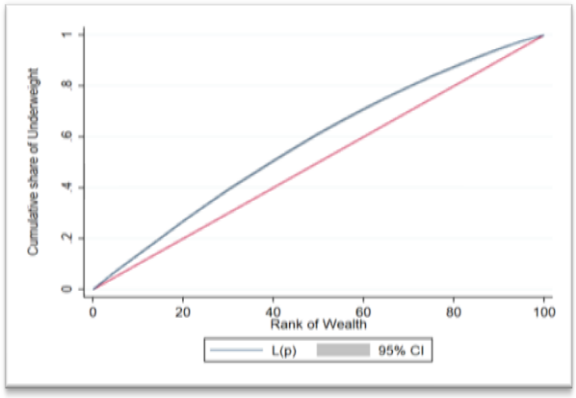

Fig.2. Concentration Curve for Underweight in selected states of India

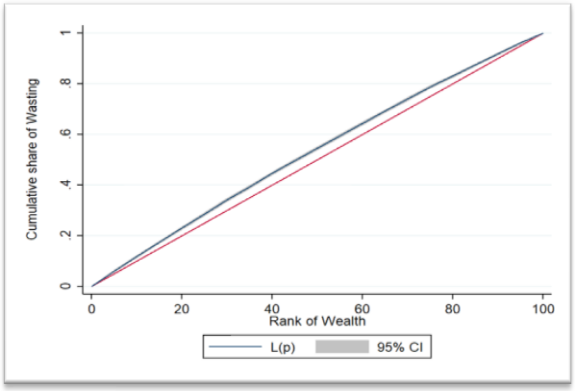

Fig.3. concentration Curve for Wasting in selected states of India

Table 1. Nutritional status among children with different sibling composition in high and low fertility states.

Sibling Composition	The high Fertility States			The low Fertility States		
	Stunted	Wasted	Underweight	Stunted	Wasted	Underweight
Male Composition						
Male With 1 Brother 1 Sister	37.5	24.1	35.8	26.6	22.5	26.4
Male With 2 Brother 2 Sister	46.4	20.5	41.4	30.6	20.3	29.0
Male with another Sibling	47.6	21.2	42.2	33.4	19.9	30.9
Total	45.2	21.6	40.7	30.5	20.8	29.0
Female Composition						
Female With 1 Brother 1 Sister	34.9	22.4	34.0	21.5	20.6	21.4
Female With 2 Brother 2 Sister	44.6	19.3	40.2	30.5	18.0	28.3
Female with another Sibling	48.4	18.9	43.2	31.4	18.3	29.3
Total	44.8	19.7	40.7	28.1	18.9	26.6

Table 2. Nutritional status among children with different sibling composition by different socio-economic characteristics in High fertility states and low fertility states.

	Sibling composition	Stunting				Wasting				Underweight			
		Illiterate	Literate	Poor	Non-Poor	Illiterate	Literate	Poor	Non-Poor	Illiterate	Literate	Poor	Non-Poor
High fertility states	Male composition												
	Male With 1 Brother 1 Sister	48.94	33.92	45.5	30.34	26.29	23.36	27	21.47	46.82	32.27	43.9	28.45
	Male With 2 Brother 2 Sister	54.74	40.72	53.6	36.29	22.59	19.12	22	18.66	48.97	36.3	48.1	32.11
	Male with another Sibling	54.21	40.16	53.2	36.64	22.11	20.1	22	19.44	47.7	35.91	47	32.55
	Female Composition												
	Female With 1 Brother 1 Sister	45.23	31.29	43.1	26.99	25.49	21.32	25	20.02	43.77	30.62	43.1	25.31
	Female With 2 Brother 2 Sister	51.98	39.46	50.8	35.07	21	18.11	21	16.44	47.19	35.22	46.1	30.95
	Female with another Sibling	53.94	41.67	53.7	36.83	19.89	17.72	20	16.91	48.56	36.81	48.1	32.83
Low fertility states	Male composition												
	Male With 1 Brother 1 Sister	46.58	24.92	42.14	23.9	33.74	21.5	28.2	21.46	44.37	24.83	41.83	23.65
	Male With 2 Brother 2 Sister	41.22	29.03	41.25	27.95	19.32	20.49	24.9	19.2	37.9	27.66	40.1	26.21
	Male with another Sibling	45.86	31.01	41.44	30.92	23.89	19.15	22.6	19.09	42.04	28.85	40.49	28.06
	Female Composition												
	Female With 1 Brother 1 Sister	42.53	20	31.63	19.72	26.82	20.13	26.1	19.59	44.39	19.78	35.56	18.93
	Female With 2 Brother 2 Sister	46.92	28.12	41.1	27.75	19.08	17.8	21.9	16.94	41.33	26.33	38.6	25.52
	Female with another Sibling	42.29	29.35	42.24	28.19	22.02	17.57	22.8	16.93	41.42	27.01	41.45	25.68

Table 6. Estimates of marginal effect and decomposition analysis of inequality in the Stunting, wasting and malnutrition in selected states of India, (2015-16)

Stunting					**Underweight**					**Wasting**				
Explanatory variables	**Marginal effect**	**CI**	**Absolute contribution to CI**	**percentage contribution to CI**	**Explanatory variables**	**Marginal effect**	**CI**	**Absolute contribution to CI**	**Percentage contribution to CI**	**Explanatory variables**	**Marginal effect**	**CI**	**Absolute contribution to CI**	**Percentage contribution to CI**
Rural	0.04***	-0.167	-0.0222	12.76	Rural	0.03***	-0.167	-0.0173	11.17571	Rural	0.002	-0.167	-0.0011	4.33
Child with 2+brother 2+ sister	0.05***	0.0398	0.0021	-1.21	Child with 2+brother 2+ sister	0.02**	0.0398	0.0008	-0.5168	Child with 2+brother 2+ sister	-0.063***	0.0398	-0.0026	10.24
Child with Others composition	0.06***	-0.1062	-0.0127	7.30	Child with Others composition	0.02***	-0.1062	-0.0048	3.100775	Child with Others composition	-0.071***	-0.1062	0.0155	-61.02
Birth order 2	-0.02**	0.0856	-0.002	1.15	Birth order 2	-0.01	0.0856	-0.0007	0.452196	Birth order 2	0.038***	0.0856	0.0042	-16.54
Birth order 3 & above	0.01	-0.2473	-0.0039	2.24	Birth order 3&above	0.02**	-0.2473	-0.0059	3.81137	Birth order 3 & above	0.044***	-0.2473	-0.0143	56.30
Primary education	-0.05***	-0.1246	0.0036	-2.07	Primary education	-0.05***	-0.1246	0.0035	-2.26098	Primary education	-0.012**	-0.1246	0.0009	-3.54
Secondary education	-0.15***	0.219	-0.0529	30.40	Secondary education	-0.13***	0.219	-0.0451	29.13437	Secondary education	-0.014***	0.219	-0.0051	20.08
Higher education	-0.25***	0.6259	-0.0687	39.48	Higher education	-0.23***	0.6259	-0.063	40.69767	Higher education	-0.041***	0.6259	-0.0115	45.28
Scheduled Caste	0.08***	-0.1694	-0.0132	7.59	Scheduled Caste	0.09***	-0.1694	-0.0133	8.591731	Scheduled Caste	0.028***	-0.1694	-0.0044	17.32
Scheduled tribe	0.05***	-0.3467	-0.0049	2.82	Scheduled tribe	0.11***	-0.3467	-0.0111	7.170543	Scheduled tribe	0.086***	-0.3467	-0.0084	33.07
Other backward caste	0.04***	0.0386	0.0033	-1.90	Other backward caste	0.04***	0.0386	0.0035	-2.26098	Other backward caste	0.018***	0.0386	0.0016	-6.30
Hindu	0.08***	-0.0274	-0.0073	4.20	Hindu	0.04	-0.0274	-0.0036	2.325581	Hindu	-0.006	-0.0274	0.0006	-2.36
Muslim	0.08***	0.0921	0.0048	-2.76	Muslim	0.04	0.0921	0.0022	-1.42119	Muslim	-0.014	0.0921	-0.0008	3.15
Total Explained			-0.174	100	Total explained			-0.1548	100	Total explained			-0.0254	100
Residual			0.01381		Residual			-0.00587		Residual			-0.03003	
Total CI			-0.16019		Total CI			-0.16067		Total CI			-0.05543	

Decomposition of inequalities (CI) in nutritional status

Table 3 shows the results of the decomposition analysis of inequality in stunting in selected states. It shows the marginal effect, concentration index, and contribution to the inequality in stunting explained by the predictor variable. The positive marginal effect indicates that the explanatory factor has a positive association with stunting and has a higher likelihood of stunting and vice versa. The value of the percentage contribution indicates the extent of inequality contributed by explanatory variables. The results show a positive association of Rural children (+0.04), child with 2+brother and 2+ sister and 1 sibling composition (0.05 & 0.06 respectively), Birth order 3 and above, scheduled caste, scheduled tribes and Other backward classes (0.01; 0.08; 0.05; 0.04 respectively) with stunting in selected states. The positive percentage contribution indicates that the exploratory variable contributes to pro-poor inequality, which means poor individuals are more prone to be stunted. Results show that rural areas, other siblings, birth order 2, 3and above are the most significant and positive contributors to the inequality for stunting. The table also shows the marginal effect and CI for underweight. Results show a positive association of Rural children with marginal effect of (0.03), child with 2+brother and 2+ sister and 1 sibling composition (0.02 & 0.02 respectively), Birth order 3 and above, schedule caste, schedule tribes, Other backward classes, Hindu and Muslims (0.02; 0.09; 0.011; 0.04; 0.04; 0.04 respectively) with underweight in selected states. Secondary and higher education (29.13%; 40.69% respectively) are the most significant and positive contributor to inequality for underweight in selected states. Further, the table also shows the marginal effect and CI for wasting. Results show a positive association of Rural children with marginal effect of (0.002), child with 2+brother and 2+ sister and another sibling composition (0.02 & 0.02 respectively), Birth order 2 and 3& above, schedule caste, schedule tribes, Other backward classes, (0.038; 0.038; 0.044; 0.028; 0.086; 0.018 respectively) with wasting in selected states. Schedule tribe, Secondary and higher education (33.07%; 29.13%; 40.69% respectively) are the most significant and positive contributor in inequality for wasting in selected states.

Fig.1, 2 and 3show the inequality for stunting, wasting, and underweight among children in selected high and low fertility states combined. The concentration curve shows pro-poor inequality for stunting among children in both states.

DISCUSSION AND CONCLUSION

This study performs an empirical analysis to understand the scenario of child malnutrition in India and highlight its distributional features and major determinants. The study indicates the fact that an alarming proportion of undernutrition exists among Indian children and whose concentration was highest among boys and girls with 4 siblings and poor at the same time. Although India had impressive economic growth in the past years, the findings of the study suggest that India is still performing very poor in the field of maternal and child health. From a policy perspective, the measure should be promoted to reduce inequality between poor and non-poor in low fertility states so that more and more concentration of inequalities among poor could be avoided whereas greater attention needs to be laid towards improving the child health conditions in high fertility states. The study shows that substantially high level of undernourishment is found among the poor children who are an outcome of their poor economic condition whereas the presence of under-nutrition among comparatively better among non-poor families is perhaps due to influence of social factors like lack of awareness and improper feeding practice evident in previous studies (World Bank 2004). Though several kinds of literature prove that poverty is a basic influencing

factor causing persistence of under-nutrition in India; the rising level of inequality is slowing down the pace of progress which is also reflected in the slow reduction in under-nutrition level. The inequality in child's nutritional achievement by economic strata, the social group, is visible and need to be cured. Such removal will help to reach Millennium Development Goals further.

Further, this paper identifies the mediating characteristics that have a bearing on the nutritional status of the child. Simple bivariate and multivariate analysis were done to find out the difference in nutritional status (stunting, wasting or underweight) of children according to their sibling composition in high fertility and low fertility states. The use of this method allows quantifying the differences in the effects of determinants and their interaction. The results of the paper indicate that children in a poor household and having 4 siblings at the same time are consistently at a disadvantaged position in both high fertility states and low fertility states across nearly all determinants affecting childhood nutritional status. Here the distribution of individual characteristics like maternal education, religion, caste, and economic status are the important influencing factors in child nutrition.

Children whose mothers had completed secondary and higher education were at a higher probability of having less child malnutrition compared with children whose mothers had no formal education. These findings are consistent with previous. [(34)] This is probably because education provides the knowledge and awareness of rules of hygiene; feeding and weaning practices and the level and quality of nutrient intake according to the age of the child are clearly affected by maternal education and household economic status. Also, age of the child and birth order were observed to be important factors behind the poor nutritional status of the children, but if a mother is educated, can certainly be more efficient in childcare with limited resources in a household. There are also some ethnic and religious differences in the level of malnutrition, for instance, children from schedules tribes and castes experience high malnutrition. The effects of religion are more consistent, Muslim experience higher morbidity and malnutrition than Hindu as also reported by others, e.g. [(35)]

The study highlighted that children living in low fertility states are at a lower probability of having under 5 malnutrition rather than children living in high fertility states. The state or region's wealth also plays a major role in organization of health services, policies, and food availability. Previous studies have suggested that regional economic development is one of the potential sources of regional variation in malnutrition (stunting, wasting, and underweight). [(23)] Another study in India found that there is a significant variation in education between the regions of India after controlling for individual demographic factors, for instance in the high fertility states (northern states) in India like Uttar Pradesh, Bihar, etc. women have a very low level of education compared to low fertility (southern states) of India. However, even the socioeconomic and education status of the household in these states are related with the place where these women live, the results of this study demonstrate that regional variation also plays an important role influencing the nutritional outcomes of the children in India. [(36)]

Coming to the sibling composition and its association with nutritional status among children. Overall the findings suggest that the children with more surviving sibling in the household are more likely to be stunted, wasted and underweight as compared to children with less no. of sibling as mentioned in previous studies for instance, boys and girls with no older surviving siblings and those with only surviving siblings of the opposite sex were comparatively better than the others. [(25)] Further, to find the main contributors to inequality in nutritional status decomposition analysis was carried out and the findings from the analysis reveal that

child with 2+brother and 2+ sister and 1 sibling composition, birth order 3 and above, caste, religion are the main contributors in inequality for stunting, wasting and underweight in selected states in India. This study found an enormous unequal distribution of wealth, which was disproportionally concentrated particularly among women who live in a rural area. Also, women with secondary and higher education, 2+brother and 2+ sister and another sibling composition, birth order 2 and 3& above, belong to SCs and STs caste and both Hindu and Muslim religion have a high marginal effect on the malnutrition with high wealth inequalities in selected states in India.

The study presents a piece of strong evidence that economic condition of the family and the more no. of children in a household can transcend the demographic and social factors and cause malnutrition and other severe morbidities among children under five leading to high under-five mortalities. It is evident that higher order births among mothers and sibling composition above 4 and 2 often lead to neglect and unequal distribution of food and health care.

REFERENCES

1. Adegbola RA, Falade AG, Sam BE, Aidoo M, Baldeh I, Hazlett D, Whittle H, Greenwood BM, Mulholland EK. The etiology of pneumonia in malnourished and well-nourished Gambian children. The Pediatric infectious disease journal. 1994 Nov;13(11):975-82.
2. Conley D, Glauber R. Sibling similarity and difference in socioeconomic status: life course and family resource effects. National Bureau of Economic Research; 2005 May 9.
3. Steelman LC, Powell B, Werum R, Carter S. Reconsidering the effects of sibling configuration: Recent advances and challenges. Annual review of sociology. 2002 Aug;28(1):243-69.
4. Pelletier DL. The relationship between child anthropometry and mortality in developing countries: implications for policy, programs and future research. The Journal of nutrition. 1994 Oct 1;124(suppl_10):2047S-81S.
5. Rajaram S, Zottarelli LK, Sunil TS. Individual, household, programme and community effects on childhood malnutrition in rural India. Maternal & child nutrition. 2007 Apr;3(2):129-40.
6. Pathak PK, Singh A. Geographical variation in poverty and child malnutrition in India. Population, poverty and health: analytical approaches. 2009:183-206.
7. Bawdekar M, Ladusingh L. Contextual correlates of child malnutrition in rural Maharashtra. Journal of Biosocial Science. 2008 Sep;40(5):771-86.
8. Handa R, Ahamad F, Kesari KK, Prasad R. Assessment of nutritional status of 7-10 years school going children of Allahabad district: A review. Middle-east journal of scientific research. 2008;3(3):109-15.
9. IIPS O. National Family Health Survey (NFHS-3), 2005-06: India. Vol. I. Mumbai: International Institute for Population Sciences. 2007.
10. Mishra V, Roy TK, Retherford RD. Sex differentials in childhood feeding, health care, and nutritional status in India. Population and development review. 2004 Jun;30(2):269-95.
11. Nair KR. Malnourishment among children in India: A regional analysis. Economic and Political Weekly. 2007 Sep 15:3797-803.
12. Pathak PK, Singh A. Trends in malnutrition among children in India: growing inequalities across different economic groups. Social Science & Medicine. 2011 Aug 1;73(4):576-85.
13. Strauss AL, Corbin J, Fagerhaugh S, Glaser BG, Maines D, Suczek B, Wiener CL. Chronic Illness and the Quality of Life 2nd edn CV Mosby. St Louis. 1984.
14. Behrman JR, Wolfe BL. The socioeconomic impact of schooling in a developing country. The Review of Economics and Statistics. 1984 May 1:296-303.
15. Maluccio JA, Hoddinott J, Behrman JR, Martorell R, Quisumbing AR, Stein AD. The impact of improving nutrition during early childhood on education among Guatemalan adults. The Economic Journal. 2009 Mar 16;119(537):734-63.
16. United Nations Children's Fund (UNICEF). The state of the world's children 1998. Bringing science to bear. Oxford, UK: Oxford University Press, 1998.

17. United Nations Children's Fund, New York, NY. Strategy for Improved Nutrition of Children and Women in Developing Countries. A UNICEF Policy Review. ERIC Clearinghouse; 1990.
18. Getaneh T, Assefa A, Tadesse Z. Protein-energy malnutrition in urban children: prevalence and determinants. Ethiopian medical journal. 1998 Jul;36(3):153-66.
19. Engle P, Menon P, Garrett J, Slack A. Urbanization and caregiving: Evidence from South and Eastern Africa. San Luis, California: Department of Psychology and Human Development, California Polytechnic, Stat. University. 1996:4-24.
20. Basu AM. Is discrimination in food really necessary for explaining sex differentials in childhood mortality? Population studies. 1989 Jul 1;43(2):193-210.
21. Mishra VK, Lahiri S, Luther NY. Child nutrition in India.National Family Health Survey Subject Reports. 1999 Jun 1; 1: 5-35.
22. Chirwa EW, Ngalawa HP. Determinants of child nutrition in Malawi. South African Journal of Economics. 2008 Dec;76(4):628-40.
23. Madise NJ, Matthews Z, Margetts B. Heterogeneity of child nutritional status between households: a comparison of six sub-Saharan African countries. Population studies. 1999 Jan 1;53(3):331-43.
24. Melville B, Williams M, Francis V, Lawrence O, Collins L. Determinants of childhood malnutrition in Jamaica. Food and Nutrition Bulletin. 1988 Mar;10(1):1-6.
25. Gupta MD. Selective discrimination against female children in rural Punjab, India. Population and development review. 1987 Mar 1;13(1):77-100.
26. Chaudhuri A. Impact of Sibling Rivalry on the Nutritional Status of Children: Evidence from Matlab, Bangladesh. Bangladesh (July 18, 2008). 2008 Jul 18.
27. Muhuri PK, Preston SH. Effects of family composition on mortality differentials by sex among children in Matlab, Bangladesh. The Population and Development Review. 1991 Sep 1:415-34.
28. Mishra V, Roy TK, Retherford RD. Sex differentials in childhood feeding, health care, and nutritional status in India. Population and development review. 2004 Jun;30(2):269-95.
29. Arokiasamy P. Regional patterns of sex bias and excess female child mortality in India. Population. 2004;59(6):831-63.
30. Murthi M, Guio AC, Dreze J. Mortality, fertility, and gender bias in India: A district-level analysis. Population and development review. 1995 Dec 1:745-82.
31. IPS and ICF National Family Health Survey (NFHS-4), 2015–16. International Institute for Population Sciences, Mumbai, India. 2017
32. Wagstaff A, Doorslaer EV. Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993–1998. Health economics. 2003 Nov;12(11):921-33.
33. Speybroeck N, Konings P, Lynch J, Harper S, Berkvens D, Lorant V, Geckova A, Hosseinpoor AR. Decomposing socioeconomic health inequalities. International journal of public health. 2010 Aug 1;55(4):347-51
34. Streatfield K, Singarimbun M, Diamond I. Maternal education and child immunization. Demography. 1990 Aug 1;27(3):447-55.
35. Pandey A, Choe MK, Luther NY, Sahu D, Chand J. Infant and Child Mortality in India: National Family Health Survey Subject Reports Number 11. International Institute of Population Sciences: Mumbai. 1998.
36. Subramanian A. Are income-calorie elasticitys really high in developing countries? some implications for nutrition and income. [Unpublished] 2001. Presented at the International Union for the Scientific Study of Population IUSSP 24th General Conference Salvador Brazil August 18-24 2001.

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