

# Socio-economic disparity's impact on child malnutrition in India: An empirical Analysis.

A seminar report

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Anisha Gauhar

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Under guidance of:

Prof. Vikram Dayal

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## Introduction

In recent decades, childhood malnutrition has emerged as a pressing public health issue, particularly in low and middle-income countries. Alarming statistics from the United Nations Children's Fund (UNICEF) reveal a global predicament: approximately 165 million children under the age of 5 suffer from stunting (low height for age), 101 million experience underweight (low weight for age), and 52 million are affected by wasting (weight for height). Furthermore, according to United Nations (UN) estimates, India, in particular, has grappled with a substantial burden—approximately 6.3 million children under the age of five have succumbed to mortality, with 45% of these tragic deaths attributed to malnutrition.

India stands at the forefront of this crisis, accounting for over 61 million stunted children, 47 million underweight children, and 25 million wasted children. Recent data from the National Family and Health Survey (2015–16) underscores the gravity of the situation, with 38% of Indian children under the age of five experiencing stunting, 36% grappling with underweight conditions, and 18% confronting wasting.

Horton has underscored that malnutrition is not just a health concern but also a critical developmental challenge, impacting both human and economic dimensions. The repercussions of childhood malnutrition extend beyond health, they permeate into socio-economic realms, perpetuating a cycle of poor nutrition, increased disease burden, and heightened poverty levels. Extensive research has shed light on both short-term and long-term consequences of early childhood malnutrition in developing countries. Short-term effects include a weakened immune system, heightened vulnerability to diarrheal diseases, acute respiratory infections, and developmental delays in motor skills and cognitive and social domains during childhood. Long-term implications encompass chronic health issues such as high blood pressure, obesity, diabetes, and heart diseases during adulthood.

Nutritional status is deep-rooted with generational consequences. It is often observed that somebody's food intake is by another choice. The mind is connected to the body and the body requires nutritional support on time. These are generally nurtured from childhood and then there comes the food practices along with various factors that affect the child's nutritional health status. Nutrition is the provision of adequate energy and nutrients to the cells which enable them to perform their function of growth, reproduction, repair, etc. Malnutrition is the result of a lack or an excess in the furnishing of energy or nutrients to the body. The nutritional

status of children is an indicator of the entire community for their nutritional profile. An adequate amount of nutrition during infancy and early childhood is helpful in the development of a child's potential. A child's health is indicated by the most important indicator of malnutrition. Malnutrition can be classified into two different types SAM (Severely acute malnutrition) and MAM (Moderately acute malnutrition). The children with severe acute malnutrition comes under the SAM type, whereas the children with moderate acute malnutrition come under the MAM type.

Prior studies have examined the socio-economic gradient of child malnutrition in India, with many highlighting that it is predominantly concentrated among households with lower socio-economic status. However, most of these studies have primarily focused on inequalities based on household economic status. Additionally, since India is administratively divided into 29 states and 7 union territories, encompassing 640 districts, disparities in basic demographic and health indicators are not confined to states alone but extend across districts. Recent insights from the National Family Health Survey (NFHS-4, 2015–16) highlight the significant variability in childhood malnutrition across Indian districts. For instance, the prevalence of stunting among children under age five ranged from a mere 13% in Kollam, a district in Kerala, to a staggering 65% in Bahraich, a district in Uttar Pradesh. Similarly, the prevalence of underweight children varied from a mere 7% in Aizwal, a district in Mizoram, to a concerning 67% in Pashchimi Singhbhum, a district in Jharkhand.

Many countries around the world have been making continuous and dedicated efforts to reform their healthcare systems, with a strong emphasis on moving toward Universal Health Coverage (UHC). These reform initiatives aim to expand, enhance, or otherwise improve access to essential healthcare services and provide financial protection for all citizens. It is essential to closely monitor health disparities and inequalities as part of the broader commitment to advancing health equity. The World Health Organization (WHO) recognizes the importance of health equity and has developed policies like Universal Health Coverage to promote fairness and accessibility in healthcare.

## Literature Review

### Socioeconomic status and malnutrition

(Barun Kanjila, 2010) paper underscores that while significant progress has been made in various fields, access to proper nutrition for children and women in the country remains a challenge. The study aims to assess the disparities in chronic malnutrition concerning social and economic factors. A key finding of this research is that there exists an unequal burden of chronic malnutrition across states, with a disproportionate impact on economically disadvantaged children. The nutritional status of children is a crucial indicator of their survival and significantly influences a household's overall living standards. To gauge the extent of socio-economic inequality, the author employs a concentration index, which ranges from -1 to +1. A negative value indicates a greater concentration of inequality among the poor. (McIntyre, 2003): This paper seeks to evaluate and quantify inequalities in both chronic and acute malnutrition. The assessment of inequality is carried out using the concentration index, which is applied to various population groups, the entire sample, and different residential areas. The study reveals that stunting is the most prevalent form of malnutrition, although wasting does not exhibit a clear socio-economic gradient. Notably, there are significant disparities in stunting and underweight prevalence among the wealthiest segments of society. This underscores the need for policies addressing malnutrition that not only aim to improve overall averages but also target the unequal distribution of malnutrition among children. Furthermore, other related issues can also benefit from such interventions. (Purnima Menon, 2012): This paper suggests that urban populations tend to have better access to healthcare facilities compared to rural communities. The socio-economic status, determined by household assets, service availability, and housing quality, is used as an index. The study finds a lower prevalence of stunting in urban areas as compared to rural regions. Importantly, it highlights that poverty is not exclusive to rural areas, as impoverished individuals can also reside in urban settings, contributing to high stunting rates. Addressing their needs through appropriate policies can be challenging but essential. (S.Basta, 2010): In this report, the author discusses intra-urban differences that appear to be significant. The paper explores potential explanations for these inequalities by highlighting various factors.

### Economic Inequality and malnutrition

(Pathak, 2009): This paper underscores the significance of maternal health promotion programs aimed at assisting the economically disadvantaged population in Uttar Pradesh, a densely populated state in India. It delves into the roles played by both public and private healthcare facilities and seeks to uncover the factors contributing to the limited access to prenatal care among the impoverished. This research also sheds light on the widening economic disparities among urban dwellers, a situation that is steadily exacerbating. (Gupta, 2007): Female mortality rates surpass those of males in South Asia, with Punjab, India, recording the highest female mortality rates and a skewed sex ratio. Researchers have documented evidence of such gender bias in Punjab and other Indian states. This gender discrimination exists at the household level and is intertwined with family strategies. The article examines how discrimination against female children or women is not a universal phenomenon but rather stems from individual beliefs and strategies. The findings are anticipated to refute the notion of general gender bias. Ethical norms and values underlie this discrimination in terms of nutrition and education, ultimately leaving a mark on future generations. (Mohanty, 2018): This paper explores the dynamics of sustained economic growth and its impact on poverty reduction from a monetary perspective. It observes a declining prevalence of stunting and underweight individuals. The study highlights the critical role of policymakers in addressing malnutrition and poverty at both global and national levels. While nutritional deficiencies can affect individuals of all ages, children under five are particularly vulnerable. The study's primary objective is to investigate the geographical disparities in malnutrition across various districts.

### Mother's Nutritional Knowledge and Malnutrition

(JasminAra Farhana Akter, 2015): This paper delves into the impact of a mother's knowledge of nutrition on her child's school performance. Healthy children are the cornerstone of a nation's future prosperity, and the primary school years are particularly pivotal in shaping their future. Children possess unique abilities and aspirations that play a central role in determining a nation's destiny. The study reveals that poor health during a child's early years has long-term adverse effects, primarily attributed to mothers' lack of nutritional knowledge. Hence, it underscores the importance of mothers acquiring comprehensive nutritional information to ensure their children's healthy development. (Harold Alderman, 2001): Improving a child's school performance and post-school productivity hinges on their good health, a fact often overlooked by some researchers who attribute it solely to behavioral choices. This paper employs longitudinal data to investigate how school enrollment is influenced by a child's health

status. (Mukherjee, 2015): This paper aims to elucidate the presence of a socioeconomic gradient in undernutrition. It establishes a relationship between economic status and undernutrition, suggesting a dual causality relationship. Impoverished individuals are more susceptible to malnutrition, leading to poor health status and diminished work capacity, ultimately reducing human capital. Research indicates that poorer children are less likely to receive antibiotics when ill. Household behavior is influenced by economic status, impacting a child's health and nutritional status. (Thomas, 2012): The author of this paper demonstrates that parental education positively influences child health and height. Maternal education, in particular, is associated with improved access to information and is closely linked to child health. Child health is correlated with wealth distribution and permanent income levels. (Jere R. behrman, 2015): The authors explain that a mother's education has a positive impact on both her own health and the health of her child.

## Objectives

Based on the existing literature review, the study aims

### Objective 1: Socio-economic disparity

- *To study the socio-economic disparity in India that influences the child's health.*
  - ✓ *To create a socio-economic status.*
  - ✓ *Analysing malnutrition through concentration curve, gini coefficients, and concentration index among the different subgroups of Socio-economic status and across the states of India.*
  - ✓ *Decomposing the factors to find out the greatest contributions to health inequality.*

### Objective 2: Regression analysis

- *To study the factors impacting children's stunted form of malnutrition.*

## Data Source and Methodology

### Data Source:

Data utilized in this study were extracted from the fifth round of the National Family Health Survey (NFHS-5), which was conducted between 2019 and 2021 as per the Indian Institute of Population Sciences (IIPS, 2021) report. The comprehensive survey encompassed data collection pertaining to population, nutrition, and health from all 28 states and eight union territories across India, covering a total of 707 districts.

The NFHS-5 survey involved the random selection of women aged 15-49 and men aged 15-54 as respondents. The sampling design adopted for NFHS-5 was stratified two-stage sampling. In the first stage, primary sampling units were chosen, and in the subsequent stage, households were selected for the study. Primary sampling units containing a minimum of 300 households were divided into segments, each comprising approximately 100-150 households.

## Variable Description

### Socio-Economic status

In accordance with the study's objectives, the present research sought to assess the socio-economic disparity in childhood malnutrition using the concentration index as a measurement tool. To effectively measure socio-economic inequality, it was imperative to identify a variable that could rank districts based on their economic well-being. Ideally, this variable would have been per capita district income. However, in India, there is a lack of accessible data sources that directly provide information on district-level income.

In light of this unavailability of direct income data at the district level, the current study adopted the socio-economic status of households as a proxy for assessing district-level economic development. This study devised a methodology to calculate socio-economic status in a manner that could reasonably reflect a district's economic development (albeit indirectly).

We have selected different variables from the data set and transformed it into required categories. The total number of observations is 232,920 and is mentioned in table 1.

### Dependent Variable

#### Assessing Malnutrition

The evaluation of undernutrition in young children typically involves measuring their height, weight, and skin-fold thickness. These measurements yield valuable indices, with the most commonly used ones being stunting (indicating low height for age), wasting (reflecting low weight for height), and underweight (signifying low weight for age). Stunting primarily serves as an indicator of chronic undernutrition, often stemming from prolonged food deprivation or illness. We applied z-scores of low heights for age to create a categorical variable that indicates whether the child is stunted, utilizing a 2-standard deviation (SD) cutoff point, and severely stunted, using a 3-standard deviation cutoff point. The summary table is given in table 6.

### Independent variable:

For the decomposition analysis and for the regression analysis, we also incorporated many variables of interest in alignment with the literature review and transformed all the variables into the required category and presented in table 7.

## Methodology

### Objective 1:

#### *Socio-economic status*

The study incorporated the principal component analysis to calculate a socio-economic status using 10 different parameters and then divided the index into 5 quantiles using the sample weight. The 5 quantiles of socio-economic status are given in table 5. We first looked for the correlation among the parameters and found from table 2 that the parameters were less correlated to each other. We have taken 6 components for the index that explain up to 78 percent of the contribution of factors to the index. The PCA table (Table 3) is given in appendix.

#### *Concentration Curve and Concentration index*

In this paper, we adopt the methodology introduced by O'Donnell et al. (2008) to illustrate inequality in malnutrition through concentration curves and derive the concentration index from these curves. Concentration curves visually depict the portion of the variable of interest (malnutrition) attributed to the cumulative proportion of the population, categorized by their respective living standards, ranging from the most disadvantaged to the most affluent (O'Donnell et al. 2008).

When every individual, regardless of their living standard, shares the same value for the health variable, the concentration curve aligns perfectly with a 45-degree line known as the "line of equality." However, if malnutrition is more prevalent among those with lower living standards, the concentration curve will be situated above this line of equality. The further the curve deviates from this line, the more pronounced the concentration of malnutrition among the impoverished.

The concentration index, denoted as 'C,' is defined in reference to the concentration curve and is calculated as twice the area between the concentration curve and the line of equality. In instances where there is no socioeconomic inequality, the concentration index assumes a value of zero. Conversely, when the concentration curve surpasses the line of equality, the index takes on a negative value, indicating the disproportionate concentration of malnutrition among the disadvantaged segments of the population.

#### *Gini coefficient*

Pyatt's inequality decomposition is a method used to analyze and decompose health inequality within a population categorized by living standards or regions. The technique breaks down the overall income or wealth inequality into several components or factors.

- 1) **Between-Group Inequality:** This part of the decomposition accounts for the inequality that exists between different demographic or economic groups within the population.
- 2) **Within-Group Inequality:** This component considers the inequality that exists within each of the groups identified in the between-group analysis.
- 3) **Interaction Effect:** The interaction effect represents the overlap between the between-group and within-group inequalities. It shows how the composition of various demographic or economic groups contributes to overall inequality.

#### *Decomposition*

We adopt the methodology outlined by (Wagstaff, 2011) study to decompose the inequalities in malnutrition. This decomposition process involves breaking down the contributions of individual factors to inequality concerning the standard of living variable.

#### *Objective 2:*

Now, the study has also analyzed the factors impacting the stunted form of malnutrition. We have applied the multinomial logistic regression.

Model:

$$\log(p/1-p) = \text{stunting} = \beta_1 + \beta_2 \text{residence} + \beta_3 \text{religion} + \beta_4 \text{caste} + \beta_5 \text{BMI} + \beta_6 \text{gender} + \beta_7 \text{child\_age\_in\_months} + \beta_8 \text{birth\_order} + \beta_9 \text{size\_at\_birth} + \beta_{10} \text{mothers\_edu} + \beta_{11} \text{mother\_age} + \beta_{12} \text{socio\_econ\_status}$$

## Results

#### *Objective 1:*

##### *Concentration Curve*

From the figure 1, the graph depicts that stunting is concentrated among the poorest quantiles more as compared to richer sections of the population. As the curve lie above the line of equality, it shows that malnutrition is concentrated among the poor groups.

##### *Concentration indices*

The "Gen. CI" label indicates that a generalized concentration index has been calculated. The concentration index value is approximately -0.0509 from table 8. In this case, the negative sign indicates that malnutrition is more concentrated among individuals with lower socioeconomic status. In other words, individuals with lower socioeconomic status are more likely to experience malnutrition compared to those with higher socioeconomic status. The p-value associated with the concentration index is 0.0000, which suggests that the concentration index is statistically significantly different from zero.

### Pyatts inequality decomposition

In our pursuit of unraveling the complexities of socioeconomic disparities, we employ Pyatt's Inequality Decomposition, a powerful tool to dissect the contributing factors to inequality. Our decomposition table 9 reveals that a substantial portion (36.224%) of the overall inequality can be attributed to disparities between different socio-economic groups. Another noteworthy finding is the "Overlap" component, contributing 44.088% to the overall inequality. It underscores the importance of recognizing that inequality is not solely confined to specific groups but is interlinked across multiple strata. The "Within-Group Inequality" component, though smaller at 19.688%, is not to be underestimated. This component highlights disparities that persist within each socio-economic group, emphasizing that even within apparently homogeneous groups, inequality can prevail.

Also from table 10, among the most economically disadvantaged, the Gini coefficient stands at 0.168, indicating a higher level of inequality within this group. Those classified as "Middle" have a Gini coefficient of 0.157, suggesting a somewhat lower level of inequality but still a significant presence. Lastly, the "Richer" segment exhibits the lowest Gini coefficient at 0.124.

### Regional Insights: Variations in health inequality by region:

Our study also unveils distinct patterns of inequality among different regions: From table 11 and figure 2 it is clear that states such as Bihar (0.171), Uttar Pradesh (0.165), and Jharkhand (0.172) exhibit the highest levels of inequality, as reflected by their relatively high Gini coefficients. This suggests pronounced disparities within these regions. While Regions like Maharashtra (0.146), Gujarat (0.144), and Andhra Pradesh (0.149) demonstrate moderate levels of inequality, indicating a somewhat more balanced distribution of income or wealth. On the contrary, Kerala (0.100) stands out with the lowest Gini coefficient, indicating a comparatively more equal distribution of resources within the state.

### Decomposition of significant factors

In our study investigating the determinants of malnutrition, we have assessed the role of various independent variables in contributing to inequality in this critical health outcome i.e. stunting. In the table 12 the concentration index for "Body Mass Index" (0.23211) indicates a significant concentration of malnutrition among individuals with particular BMI profiles. This highlights the importance of maintaining a healthy BMI for overall nutrition and suggests that individuals with lower BMIs may be more vulnerable to malnutrition. The substantial positive concentration index value for "Mother's Education" (0.784492) indicates a significant

concentration of malnutrition among individuals with less-educated mothers. The other significant factors are mothers' age and caste.

## Objective 2:

### Regression Result

In our investigation of the factors contributing to childhood stunting, we employed ordered logistic regression to explore various determinants. This type of regression is used when you have an ordinal dependent variable (in this case, "stunting" with multiple ordered categories). From table 12 we can see that the coefficient for living in a rural area is approximately 0.0388. This suggests that, holding all other variables constant, individuals living in rural areas have a higher log-odds of being in a higher stunting category compared to those in urban areas. The coefficient for being Muslim is approximately 0.3127. It indicates that, all else being equal, Muslims have a higher log-odds of being in a higher stunting category compared to other religions. The coefficient for being Christian is approximately -0.1234. It suggests that, all else being equal, Christians have lower log-odds of being in a higher stunting category compared to other religions.

The coefficients for these caste categories are positive, indicating that individuals belonging to these caste categories are more likely to be in higher stunting categories compared to the reference category. Negative coefficients for these BMI categories suggest that as BMI increases (moving from "NORMAL WEIGHT" to "OBSESE"), the log-odds of being in a higher stunting category decrease. The coefficient for being female is approximately -0.0144. This suggests that, holding all other variables constant, females have slightly lower log-odds of being in a higher stunting category compared to males. The coefficients for different age categories indicate how child age influences stunting. For example, a positive coefficient for "31-40 MONTHS" suggests that children aged 31-40 months have higher log-odds of being in a higher stunting category compared to the reference category. Positive coefficients for birth order categories indicate that children with higher birth orders are more likely to be in higher stunting categories compared to those with lower birth orders. Positive coefficients for categories suggest that children born larger or of average size have higher log-odds of being in higher stunting categories compared to smaller-sized babies.

Higher coefficients for higher levels of mothers' education (e.g., "greater than 12 years") indicate that as mothers' education level increases, the log-odds of their children being in higher stunting categories decrease. Positive coefficients for different age categories of mothers

suggest that, as mothers' age increases, the log-odds of their children being in higher stunting categories also increase.

Positive coefficients for higher socio-economic status categories indicate that as socio-economic status improves, the log-odds of children being in higher stunting categories decrease. These thresholds represent the estimated cut-off points on the latent continuous scale where the stunting categories change. These thresholds help determine which category a specific observation falls into based on the linear combination of predictors.

### Predicted Probabilities

#### *Socio-economic status*

Figure 3 reveals yet another interesting thing

The predictive margins analysis reveals that the probability of a child being classified as "stunted" varies significantly across different socio-economic status groups. Children from the "poorest" socio-economic group have an estimated probability of approximately 39.31% (with a standard error of approximately 0.30%) of being classified as "stunted." This means that, in this group, about 39.31% of children are likely to experience stunting. Moving up the socio-economic ladder to the "poor" group, the probability of a child being classified as "stunted" increases to around 38.4% (with a standard error of approximately 0.25%). This indicates a higher likelihood of stunting in the "poor" group compared to the "poorest" group. Similarly, the probability of stunting further increases to approximately 36% (with a standard error of approximately 0.24%) in the "middle" socio-economic group. In the "rich" group, the probability of stunting is approximately 33% (with a standard error of approximately 0.25%). This suggests that, despite higher socio-economic status, a significant proportion of children in this group still experience stunting. Among the "richer" socio-economic group, the probability of stunting is approximately 30% (with a standard error of approximately 0.31%).

The similar interpretation is for the non stunted group. The probability of being not stunted is higher among the richer section of the population.

#### *Mothers' Education*

From the figure, the similar interpretation can be given for the predictive margins.

In the predictive margins analysis for the variable "mothers\_education" with respect to the category "not\_stunted," the results indicate the estimated probabilities of a child being classified as "not stunted" across different levels of maternal education. Children whose

mothers have had no schooling have an estimated probability of approximately 47.43% (with a standard error of approximately 0.29%) of being classified as "not stunted. For children whose mothers have received less than 5 years of schooling, the estimated probability of being "not stunted" is approximately 45.72% (with a standard error of approximately 0.48%). In the category of mothers with 5-8 years of schooling, the estimated probability of their children being "not stunted" is higher at approximately 48.77% (with a standard error of approximately 0.22%). This suggests that maternal education beyond primary levels is associated with a higher likelihood of child health. Children whose mothers have received 9-12 years of schooling have an even higher estimated probability of approximately 50.91% (with a standard error of approximately 0.20%) of being "not stunted." Among children whose mothers have more than 12 years of schooling (indicating higher education levels), the estimated probability of being "not stunted" is the highest at approximately 55.95% (with a standard error of approximately 0.35%). As maternal education levels increase, the probability of child stunting decreases.

## Conclusion

This paper has undertaken a comprehensive analysis of the socioeconomic disparities and determinants of childhood malnutrition in India using data from the National Family Health Survey (NFHS-5, 2019–2021). The study revealed significant socioeconomic disparities in childhood malnutrition, with a concentration of malnutrition among individuals with lower socioeconomic status. The concentration index and Pyatt's inequality decomposition demonstrated that a substantial portion of the overall inequality in malnutrition can be attributed to disparities between different socioeconomic groups. There were notable regional variations in health inequality, with states like Bihar, Uttar Pradesh, and Jharkhand exhibiting higher levels of inequality in malnutrition. Kerala, on the other hand, stood out with a more equal distribution of resources within the state. The multinomial logistic regression model identified several key determinants of childhood stunting. Notable factors included maternal education, socioeconomic status, birth order, and size at birth. Higher maternal education levels were associated with a reduced likelihood of childhood stunting, emphasizing the critical role of education in improving child health. Promoting maternal education is a crucial strategy to combat childhood malnutrition. Investments in female education can lead to improved health outcomes for both mothers and children, breaking the cycle of malnutrition. Addressing this challenge requires a comprehensive approach that encompasses education, healthcare, and

targeted interventions to ensure that all children have the opportunity to grow and thrive. By prioritizing health equity and focusing on evidence-based policies, India can make significant strides toward reducing childhood malnutrition and improving the overall well-being of its future generations.

## References

- Barun Kanjila, P. (2010). Nutritional status of children in india: Household socio-economic condition as contextual determinant. *International journal for equity in health* .
- Gupta, M. (2007). Selective discrimination against female children in rural punjab, India.
- Harold Alderman, J. (2001). Child health and school enrollment: A longitudinal analysis.
- JasminAra Farhana Akter, M. (2015). Role of mothers nutritional knowledge, nutrition factors on school performance.
- Jere R. behrman, B. (2015). How does mothers' schooling affect family health nutrition medical care usage and household sanitation?
- McIntyre, E. (2003). Inequalities in under five child malnutrition in South Africa.
- Mohanty, J. (2018). Spatial heterogeneity and correlates of child malnutrition in districts of India.
- Mukherjee, M. (2015). Childhood undernutrition and SES gradient in India: Myth or reality.
- Pathak, S. (2009). Does safe motherhood programme reach poor in uttar pradesh, India?
- Purnima Menon, M. (2012). Socioeconomic Differentials in child stunting are consistently larger in urban than in rural areas.
- S.Basta, S. (2010). Nutrition and health in low income urban areas .
- Thomas, D. (2012). How does mothers' education affect child height?
- Wagstaff, A. (2011). Socioeconomic inequalities in child mortality: comparison across nine developing countries.

## Appendix

Variable	Categories
Type of cooking fuel	Clean fuel Primitive Source Other
Source of drinking water	Treated water Untreated water
Household has electricity	Yes No
Household has television	Yes No
Household has refrigerator	Yes No
Type of house	Pucca house Semi-pucca house Kutchra house
Access to newspaper	Yes No
Health insurance	Yes No
Access to a health facility	Yes No
Highest Education of Mother	No education Primary Secondary Higher

**Table 1: Variables use in creating Socio economic status**

	cooking fu	drinking w	electr~y	televi~n	refige~r	type_o~e	newspa~r	health~e	access~h	highes~n
cooking_fuel	1									
drinking_water	0.3787	1								
electricity	-0.4663	-0.4397	1							
television	-0.4491	-0.2109	0.3482	1						
refrigerator	-0.4035	-0.1506	0.1991	0.4518	1					
type_of_house	0.4066	0.3024	-0.3234	-0.3478	-0.3392	1				
newspaper	-0.1604	-0.0194	0.0259	0.1569	0.2085	-0.0957	1			
health_insurance	0.0155	0.0286	0.0279	0.0393	-0.0076	0.0398	0.0352	1		
access_to_health	0.1083	0.0216	-0.0219	-0.1072	-0.1601	0.0828	-0.1014	0.017	1	
highest_education	-0.2303	-0.0042	0.0633	0.3361	0.3436	-0.1569	0.2785	0.0084	-0.1266	1

**Table 2: Correlation table**

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.97209	1.55685	0.2972	0.2972
Comp2	1.41524	0.392042	0.1415	0.4387
Comp3	1.0232	0.101101	0.1023	0.5411
Comp4	0.922098	0.0893974	0.0922	0.6333
Comp5	0.8327	0.143854	0.0833	0.7165
Comp6	0.688846	0.0820644	0.0689	0.7854
Comp7	0.606782	0.0360989	0.0607	0.8461
Comp8	0.570683	0.06826	0.0571	0.9032
Comp9	0.502423	0.0364868	0.0502	0.9534
Comp10	0.465936	.	0.0466	1

**Table 3: PCA**

Variable	Obs	Mean	Std. Dev.	Min	Max
SES	2,32,920	-1.85E-09	0.718505	-1.69574	1.608254

**Table 4: Summary table of Socio -Economic status**

5 quantiles of SES	Freq.	Percent	Cum.
Poorest	46,060	19.78	19.78
Poor	50,696	21.77	41.54
Middle	49,139	21.1	62.64
Rich	45,416	19.5	82.14
Richer	41,609	17.86	100
Total	2,32,920	100	

**Table 5: Quantiles of SES**

Stunting	Frequency	Percent	Cumulative
Severely Stunted	32,870	14.5	14.5
Stunted	81,173	35.82	50.32
Not Stunted	1.12.595	49.68	100
Total	2,26,638	100	

**Table 6: Summary table of dependent variable stunting**

Variables	Category
Residence	Rural Urban
Religion	Hindu Muslim Christian Sikh Others
Caste	Schedule caste Schedule tribe OBC Others
Body mass Index of mother	Underweight Normal weight Overweight Obese
Gender	Male Female
Child age in months	0-10 months 11-20 months 21-30 months 31-40 months 41-50 months 51-59 months
Birth order	1 2-3 4-5 6-16
Size at birth	Smaller Larger Average
Mothers' education	No schooling Less than 5 years 5-8 years 9-12 years Greater than 12 years
Mothers' age	15-19 years 20-29 years 30-39 years 40-49 years
Quantiles of socio-economic status	Poorest Poor Middle Rich Richer

**Table 7: Independent variables**

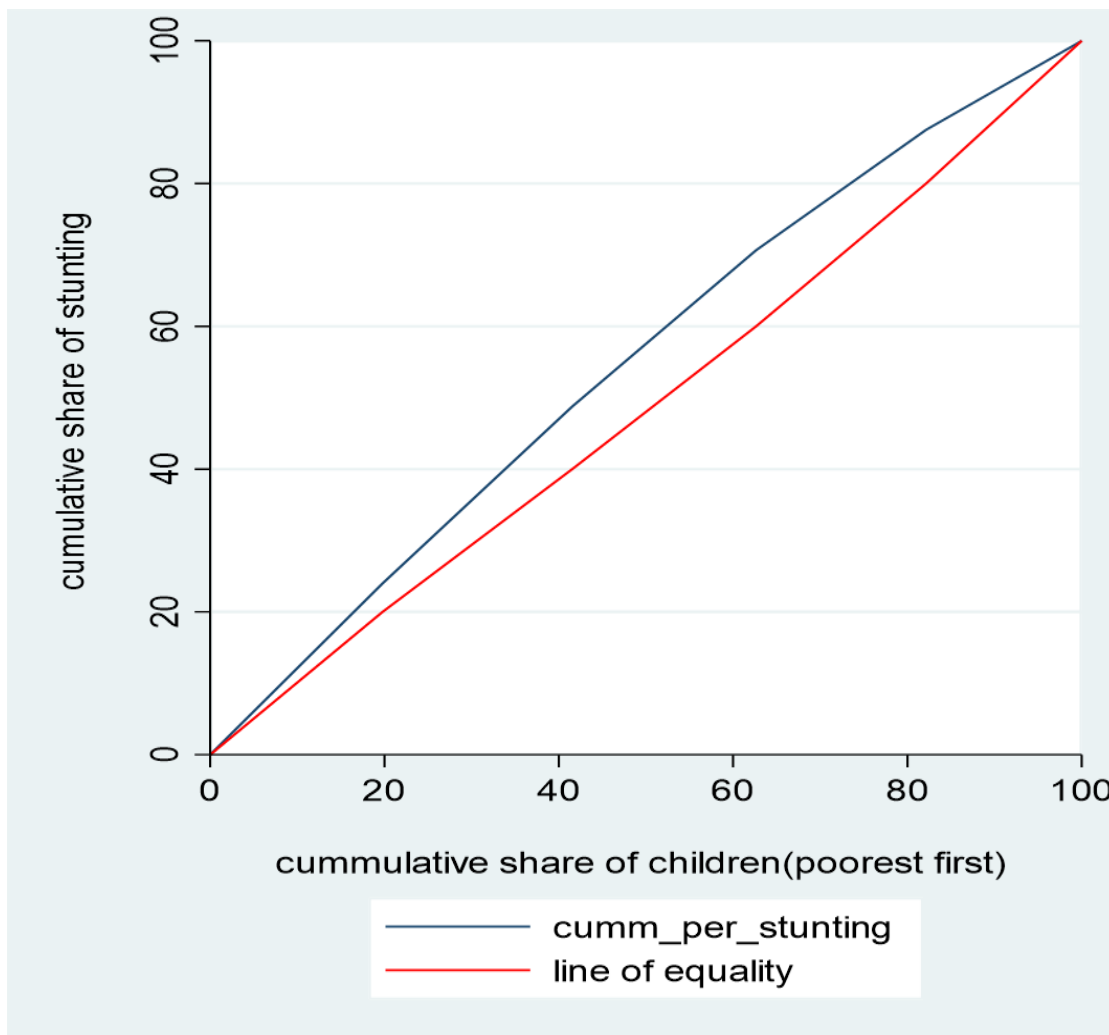


Figure 1: Concentration Curve

Index:	No. of observation	Index value	Robust Standard error	p-value
Gen. CI	226638	-0.0508544	0.0010476	0.000

Table 8: Concentration indices

Decomposition	Indices	Part
Between	0.056	36.224
Overlap	0.068	44.088
Within	0.03	19.688
Total Gini	0.154	100

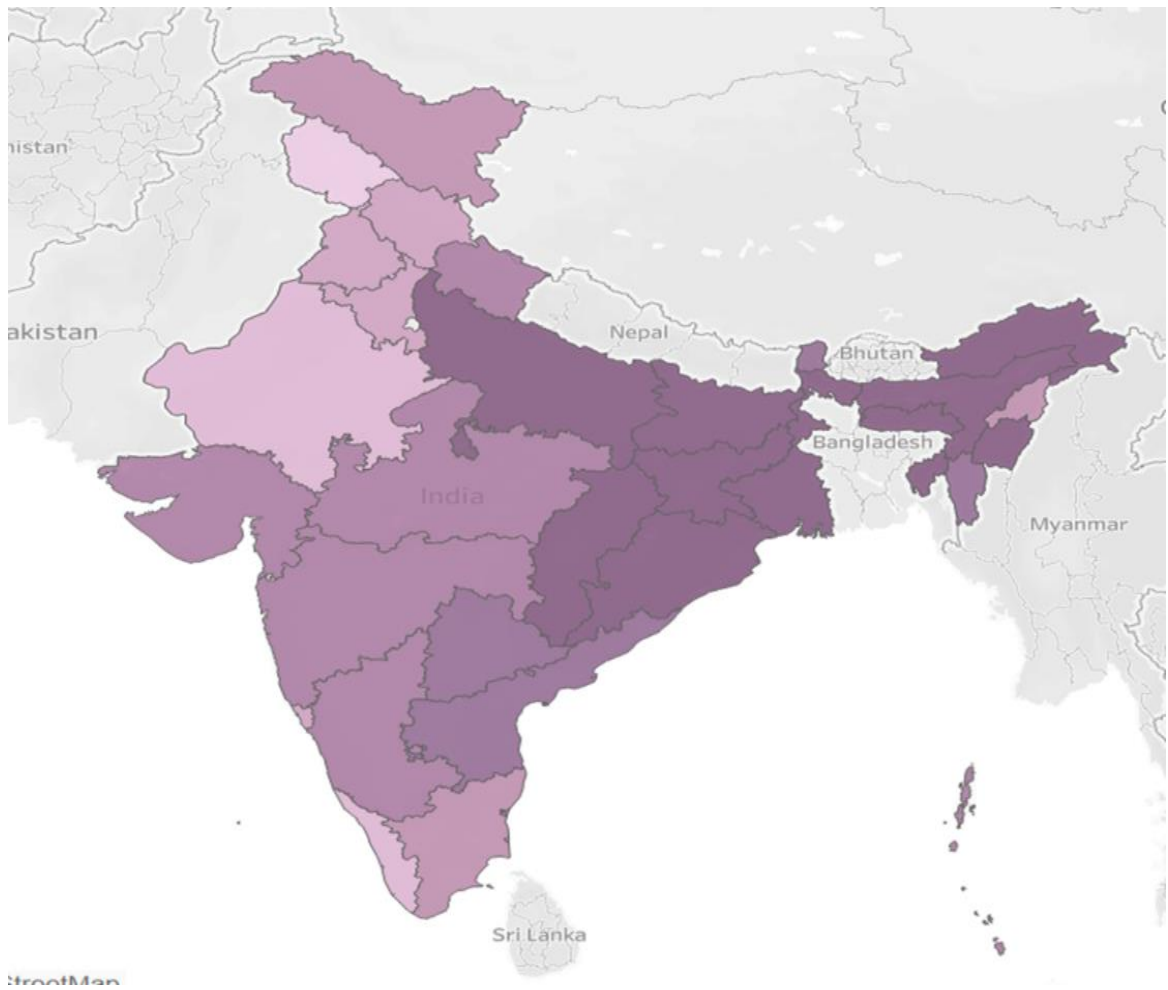
Table 9: Pyatts inequality decomposition

<b>Groups</b>	<b>Gini Coefficient</b>
Poorest	0.168
Poor	0.164
Middle	0.157
Rich	0.142
Richer	0.124

**Table 10: Gini coefficient table for Socio economic status**

state	gini coeff
meghalaya	0.172
jharkhand	0.172
bihar	0.171
arunachal pradesh	0.169
tripura	0.169
assam	0.169
odisha	0.168
west bengal	0.167
uttar pradesh	0.165
chhattisgarh	0.163
manipur	0.162
sikkim	0.155
telangana	0.151
mizoram	0.149
dadra & nagar haveli and daman	0.149
andhra pradesh	0.149
nct of delhi	0.148
madhya pradesh	0.146
maharashtra	0.146
karnataka	0.145
gujarat	0.144
andaman & nicobar islands	0.139
uttarakhand	0.134
lakshadweep	0.13
tamil nadu	0.127
nagaland	0.126
ladakh	0.123
goa	0.121
haryana	0.119
chandigarh	0.115
himachal pradesh	0.113
punjab	0.111
puducherry	0.109
rajasthan	0.108
kerala	0.100
jammu & kashmir	0.083

**Table 11: Gini coefficient across state**



**Figure 2: State disparity**

Independent Variable	Concentration Index	Percentage
Residence	-0.25023	0.0336
Religion	0.04223	0.002426
Caste	0.244467	0.06688
Body Mass Index	0.23211	0.1823
Gender	-0.00625	0.000116

Child age in months	0.0101353	0.000509
Birth order	-0.282279	0.02453
Size at birth	0.0374	0.00713
Mothers Education	0.784492	0.4744
Mothers Age	0.00635	0.097

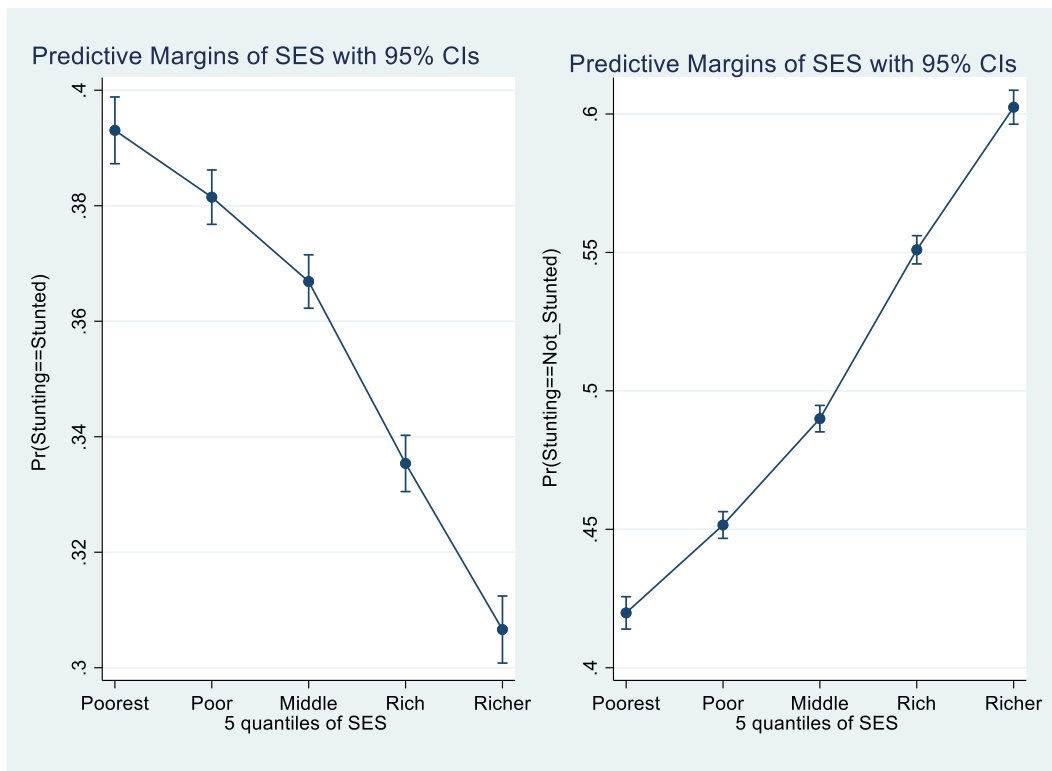
**Table 12: Decomposition of factors**

Variables	Category	Coefficients
Residence	Rural	0
	Urban	0.038*** (0.011)
Religion	Hindu	0
	Muslim	0.313*** (0.014)
	Christian	-0.123*** (0.017)
	Sikh	0.862*** (0.037)
	Others	-0.156*** (0.028)
Caste	Schedule caste	0
	Schedule tribe	0.223*** (0.014)
	OBC	0.194*** (0.011)
	Others	0.401*** (0.014)
Body mass Index of the mother	Underweight	0
	Normal weight	-0.062*** (0.011)
	Overweight	-0.128*** (0.015)
	Obsese	-0.165*** (0.024)
Gender	Male	0

	Female	-0.014 (0.008)
Child age in months	0-10 months	0
	11-20 months	-0.009 (0.014)
	21-30 months	0.031* (0.014)
	31-40 months	0.025 (0.014)
	41-50 months	0.036* (0.014)
	51-59 months	0.056*** (0.015)
Birth order	1	0
	2-3	-0.025** (0.009)
	4-5	-0.101*** (0.016)
	6-16	-0.224*** (0.028)
Size at birth	Smaller	0
	Larger	0.220*** (0.016)
	Average	0.197*** (0.013)
Mothers' education	No schooling	0
	Less than 5 years	-0.078*** (0.020)
	5-8 years	0.066*** (0.014)
	9-12 years	0.162*** (0.014)
	Greater than 12 years	0.372*** (0.019)
Mothers' age	15-19 years	0
	20-29 years	0.232*** (0.020)
	30-39 years	0.355*** (0.030)
	40-49 years	0.362*** (0.042)
Quantiles of socio-economic status	Poorest	0
	Poor	0.135***

	Middle	(0.013) 0.300***
	Rich	(0.015) 0.553***
	Richer	(0.016) 0.769***
Cut1		-0.765*** (-21.28)
Cut2		1.088*** (30.23)
N		205423

**Table 13: Regression table**



**Figure 3: Predicted probability graph for SES**

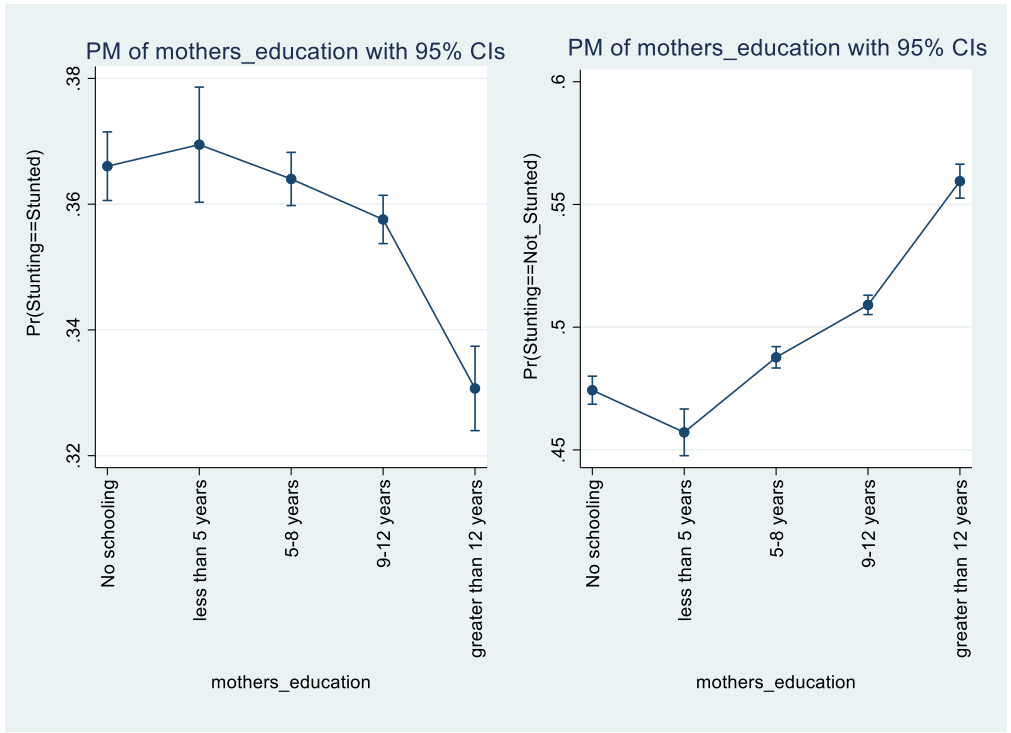


Figure 4: Predicted probability graph for mother's education