

# Decomposing of Urban Poor / Non-Poor Differential in Childhood Malnutrition and Mortality in India, 2015-16

Ujjwal Das

Research Scholar, Department of Public Health and Mortality, International Institute for Population Sciences, Mumbai, INDIA

Corresponding Author: [ujjwaldas608@gmail.com](mailto:ujjwaldas608@gmail.com)

## ABSTRACT

### Background

The high level of childhood malnutrition due to mortality in India is a major hurdle impeding the achievement of the Sustainable Development Goals–3 (SDG–3). The present study aims to quantify the contribution of factors that explain the poor/non-poor gap in malnutrition and mortality status of children 0-5 years in urban India using data from 2015-16 of fourth round National Family Health Survey (NFHS-4).

### Methods

For understand the gap in child health between the urban poor and non-poor, and across the selected covariate were used the descriptive statistics. Furthermore Blinder–Oaxaca decomposition and non-linear Fairlie decomposition technique both were used to explain the factors contributing to the average gap in under nutrition between poor and non-poor children in urban India.

### Result

The result suggested that explained the gap urban poor/non-poor in nutritional indicator stunting and underweight were 40 and 46 percentage and childhood infant and under-five mortality were 40 and 48 percentage respectively. The maternal factor mainly for lower education contributed much more changed in child health status those are living in urban poverty.

### Conclusion

The overall finding indicate that children living poor household higher level malnutrition and mortality due to poor health status and poor education of mother, lower health care service and less exposed to mass media. This finding help to policy maker reducing the gap of child undernutrition between urban poor and the non-poor and low coverage of health services among the urban poor.

**Keywords--** Child Malnutrition, Blinder–Oaxaca, Fairlie Decomposition, Poverty

often coexistent, factors that together constitute what may be termed as the poverty syndrome (Gopalan 1992:18). More than poverty, neo-natal infections and disorders–responsible for nearly 75 per cent of child deaths in two regions:41 per cent in Sub-Saharan Africa and 34 per cent in South Asia –are an outcome largely of maternal malnutrition and mortality (Matthews, 2002, Black, Morris and Bryce, 2003).

The high level of childhood mortality due to malnutrition now a day has a new challenge in urban India. India has the highest number of malnourished children in the world with nearly 60 million children estimated to be underweight (Deaton & Dreze, 2009; Pathak & Singh, 2011).Data from the India’s nationally representative National Family Health Survey (NFHS) conducted 2015-16, an estimated 31.0%of children under five were stunted and 29.1%were underweight in urban India. Similarly the infant and under-five mortality in India 45 and 58 per thousand live births respectively. The higher level of health disparity in urban India due to the unequal wealth quintile and different type of distribution resources between urban poor and non-poor. Recent estimates show that about 31% of the Indian population were living in urban areas in 2011, which is almost five times higher than in 1951 (Census,2011). The explosive growth of urban population in India is mainly fuelled by poverty led rural to urban migration (Kumar and sing, 2013).This unprecedented growth of urban population creates alarming problems related to health and wealth into the urban areas of the country. According to the Urban Poverty in India Rangarajan committee report (2011), 27% of total urban population of India lives below the poverty line. For instance, those are young children mainly under age of five, from the disadvantage families are living congested space and bad environmental condition in urban area. Thus urban poor and slum dwelling children have higher levels of stunting and mortality than their non-poor and non-slum dwelling urban counterparts, respectively; urban poor children are more stunted but not more likely to die than their rural counterparts (Nolan, 2014). Victora et al., 2003 suggest that under-5 mortality rate among the richest households is only one-third of the rate found among the poorest households in India. The large gap in child mortality and morbidity between poor and rich household in countries relate to entrenched inequalities in income, and inequality access to health services and facilities. In a sense, these excessive socio-economic gaps between these group are

## I. INTRODUCTION

Improvement of the child health one of the key indicators towards the third goal of united nation sustainable development: A universal guarantee of a healthy life and well-being at all ages. In globally one-third of deaths among children under age of five are due to undernutrition (Nie et al., 2016). Undernutrition not only puts children at a greater risk of disease vulnerability, it also adversely affects of their physical, cognitive, and mental development (Barker, 1995). Similarly, it is also associated with a cluster of related,

not simply inequalities, they are also a mark of inequity—inequalities that are unjust and unfair (Victora et al., 2003:233).

The various factors are responsible for unparalleled high level malnutrition in India have been addressed by different authors. The proportion of children having low birth weight is higher risk among women who are not educated (Khadse, 2019). Similarly slum dwelling women are more likely to be underweight and they are more report worse maternal and child health indicators than their non-poor counterpart. Pathak and Singh (2011) demonstrate that child differences in nutritional outcomes have widened between rich and poor households, and that child nutritional outcomes are relatively better in areas where households have been able to access Integrated Child Development Services (ICDS). The prevalence of child malnutrition was also found different caste heterogeneity in India. Consequently, children born in disadvantaged castes (SC/ST) are facing the threat of poor health outcomes from high mortality to high malnutrition (Bora et al., 2018). The higher level of child malnutrition also highlighted by poor/non-poor gap health care utilization factor in urban India. Urban residents may be especially vulnerable to the higher cost of health services, which are often of poor quality and associated with unnecessary drug purchases (Das, 2007). In this context, it is crucial to identify the causes of child malnutrition among urban poor and find the adapted solutions.

From this above background present study examine the child under nutrition and mortality gap between urban poor and non-poor in India by using the cross sectional data on fourth round of National Family Health Survey in 2015-16. Blinder Oaxaca decomposition was used to decompose differences in a continuous variable (e.g., child undernutrition outcome) into a two part; one is that attributable to differences in the level of determinants, (explained part or endowments part) and another a part attributable to differences in the effect of the determinant on the child nutritional (unexplained part or coefficients part). Nonlinear decomposition, in essence, employs an extension of the BO decomposition for binary variables (e.g., underweight or stunting). The Oaxaca decomposition quantifies the contribution of each factor to the gap in the outcome, thus identifying which factors contribute most generating inequality between the two groups (O'Donnell, 2008). Identification of the factors responsible for the poor/non-poor gap in child undernutrition and mortality may help policy makers and reduce the gap for vulnerable group in India.

## II. DATA AND METHODS

The study used data from the fourth round of the National Family Health Survey conducted during 2015-16. The NFHS is equivalent to the worldwide Demographic and Health Survey (DHS) conducted in many other countries. It is a large-scale survey covering

about 99% of the population with the data designed to be representation for the whole country and the states. The design of the survey is a multistage stratified cluster sampling- for two sampling designs a rural area and three stage for urban area. From each state, primary sampling units (PSU) are drawn, employing probability proportional to size (PPS) systematic sampling and households are further drawn from the PSU following circular systematic sampling (Ladusing, 2007). The selection criteria of PSU in rural area is either a village or portion of a village and for urban area urban frame survey (UFS) block of the National Sample Survey Organisation (NSSO). The NFHS provides information on important indicators of maternal and child health, fertility and mortality. In this paper child- health related information and household socio-economic information was used for identifying decomposition gap of poor and non-poor in childhood undernutrition and mortality in urban India.

### 2.1 Outcome Variables

The outcome variables in present study are height for age (stunting), weight for age (underweight), infant mortality and under-five mortality. The nutritional indicator of stunting and underweight are measured in terms of standard deviation unit (Z score) from the median of the reference population. These indicators are based on a new international reference population recommended by the World Health Organization in April 2006 (WHO Multicenter Growth Reference Study Group, 2006). Form the number of sample size present study was restricted to 259,627 children below the age of five.

### 2.2 Explanatory Variables

The NFHS not provide direct information on income or consumption of households. However, NFHS-4 collects the information related to ownership of assets, consumer durable variables and infrastructure (sanitation facility and source of water), which can be proxy indicators of the household's wealth quintile. In that situation to overcome the problem identify the poor based on the officially accepted estimates consumption data of Rangarajan committee by the planning commission, Government of India, in 2011-12. Based on this report separate wealth index was created and defined 26 percent of urban population are living below poverty line as well as urban poor and else are non-poor.

The present study includes some socio-economic and health care predictor variables for the explaining the gap between urban poor and non-poor. These predictor variables are birth order (1; 2;  $\geq 3$ ), preceding birth interval (<24 months; 24-47 months;  $\geq 47$  months), sex of the child (male; females), mother's age at birth (15-24 years; 25-34 years;  $\geq 35$  years), mother's education (no education; primary; secondary and higher secondary); caste (SC/ST; OBC; others), religious (Hindu; Muslim and others), mother's received the at least four antenatal care (yes; no), delivery care (home; institutional) and exposer to mass media- radio, television and newspaper (at least one ; no).

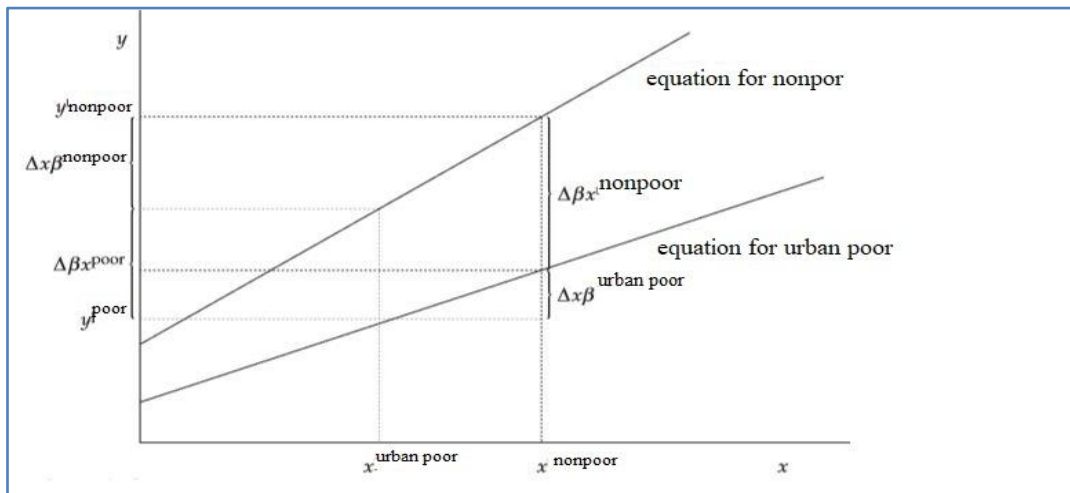
**2.3 Statistical Analysis**

The present study adopts a bivariate analysis for understand the gap in proportion of stunting, underweight, infant mortality and under-five mortality between urban poor and non-poor children in India in 2015-16. In the bivariate analysis child consider as stunting and underweight based on WHO standard definition. In the following WHO definition, if the child z score is less than minus two standard definition of these variables was classified as stunting and underweight respectively (a binary outcome indicating 1= stunting; 0= otherwise and so on). The measurement of childhood mortality have taken infant mortality rate (IMR) and under-five mortality rate (U5MR), these are important indicators of average population health and are widely used to document the progress in the achievement of the fourth Millennium Development Goal (MDG-4: a commitment to reduce under-five mortality by two-thirds, between 1990 and 2015). Whereas ‘infant’ and ‘under-five death’ was assigned a value of 1 if the child died before age 12 months and 59 months and 0 if the child was alive at least until age 12 months and 59 months respectively. Furthermore identifying the gap between poor and non-poor in nutritional measure and mortality

measure used the Blinder-Oaxaca and Fairlie non-linear decomposition technique in this analysis.

**2.4 Blinder-Oaxaca Decomposition Method**

The Blinder-Oaxaca decomposition technique is a useful method to explain the between-group differentials in outcome variables using a set of predictors. BO decomposition of child undernutrition over time is based on the assumption that the relation between child undernutrition and a set of socio-economic and demographic characteristics is linear and additive (Nie et al., 2016). One advantage of BO decomposition over regression analyses is that it quantifies the three relative contributions of specific factors accounting for the average gap in an outcome (Blinder, 1973; Oaxaca, 1973). These are (i) due to difference in the distribution of the determinants between the groups (poor and non-poor), (ii) due to difference in the effect of these determinants between groups (poor and non-poor) and (iii) the distributions of unobservable determinants. More specifically, it not only quantifies the distribution differences of factors that explain the average gap, it identifies the differences in these factors’ effects (Jann, 2008; Kumar & Singh, 2013). In the analysis total difference in poor and non-poor of child health can be decomposed as follows



$$y^{poor} = \beta^{poor} x^{poor} + e^{poor} \text{ if a child belong to urban poor household (1)}$$

$$y^{nonpoor} = \beta^{nonpoor} x^{nonpoor} + e^n \text{ if a child belong to non-poor household (2)}$$

The gap between the mean outcomes,  $y^{nonpoor}$  and  $y^{poor}$ , is equal to

$$Y^{nonpoor} - y^{u.poor} = \beta^{nonpoor} x^{u.poor} - \beta^{poor} - x^{u.poor} \text{ (3)}$$

It is clear that the gap between the two outcomes could be express in either two ways:

$$y^{nonpoor} - y^{u.poor} = \Delta x \beta^{u.poor} + \Delta x \beta^{nonpoor} \text{ (4)}$$

$$\Delta x = x^{nonpoor} - x^{u.poor} \text{ and } \Delta \beta = \beta^{nonpoor} - \beta^{u.poor}, \text{ or as}$$

$$y^{nonpoor} - y^{u.poor} = \Delta x \beta^{nonpoor} + \Delta \beta x^{u.poor} \text{ (5)}$$

The decomposition equation (4) and (5) can be written as

$$y^{nonpoor} - y^{u.poor} = \Delta x \beta^{u.poor} + \Delta \beta x^{u.poor} + \Delta x \Delta \beta$$

$$= E + C + CE$$

So that the gap in mean outcome can be thought of as deriving from a gap in endowments (E), refer to contribution attributable to the difference in distribution of the determinants x between urban poor and non-poor, a

gap in coefficients (C), refer to gap attributable to the difference of effect x between urban poor and non-poor, and (CE) refers to gap arising from the interaction of endowments and coefficients.

**2.5 Fairlie’s Non-Linear Decomposition**

In this paper using standard BO decomposition to a linear probability model provides misleading estimates when dependent variables are binary, particularly if the group differences for an influential independent variable are relatively large (Fairlie, 2016). In prior research work Poel, 2009 suggest that BO decomposition technique, intercept differences are not particularly helpful in pinpointing the source of rural-urban disparities in infant mortality since they provide no

information on the level at which unobservable operate. In this, cases it is better to apply extension of Blinder Oaxaca non-linear decomposition technique (Fairlie, 1999), which is contributes the socio-economic and demographic factor for identifying the gap between urban poor and non-poor for our binary dependent variables. So the decomposition of non-linear function ,  $Y = F(X_i\beta)$  can be express as

$$\bar{Y}^{nonpoor} - \bar{Y}^{poor} = \sum_{n=1}^{N^{poor}} \left( \frac{F(X_{i,poor} \hat{\beta}^{nonpoor})}{N^{poor}} \right) - \sum_{n=1}^{N^{nonpoor}} \left( \frac{F(X_{i,nonpoor} \hat{\beta}^{nonpoor})}{N^{nonpoor}} \right) + \sum_{n=1}^{N^{poor}} \left( \frac{F(X_{i,poor} \hat{\beta}^{poor})}{N^{poor}} \right) - \sum_{n=1}^{N^{nonpoor}} \left( \frac{F(X_{i,poor} \hat{\beta}^{nonpoor})}{N^{nonpoor}} \right) \quad (6)$$

Where denotes the sample size of each wave (j = poor, non-poor). Two aspects are worth noting: First, the BO decomposition in equation (1) is a special case of equation (6) where,  $F(X_i\beta) = X_i\beta$  Second, in equations (1) and (6), the first (explained) term on the right indicates the contribution resulting from a difference in the distribution of the determinant of X, and the second (unexplained) term refers to the part attributable to a difference in the effect of the determinants. Equally noteworthy, the second term captures all the potential effects of differences in unobservables (Fairlie, 2016). In Fairlie decomposition focus on the explained terms and their disaggregated contribution for individual covariates, thus it is very difficult the interpreting unexplained part (Nie et al., 2016). The contribution of a variable is given more weightage in the average change in function of the variables, when the all other variables remain same.

**III. RESULTS**

Figure 1 depicts the prevalence of stunting, underweight, infant mortality and under-five mortality rate among the poor and non-poor children in urban India. The differences child health status among the urban poor and non-poor was very stark. The overall prevalence of stunting and underweight children’s among the urban poor was 42.5% and 39.9%. The corresponding prevalence for urban non-poor was 25.5% and 24.1% respectively. Similarly the children’s belong to urban poor family higher chances of mortality than non-poor family. The infant mortality rate for urban poor 47 per thousand and non-poor was 26 per thousand live birth live births in 2015-16 respectively. The situation of under-five mortality was 58 and 31 per thousand live births among the urban poor and non-poor respectively.

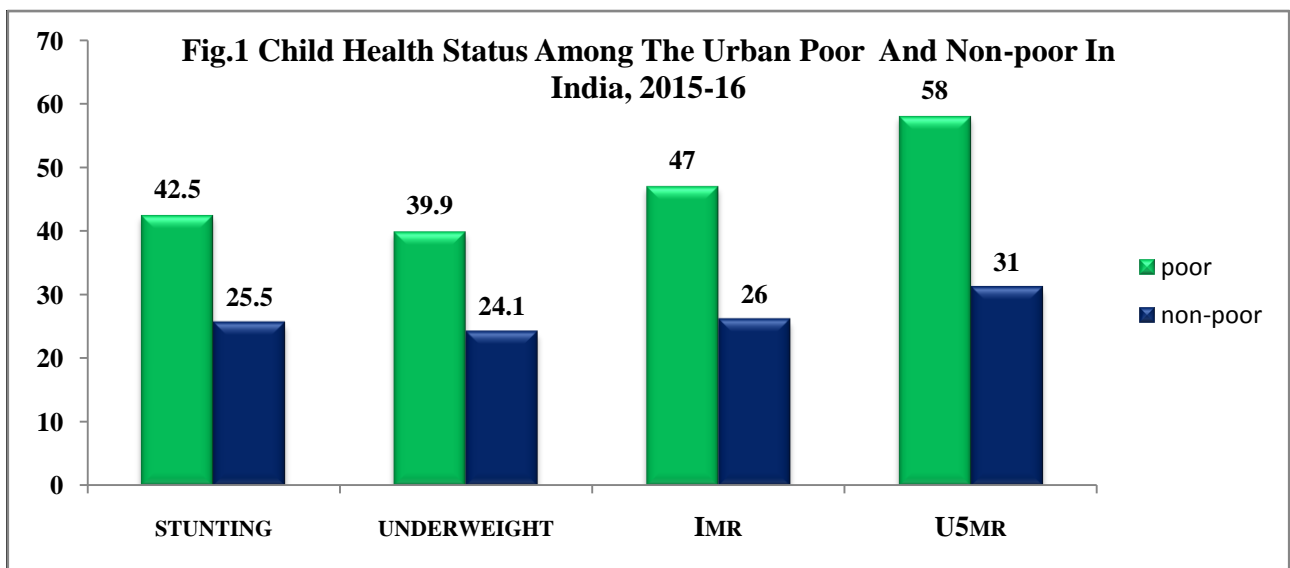


Table 1 shows the differences in selected background characteristics of children belonging to the urban poor and non-poor in India. In general poor children belong to less educated parents lower maternal ages of birth, less likely use to health service and less

exposed to mass media thus the risk of child malnutrition and childhood mortality are higher among the urban poor household than non-poor household. For example that mother age of child birth below 20 years the risk of stunting and underweight among the poor was 40 % and

37 % and non-poor was 29% and 26% respectively. The corresponding risk of under-five mortality among the

poor was 57 per thousand and non-poor 28 per thousand live births respectively.

**Table 1:** Difference in selected background characteristics among children across the poor and non-poor in urban India, 2015-16

Variables	HAZ (%)		WAZ (%)		IMR (Per 1000 live births)		U5MR (Per 1000 live births)	
	Poor	Non-poor	Poor	Non-poor	Poor	Non-poor	Poor	Non-poor
Children of small size at birth	46.82	30.31	45.18	30.5	44	38	70	42
Birth order <3	45.01	30.04	40.13	26.46	50	31	74	37
Mother age at birth <20 year	40.02	28.18	36.68	25.97	46	23	57	28
Preceding birth interval <24 month	48.71	32.44	43.43	29.35	59	30	73	36
Mother's education with higher secondary	26.75	19.16	22.95	16.99	52	12	65	16
Mother's received the antenatal care	38.25	24.5	35.23	22.21	28	12	37	15
Intuitional delivery	38.81	22.49	33.95	20.74	48	17	58	22
Mother's have exposed to mass media	39.29	25.11	35.24	22.88	43	21	56	26

### 3.1 Result of the Decomposition Analysis

For explaining the urban poor and non-poor gap among the selected child health variables the Blinder-Oaxaca decomposition technique was used. The check for evidences of differences in the effect of determinants, a regression analysis was carried out separately for height for age, weight for age z score, infant mortality and under-five mortality. Table 2 represent decomposition of urban poor –non poor malnutrition and mortality gap into three parts. The first part known as endowment effect and claimed a gap due to the difference in the level of determinants between urban poor and non-poor, the second part is a gap due to the difference in the effect of

the coefficients and third part is a gap due to the interaction between both – endowment effect and coefficient effect. The result shown for endowments and coefficient for those children higher z score gap for height for age and weight for height. And interaction component indicates the simultaneous effect of the disparities in the magnitude of the determinants and coefficients of child health status between urban poor and non –poor. For instance endowments effect 0.087for height for age and 0.076 for weight for height, and coefficient effect accounted 0.092 and 0.079 for height for age and weight for height between urban poor and non-poor.

**Table 2:** Threefold Decomposition

Differential	HAZ	WAZ	IMR	U5MR
Poor	0.426*** [0.411-0.441]	0.396*** [0.237 - 0.261]	0.029*** [0.025 - 0.034]	0.033*** [0.028 - 0.037]
Non-Poor	0.271*** [0.259 -0.283]	0.249*** [0.237 - 0.261]	0.014*** [0.012 - 0.016]	0.015*** [0.013 - 0.018]
Difference	0.155*** [0.136 - 0.186]	0.147*** [0.118 - 0.178]	0.015*** [0.010 - 0.020]	0.017*** [0.012- 0.023]
Decomposition				
Endowments (E)	0.087*** [0.049 - 0.102]	0.076*** [0.067 - 0.084]	0.005*** [0.002 - 0.049]	0.006*** [0.002 - 0.012]
Coefficients (C)	0.092*** [0.086 - 0.125]	0.079*** [0.039 - 0.092]	0.008*** [0.001 - 0.047]	0.010*** [0.05 - 0.056]
Interaction (CE)	-0.024** [-0.053 - 0.005]	-0.009 [-0.037- 0.020]	0.002 [0.006 - 0.009]	0.001 [0.007 - 0.009]
N	25,225	25,225	28,517	28,517

Note: \*p<0.05, \*\*p<0.01, \*\*\*p<0.001

The result show that child health z score differential higher in stunting (height for age) followed by underweight (weight for height) and under-five mortality. The average height-for-age was 0.426 among urban poor, compared to 0.271 among non-poor. Similarly, the average weight-for-height was 0.396 among the urban poor and 0.249 among non-poor. For considering the infant mortality among the poor was 0.029 and 0.014

among non-poor in urban India. The difference in the mean effects is reflected in the difference in the intercepts of urban poor and non-poor specific regressions. But these intercept differences are not particularly helpful in pinpointing the source of poor-non poor disparities in infant mortality and under-five mortality since they provide no information on the level at which unobservables operate (Poel et al., 2009).

**Table 3:** Decomposition results of the urban poor non-poor gap in malnutrition and mortality with different weighting schemes

Panel A		HAZ			
D:	0	1	0.5	0.348	*
Unexplained (U){C+(1-D)CE}:	0.068	0.092	0.08	0.077	0.051
Explained (V) {E+D*CE}:	0.087	0.063	0.075	0.078	0.104
% unexplained {U/R}:	44.1	59.4	51.8	49.4	33.2
% explained (V/R):	55.9	40.6	48.2	50.6	66.8
Panel B		WAZ			
Unexplained (U){C+(1-D)CE}:	0.071	0.079	0.075	0.074	0.051
Explained (V) {E+D*CE}:	0.076	0.068	0.072	0.073	0.096
% unexplained {U/R}:	48	53.9	51	50.1	34.6
% explained (V/R):	52	46.1	49	49.9	65.4
Panel C		IMR			
Unexplained (U){C+(1-D)CE}:	0.01	0.008	0.009	0.009	0.006
Explained (V) {E+D*CE}:	0.005	0.007	0.006	0.006	0.01
% unexplained {U/R}:	64.2	52	58.1	60	36.4
% explained (V/R):	35.8	48	41.9	40	63.6
Panel D		U5MR			
Unexplained (U){C+(1-D)CE}:	0.011	0.01	0.011	0.011	0.007
Explained (V) {E+D*CE}:	0.006	0.007	0.007	0.006	0.011
% unexplained {U/R}:	65	59.1	62.1	63	38.1
% explained (V/R):	35	40.9	37.9	37	61.9

Table 3 presents results of the Oaxaca decomposition, using different weights, for both child undernutrition and mortality. The first and second columns reflect the decomposition in Eqs. 1 and 2, in which the matrix of weights (D) has a diagonal of weights equals 0, and equals one respectively. The Reimers (1983), and Cotton (1988) decomposition are in the third and fourth columns respectively. The last column, named

\*, refers to Neumark (1988) decomposition, which uses pooled regression coefficients. The result of table 3 suggested that contributions of HAZ and WAZ the equal weight one explained part are 41% and 46% respectively. The corresponding explained part of infant and under-five mortality are 48 % and 41% between poor and non-poor gap in urban India 2015-16.

**Table 4:** Which covariates explain most of the urban poor non-poor gap in child health in India?

Variables	HAZ		WAZ		IMR		U5MR	
	Gap	% cont.	Gap	% cont.	Gap	% Cont.	gap	% Cont.
Birth order	-0.003*** (0.004)	-1.94	0.002 (0.004)	1.36	0.004*** (0.001)	26.67	0.004*** (0.001)	23.53
Preceding birth interval	0.013*** (0.002)	8.39	0.011*** (0.002)	7.48	0.001** (0.007)	6.67	0.001** (0.0007)	5.88
Sex of the child	0.00 (0.000)	0.00	0.000 (0.0002)	0.00	0.0002 (0.0004)	0.00	0 (0.000)	0.00

Mother age	-0.003*** (0.001)	-1.94	-0.002** (0.001)	-1.36	0.0001 (0.0004)	0.00	0.0002* (0.0004)	0.00
Mother education	0.025*** (0.008)	16.13	0.032*** (0.008)	21.77	0.00004 (0.003)	0.00	0.0001** (0.003)	0.00
Religion	0.00 (0.000)	0.00	0.000 (0.0002)	0.00	0.0 (0.000)	0.00	0 (0.000)	0.00
Caste	0.005* (0.003)	3.23	0.005* (0.003)	3.40	0.001 (0.0008)	6.67	0.001 (0.0008)	5.88
Antenatal care	0.002 (0.002)	1.29	0.000 (0.002)	0.00	0.001 (0.0008)	6.67	0.0011** (0.0008)	5.88
Delivery care	0.014** (0.006)	9.03	0.016*** (0.006)	10.88	-0.001 (0.002)	-6.67	-0.0014 (0.002)	-5.88
Mass media	0.01*** (0.004)	6.45	0.004 (0.004)	2.72	0.001 (0.001)	6.67	0.0013 (0.001)	5.88
Total	0.063	<b>40.6</b>	0.068	<b>46.1</b>	0.007	<b>48</b>	0.007	<b>40.9</b>

Note: The dependent variables are height for-age (HAZ), and weight-for-age (WAZ). Standard errors are in parentheses. \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

Table 4 present the contribution of each determinant in the overall explained urban poor non-poor gap in India in different child health predictor variables, thus identify which factor explains most of the overall gap. A negative contribution indicates that the determinant has narrowing the gap between the poor and non-poor and vice-versa. As regards the separate contributions to the explained part, maternal education is the most important contributor to the improvement in the average values of HAZ (16%) and WAZ (22%). On the other hand birth order play the over whelming role for increasing infant mortality (27%) and under-five mortality (24%). In addition, the contribution of birth order, birth interval, caste, and mass media was also significant over the study period for both child nutrition and mortality. For instance, in height for age z score, the contribution of preceding birth interval was 8%, caste was 3%, delivery care was 9% and mass media was 6%. Similarly weight for height z score, preceding birth interval contributed 7%, cate contributed 3%, delivery care contributed 11% and mass media 3% in the gap. It is important to note that, the contribution of mother age is decreasing for child malnutrition while the contribution of delivery care is decreasing childhood mortality over the study period. But we do not find any significant

impact of gender and religion discrimination on the urban poor –non poor gap in childhood malnutrition and mortality in India.

### 3.2 Fairlie Nonlinear Decomposition Estimates

The results of Fairlie non-linear decomposition are presented in table 5. As can be seen, the contributions of the explained part vary substantially for the different measures of child under nutrition and childhood mortality: 39% for stunting, 47% for underweight, 44% for infant mortality and 48% for under-five mortality. For the individual contribution of each dimension in the explained part, mother education status uniformly explains the largest proportion of improvements in stunting, underweight, infant mortality and under-five mortality, with contributions of 22%, 28%, 19%, and 25% respectively. The maternal characteristics like preceding birth interval explained 6% of stunting, 5% of underweight, 10% of infant mortality and 8% of under-five mortality. For considering the antenatal care contributed 2 % for stunting, 1 % for underweight, 4% and 3% for infant and under-five mortality respectively. On the other hand variables of religion, caste, delivery care and mass media play the important role for decreasing the infant mortality in over the study periods in urban India.

**Table 5:** Non-linear decomposition of socio-economic differences in stunting, underweight and IMR, U5MR among Indian children under five: Urban poor- Non-poor

Decomposition	Stunting	%	Underweight	%	IMR	%	U5MR	%
Poor	0.414		0.376		0.031		0.034	
Non-poor	0.265		0.238		0.018		0.020	
Total difference	0.149		0.138		0.013		0.014	
Explained	0.058	39	0.065	47	0.006	44	0.007	48
Unexplained	0.091	61	0.073	53	0.007	56	0.007	52
<b>Explained part</b>								
Birth order	0.0026 (0.002)	1.76	0.0044* (0.002)	3.16	0.002*** (0.0007)	18.78	0.002*** (0.000)	17.32

Preceding birth interval	0.0089*** (0.001)	5.98	0.0076*** (0.001)	5.49	0.001*** (0.0004)	10.35	0.001*** (0.0003)	8.38
Sex of the child	-0.0003*** (0.00)	-0.18	-0.0002** (0.0001)	-0.17	0.000 (0.00)	0.29	0.000 (0.00)	0.19
Mother age	-0.0018*** (0.005)	-1.20	-0.0008* (0.0004)	-0.61	0.000 (0.00)	1.06	0.000 (0.0002)	1.28
Mother education	0.0329*** (0.005)	22.09	0.0390*** (0.005)	28.33	0.003 (0.002)	19.94	0.003** (0.002)	24.57
Religion	0.0005*** (0.0001)	0.35	0.0016*** (0.0002)	1.15	-0.000 (0.00)	-0.12	0.000 (0.00)	0.02
Caste	0.0011 (0.002)	0.76	0.0014 (0.002)	1.03	-0.000 (0.0004)	-1.22	-0.0001 (0.0004)	-0.73
Antenatal care	0.0033** (0.001)	2.19	0.0001 (0.001)	0.08	0.001 (0.0005)	4.32	0.001 (0.0005)	3.73
Delivery care	0.0039 (0.003)	2.60	0.0033 (0.003)	2.39	-0.001 (0.0009)	-7.90	-0.001 (0.0009)	-7.24
Mass media	0.0070** (0.007)	4.69	0.0088*** (0.003)	6.36	0.000 (0.0009)	-1.16	0.000 (0.0008)	0.93
Number of replications	100		100		100		100	

Note: Standard errors are in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

#### IV. DISCUSSION

High levels of malnutrition and mortality among the children in India compared to other developing countries have been since long a much-debated issue in literature. Not only is India the largest contributor to the critical public health problem of wasting in South Asia (UNICEF, 2013), but it has the worst record for stunting in children under five. Our study comprehensively investigated that determines of child malnutrition and mortality in India due to poverty- undernutrition linkage. For this purpose we used the Blinder Oaxaca and fairile non liner decomposition technique for identifying urban poor and non-gap in child malnutrition and mortality. Result of Oaxaca decomposition showing contribution of differences in the distribution of the determinants (endowments effects) of z-score gap between urban poor and non-poor population, 2015-16 ; *second*, it identifies the factors responsible for the poor-non poor gap in childhood malnutrition and mortality, and quantifies their contribution in explaining the gap. The result of the study explained the gap Stunting 46%, underweight 41%, infant mortality 48% and under-five mortality 41%. All the child health predictor variables were not explaining the gap more than 50%. It is clear that the very high levels of malnutrition among children and no significant association between poverty and child malnourishment (Arief et al., 2014). Another study *Bhatet et al.*, 1999 found that poverty may not solely be the determinant of child malnutrition, because child health may also depend on the dietary pattern, calorie intake and not merely on the standard of living of households. Although the prevalence of childhood undernutrition was higher among the children of urban poor than the non-poor. The pattern remained consistent across the selected background characteristics. Both decomposition techniques (BO and non-linear) indicate that mother education status

consistently makes the largest contribution to the explained part of all four child health variables.

The results of our analysis reveal that maternal education is the dominating factor which direct and indirect effects on reducing risks of child malnutrition. Maternal education might lead to better nutritional practices, higher knowledge of health issues and empowerment within the household all of which might contribute to better health status of children (Miller & Rodgers, 2009). It is also evident that lower prevalence of malnutrition among the children of educated mothers in India (Mazumdar, 2010). So it is indicative that the probable poverty-illiteracy nexus intensifying malnutrition.

Malnutrition among Indian children under five years of age rises steadily with age, similar to other developing country settings (Wagstaff and Watanabe 2000, Mishra et. al. 1999, Nair 2007). However, no significant sex and religious differential in malnutrition was noted due to urban poverty, which, in a society known for gendered norms in household food allocation and care practices for children, is surprising (Mazumdar,2010). This area warrants micro-level investigation to identify the reasons behind such observed paradox. Consider to demographic factor higher parity and older children are more prone to malnutrition, whether short birth intervals in areas that accounts for almost 8% of the gap of stunting underweight. Higher parity may influence children malnutrition through the division of household resources and care in the presence of many siblings in the households (Kumar & Ram, 2012; Lalou & Mbacke, 1992; Sereebutra, Solomon, Aliyu, & Jolly, 2006). Childbearing at a younger or adolescent age is significantly associated with higher risk of malnutrition. It may be because of the biological immaturity of the mother or because of her poor



nutritional status in the poor household (Kumar and Kumari, 2014).

The result of the decomposition analysis reflects more or less a similar pattern in the contribution of the factor explaining the gap in infant and under-five mortality between urban poor and non-poor. It shows that particular birth order, preceding birth interval and mother education were the most important contributors explaining the gap in infant and under-five mortality between urban poor and non-poor. The negative contribution of delivery care indicates that it has a more protective effect on childhood mortality among the urban poor. On the other hand sex of the child, religion was play a negligible role for increasing the under-five mortality. Although the unexplained part of mortality was higher than explained part that indicates the poverty is not fully associated with mortality among the urban poor and non-poor gap. Because the urban children suffer from illnesses particularly diarrhoea, food availability even though their dietary requirements are met, cannot grow robustly as excessive nutrition losses occur during the frequent episodes of disease (Rosenberg, Soloman, and Schneider, 1977). The frequent episodes of diarrhoea account for high neonatal and infant mortality, which is the second most killing disease among children in world UNICEF, 2011).

In the event of an acute health episode, however, children under five years old appear more likely to be able to avert death in urban areas than in rural areas, regardless of household deprivation and/or poor environmental living conditions (Nolan et al., 2014). This may reflect the urban poor people less likely use the health services because of the cost and quality of the services provided present significant issues. The health services accessed by the poor are of particularly poor quality – private providers located in their areas often have little or no medical training. The lack of motivation among the health providers and poor communication between health care providers and patients is also among important hurdles in utilization of MCH services by the urban poor in India (Matthews Z et al, 2010 and Wiley, 2002).

## V. CONCLUSION AND POLICY IMPLICATIONS

This paper examines decomposed and underlying differential factor of malnutrition among children under the age of five in India and the linkage between poverty and socioeconomic inequality and undernutrition. The result highlighted that the poor and vulnerable section of Indian population disproportion burden of child malnutrition in India. But the undernourished of the children belong to the poor household not only because of poverty, but also other factor like maternal health care service, dietary pattern, mother BMI index and poor educational status of the mothers, which is arrived at application of decomposition

technique on most recent household survey data in India. This finding informs and guide to policy maker reducing the gap of child undernutrition between urban poor and the non-poor, low coverage of health services and mother's education should be addressed among the urban poor. Based on the findings, the study suggest the mission of the National Urban Health Mission (NUHM) should be targeted toward removing the malnutrition level with improved health and nutritional status of the urban poor population, particularly slum dwellers and other disadvantaged sections (NUHM, 2010). Furthermore the NUHM should be addressed the economic growth for removal socio-economic inequity between urban poor and non-poor population which is not only reduce poverty but also contribute overall burden of child health (particularly underweight, infant mortality) in urban India. In another public health intervention program like National Nutrition Mission (NNM), National Midday Meal Scheme, the Integrated Nutrition and Health Program may have contributed to the improve child health status among the vulnerable people in India.

## AUTHOR'S CONTRIBUTIONS

I am solely responsible for the conception and design of the study. I fully and independently both carried out of the empirical analysis and interpreted the results of the manuscript. In addition, I am also fully responsible for any concept and ideas within the paper. I read and approved the final manuscript.

### *Authors' Information*

The author is a MPhil Researcher in population studies in IIPS.

### *Funding*

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## REFERENCES

- [1] Arif, G. M., Farooq, S., Nazir, S., & Satti, M. (2014). Child malnutrition and poverty: the case of Pakistan. *The Pakistan Development Review*, 53(2), 99-118.
- [2] Barker, D. J. (1995). Fetal origins of coronary heart disease. *British Medical Journal*, 311, 171-174.
- [3] Bhat, P. N. Mari & Xavier, Francis. (1999). Findings of national family health survey—Regional analysis. *Economic and Political Weekly*, 34, 3008-3032.
- [4] Black, R. E., Morris, S. S., & Bryce, J. (2003). Where and why are 10 million children dying every year?. *The Lancet*, 361(9376), 2226-2234.
- [5] Blinder AS. (1973). Wage discrimination: reduced form and structural estimates. *Journal of Human Resources*, 8, 436-455.
- [6] Bora, J. K., Lutz, W., & Raushan, R. (2018). Contribution of education to infant and under-five mortality disparities among caste groups in India (No.

- 03/2018). *Vienna Institute of Demography*. Working Papers.
- [7] Cotton J. (1998). On the decomposition of wage differentials. *Rev Econ Stat.*, 70(2), 236–243.
- [8] Das J & Hammer J. (2007). Location, location, location: Residence, wealth, and the quality of medical care in Delhi, India. *Health Affairs*. 26(3), 338-351.
- [9] Deaton, A. & Dréze., J. (2009). Food and nutrition in India: Facts and interpretations. *Economic and Political Weekly*, 44, 42–65.
- [10] Fairlie, R.W. (2016). Addressing path dependence and incorporating sample weights in the nonlinear blinder-oaxaca technique for logit, probit and other nonlinear models. *University of California: Santa Cruz, CA, USA*, pp. 1–23.
- [11] Gopalan C. (1992). Under-nutrition: Measurement and implications. In: OSMANI, Siddiq (ed.) *Nutrition and Poverty*, Oxford University Press, New Delhi, pp. 17-47.
- [12] Jann B. (2008). The blinder-oaxaca decomposition for linear regression models. *The Stata Journal*, 8(4), 453–479.
- [13] Khadse, R. P. & Chaurasia, H. (2019). *Nutrition status and inequality among children in different geographical regions of Maharashtra, India*. Available at: [https://cegh.net/article/S2213-3984\(18\)30344-0/pdf](https://cegh.net/article/S2213-3984(18)30344-0/pdf).
- [14] Kumar A & Ram F. (2012). Influence of family structure on child health: Evidence from India. *Journal of Biosocial Science*. Available at: <https://www.doi.org/10.1017/S0021932012000764>.
- [15] Kumar, A. & Kumari, D. (2014). Decomposing the rural-urban differentials in childhood malnutrition in India, 1992–2006. *Asian Population Studies*, 10(2), 144-162.
- [16] Kumar, A. & Singh, A. (2013). Decomposing the gap in childhood undernutrition between poor and non-poor in urban India. *PLoS One*, 8(5), 2005–2006.
- [17] Lalou, R. & Mbacke, C. (1992). The micro consequences of high fertility on child malnutrition in Mali. Fertility, family size and structure. *New York: Population Council*, pp. 193-223.
- [18] Ladusingh, L. & Holendro Singh, C. (2007). Rich-poor gap in maternal care: the case of northeast India. *Asian Population Studies*, 3(1), 79-94.
- [19] Matthews, Z., Channon, A., Neal, S., Osrin, D., Madise, N., & Stones, W. (2010). Examining the “urban advantage” in maternal health care in developing countries. *PLoS Medicine*, 7(9).
- [20] Mazumdar, S. (2010). Determinants of inequality in child malnutrition in India. *Asian Popul. Stud.*, 6, 307–333.
- [21] Miller, J. E. & Rodgers, Y. V. (2009). *Mother’s education and children’s nutritional status: New evidence from Cambodia*. Available at: <https://econpapers.repec.org/article/risadbdr/2615.htm>.
- [22] Mishra, V.K., S. Lahiri, & N.Y. Luther. (1999). Child nutrition in India. *National Family Health Survey Subject Reports*.
- [23] Nie, P., Rammohan, A., Gwozdz, W., & Sousa-Poza, A. (2019). Changes in child nutrition in India: A decomposition approach. *International Journal of Environmental Research and Public Health*, 16(10), 1815.
- [24] Nair, K.R.G. (2007). Malnourishment among Children in India: A Regional Analysis. *Economic and Political Weekly*, pp. 3797-3803.
- [25] National Urban Health Mission. (2010). National urban health mission draft. *Urban Health Division, Ministry of Health and Family Welfare, Government of India, New Delhi*. Available at: [http://mohfw.nic.in/NRHM/Documents/Urban\\_Health/UH\\_Framework\\_Final.pdf](http://mohfw.nic.in/NRHM/Documents/Urban_Health/UH_Framework_Final.pdf).
- [26] Neumark D. (1998). Employers’ discriminatory behaviour and the estimation of wage discrimination. *J Hum Resource*, 23, 279–295.
- [27] Nolan, L., Balasubramanian, P., & Muralidharan, A. (2014). Urban poverty and health inequality in India. In: *Population Association of America Annual Meeting, Boston, MA*.
- [28] Oaxaca R. (1973). Male-female wage differentials in urban labor markets. *International Economic Review*, 14, 693–709.
- [29] Pathak, P. K. & Singh, A. (2011). Trends in malnutrition among children in India: Growing inequalities across different economic groups. *Social Science & Medicine*, 73, 576–585.
- [30] Rosenberg, I. H., Solomons, N. W., & Schneider, R. E. (1977). Malabsorption associated with diarrhea and intestinal infections. *The American Journal of Clinical Nutrition*, 30(8), 1248-1253.
- [31] Sereebutra, P., Solomons, N., Aliyu, M. H., & Jolly, P. E. (2006). Socio demographic and environmental predictors of childhood stunting in rural Guatemala. *Nutrition Research*, 26(2), 65-70.
- [32] United Nations Children’s Fund. (2013). *Improving child nutrition: The achievable imperative for global progress*. New York: UNICEF.
- [33] Victora, C. G., Wagstaff, A., Schellenberg, J. A., Gwatkin, D., Claeson, M., & Habicht, J. P. (2003). Applying an equity lens to child health and mortality: More of the same is not enough. *The Lancet*, 362(9379), 233-241.
- [34] Wagstaff, A. & N. Watanabe. (2000). Socioeconomic Inequalities in Child Malnutrition in the Developing World. *Policy Research Working Paper, WPS 2434*, Development Research group, The World Bank: Washington D.C.
- [35] Who Multicentre Growth Reference Study Group (2006). *WHO Child Growth Standards*. Available at: [https://www.who.int/childgrowth/standards/Technical\\_report.pdf](https://www.who.int/childgrowth/standards/Technical_report.pdf).
- [36] Wiley A. (2002). Increasing use of prenatal care in Ladakh (India): The roles of ecological and cultural factors. *Social Science & Medicine*, 55(7), 1089–1102.