



**ORIGINAL RESEARCH PAPER**

**Geography**

**ECONOMIC DISPARITY IN CHILDHOOD GROWTH IN BIHAR**

**KEY WORDS:** Economic inequality; Stunting; Nutritional Status; Malnutrition; India

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**ABSTRACT**

Stunted childhood growth is a major child health problem in most of the developing nations. It is a proxy indicator for determining the general health status of the population and is one of the main predictors of child survival. World Health Organisation reported that around 45% of deaths are related to undernutrition in children under five years of age. These deaths fare mainly from low- and middle-income countries. The economic disparity across the socioeconomic and demographic factors among children under-five in Bihar is carried out in this study using the data from the National Family Health Survey conducted during 2015-16. The bivariate analyses were used to achieve the objectives of the analysis. The prevalence of stunting in Bihar (48%) is 10% higher than the national average. The findings show that the children with higher educated mothers, higher birth order, higher age at birth, Magadh region, have a significantly higher economic disparity in stunting among children under-five in Bihar as compared to their counterparts. Therefore, it is recommended that socioeconomically, demographically, and regionally backward sections should get focussed on policy modification and program interventions.

**INTRODUCTION**

Globally, almost 200 million children below five years of age suffer from stunting. At the same time, 40 million children below five years of age are overweight and obesity keeps rising, even in lower-income nations (Keeley et al., 2019). Nearly 200 million children under the age of five years worldwide suffer from stunting. These trends represent a significant triple burden of malnutrition that threatens children and nations' sustainability, growth, and development (UNICEF, 2013). Childhood malnutrition has been a problem for the past few decades. In low and middle-income economies, one of the main public health issues. Estimates from the United Nations Children's Fund (UNICEF) show that about 165 million children under the age of five have become raised worldwide.

In India, 38% (low- height- for - age) of children below five years of age are stunted. About 36% (low- weight-for-height) of children under five years of age are underweight. Since 2005-06, the prevalence of stunting declined, for stunting the values have fallen from 48% in 2005-06 to 38% in 2015-16. The nutritional condition of children in Bihar has improved after NFHS-3 across all measurements. Stunting in the decreased from 56% to 48% between NFHS-3 and NFHS-4. Given the gains in stunting in Bihar, child malnutrition is still a serious problem. (IIPS & ICF, 2017).

**Previous Literature**

One of the key factors in the health and nutrition status of children is the assessment of people's quality of life. Stunting can be understood as an indicator of linear growth failure (Lartey, 2015). The idea of child stunting is explained as an interaction of household specificities (Stewart et al., 2013). The previous literature also suggests that bad sanitation and undernutrition adds to the vulnerability towards repeated parasitic infections and environmental centric dysfunction (EED) (DeBoe et al., 2017 & Ishita et al., 2018 & Sabuj et al., 2018). These factors are inevitable in low resource settings and contribute to stunting (Dewey et al., 2016).

The multivariate study of the impact of identified demographic and socio-economic influences on child malnutrition reveals that the main predictors of child nutrition in India are the age of the mother, the birth order of infants, the schooling of mothers, and the living status of households (Vinod et al., 1999). Previous researches indicate that gender differences and spatial variability affect the nutritional status of children in India. The prior analysis has revealed a poor picture of children in almost every state (Appoh & Krekling, 2005). Determinants of the nutritional status of a child under five years' age expose the economic status, parents' education, the

number of prenatal check-ups, the age of the infant, the order of birth, and the prenatal period are significant determinants of infant stunting (Girma & Genebo, 2002).

Poor health condition of the children erodes social and economic benefits, putting the nation in a vicious circle of poor nutritional health, high disease burdens, and increased suffering. A significant number of studies have documented the short-term and long-term effects of early childhood malnutrition in developed nations. (Barker et al., 1986; Dewey et al., 2011; Kar et al., 2008; Victora et al., 2008; Martorell et al., 1999; Idermem et al., 2006; Lakshminarayanan et al., 2015). Household income significantly influences the degree of child nutrition. Secure food and access to adequate sanitation and health care reliably thus decreases the risk of poorer nutritional conditions in children (Renzoha et al., 2019). In the year 2012, the World Health Assembly had set a goal of lessening the number of stunted children by 40% by the year 2025. In terms of socio-economic growth and population changes, Bihar is one of the backward states in contrast to several other states in India. The state also provides a comparatively higher level of nutritional status of children. Therefore, this study is an attempt to explore the socio-economic factors on child nutritional status in Bihar.

**Data And Methods**

**Data Sources**

In this analysis, data was used from the National Family Health Survey-4 (NFHS-4) conducted in 2015-16. The NFHS-4 is a multi-round, large-scale survey conducted across the country. The Indian version of the Demographic and Health Survey (DHS) offers accurate and consistent estimates of, fertility, mortality, morbidity, child nutritional status, family planning, anemia and consistency, child and maternal health care services, and other relevant countries, state, and regional indicators.

**Variable Descriptions**

The variable of interest of this variable is the childhood stunting. The stunting is the short height against their respective height (height for age). As per the WHO growth standard, the NFHS calculates the prevalence of stunting based on the height and age of the children (IIPS & ICF, 2017). This indicator is used in this study. For economic disparity, the wealth index is used. The prevalence of nutritional status among under-five children is estimated based on wealth status (poorest, poorer, middle, richer, and richest).

The child level independent variables are sex of the child, have at least one son, preceding birth interval, sibsize, child intendedness, and child age. At the mother level, the

explanatory variables selected were mother's age at child's birth (years) (<20, 20-24, 25+), mother's height (>145 cm, <=145 cm), mother level of education (No education, primary, secondary and higher), working status (not working, working, missing/not reported), place of residence (Urban and Rural), religion (Hindu, and Other), caste (Others, SC, ST, OBC), region (Patna, Tarhut, Darbhanga, Kosi, Purnia, Bhagalpur, Munger, Magadh) were selected at the household level. In NFHS-4 and similar surveys, the wealth status is used to calculate the socioeconomic status of the household and the reports of the wealth status can be found in the NFHS-4 report (IIPS & ICF, 2015-16).

**Statistical Methods**

Univariate descriptive statistics and bivariate percentage estimation were done. In order to describe the characteristics of the survey, univariate descriptive statistics were calculated. The economic disparity in the percentage of childhood stunting was determined by different socio-economic and demographic factors. The percentage of stunting distribution is presented in a graph. To examine the differentials in economic disparity in childhood stunting in Bihar, the chi-square test was used.

**RESULTS**

**Sample Characteristics**

Table 1 deals with the sample distribution of under-five children across the socio-economic demographic and regional characteristics in Bihar in the year 2015-16. In Bihar, the wealth status indicates that about 23% are poorest followed by poorer (22.4%), middle (20.9%), richer (19%), and richest (14.7%). Patna, the capital city of Bihar, has a maximum of richest 31.5% followed by Saran (19.2%) and Magadh (17.2%). Kosi has only a small percentage of the richest people (6%). The richer section also follows a similar trend with the maximum in Patna 24.7%, Saran (25.7%), and least in Kosi (10.5%). The poorest are maximum in Kosi (32.3%) followed immediately by Darbhanga (31.8%) and Purnia (29%) the least population of poorest is in Patna 9.5%. The poorer is highest in Kosi (29.7%) followed by Purnia (29%) and Tarhut (23.3%). Out of a total sample size of 22,275 children, the number of male children under five years old is more (11490) than the female children (10785). Most of the male children belong to the poorest (22.5%) followed by poorer (22.3%) and middle (20.7%). Among these samples, only 19.5% belong to the rich and 15.2% to the richest wealth status. Out of these male children, 17,237 are at least one male child in the family among which about 14.4% of children belong to the richest, 18.7% to richer, 20.5% to the middle, 22.8% to poorer and the rest (23.6%) to the poorest. The families with no male child are 22.9% to the middle, 21.1% to poorer, 20.9% to poorest, 19.8 to richer, and just 15.7% to the richest wealth status. The children with preceding birth interval more than 48 months are highest amongst the poorest followed by poorer (22.3%), followed by middle (20.5%),

richer (18.4%), and richest (14.8%). Children from the poorest households constitute most in the preceding the birth interval of 37 to 48 months with 27.3% followed by 23.3% to poorer and 20.9% to the middle, 16.6% to the richer, and 12.0% the richest. The preceding birth interval of 25 to 36 months is highest in the poorest (25.1%), followed by the poorer by 24.3%. The middle class is next to the poorer with 21.2%. The richer makes 18.3% and the richest the minimum with 11%. The birth interval between the siblings less than 25 months also follows the same trend; the children are maximum from a family with poorer wealth status (24.8%) and minimum amongst the richest 13.2%.

The first order births are maximum in richer households (21.3%) and minimum in the poorest (17.4%). The Sibsize of a single child is also maximum amongst the richest (22.5%) and somewhat similar in middle and richer households (20.9%) and (20.1%) and least for the poorest. In the poorest wealth status, about 35.2% of children are with 5+ sibsize and only 5.6% of children are with 5+ children. The increasing sibsize reduces with the increasing wealth status of the family. Child intendedness can be seen highest in the and lowest among the poorest. The maximum unwanted children were to be seen in the poorest wealth status (27.4%) followed by poorer (25.6%). The share of children is 14.1%, 14.6%, 15.2%, 15.2%, and 14.3% for 1 year, 2 years, 3 years, 4years, and 5 years respectively for the richest. About 22.7%, 21.5%, 23.1%, 23.8%, 24% children are for 1 year, 2 years, 3 years, 4 years, and 5 years respectively in the case of the poorest families. The percentage with a height of less than 145 cm is 27.7% among the poorest wealth quintile. The share of these mothers decreases with increasing wealth status. The status of higher education for mothers is higher in the richest section 69.1% as compared to other groups. The females with secondary education are highest at 29.6% in the richer section which is higher as compared to the poorest wealth quintiles.

The mothers with primary education are highest in middle households with 25.8%, but the least number of uneducated mothers is in the poorest families. The share of working women is the lowest among the richest wealth quintiles. About 52.3% of the richest residents in urban areas, while about 8.5% and 7.6% poorest and poorer respectively reside in urban dwellings. The maximum sample lives in rural households from the poorest (24.7%) and poorer (24.1%). About 22.9% of the sample in the poorest, nearly 22.1% from poorer, 21%, 19%, 14.9% are middle, richer and the richest respectively follow the Hinduism as their religion. The share of the poorest wealth quintiles of scheduled caste and scheduled tribes are higher as compared to other backward class and other groups. On the contrary, as expected, the share of richest wealth quintile households is higher among the scheduled caste and scheduled tribes are higher as compared to other backward class and other groups.

**Table 1: Sample Distribution Of Under-five Children Across The Socioeconomic, Demographic And Regional Characteristics In Bihar, 2015-16**

Background characteristics	Poorest	Poorer	Middle	Richer	Richest	N
Sex of the child						
Male	22.5	22.3	20.7	19.3	15.2	11,490
Female	23.5	22.5	21.2	18.5	14.2	10,785
Have at least one son						
No	20.9	21.1	22.6	19.8	15.7	5,038
Yes	23.6	22.8	20.5	18.7	14.4	17,237
Preceding birth interval						
>48 months	24.0	22.3	20.5	18.4	14.8	2,435
37-48 months	27.3	23.3	20.9	16.6	12.0	2,910
25-36 months	25.1	24.3	21.2	18.3	11.0	5,659
<25 months	24.8	22.9	20.8	18.4	13.2	4,970
First birth order	17.4	19.9	21.0	21.3	20.4	6,301
Sibsize						
1	17.0	19.5	20.9	20.1	22.5	3,764

2	18.2	20.5	20.6	22.2	18.6	6,808
3	22.5	22.9	22.6	19.2	12.9	5,610
4	30.0	26.0	18.9	16.2	9.0	3,213
5+	35.2	25.8	20.9	12.5	5.6	2,880
Child intendedness						
Wanted then	23.0	22.2	20.7	18.9	15.2	19,497
Wanted later	15.0	21.4	24.8	22.7	16.1	1,034
Wanted no more	27.4	25.6	21.1	16.9	9.0	1,744
Child age (years)						
1	22.7	22.0	20.6	20.7	14.1	4,220
2	21.5	22.9	21.7	19.3	14.6	4,553
3	23.1	22.2	21.1	18.4	15.2	4,334
4	23.8	22.2	20.6	18.2	15.2	4,754
5	24.0	22.7	20.7	18.3	14.3	4,414
Mothers' age at birth						
<20 years	23.6	23.5	21.5	19.1	12.4	9,733
20-24 years	22.0	21.6	20.8	19.3	16.3	10,532
25+ years	25.4	21.5	18.9	16.8	17.5	2,010
Mothers' height						
<145 cm	27.7	24.2	21.5	17.5	9.2	4,328
145+ cm	21.9	22.0	20.8	19.3	16.0	17,947
Mothers' level of education						
No education	34.1	28.0	21.5	13.0	3.4	12,461
Primary	17.5	24.4	25.8	22.3	10.1	2,764
Secondary	5.6	12.6	19.7	29.6	32.5	6,126
Higher	0.7	2.4	6.8	21.0	69.1	924
Working status						
Not working	19.2	22.7	22.2	19.7	16.2	3,215
Working	24.9	32.6	19.2	14.1	9.3	464
Missing/Not reported	23.6	22.1	20.8	18.9	14.6	18,596
Place of residence						
Urban	8.5	7.6	11.6	20.0	52.3	2,308
Rural	24.7	24.1	22.0	18.8	10.4	19,967
Religion						
Hindu	22.9	22.1	21.0	19.0	14.9	18,511
Others	23.4	23.9	20.4	18.5	13.8	3,764
Caste						
Others	14.6	16.2	18.1	21.4	29.7	3,312
SC	32.1	26.1	21.6	13.6	6.6	4,948
ST	36.5	21.7	18.8	15.6	7.4	702
OBC	21.0	22.7	21.5	20.5	14.3	13,313
Regions						
Patna	9.5	15.0	19.3	24.7	31.5	3,753
Turhut	26.6	23.3	22.2	16.7	11.2	3,318
Saran	12.9	17.9	24.2	25.7	19.2	1,434
Darbhangha	31.8	23.2	19.4	17.3	8.3	1,678
Kosi	32.3	29.7	20.9	10.5	6.5	2,058
Purnia	29.0	29.0	20.6	14.5	6.8	2,408
Bhagalpur	21.0	21.0	21.5	18.3	18.1	1,164
Munger	20.8	22.7	21.3	21.8	13.4	3,677
Magadh	20.7	20.9	19.9	21.4	17.2	2,785
India	23.0	22.4	20.9	19.0	14.7	22,275

Note: Estimates are unweighted; Source: Estimated from National Family Health Survey (2015-16)

Figure 1 presents the economic disparity in child stunting in Bihar in the year 2015-16. The prevalence of child stunting monotonically reduces from the poorest children to the richest children. The figure shows that the prevalence of stunting in under-five years' children in Bihar is 48%. The poorest wealth status shows maximum stunting with 58% followed by poorer with 54% and middle with 49%, richer with 44%, and the richest with 30%.

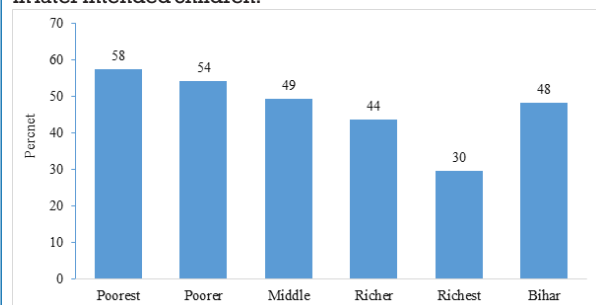
#### Economic Disparity In Childhood Stunting

Table 2 shows the economic disparity of stunting among under-five children across the socio-economic, demographic, and regional characteristics in Bihar for the year 2015-16. In Bihar, about 29.7% of the children under five years of age who belong to the richest class suffer from stunting. The maximum number of children come from the

poorest class with 57.6%, followed by poorer with 54.2%, middle with 49.4%, and richer with 29.7%. When, we take a look at the families with the poorest wealth status the maximum number of stunted children under the age of five is seen in Magadh with 67.6%, followed by Patna with 61.3% and Darbhanga with 58.5%. The minimum stunted children in the poorest section are contributed by Purnia with 52.0%. Among the poorer, Patna shows a peak in stunted growth in under-five children with 61.6%. Magadh lies just next by only a difference of 0.4%. The children in middle wealth status families show a varying trend from 44.6% in Darbhanga to 55.1% in Magadh. In the richer section, the share of children is a maximum at 47.9% in Tirhut and minimum in Saran with 36.5%.

The richest section shows the least stunted growth with 32.6%

in Patna that is the lowest Kosi with 26.1%. The number of male and female children showing stunted growth is maximum amongst the poorest with 56.9% and 58.3% respectively. The families having no sons show lesser stunted growth in the children under-five years with 54.1% in the poorest, 46.4% in the middle, and 28.9% in the richest. At the same time, the children in families with at least one single male child show more stunted children under five years of age with 58.5 %, being highest, in the poorest, 50.3% in middle, and 30% in the richest. The maximum of stunted growth is seen among the children with a birth interval of 37-48 months (60%) amongst the poorest. About 53.6% of children are stunted in the middle wealth status where the preceding birth interval was less than 25 months. The 5+ sibsize shows the maximum stunted growth in all families irrespective of the wealth status which is 61.2%, 59.4%, 56.3%, 47.6%, and 44.3% in poorest, poorer, middle, richer, and the richest respectively. The wanted children showed the least stunted growth in the poorest (57.4%), poorer (54.3%), and middle (48.4%) wealth status, whereas the richer (41.4%) and the richest (24.5%) show least stunted in later intended children.



Source: Estimated from the data of the National Family Health Survey (2015-16)

**Figure 1: Economic disparity in child nutritional status in Bihar, 2015-16**

In the poorest (67.2%), poorer (63.8%), and middle (56.9%)

household, the children with 4 years of age show maximum stunted growth whereas in the richest quintiles, it is 3 years old (52.5%) and 2 years old (38.4%). Children of mothers with less than 20 years of age show the highest stunted growth in the poorest (58.4%), middle (51.8%), richer (42.8%), and richest (33.2%). Only in the poorer section the children of mothers more than 25 years of age show maximum stunted growth (59.4%). The mothers with a height lesser than that of 145 cms have children that show more stunted growth. Children of Mothers with no education show maximum stunted growth with 57.4% in poorer, 52.5% in middle, 49.3% in richer, and 38.6% in richest except for the poorest where the women with higher education have children with maximum stunted (72.4%).

The non-working household has maximum stunted growth children amongst the poorest whereas the poorer (56%) and richer (33.1%) have maximum stunted growth in the working household. About 57.5% of the urban dweller and 57.6% rural resident poorest family shows stunting. Nearly 57.7% Hinduism following the poorest and 57.6% non-Hindus of poorest wealth status show stunted growth. There is a decreasing trend in stunting as we go higher in wealth status and urban residents. A similar trend is observed in Hindus and non-Hindus. The maximum stunted growth is seen amongst the poorest while the least in the richest (Hindus with 29% and non-Hindus with 33%). The poorest section shows the highest percentage of stunted growth scheduled caste community with 61.9% children and scheduled tribe community with 54.4%. The poorer section also shows a similar peak amongst the scheduled caste community with 59.1% and minimum in scheduled tribe community with 49.3%. In the middle wealth status families, a maximum of scheduled caste (54.8%) and scheduled tribe (49.7%) show stunted growth in under-five children. Similarly, in the richer (49.7%) and the richest (46.7%), the majority of the children show stunted growth in scheduled caste and scheduled tribe communities correspondingly followed by other backward class, 43.9% in richer and 34.9% in scheduled caste for richest quintile.

**Table 2: Economic Disparity Of Stunting Among Under-five Children Across The Socioeconomic, Demographic And Regional Characteristics In Bihar, 2015-16**

Background characteristics	Poorest	Poorer	Middle	Richer	Richest	Chi-square test
Sex of the child						
Male	56.9	54.8	49.7	42.5	29.4	442.4***
Female	58.3	53.5	49.1	45.0	30.0	351.6***
Have at least one son						
No	54.1	50.5	46.4	41.8	28.9	152.8***
Yes	58.5	55.2	50.3	44.3	30.0	632.1***
Preceding birth interval						
>48 months	51.5	50.1	47.8	37.5	24.6	98.3***
37-48 months	60.0	50.5	46.6	43.4	28.1	114.9***
25-36 months	55.8	55.1	51.2	45.5	34.9	127.8***
<25 months	59.3	58.2	53.6	47.8	34.9	142.5***
First birth order	59.7	53.4	46.3	41.8	26.4	297.1***
Sibsize						
1	51.8	49.1	43.7	38.8	24.4	146.2***
2	58.7	53.8	46.8	40.4	29.5	278.2***
3	58.5	54.7	49.6	47.3	31.7	156.1***
4	55.1	53.9	55.2	50.1	33.1	52.7***
5+	61.2	59.4	56.3	47.6	44.3	42.7***
Child intendedness						
Wanted then	57.4	54.3	48.4	43.4	29.8	711.3***
Wanted later	60.6	48.7	54.6	41.4	24.5	46.0***
Wanted no more	58.4	56.0	55.5	49.3	33.5	33.2***
Child age (years)						
1	28.9	27.7	25.0	24.8	13.5	55.5***
2	62.5	53.9	52.7	48.1	38.4	122.8***
3	63.9	61.8	55.7	52.5	31.2	224.2***
4	67.2	63.8	56.9	48.2	33.9	242.1***
5	62.5	61.4	54.4	45.6	29.3	224.7***

Mothers' age at birth						
<20 years	58.4	54.3	51.8	42.8	33.2	278.3***
20-24 years	57.2	53.0	48.0	45.4	28.5	402.3***
25+ years	55.9	59.4	44.3	38.7	23.8	113.3***
Mothers' height						
<145 cm	67.5	64.6	63.2	56.7	45.3	74.0***
145+ cm	54.8	51.6	46.1	41.0	27.6	630.8***
Mothers' level of education						
No education	58.1	57.4	52.5	49.3	38.6	111.8***
Primary	56.9	50.1	51.0	47.0	41.5	27.4***
Secondary	51.9	43.0	42.1	39.2	28.4	116.2***
Higher	72.4	49.7	32.8	26.7	22.3	18.0**
Working status						
Not working	58.2	52.6	47.8	44.3	28.3	123.0***
Working	53.9	56.0	47.8	43.3	33.1	9.8*
Missing/Not reported	57.6	54.4	49.7	43.6	29.9	658.4***
Place of residence						
Urban	57.5	53.7	55.2	46.6	29.2	113.6***
Rural	57.6	54.2	49.0	43.3	30.0	605.1***
Religion						
Hindu	57.7	54.5	49.8	43.2	29.0	720.8***
Others	57.2	52.9	47.5	45.9	33.2	80.8***
Caste						
Others	54.6	51.4	42.8	38.1	21.5	220.0***
SC	61.9	59.1	54.8	49.9	34.9	94.5***
ST	54.4	49.3	49.7	40.1	46.7	8.5
OBC	56.1	52.9	48.8	43.9	32.6	324.6***
Regions						
Patna	61.3	61.6	54.4	45.9	32.6	180.2***
Turhut	57.6	53.3	48.9	47.9	29.6	87.9***
Saran	53.7	44.9	45.7	36.5	27.0	41.8***
Darbhangha	58.5	52.9	44.6	46.5	30.0	46.0***
Kosi	55.6	52.1	45.2	34.2	26.1	71.5***
Purnia	52.0	54.6	50.0	44.4	30.6	35.6***
Bhagalpur	57.1	52.5	52.4	44.6	31.4	36.6***
Munger	57.4	52.3	48.2	41.5	26.9	150.2***
Magadh	67.6	61.2	55.1	41.1	25.7	205.6***
India	57.6	54.2	49.4	43.7	29.7	790.0***

Source: Estimated from National Family Health Survey (2015-16); Note: Estimates are height with state weights

## DISCUSSION

This study attempts to examine the economic disparity in childhood stunting across the socioeconomic, demographic, and regional characteristics among the under-five children in Bihar. The prevalence of stunting and underweight has decreased since 2005-06, especially for stunting, which declined from 48% in 2005-06 to 38% in 2015-16 in India. Progress in terms of economic disparities in nutritional status among children under the age of five years is not satisfactory, especially in Bihar. Overall the level of childhood stunting is almost doubled among the children living in the poorest wealth quintile as compared to the children living in the richest wealth quintile. This finding grossly calls for urgent program intervention on reducing the economic disparity in Bihar.

The previous studies have also investigated that the effects of socioeconomic, demographic, and regional effects on childhood stunting are found across different development settings in the world (Black & Victora, 2002 and Victora et al., 1987). As per the findings of this study, the economic disparity in childhood growth is higher among the higher educated mothers as compared to the mothers with no education or primary education. This finding indicates that the decline in childhood stunting has started from the educated groups and mothers with no education are yet to follow the educated groups of mothers. Thus, along with the mothers with no education and lower education, mothers with higher education living in the lowest wealth quintiles should get policy focus.

The economic inequality in child stunting among the children

who were reported as wanted then by their mothers or intended is very high as compared to the children who were reported as either wanted later or wanted no more. The children born to the mothers whose at birth is 25+ years and above have higher economic inequality as compared to the children with mothers who are birth below 20 years. In addition, the children who have two sibs size has the highest level of economic disparity in childhood growth in Bihar. Perhaps, since the majority of the children are in this group, economic and regional exposure is higher in the same group as compared to other groups of children.

There is a moderate level of regional variation in terms of economic disparity in childhood stunting in Bihar. Magadh region of southern Bihar has the highest economic inequality in child growth that has the highest level of stunting among the poorest group and lowest level of stunting among the richest groups of all regions. On the other hand, in the Kosi and Purnia regions where a recurrent flood can be observed, the levels of childhood stunting are moderate. Significant economic inequality in stunting is not found in those regions (Bhatt et al., 2010). In the Patna region, economic inequality is also noticeable. Perhaps, in this region, the district of Patna has a low level of stunting but the neighbouring district may have a high level of stunting. Therefore, this study concludes that the effective program should be implemented into consideration all social, demographic, and regional factors in economic inequality in childhood mortality in Bihar. An effective approach considering the economic disparity in childhood stunting can help Bihar achieve sustainable development goals on time.

**REFERENCES**

1. Alderman, H., Hoddinott, J., & Kinsey, B. (2006). Long term consequences of early childhood malnutrition. *Oxford economic papers*, 58(3), 450-474.
2. Appoh, L. Y., & Krekling, S. (2005). Maternal nutritional knowledge and child nutritional status in the Volta region of Ghana. *Maternal & child nutrition*, 1(2), 100-110.
3. Barker, D. J., & Osmond, C. (1986). Infant mortality, childhood nutrition, and ischaemic heart disease in England and Wales. *The Lancet*, 327(8489), 1077-1081.
4. Bhatt, C. M., Rao, G. S., Manjushree, P., & Bhanumurthy, V. (2010). Space based disaster management of 2008 Kosi floods, North Bihar, India. *Journal of the Indian Society of Remote Sensing*, 38(1), 99-108.
5. Black, R. E., & Victora, C. G. (2002). Optimal duration of exclusive breast feeding in low income countries: Six months as recommended by WHO applies to populations, not necessarily to individuals.
6. DeBoer, M. D., Scharf, R. J., Leite, A. M., Ferrer, A., Havt, A., Pinkerton, R., ... & Guerrant, R. L. (2017). Systemic inflammation, growth factors, and linear growth in the setting of infection and malnutrition. *Nutrition*, 33, 248-253.
7. Dewey, K. G. (2016). Reducing stunting by improving maternal, infant and young child nutrition in regions such as South Asia: evidence, challenges and opportunities. *Maternal & Child Nutrition*, 12, 27-38.
8. Dewey, K. G., & Begum, K. (2011). Long term consequences of stunting in early life. *Maternal & child nutrition*, 7, 5-18.
9. Girma, W., & Genebo, T. (2002). Determinants of nutritional status of women and children in Ethiopia.
10. IIPS, I. (2017). National Family Health Survey (NFHS-4), 2015–16. *International Institute for Population Sciences (IIPS), Mumbai, India*.
11. Kar, B. R., Rao, S. L., & Chandramouli, B. A. (2008). Cognitive development in children with chronic protein energy malnutrition. *Behavioral and Brain Functions*, 4(1), 31.
12. Keeley, B., Little, C., & Zuehlke, E. (2019). The State of the World's Children 2019: Children, Food and Nutrition--Growing Well in a Changing World. *UNICEF*.
13. Lakshminarayanan, S., & Jayalakshmy, R. (2015). Diarrheal diseases among children in India: Current scenario and future perspectives. *Journal of natural science, biology, and medicine*, 6(1), 24.
14. Lartey, A. (2015). What would it take to prevent stunted growth in children in sub-Saharan Africa?. *Proceedings of the Nutrition Society*, 74(4), 449-453.
15. Martorell, R. (1999). The nature of child malnutrition and its long-term implications. *Food and nutrition Bulletin*, 20(3), 288-292.
16. Mishra, V. K., Lahiri, S., & Luther, N. Y. (1999). Child nutrition in India.
17. Mistry, S. K., Hossain, M. B., Khanam, F., Akter, F., Parvez, M., Yunus, F. M., ... & Rahman, M. (2019). Individual-, maternal- and household-level factors associated with stunting among children aged 0–23 months in Bangladesh. *Public health nutrition*, 22(1), 85-94.
18. Mostafa, I., Naila, N. N., Mahfuz, M., Roy, M., Faruque, A. S., & Ahmed, T. (2018). Children living in the slums of Bangladesh face risks from unsafe food and water and stunted growth is common. *Acta Paediatrica*, 107(7), 1230-1239.
19. Nutrition, I. C. (2013). The achievable imperative for global progress. *New York, NY: UNICEF*.
20. Renzaho, A. M., Chen, W., Rijal, S., Dahal, P., Chikazaza, I. R., Dhakal, T., & Chitekwe, S. (2019). The impact of unconditional child cash grant on child malnutrition and its immediate and underlying causes in five districts of the Karnali Zone, Nepal—A trend analysis. *Archives of Public Health*, 77(1), 24.
21. Stewart, C. P., Iannotti, L., Dewey, K. G., Michaelsen, K. F., & Onyango, A. W. (2013). Contextualising complementary feeding in a broader framework for stunting prevention. *Maternal & child nutrition*, 9, 27-45.
22. Victora, C. G., Adair, L., Fall, C., Hallal, P. C., Martorell, R., Richter, L., ... & Maternal and Child Undernutrition Study Group. (2008). Maternal and child undernutrition: consequences for adult health and human capital. *The lancet*, 371(9609), 340-357.
23. Victora, C., Vaughan, J. P., Lombardi, C., Fuchs, S. C., Gigante, L., Smith, P., ... & Barros, F. (1987). Evidence for protection by breast-feeding against infant deaths from infectious diseases in Brazil. *The Lancet*, 330(8554), 319-322.