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Title of Research Paper: Socio-Economic Differentials in Child Malnutrition Among Children Under Five Years in Jharkhand: A Cross-Sectional Analysis Using NFHS-5 Unit-Level Data

Zeba Ashraf* Dr. Dhiraj Mani Pathak**

*Research Scholar, University Department of Economics, Ranchi University, Ranchi, Jharkhand, India

**Assistant Professor, Department of Economics, St. Xavier's College (Autonomous), Ranchi, Jharkhand, India

Abstract

Background: Jharkhand has one of the highest rates of child malnutrition in India, yet survey-weighted estimates from NFHS-5 (2019-21) using unit-level microdata are scarce.

Objective: To estimate the weighted prevalence of stunting, wasting, and underweight among children aged 0-59 months and to describe variation by wealth, caste, residence, maternal education, birth order, and maternal nutritional status.

Methods: The study used the NFHS-5 Children's Recode restricted to Jharkhand (n = 9,512 children aged 0–59 months). Survey-weighted means were estimated in Stata 14.2 with linearised standard errors. Stunting, wasting, and underweight were defined using WHO 2006 growth standards (z-score < -2 SD).

Results: Stunting prevalence was 40.2%, 22.3% for wasting, and 37.5% for underweight. Stunting and underweight fell sharply with household wealth (Poorest: 47.4% to Richest: 16.9% for stunting). Scheduled Tribe children had the highest rates across all three indicators (stunting 46.2%, wasting 25.1%, underweight 43.5%). Children of mothers with a BMI below 18.5 kg/m^2had substantially higher prevalence on all three measures. Wasting showed almost no variation by wealth or rural-urban residence.

Conclusion: Child undernutrition in Jharkhand is concentrated among poor, tribal, and rural children, and is closely tied to maternal nutritional status. The absence of a wealth gradient for wasting suggests that acute malnutrition has different drivers from chronic undernutrition, and warrants a different policy response.

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Keywords: Child Malnutrition, Stunting, Wasting, Underweight, Jharkhand, NFHS-5, Socio-Economic determinants, Maternal BMI, Tribal Children

Introduction

Child undernutrition remains one of the most persistent public health problems in Jharkhand. The recent National Family Health Survey (NFHS-5, 2019-21) places the state's stunting prevalence at around 39.6% among children under five years, which is well above the national average of 35.5%. More than one in five children is wasted, and nearly two in five are underweight. These numbers have come down since 2005, but the pace of improvement has been slower than in several other Empowered Action Group (EAG) states.

Beyond the aggregate figures, the distribution of malnutrition within the state matters. Jharkhand's population is predominantly rural, economically poor, and includes a substantial Scheduled Tribe (ST) population that faces specific barriers to food security and health care: remote geography, dependence on forest-based incomes, and seasonal food shortages. Roy and Rahaman (2023) found that most EAG states still reported stunting above 30% in NFHS-5 despite national progress, and that maternal education and economic empowerment were the variables most consistently associated with improvement.

Studies using NFHS-4 and earlier data document a well-established wealth gradient in stunting and underweight across India. Kim et al. (2021) estimated assembly-constituency-level undernutrition using NFHS-4 and found that Jharkhand had both a high mean stunting prevalence (43.76%) and considerable variation across constituencies, indicating that district or sub-district targeting is possible and necessary. Jain et al. (2024), using spatial regression across four NFHS rounds from 1998 to 2021, identified Jharkhand as a consistent hotspot along with Madhya Pradesh, Odisha, and Bihar, and found that wealth index, sanitation access, and maternal education were each independently associated with reductions in stunting.

Maternal characteristics are proximate determinants. Prasad et al. (2021) used NFHS-4 data to show that children of underweight mothers faced more than 2.7 times the odds of being stunted or underweight. Poor households accounted for 40% of stunted children nationally. Hussain et al. (2025), focusing on aspirational districts, which heavily overlap with Jharkhand's

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tribal blocks, found that SC/ST membership, rural residence, higher birth order, and no maternal education each independently elevated severe malnutrition odds. These findings point to the need for state-specific, disaggregated evidence to calibrate targeted policy responses.

However, most existing quantitative studies either aggregate at the national or regional level, or rely on published NFHS district-level summaries rather than unit-level microdata with full survey-weighted inference. State-specific analysis using NFHS-5 unit-level data for Jharkhand, with linearised standard errors that account for the complex DHS sample design, is scarce.

This study addresses that gap. We use the India NFHS-5 (2019–21), restricted to Jharkhand (n = 9,512 children aged 0–59 months), to estimate the survey-weighted prevalence of stunting, wasting, and underweight. The present study addresses differentials by ten socioeconomic and demographic characteristics: wealth quintile, place of residence, caste, maternal education, sex of child, birth order, maternal BMI, maternal age cohort, antenatal care visits, and breastfeeding status. The descriptive analysis presented in this paper provides a foundation for adjusted regression modelling.

Data and Methods

2.1 Data Source

The present study used secondary data from the National Family Health Survey (NFHS-5). This survey was conducted during 2019-21 by International Institute for Population Sciences (IIPS), Mumbaiunder the Ministry of Health and Family Welfare. The unit level data of India were downloaded from the Demographic and Health survey (DHS). Then the data is cleaned and restricted to Jharkhand, which yielded 9,512 children aged 0-59 months.

2.2 Outcome Variables

Three binary outcomes were constructed following WHO 2006 child growth standards. Stunting is low height-for-age (HAZ < -2 SD), wasting is low weight-for-height (WHZ < -2 SD), and underweight is low weight-for-age (WAZ < -2 SD). Observations with flagged values (>= 9,990)

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were dropped as per standard DHS practice. After exclusions, valid anthropometric data were available for 8,579 children for stunting and underweight, and for 8,704 children for wasting.

2.3 Explanatory Variables

Wealth indexwas categorised into five quintiles. **Place of residence** was coded urban or rural. **Caste/social group**was coded as Scheduled Caste (SC), Scheduled Tribe (ST), OBC, or General/None. **Mother's education**was grouped into no education, primary, and secondary or higher. **Sex of child** was male or female. **Birth order**was recoded as 1st, 2nd, 3rd, and 4th or higher. **Mother's BMI**was coded as thin (BMI < 18.5 kg/m^2) or normal and above≥ 18.65. **Mother's age cohort** was 15-24, 25-34, or 35-49 years. **ANC visits** (m14) were recoded as none, 1-3, or 4 or more. **Breastfeeding status** (v404) was not currently breastfeeding or currently breastfeeding. Child age group was used for descriptive purposes only and was not treated as a primary explanatory variable.

2.4 Statistical Analysis

All analyses were carried out in Stata 14.2 MP. Analyses used Stata's survey methods to account for complex sampling design, producing appropriate standard errors for estimates from the stratified, clustered sample. Weighted proportions were estimated using svy: mean for each binary outcome, which gives linearised standard errors that properly account for clustering and stratification. Results are reported as weighted prevalence percentages with 95% confidence intervals. This paper is descriptive; adjusted logistic regression will be reported in a companion analysis.

Results

3.1 Sample Characteristics

Table 1 shows the weighted distribution of all sample characteristics. The sample was mostly rural (82.8%). Half of all children (50.4%) came from the poorest wealth quintile, and nearly three-quarters from the two lowest quintiles combined. OBC households accounted for the largest share (46.8%), with ST households comprising 26.9% and SC households 17.9%. Among the mothers surveyed, 60.2% possessed secondary or higher education, while 28.1% had not

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received any formal schooling. Approximately 29% of the mothers were identified as nutritionally thin. Regarding antenatal care, 7.9% of mothers did not receive any visits, and only 39% completed four or more visits. The sample was nearly evenly distributed by sex, with 52.8% being male. About 75% of children were currently breastfeeding.

Table 1. Background Characteristics of the Study Sample (n = 9,512), Jharkhand, NFHS-5 (2019-21)

Variable	Category	Weighted (%)
Place of Residence		
	Urban	17.2
	Rural	82.8
Wealth Index		
	Poorest	50.4
	Poorer	22.6
	Middle	13.3
	Richer	9.0
	Richest	4.7
Caste / Social Group		
	Scheduled Caste (SC)	17.9
	Scheduled Tribe (ST)	26.9
	OBC	46.8
	General/None	8.5
Mother's Education		
	No education	28.1
	Primary	11.7
	Secondary or higher	60.2
Sex of Child		

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Variable	Category	Weighted (%)
	Male	52.8
	Female	47.2
Birth Order		
	First	35.8
	Second	31.2
	Third	17.4
	Fourth or higher	15.6
Mother's BMI		
	Normal / above (>=18.5)	71.3
	Thin (<18.5)	28.7
Mother's Age Cohort		
	15-24 years	40.9
	25-34 years	51.3
	35-49 years	7.8
ANC Visits		
	None	7.9
	1-3 visits	53.2
	4 or more visits	39.0
Breastfeeding Status		
	Not currently breastfeeding	24.7
	Currently breastfeeding	75.4
Child Age Group		
	0-5 months	11.0
	6-11 months	9.5
	12-23 months	20.4
	24-35 months	19.3

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Variable	Category	Weighted (%)
	36-47 months	19.6
	48-59 months	20.2

Source: Author's Calculation from India DHS NFHS-5, Jharkhand.

3.2 Overall Prevalence of Malnutrition

Table 2 shows overall weighted prevalence. Stunting was the most common indicator at 40.2% (SE = 0.72%; 95% CI: 38.75-41.58%). Underweight was close behind at 37.5% (SE = 0.70%; 95% CI: 36.09-38.83%). Wasting was 22.3% (SE = 0.60%; 95% CI: 21.11-23.48%). At these levels, roughly two in every five children in Jharkhand are stunted or underweight, and more than one in five is wasted.

Table 2. Overall Weighted Prevalence of Stunting, Wasting, and Underweight, Jharkhand, NFHS-5 (2019-21)

Outcome	Prevalence (%)	SE (%)	95% CI Lower	95% CI Upper
Stunting (HAZ < -2 SD)	40.2	0.72	38.75	41.58
Wasting (WHZ < -2 SD)	22.3	0.60	21.11	23.48
Underweight (WAZ < -2 SD)	37.5	0.70	36.09	38.83

Note: *Estimates based on 8,579 children with valid HAZ/WAZ measurements and 8,704 with valid WHZ. SE = linearised standard error. HAZ = height-for-age z-score; WHZ = weight-for-height z-score; WAZ =weight-for-age z-score.*

Source: *Author's Calculation from India DHS NFHS-5, Jharkhand.*

3.3 Prevalence by Socioeconomic and Demographic Characteristics

The disaggregated prevalence estimates for all three outcomes are presented in Table 3.

Table 3. Weighted Prevalence (%) of Stunting, Wasting, and Underweight by Socioeconomic and Demographic Characteristics, Jharkhand, NFHS-5 (2019-21)

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Variable / Category	Stunting %	Wasting %	Underweight %
Place of Residence			
Urban	26.8	22.7	29.7
Rural	43.0	22.3	41.4
Wealth Index			
Poorest	47.4	24.0	44.6
Poorer	38.7	20.5	34.2
Middle	33.6	19.8	31.8
Richer	25.2	21.1	24.5
Richest	16.9	22.1	17.0
Caste / Social Group			
Scheduled Caste (SC)	41.7	20.5	39.6
Scheduled Tribe (ST)	46.2	25.1	43.5
OBC	38.1	21.5	34.7
General/None	31.3	20.0	28.1
Mother's Education			
No education	48.4	24.4	45.4
Primary	46.8	23.8	44.3
Secondary or higher	35.2	21.1	32.6
Sex of Child			
Male	40.0	23.3	39.8
Female	39.3	21.3	39.0
Birth Order			
First	37.6	21.6	36.8
Second	37.5	22.0	38.1
Third	40.7	23.8	40.6

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Variable / Category	Stunting %	Wasting %	Underweight %
Fourth or higher	47.3	23.5	46.7
Mother's BMI			
Normal / above (>=18.5)	37.4	20.6	36.3
Thin (<18.5)	45.2	26.4	47.2
Mother's Age Cohort			
15-24 years	38.6	21.2	37.6
25-34 years	40.1	23.0	40.5
35-49 years	41.9	24.2	41.9
ANC Visits			
None	42.4	24.0	41.5
1-3 visits	38.6	24.8	40.4
4 or more visits	35.3	24.3	36.5
Breastfeeding Status			
Not currently breastfeeding	38.5	18.4	37.9
Currently breastfeeding	40.0	23.6	39.9
Child Age Group			
0-5 months	27.3	32.0	36.7
6-11 months	26.0	28.7	33.3
12-23 months	44.7	25.5	40.8
24-35 months	40.8	21.0	39.0
36-47 months	46.3	16.3	40.5
48-59 months	39.7	18.6	41.7

Note: *Values are weighted prevalence (%) rounded to one decimal place.*

Source: Author's Calculation from India DHS NFHS-5, Jharkhand.

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Wealth index. Stunting and underweight fell sharply and consistently from the poorest to the richest quintile. Stunting dropped from 47.4% in the poorest to 16.9% in the richest, a gap of 30.5 percentage points. Underweight followed the same direction, falling from 44.6% to 17.0%. Wasting showed a quite different picture: the range was 19.8% to 24.0%, with no clear direction and the highest rate in the poorest quintile only marginally above that in the richest (24.0% vs. 22.1%).

Place of residence. Rural children had higher stunting (43.0%) and underweight (41.4%) than urban children (26.8% and 29.7%), with gaps of about 16 and 12 percentage points respectively. Wasting was nearly the same in both groups: 22.7% urban, 22.3% rural.

Caste/social group. ST children had the highest rates on all three measures: 46.2% stunting, 25.1% wasting, and 43.5% underweight. SC children came next for stunting (41.7%) and underweight (39.6%). General-category children had the lowest rates across all three indicators. The gap between ST and General children was about 15 percentage points for stunting and underweight. For wasting, the range was narrower, from 20.0% (General) to 25.1% (ST).

Mother's education. Children of uneducated mothers had 48.4% stunting and 45.4% underweight; among mothers with secondary or higher education these figures were 35.2% and 32.6%. That is a difference of about 13 percentage points for both indicators. Even children of mothers with only primary education had substantially higher rates (46.8% stunting) than the secondary-educated group, suggesting that completing secondary school, not just any schooling, matters. For wasting, the gradient was shallower: 24.4% (no education) to 21.1% (secondary or higher).

Birth order. Stunting and underweight both rose with birth order. First and second-born children exhibited comparable stunting rates, approximately 37-38%. In contrast, third-born children had a stunting rate of 40.7%, and children born fourth or later had a rate of 47.3%. Underweight followed the same pattern, from 36.8% for first-borns to 46.7% for fourth-or-higher. Wasting increased modestly across birth orders (21.6% to 23.5%).

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Mother's BMI. Children of thin mothers had higher rates on all three outcomes. Stunting was 45.2% when the mother was thin versus 37.4% when she was not (a difference of 7.8 pp). For wasting the difference was 5.8 pp (26.4% vs. 20.6%), and for underweight it was 10.9 pp (47.2% vs. 36.3%). Among the factors examined, maternal BMI was the strongest predictor of wasting.

ANC visits. Stunting was 42.4% where mothers had no antenatal care, compared with 35.3% where mothers completed four or more visits. Underweight showed a similar gradient (41.5% vs. 36.5%). Wasting showed no clear gradient across ANC categories (None: 24.0%, 1-3 visits: 24.8%, 4+ visits: 24.3%).

Mother's age. There was a modest increase in all three outcomes with maternal age. stunting rose from 38.6% (ages 15–24) to 41.9% (ages 35–49), and underweight from 37.6% to 41.9%. Younger maternal age likely reflects younger birth cohorts with better access to nutrition programmes; older mothers may belong to higher-parity households.

Sex of child. Male (40.0%) and female (39.3%) children had nearly identical stunting; similarly for underweight (39.8% vs. 39.0%). Wasting was marginally higher in males (23.3%) than females (21.3%). The sex differential in Jharkhand is notably smaller than in some national-level studies, though Barik et al. (2026) found slight but significant nutritional disadvantages for girls in central and eastern India at the national level.

Child age group. Age patterns differed sharply by outcome. Wasting peaked sharply among infants aged 0–5 months (32.0%) and declined progressively to 16.3% at 36–47 months. Stunting, by contrast, was lowest among infants (27.3%) and highest at 36–47 months (46.3%), reflecting the cumulative nature of chronic malnutrition. Underweight showed a flatter age profile.

Breastfeeding status. Currently breastfed children had marginally higher stunting (40.0%) and wasting (23.6%) than those not breastfed (38.5% and 18.4%). This is a well-documented reverse-causation artefact in cross-sectional DHS data: sicker and thinner children tend to continue breastfeeding longer, yielding an apparent adverse association in unadjusted estimates.

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Discussion

This study examines child malnutrition in Jharkhand by employing unit-level data from NFHS-5, ensuring the application of appropriate survey weighting. The findings reveal several noteworthy patterns.

4.1 The Overall Burden

With stunting at 40.2% and underweight at 37.5%, Jharkhand's rates are significantly above the national NFHS-5 averages of 35.5% and 32.1%, respectively. Wasting (22.3%) is also the national average (19.3%). These differences are not marginal. The multiple round of national surveys shows Jharkhand as the most burdened states. Narayanan et al. (2024) which covers the data from 1993 to 2021 found that severe wasting has increased in 13 of 36 Indian states between 2016 and 2021. But at the same time, stunting has declined. Another study Khadilkar et al. (2022) who examined four NFHS rounds have found that wasting had barely changed (from 19% to 20%) over more than two decades. This concern extends beyond the chronic undernutrition narrative in Jharkhand.

4.2 Stunting and Underweight Follow Socioeconomic Lines; Wasting Does Not

The wealth gap in stunting is 30 percentage points which ranges from 47.4% in the poorest group to 16.9% in the richest. This pattern matches the findings from other high-burden states. Prasad et al. (2021) reported that poor households accounted for about 40% of all stunted children nationwide. Children from the poorest group were 2.67 times more likely to be stunted than those from the richest group. Hussain et al. (2025) confirmed that low wealth status has more odds of severe stunting and being underweight in aspirational districts of India. Singh et al. (2026) found that the wealth index was a key predictor of all three outcomes in a structural equation model for Uttar Pradesh.

The rural-urban gap for stunting and underweight (16 and 12 percentage points respectively) is also expected given Jharkhand's geography. Rural children have limited access to diverse diets, healthcare, and safe water, which cumulatively result in chronic nutritional deficits over time.

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In contrast, the issue of wasting presents differently. The prevalence of wasting across wealth quintiles varies only slightly, from 19.8% to 24.0%, without a consistent trend. The rates of wasting in rural and urban areas are nearly identical, at 22.3% and 22.7% respectively. This indicates that acute malnutrition in Jharkhand is not predominantly a problem of poverty relative to other factors; it affects children across all wealth levels at similar rates. Consequently, the factors contributing to wasting in the state are not solely related to household income. Instead, high infant morbidity, inadequate feeding practices during the first six months of life, and a generally low-quality food environment across the economic spectrum are more likely contributors. The age pattern presented in Table 3 corroborates this interpretation: wasting peaks at 0-5 months (32.0%), a period when infants rely entirely on breastfeeding and early complementary feeding, and subsequently declines.

4.3 Scheduled Tribe Children Bear a Disproportionate Burden

ST children had the highest rates in all three outcomes: 46.2% stunting, 25.1% wasting, and 43.5% underweight. They make up 26.9% of the sample. The gap between ST and General groups was about 15 percentage points for stunting and underweight. Jain et al. (2024) found that child growth failure is geographically clustered in states like Jharkhand, where poor indicators often overlap with tribal populations. Hussain et al. (2025) showed that SC/ST membership is linked to severe malnutrition, even when wealth and education are considered.

Malnutrition in ST communities in Jharkhand is not just due to poverty, though it plays a role. It also involves geographic isolation, limited access to Anganwadi centres and health facilities, seasonal income insecurity from forest and agricultural work, and cultural and language barriers to nutrition advice. These issues need specific responses, not general ones. POSHAN Abhiyaan has increased coverage in tribal areas, but data shows that improving coverage alone won't close the gap unless the quality and cultural relevance of services are also improved.

4.4 Maternal Undernutrition and Its Effects on Children

Around 29% of mothers in this sample had a BMI below 18.5 kg/m^2. Children of thin mothers had notably higher rates on all three outcomes: the gap was 7.8 percentage points for stunting,

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5.8 for wasting, and 10.9 for underweight. For wasting, maternal BMI was actually the strongest correlate in the data. This is consistent with what Kumar and Mohanty (2022) found for India overall, where poor wealth status and low maternal stature were significant predictors of co-occurring maternal overnutrition and child undernutrition in NFHS-4 data. In Jharkhand, the more typical scenario is the reverse: both mother and child are undernourished. A thin mother delivers a smaller baby and may have lower milk quality; both lower birthweight and inadequate breastfeeding increase wasting risk in the first months of life. Addressing maternal nutrition in the preconception and antenatal period is therefore relevant not only for chronic outcomes like stunting but also for acute outcomes like wasting.

4.5 Education, ANC, and Birth Order

The difference in stunting between mothers with no education and those with secondary or higher education was 13.2 percentage points (48.4% vs. 35.2%). Yet, even among educated mothers in Jharkhand, 35% of children are stunted. Education helps in making better nutrition choices and accessing health care, but it cannot replace food availability, income security, or effective health services. This aligns with Roy and Rahaman's (2023) view that maternal empowerment, which includes not just education but also income and decision-making power, is more important for EAG states.

ANC use showed a pattern for stunting and underweight but not for wasting. This makes sense theoretically: antenatal care like iron-folate supplements, dietary advice, and birth planning mainly influence long-term growth rather than immediate nutritional status, which relies more on postnatal feeding and disease exposure.

Birth order had a clear relationship with both stunting and underweight. Fourth-or-higher-born children had 9.7 percentage points more stunting (47.3%) and 9.9 more underweight (46.7%) than first-born children. Hussain et al. (2025) found higher birth order to be among the strongest predictors of severe malnutrition in aspirational districts. Resource dilution within large families, shorter interpregnancy intervals, and reduced maternal attention per child are

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the commonly cited mechanisms. Family planning as a nutrition intervention is therefore not a peripheral consideration for Jharkhand.

4.6 Sex Differences and Breastfeeding

Sex differences in malnutrition were small in this sample. Barik et al. (2026), examining son preference and girl's undernutrition using NFHS-5 data nationally, found slightly higher odds of malnutrition for girls in son-preferring households, particularly in central and eastern India. The Jharkhand data do not show a pronounced sex gap, which may partly reflect that ST communities in the state historically have relatively more gender-equal practices around food distribution.

The higher wasting among currently breastfed children (23.6% vs. 18.4%) is a reverse-causation pattern common in cross-sectional DHS data. Thinner, sicker children are more likely to still be breastfed at time of interview because continued breastfeeding is an adaptive response to illness; the unadjusted association therefore does not represent a negative effect of breastfeeding on wasting.

Conclusion

Stunting, wasting, and underweight remain highly prevalent among children under five in Jharkhand, with rates consistently above national averages. The burden falls most heavily on children in the poorest households, in Scheduled Tribe communities, in rural areas, and in families where the mother is undernourished or has had little formal schooling. Fourth-or-higher-born children are at notably higher risk than first-borns. These are not new findings for India in general, but the survey-weighted, unit-level estimates from NFHS-5 reported here confirm that Jharkhand-specific patterns are persistent and that progress since NFHS-3 has been real but incomplete.

The most practically important finding may be the absence of a wealth gradient for wasting. Unlike stunting and underweight, wasting is almost equally common across the wealth distribution and across rural and urban areas. This means that wealth-redistribution

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programmes alone will not bring wasting down. A food-environment approach, focused on improving the quality of infant feeding in the first six months of life and on reducing infectious disease burden, is probably more relevant for reducing wasting than income transfers.

This descriptive analysis forms the base for adjusted multivariate regression, where the independent contribution of each factor can be estimated after controlling for confounders. Inter-district analysis using the PR file, which carries the district identifier, is also in progress. Together, these outputs are intended to support evidence-based targeting of Jharkhand's nutrition programmes, particularly under POSHAN 2.0 and the broader National Family Health Mission.

Declarations

Ethics: This study uses anonymised, publicly available secondary data from the DHS Programme and does not involve any direct participant contact. Ethical approval was not required.

Data availability: NFHS-5 data are available at dhsprogram.com/data/available-datasets.cfm upon free registration.

Conflict of interest: None.

Funding: None.

Reference:

Barik, S., Nagdeve, D. A., Singh, A., & Singh, M. (2026). Son preference and regional inequalities in girls undernutrition in India. *Scientific Reports*, *16*(1). https://doi.org/10.1038/s41598-026-52420-y

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Zeba Ashraf is a Research Scholar at the University Department of Economics, Ranchi University, where she is pursuing her doctoral research on the status, trends, and socio-economic determinants of child malnutrition in Jharkhand. She holds an M.Sc. in Economics (specialising in Mathematical Economics and Econometrics) from the University of Leeds, United Kingdom, and is a UGC-NET qualified economist. She has served as a Research Assistant on an ICSSR-funded Minor Research Project examining malnutrition among school-going children in Ranchi District. Her research interests encompass development economics, demography, public economics, and health economics. She has published peer-reviewed articles in national and international journals on themes including child Undernutrition, anaemia, gender-based violence, and public finance.

Email: ashrafzeba.zeb@gmail.com

Dr. Dhiraj Mani Pathak is Assistant Professor in the Department of Economics, St. Xavier's College (Autonomous), Ranchi, where he has been teaching at the undergraduate and postgraduate levels since 2008. He holds a Ph.D. from the Department of Economics, Ranchi University, with a doctoral thesis on Public Debt and Its Sustainability in Jharkhand (2016), and an M.Phil. in Economics. His research interests encompass public debt sustainability, macroeconomic policy, regional economic development, and food and nutrition economics. He has served as a Project director of a ICSSR-funded Minor Research Project examining malnutrition among school-going children in Ranchi District. He has published research in reputed national and international outlets, including Palgrave Macmillan, Global Policy (Wiley), SAGE's SEDME Journal, and the Indian Economic Journal. He has also presented papers at several national and international conferences on themes including debt management, fiscal policy, and sustainable development.

Email: pathaksxc@gmail.com

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