Inter-State Disparities in Health and Nutrition Outcomes in India: A Statistical Analysis Based on NFHS-5 Data

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Abstract:

Health and nutrition are fundamental components of human development and play a crucial role in achieving sustainable and inclusive growth. India, despite significant progress in healthcare infrastructure, continues to face substantial inter-state disparities in health and nutrition outcomes. The present study examines inter-state variations in selected health and nutrition indicators using secondary data from the National Family Health Survey (NFHS-5). The analysis focuses on indicators such as child stunting, wasting, and underweight, anemia among women, and institutional deliveries. Descriptive statistics, coefficient of variation, ranking methods, and composite index analysis are employed to measure the extent of disparities across Indian states. The results reveal significant variation in health outcomes, indicating uneven progress among states. The study highlights the need for targeted policy interventions in lagging states to reduce health inequality and improve overall health performance in India.

Introduction:

Health is an integral part of human development, and a key indicator of economic growth and social welfare. A healthy population is associated with increased productivity, better education and quality of life. Equitable access to health in such a diverse country as India is a significant policy challenge. While there has been great development in the health care system and the adoption of a number of national health programs, there remains considerable variation between states.

The health situation in India is very uneven with issues of nutrition, maternal health, child health and access to healthcare services. The socio-economic inequalities, educational status, income, health infrastructure, and governance are also important factors that can affect health outcomes between states. Child stunting, wasting, prevalence of underweight children and anemia in women continue to be serious public health problems, especially in the economically and socially deprived areas.

The National Family Health Survey (NFHS-5) is a comprehensive and reliable source of population health, nutrition, maternal and child health indicators at state level. This dataset is an important resource for studying variation and understanding the level of inequality, at a regional level, in health outcomes in the Indian states. An analysis of NFHS data enables identification of the disparities not only from the national averages but also from the statistics. It is crucial to grasp inter-state health inequalities in order to develop targeted and effective policy interventions. A statistical systematic evaluation can help policy makers prioritize

regions for immediate attention and allocation of resources. The present study thus statistically analyzes NFHS-5 secondary data of India for inter-state disparities objective-wisely to provide evidence-based inputs for inclusive health development from a nutrition and maternal and child health indicator perspective.

Review of Literature:

In the past decade, a large number of studies have focused on health and nutrition inequities between regions based on secondary data gathered at the national level like the National Family Health Survey (NFHS) and World Health Organization (WHO) reports. It is clear from these studies that enhancing health status outcomes can fail to address significant socio-economic and inter-state disparities.

World Health Organization has consistently brought to the fore that health inequities are one of the major issues in the low and middle income countries like India. WHO (2014) states that inequalities in health are strongly linked to social determinants like income, education, gender and geographic location. WHO (2018) highlighted later that maternal and child under nutrition is still one of the major contributors to morbidity and mortality, especially in South Asia.

WHO recent publications emphasize that anemia in both women and children remains an important public health problem in the developing world. WHO (2021) reported that iron-deficiency anemia affects more than half of women of reproductive age in many regions, including India, and called for integrated nutrition and health interventions.

Studies based on NFHS-4 and NFHS-5 data have documented persistent regional disparities in child nutrition outcomes. IIPS and ICF (2017) observed substantial inter-state variation in child stunting, wasting, and underweight prevalence. Using NFHS-5 data, IIPS and ICF (2021) further confirmed that although some improvement is visible, the pace of reduction in malnutrition has slowed in several states.

Dreze and Sen (2013) argued that health inequality in India reflects uneven social development and governance rather than income growth alone. More recent studies have supported this view, showing that states with better health governance and higher female literacy achieve superior maternal and child health outcomes (NITI Aayog, 2021).

WHO (2022) further emphasized that achieving health equity requires region-specific strategies and continuous monitoring using disaggregated data. The existing literature thus underscores the importance of state-wise statistical analysis using updated NFHS data, providing a strong rationale for the present study.

Research Gap:

Although several studies have examined health and nutrition outcomes in India using NFHS data, most focus on individual indicators or national averages and do not provide a

comprehensive objective-wise analysis of inter-state disparities. Existing literature rarely combines descriptive statistics, nutritional assessment, maternal and child health comparison, disparity measurement using the coefficient of variation, and composite ranking within a single framework, particularly using the latest NFHS-5 data. Moreover, limited studies quantify the magnitude of inter-state inequality and rank states based on overall health performance. Therefore, a clear research gap exists in conducting an integrated, objective-wise statistical analysis of inter-state health disparities using NFHS-5 secondary data, which the present study attempts to address

Objectives of the Study:

- To examine the inter-state variation in health and nutrition indicators in India using NFHS data.
- To analyze the nutritional status of children and women across Indian states.
- To compare health outcomes such as maternal and child health indicators among different states.
- To measure disparities in health and nutrition outcomes using statistical tools.
- To rank Indian states based on selected health and nutrition indicators.

Research Methodology:

Nature of the Study

The study is descriptive and analytical in nature, focusing on the measurement and comparison of health and nutrition outcomes across Indian states.

Source of Data

The study is based entirely on secondary data collected from the National Family Health Survey (NFHS) published by the Ministry of Health and Family Welfare, Government of India. The NFHS provides state-wise data on health, nutrition, maternal and child health indicators. The analysis is based on the latest available NFHS round (NFHS-5). Where required, comparisons may be made with earlier NFHS rounds for understanding disparities.

Variables

The study uses selected indicators such as:

- Child stunting, wasting, and underweight
- Anemia among women and children
- Maternal health indicators
- Institutional delivery and immunization coverage

(Indicators are selected based on data availability.)

Statistical tools and Techniques

- Percentages and averages
- Mean and Standard Deviation
- Coefficient of Variation (to measure inter-state disparities)
- Ranking method
- Graphical presentation (bar charts and diagrams)

The Analysis was conducted using the Python (Google Colab) with packages such as Pandas, Nmpay and Matplotlib etc.

Data Analysis and Interpretation:

Inter-state variation (Descriptive Statistics)

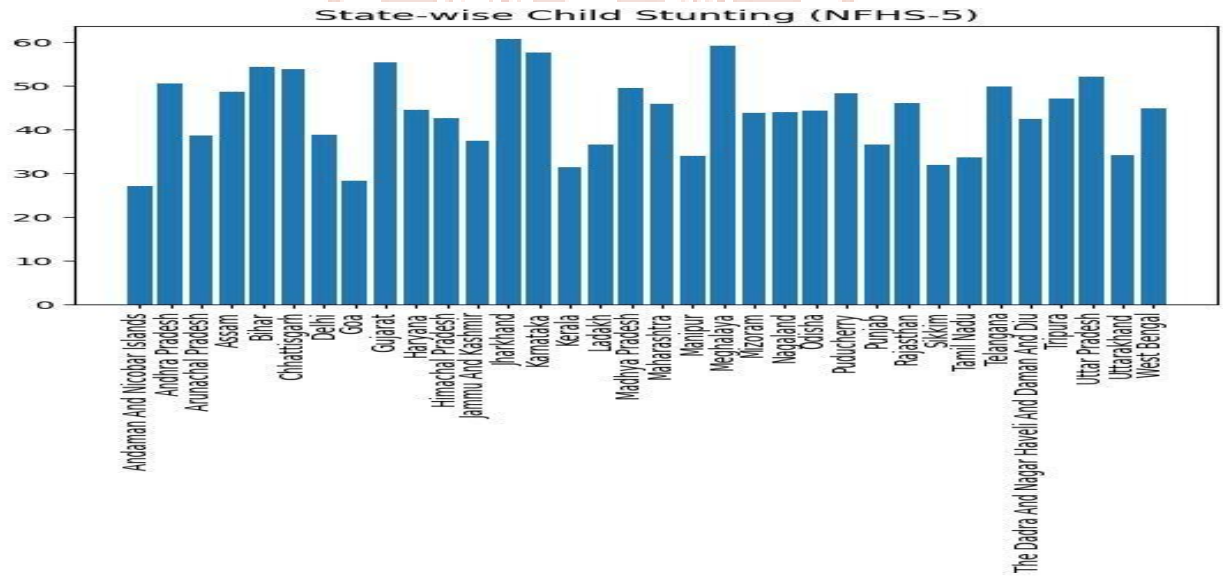
Indicator	Full Immunization	Child Stunting	Child Underweight	Child Wasting	Institutional Delivery	Women Anemia
Count	728.000	733.000	733.000	733.000	733.000	733.00
Mean	76.762	33.340	29.178	18.423	88.471	55.532
Std. Dev	14.407	8.417	9.831	6.521	12.319	12.340
Min	0.000	13.200	7.200	4.500	21.400	14.900
25%	69.175	27.100	21.600	13.300	83.500	48.900
50%	77.600	32.500	29.000	18.000	92.200	57.000
75%	87.350	39.100	36.100	22.500	97.400	63.400
Max	100.00	60.600	62.400	48.000	100.00	93.500

- The mean level of full immunization is 76.76% with a high standard deviation of 14.41, indicating large inter-state variation in immunization coverage.
- Child stunting records an average prevalence of 33.34% (SD = 8.42), showing uneven distribution of chronic under nutrition across states.
- Child underweight has a mean of 29.18% with a standard deviation of 9.83, reflecting wide nutritional differences among states.
- Child wasting shows a mean value of 18.42% (SD = 6.52), indicating acute malnutrition varies considerably.
- Institutional delivery shows a relatively high mean of 88.47%, but the standard deviation of 12.32 confirms disparities in maternal healthcare access.

- Women anemia has a high mean prevalence of 55.53% (SD = 12.34), indicating widespread nutritional deficiency with inter-state inequality.

Nutritional status analysis

Indicator	Values
Child Stunting	33.340017
Child Wasting	18.423523
Child Underweight	29.178414
Women Anemia	55.532500



- On average, 33.34% of children are stunted, indicating persistent chronic malnutrition.
- Child wasting affects 18.42% of children, reflecting acute nutritional stress in several states.
- Child underweight prevalence stands at 29.18%, suggesting long-term nutritional deprivation.
- Anemia among women affects 55.53%, highlighting a severe public health concern across states.

Maternal & child health comparison

Indicator	Institutional Delivery	Full Immunization
Count	733.000000	728.000000
Mean	88.471068	76.762263
Std	12.319126	14.407293
Min	21.400000	0.000000

25%	83.500000	69.175000
50%	92.200000	77.600000
75%	97.400000	87.350000
Max	100.000000	100.000000

Indicator/indicator	Institutional Delivery	Full Immunization
Institutional Delivery	1.000000	0.359163
Full Immunization	0.359163	1.000000

- Institutional delivery coverage is high with a mean of 88.47%, suggesting improved access to maternal health services.
- Full immunization coverage is comparatively lower at 76.76%, indicating gaps in child healthcare delivery.
- The correlation coefficient between institutional delivery and full immunization is 0.36, showing a moderate positive relationship between maternal care and child immunization.

Inter-state disparity (Coefficient of Variation)

	Indicator	Coefficient of Variation
0	Child Stunting	25.248241
1	Child Wasting	35.397565
2	Child Underweight	33.693967
3	Women's Anemia	22.222384

- Child wasting shows the highest disparity with a coefficient of variation of 35.40%.
- Child underweight also exhibits high inequality with a CV of 33.69%.
- Child stunting has a CV of 25.25%, indicating moderate disparity.
- Women anemia shows relatively lower but still significant disparity with a CV of 22.22%.

Ranking of states

Indicator	State	District	Year	Full Immunizati	Child Stunting	Child Underweig	Child Wasting	Institutiona l Delivery	Women Anemia	Composite Score	Overall Rank
400	Manipur	Imphal West	(Jan – Dec), 2019	74.10	15.60	10.20	9.30	95.70	26.8	61.90	1.0
34	Arunachal Pradesh	Siang	(Jan – Dec), 2019	60.30	21.30	8.800	12.1	81.10	23.9	66.10	2.0

27	Arunachal Pradesh	Lower Dibang Valley	(Jan – Dec), 2019	73.80	14.30	9.700	7.60	90.10	34.6	66.200	3.0
396	Manipur	Bishnupur	(Jan – Dec), 2019	66.60	15.50	11.70	7.90	89.50	35.8	70.900	4.0
698	Uttarakhand	Bageshwar	(Jan – Dec), 2019	86.90	23.60	11.90	7.70	82.000	27.8	71.000	5.0
423	Mizoram	Aizawl	(Jan – Dec), 2019	66.40	25.30	9.600	7.30	97.40	31.7	73.900	6.0
22	Arunachal Pradesh	Kra Daadi	(Jan – Dec), 2019	63.60	28.80	14.50	9.40	73.50	22.6	75.300	7.0
432	Mizoram	Saitual	(Jan – Dec), 2019	74.98	26.16	11.18	9.48	97.08	28.9	75.801	8.0
411	Manipur	Ukhrul	(Jan – Dec), 2019	39.40	27.1	16.00	11.60	44.60	21.9	76.600	9.5
403	Manipur	Kamjong	(Jan – Dec), 2019	39.40	27.1	16.00	11.60	44.60	21.9	76.60	9.5

- Manipur (Imphal West) ranks first with the lowest composite score of 61.9, indicating better overall health performance.
- Arunachal Pradesh (Siang) ranks second with a composite score of 66.1.
- Arunachal Pradesh (Lower Dibang Valley) ranks third with a composite score of 66.2.
- Higher composite scores correspond to poorer health outcomes, revealing sharp regional differences in overall health performance.

Findings:

- Significant inter-state variation exists in health indicators.
- Malnutrition and anaemia remain widespread problems.
- Maternal and child health outcomes vary considerably across states.
- High coefficient of variation confirms persistent health inequality.
- State ranking reveals regional concentration of poor health performance.

Suggestions:

- Region-specific health and nutrition policies should be implemented.
- Strengthening primary healthcare infrastructure in low-performing states.
- Focused nutrition programs for women and children.
- Increased public health expenditure in lagging states.
- Monitoring and evaluation using state-level health indices.

Conclusion:

This study analyzed inter-state health disparities in India using NFHS-5 secondary data through an objective-wise statistical approach. The findings reveal significant variation in nutrition, maternal, and child health indicators across states, with particularly high inequality in child wasting and underweight. Although institutional delivery and immunization coverage show relatively high averages, disparities persist, indicating uneven access and outcomes. The composite ranking highlights sharp regional differences in overall health performance. The study finds that while there has been improvement in health at the national level, there are large inter-state inequalities, hence, there is a need for specific measures at the regional level as well as constant monitoring of health status based on data for ensuring equitable health outcomes across India.

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