Disparities in Child Health Status: Evidence from the Backward Districts of West Bengal

Chandrima Chakraborty
(Corresponding Author)
Associate Professor
Department of Economics, Vidyasagar University, India
chandrimaeco@gmail.com

Anindita Jana
ICSSR Doctoral Fellow
Department of Economics, Vidyasagar University, India

Abstract

The health of children is a fundamental measure of a nation's overall welfare and progress. It reflects both the physical and emotional health of the youngest members of society, as well as the efficacy of public health initiatives, socioeconomic fairness, and access to necessary services. Therefore, the main emphasis of this research is to use a composite child health index (CHI) to analyze the variations in child health across the backward districts of West Bengal and also to identify the factors encouraging child health using National Family Health Survey (NFHS) data for the period 2015-16 and 2019-21. The study suggests an improvement in the child health status over time considering all districts. In 2015-16, the CHI values ranged from a minimum of 23.334 to a maximum of 30.812, with a mean value of 27.048. In 2019-21, the CHI values improved, with the minimum value rising to 28.529 and the maximum to 32.793, while the mean increased to 30.560, reflecting better overall child health. The encouraging factors of child health in backward districts of West Bengal turned out to be percentage of Women who are literate, percentage of Population living in households using improved sanitation facility, number of Sub Centres, number of Primary Health Centres, percentage of Households using iodized salt and number of District Hospitals.

Keywords: *Health, Child health, backward districts, Child health index, West Bengal*

1. Introduction

The nation's economic growth is a complex endeavour, including elements such as educational infrastructure, healthcare quality, and overall quality of life. (De, 2017; Jedrzejczak-Gas et al., 2021; Guo et al., 2022). Every person has the right to adequate mental and physical health, which is a fundamental element of a nation's economic growth (Rao, 2004; Subhalakshmi, 2022). A healthy person may work effectively to amass wealth. The aggregate wealth of people enhances the nation's total wealth, hence augmenting economic power. Conversely, poor health among the population leads to economic harm due to reduced worker productivity. This eventually hinders the development of the whole country. Health includes not just physical wellness but also peak productivity. Besides the existing direct association between health and wealth, health may also affect the future developmental capacity of the economy (Hati et al., 2013). The health of children is a fundamental measure of a nation's overall welfare and progress. In a nation as demographically extensive and socioeconomically varied as India, achieving optimum health outcomes for children is a significant challenge. A healthy and well-nourished kid population may underpin India's future economic and social progress. Conversely, ongoing malnutrition, elevated rates of newborn and under-five mortality, and inequitable access to healthcare services jeopardise the cessation of poverty and poor health

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cycles, particularly within marginalised populations. Numerous national efforts have been enacted to enhance child health outcomes. West Bengal, situated in eastern India, serves as a significant case study for analysing the situation of child health within a regional framework. As the fourth most populous state in India, West Bengal's diverse topography, mixed urban-rural demographic and moderate economic indicators place it at the intersection of the country's developmental challenges and opportunities. The National Family Health Survey (NFHS-5) performed from 2019 to 2021 indicates that West Bengal has an under-five mortality rate of 25 per 1,000 live births, which is below the national average. Immunisation coverage in the state has improved, with approximately 90% of children aged 12 to 23 months getting all fundamental immunisations. Nonetheless, malnutrition continues to be a substantial issue: 32.2% of children under five are stunted (low height-for-age), 17.2% are wasted (low weight-for-height), and 30% are underweight—statistics that, while better from prior years, underscore the ongoing challenge of child undernutrition. Moreover, almost 60% of children aged 6 to 59 months are anaemic, indicating insufficient dietary variety and maternal nutrition. The correlation between child health and overarching determinants—such as maternal education, family income, sanitation, and health infrastructure—is particularly evident in West Bengal. Rural regions and marginalised socioeconomic groups often endure an unequal share of adverse health consequences. Children from Scheduled Caste (SC) and Scheduled Tribe (ST) populations have elevated malnutrition rates and diminished access to institutional healthcare. The COVID-19 epidemic exacerbated the child health situation in India and West Bengal. Interruptions in normal immunisation programmes, closures of anganwadi (childcare) centres, heightened food insecurity, and less family income owing to lockdowns intensified pre-existing vulnerabilities among children. The pandemic resulted in setbacks for school-based health measures, including deworming and vitamin supplementation, which are critical for child nutrition and well-being. This research highlights the essential need of continuous, inclusive, and evidence-based interventions to enhance the health and well-being of children, serving both as a moral obligation and a strategic investment in the nation's future. This research examines child health in the backward districts of West Bengal, a state in India. Different studies have undergone various topics related to child health considering different dimensions, areas, time periods and methods. Jaleel et al. (2025) examined the incidence, features, and determinants of child malnutrition in the urban slums of the Kolkata Municipal Corporation (KMC) and Siliguri Municipal Corporation (SMC) in West Bengal. A cross-sectional study was performed; including 736 children aged 6 to 59 months. The results indicated a considerable frequency of stunting (24.1%), underweight (22.3%), and wasting (15.4%) in children aged 6–59 months, with notable discrepancies between the two research locations. The district-level statistics on child growth failure indexes were obtained from the district fact sheets of West Bengal, issued by NFHS, India. The findings indicated a rise in the incidence of stunted children across seven districts, while wasting was seen in ten districts and underweight in nine districts of West Bengal. According to the NFHS-5 fact sheet, several districts in West Bengal continue to exhibit a prevalence of stunting, wasting, and underweight children over 30% (Das et al. (2021)). Chakma et al. (2024) aimed to evaluate the trends and varying patterns of stunting prevalence among children under five in metropolitan India, specifically focusing on West Bengal, using National Family Health Survey data. The findings indicated that the incidence of stunting among children has risen in both impoverished and affluent socio-economic groups; however, it is comparatively more pronounced in the impoverished socio-economic group than in the affluent group in urban West Bengal. Sehgal et al. (2024) concentrated on the formulation and validation of a Child Health Index (CHI) for India, utilising publicly accessible district-level data and principal component analysis. This index comprises 16 variables across six domains: socio-cultural factors, child health status, determinants of child health (including both risk and protective factors), household

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environment, and health system and policy. This research introduced a novel instrument for assessing child health and identifying disparities in child health at the district level in India. Tarafdar (2022) examined the prominent involvement of women and their substantial responsibilities in health-seeking behaviour connected to pregnancy, delivery, and associated healthcare difficulties. Moreover, the whole discussion clarifies the condition of motherhood and its inherent decision-making behaviour to maintain the economic viability of the population. Mathur, Jaitli, and Amarnath (2022) assessed the Child Development Index at the state level for all states in 2015, analysing 640 districts throughout India. The research also addressed state-level expenditures on children in relation to district performance on the Child Development Index. Panda et al. (2020) computed the Coverage Gap Index (CGI), which is the weighted average of eight preventative maternity and child care interventions across various administrative tiers. Bivariate and spatial analyses were used to comprehend the geographical variety and spatial grouping within Indian districts. A socio-economic development index (SDI) was established and used to evaluate the connections between CGI and development. The national average CGI was 26.23%, with Kerala recording the lowest at 10.48% and Nagaland the highest at 55.07%. Richards et al. (2022) sought to address the gap in studies about the health implications of religious heterogeneity at the district level in India. Weighted state fixed effects multivariate logistic regression was used on India's Third District Level Household Survey (2007–2008). The dependent variables included child mortality under five years and indices of healthcare use. The primary independent variables were the proportions of Hindus, Muslims, Christians, Buddhists, and Sikhs within the district. The research accounted for general community diversity, family religion, and socioeconomic position. Conduct separate subgroup analyses just for Muslims, Christians, and Buddhists. Households located in areas with elevated concentrations of religious minorities in India have worse child survival rates. The study by Pooja and Guddattu (2022) focused on the proportion of stunted children across 692 Indian districts throughout two survey periods and its correlates from NFHS-5. The decrease in childhood stunting at the district level was determined by subtracting the NFHS-4 estimates from the NFHS-5 estimates. Descriptive statistics were used to analyse the characteristics of the variables, and Moran's I statistic was computed to assess geographic autocorrelation in childhood stunting. Of the Indian districts analysed, 243 exhibited an increase in childhood stunting throughout the specified time periods. Presently, around 33.56% of children in India experience stunting, with significant geographic variation in the incidence of childhood stunting throughout its districts. Significant areas of childhood stunting were identified in regions of Uttar Pradesh, Bihar, Jharkhand, and West Bengal. Access to better sanitary facilities, iodized salt, clean fuel, a minimum of ten years of education for women, and post-natal care for mothers were identified as major protective variables. Maitra and Ray (2013) examined four interconnected child health indicators in West Bengal like child malnutrition (assessed by stunting and wasting rates), and prenatal, newborn, and child death rates. It also presents research about the variation of these rates according on the child's gender, parental education, and family financial level. The data indicates that West Bengal does rather well in child health compared to national averages and surpasses the rest of East India; however it falls short of South India. The literature suggests that there is limited research available regarding the backward district-level fluctuations in the utilization of child health care in West Bengal from 2015 to 2021. Thus the main emphasis of this research is to use a child health index to analyze the variations in the child health that exist throughout the various backward districts of West Bengal and also to identify the factors encouraging child health in those districts. Districts with low productivity, low wages, and a high SC/ST population are considered backward (Planning Commission report, 2003). Considering this as a benchmark, this article considers 14 districts namely Bankura, Birbhum, Dakshin Dinajpur, Darjeeling, Hooghly, Jalpaiguri, Koch Bihar, Maldah, Murshidabad, Nadia, Paschim

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Barddhaman, Paschim Medinipur, Purba Barddhaman, and Puruliya districts as backward districts of West Bengal. Consequently, there is a discrepancy throughout the various districts of West Bengal. So, the article's main purpose is twofold; first to analyze the differences in child health status using a composite child health index across different backward districts of West Bengal, especially the backward districts of West Bengal and finally to explore factors encouraging child health in backward districts.

2. Methodology and Data Source

The present chapter uses two-stage methodologies. In the first stage, we tried to understand Child Health Status by constructing a Child Health Index (CHI). In the second stage, major factors influencing Child Health (CH) are determined using regression analysis. The Child Health Index (CHI) is constructed to assess the child health status in different backward districts of West Bengal. This index incorporates data from 14 backward districts in West Bengal. The data used in this research are collected from NFHS 4 (2015–16) and NFHS 5 (2019–21) of the National Family Health Survey. CHI is a composite index that is constructed using nine different indicators mentioned as follows:

Children who received postnatal care from a doctor/nurse/LHV/ANM/midwife/other health personnel within 2 days of delivery (%) (Sehgal, Jatrana, Johnson and Ghosh (2024)); Children age 12-23 months fully vaccinated based on information from either vaccination card or mother's recall (%) (Mathur, Jaitli and Amarnath (2022), Panda, Kumar and Awasthi (2020)); Children age 9-35 months who received a vitamin A dose in the last 6 months (%) (Bora (2022), Mathur, Jaitli and Amarnath (2022); Panda, Kumar and Awasthi (2020)); Prevalence of diarrhoea in the 2 weeks preceding the survey (%) (Sehgal, Jatrana, Johnson and Ghosh (2024), Mathur, Jaitli and Amarnath (2022)); Prevalence of symptoms of acute respiratory infection (ARI) in the 2 weeks preceding the survey (%) (Sehgal, Jatrana, Johnson and Ghosh (2024), Mathur, Jaitli and Amarnath (2022)); Children under age 3 years breastfed within one hour of birth (%) (Sehgal, Jatrana, Johnson and Ghosh (2024)); Children under 5 years who are stunted (height-for-age) (%) (-) (Sehgal, Jatrana, Johnson and Ghosh (2024), Mathur, Jaitli and Amarnath (2022)); Children under 5 years who are wasted (weight-for-height) (%) (-) (Sehgal, Jatrana, Johnson and Ghosh (2024), Mathur, Jaitli and Amarnath (2022)); Children age 6-59 months who are anaemic (<11.0 g/dl) (%) (-) (Sehgal, Jatrana, Johnson and Ghosh (2024)). The Child Health Index (CHI) is computed as the weighted average of the underlying individual indicators. Averaging the different indicators would implicitly give more weight to the measure that exhibits the largest variability or standard deviation. We therefore first normalize the indicators by equalizing their standard deviations. Then we determine what a 1%-point change would translate to in terms of standard deviations by dividing 0.01 by the standard deviation for each indicator. These values are then used as weights to calculate the weighted average of all indicators. This way of weighting indicators allows us to make sure that each indicator has the same relative impact on the index (Global Gender Gap Report, July 2022, World Economic Forum). The backward districts of West Bengal are considered in the present study namely Bankura, Birbhum, Dakshin Dinajpur, Darjeeling, Hooghly, Jalpaiguri, Koch Bihar, Maldah, Murshidabad, Nadia, Paschim Barddhaman, Paschim Medinipur, Purba Barddhaman, and Puruliya, considering the National Family Health Survey (NFHS) 4 & 5 data. A second-stage regression analysis of Child Health (CH) can help to identify factors that enhance or hinder it. This, in turn, becomes helpful for public policy for improving Child Health. To get a comprehensive picture of the possible determinants influencing Child Health, the following equation is used employing panel regression technique:

$$CHI = \beta_0 + \beta_1 WL + \beta_2 ISF + \beta_3 SC + \beta_4 PHC + \beta_5 UIS + \beta_6 DH + \varepsilon_i$$

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Where WL represents Women who are literate; ISF represents Population living in households that use an improved sanitation facility; SC stands for Sub Centres; PHC represents Primary Health Centres; UIS indicates Households using iodized salt and District Hospital denoted by DH.

3. Results and Discussion

This section represents the analysis of the results and results are presented using different tables as follows: Table 1 represents the Child Health Index Values for backward districts of West Bengal in 2015-16 (NFHS-4) and 2019-21 (NFHS-5).

Table 1: Child Health Index in 2015-16 and 2019-21

Districts	2015-16	2019-21
Bankura	28.986	31.091
Birbhum	29.177	32.793
Dakshin Dinajpur	29.225	31.208
Darjeeling	23.334	31.196
Hooghly	26.665	30.850
Jalpaiguri	29.502	29.009
Koch Bihar	27.769	28.529
Maldah	25.847	28.990
Murshidabad	26.424	30.100
Nadia	24.577	30.577
Paschim Barddhaman	24.281	29.720
Paschim Medinipur	27.788	30.816
Purba Barddhaman	24.281	30.510
Puruliya	30.812	32.458

Source: Authors' calculation

Table 1 displays the Child Health Index (CHI) values for the backward districts of West Bengal for the periods 2015–16 and 2019–21, indicating a general improvement in child health for all the districts except Jalpaiguri. Birbhum shown an improvement from 29.177 to 32.793, but Darjeeling show the most pronounced rise, escalating from 23.334 in 2015–16 to 31.196 in 2019–21. Nadia increased from 24.577 to 30.577, whereas Paschim Bardhhaman ascended from 24.281 to 29.720. Puruliya, the highest-performing district in 2015–16 with a CHI of 30.812, increased its score to 32.458, therefore retaining its leading status. Conversely, Jalpaiguri was the only district decreasing from 29.502 to 29.009, although Koch Bihar shown little rising from 27.769 to 28.529. Other districts, including Bankura (28.986 to 31.091), Dakshin Dinajpur (29.225 to 31.208), Hooghly (26.665 to 30.850), Maldah (25.847 to 28.990), Murshidabad (26.424 to 30.100), Paschim Medinipur (27.788 to 30.816), and Purba Barddhaman (24.281 to 30.510), exhibited improvements, reflecting a favourable trend in child health outcomes across the majority of the underdeveloped districts in the state. Table 2 depicts the Summary Statistics of Child Health Index.

Table 2: Summary Statistics of Child Health Index

	Minimum	Maximum	Mean	CV
NFHS 4	23.334	30.812	27.048	0.087
NFHS 5	28.529	32.793	30.560	0.040

Source: Authors' calculation

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Table 2 presents summary statistics for the Child Health Index (CHI) from the National Family Health Survey (NFHS) for two periods: 2015-16 (NFHS 4) and 2019-21 (NFHS 5). In 2015-16, the CHI values ranged from a minimum of 23.334 to a maximum of 30.812, with a mean value of 27.048 and a coefficient of variation (CV) of 0.087, indicating a relatively moderate level of variation across districts. In 2019-21, the CHI values improved, with the minimum value rising to 28.529 and the maximum to 32.793, while the mean increased to 30.560, reflecting better overall child health. The CV decreased to 0.040, suggesting that the variability in child health outcomes across districts was much lower, indicating more uniform improvement in child health over the five-year period. and Table 3 represents the rank of backward districts of West Bengal based on Child Health Index.

Table 3: Rank of Backward Districts of West Bengal based on Child Health Index

Districts	Rank (2015-16)	Rank (2019-21)	Difference in rank
Bankura	5	5	Unchanged
Birbhum	4	1	3(⇑)
Dakshin Dinajpur	3	3	Unchanged
Darjeeling	14	4	10(⇑)
Hooghly	8	6	2(⇑)
Jalpaiguri	2	12	10(⇩)
Koch Bihar	7	14	7(⇩)
Maldah	10	13	3(⇩)
Murshidabad	9	10	1(⇩)
Nadia	11	8	3(⇑)
Paschim Barddhaman	12	11	1(⇑)
Paschim Medinipur	6	7	1(⇩)
Purba Barddhaman	13	9	4(⇑)
Puruliya	1	2	1(⇩)

Source: Authors' calculation

Table 3 ranks the backward districts of West Bengal based on the Child Health Index (CHI) for the years 2015-16 and 2019-21, highlighting the changes in ranks over the five-year period. Birbhum saw the most improvement, rising from 4th in 2015-16 to 1st in 2019-21, a gain of 3 positions. Similarly, Darjeeling experienced a remarkable jump of 10 positions, moving from 14th to 4th. Hooghly and Nadia also showed improvements, advancing 2 and 3 ranks, respectively. On the other hand, Jalpaiguri and Koch Bihar experienced notable declines in rank, dropping 10 and 7 places, respectively. This decline suggests a relative deterioration in child health outcomes in these districts. Maldah, Murshidabad, and Paschim Medinipur also saw slight declines in their ranks. Purba Barddhaman and Puruliya, while showing slight changes in rank, both dropped by 4 and 1 place, respectively. Overall, the table reflects considerable shifts in the relative child health status of districts, with some improving significantly, while others saw declines, indicating changes in the effectiveness of health initiatives or varying local challenges.

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Table 4: Determinants of Child Health in Backward Districts of West Bengal

Explanatory Variables	Coefficient	t-Statistic	p-values
C	12.715	8.287	0
WL	0.299	18.512	0
ISF	0.052	94.322	0
SC	0.012	10.222	0
PHC	0.056	6.514	0
UIS	0.119	49.389	0
DH	1.170	9.694	0
Adjusted R-squared	0.879		
F-statistic	33.599		
Prob (F-statistic)	0		

Source: Authors' calculation

The determinants of CH of backward districts of West Bengal are WL, ISF, SC, PHC, UIS and DH. All the determinants are positively affecting CH i.e. promoting the child health. The results are shown in Table 4. Educated mothers significantly enhance child health by using their knowledge to make educated choices about diet, healthcare, and cleanliness habits. (Basu & Stephenson, 2005; Frost et al., 2005). The population residing in houses with enhanced sanitation facilities has superior child health outcomes, likely attributable to less exposure to infectious illnesses. Access to clean and sanitary sanitation facilities reduce the risk of illnesses, diminishes infant death rates, and enhances child health (Gertler et al., 2015; Fink et al., 2011; Headey and Palloni, 2019). Subcentres are crucial for maternal health since they provide key maternity and child health services at the community level. They provide prenatal care, postnatal care, immunisations, family planning, and health education, ensuring that pregnant women have timely and high-quality healthcare, hence decreasing maternal mortality and enhancing maternal well-being (Yazbeck, 2009; Bhutta et al., 2015; WHO, 2015). Primary Health Care (PHCs) is essential for decreasing child mortality and morbidity rates (Bhutta et al., 2013). Primary Health Centres (PHCs) function as the first point of contact for addressing prevalent paediatric ailments such as diarrhoea and respiratory infections, facilitating prompt medical intervention to avert complications (WHO, 2018).

The use of iodized salt is essential for enhancing child health, since it averts iodine deficiency, a primary contributor to avoidable intellectual impairments and developmental problems in children (Hetzel & Pandav, 1994; WHO Report, 2007; Zimmermann & Andersson, 2012). District hospitals can enhance paediatric health by delivering vital medical services, such as immunisations, nutritional programmes, and maternal healthcare. These facilities provide accessible and economical treatments for paediatric ailments, hence decreasing mortality and morbidity (WHO, 2022; Bryce, 2005; Bhutta, 2013).

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4. Conclusion

The chief emphasis of this research is to analyse child health using a composite child health index across the backward districts of West Bengal using National Family Health Survey (NFHS) data for the period 2015-16 and 2019-21. Along with it, the paper tries to explore the major factors encouraging child health. The study suggests an improvement in the child health status over time considering all districts. In 2015-16, the CHI values ranged from a minimum of 23.334 to a maximum of 30.812, with a mean value of 27.048. In 2019-21, the CHI values improved, with the minimum value rising to 28.529 and the maximum to 32.793, while the mean increased to 30.560, reflecting better overall child health. The Child Health Index (CHI) values for the backward districts of West Bengal for the periods 2015–16 and 2019–21, indicates a general improvement in child health for all the districts except Jalpaiguri. Darjeeling show the most pronounced rise. Ranks of the backward districts of West Bengal based on the Child Health Index (CHI) for the years 2015-16 and 2019-21, highlights the changes in ranks over the five-year period. Birbhum saw the most improvement, rising from 4th in 2015-16 to 1st in 2019-21, a gain of 3 positions. Similarly, Darjeeling experienced a remarkable jump of 10 positions, moving from 14th to 4th. Hooghly and Nadia also showed improvements, advancing 2 and 3 ranks, respectively. On the other hand, Jalpaiguri and Koch Bihar experienced notable declines in rank, dropping 10 and 7 places, respectively. The encouraging factors of child health in backward districts of West Bengal turned out to be percentage of Women who are literate, percentage of Population living in households using improved sanitation facility, number of Sub Centres, number of Primary Health Centres, percentage of Households using iodized salt and number of District Hospitals. The paper suggests more women education, sanitation facility, increase in the number of SCs, PHCs and DHs and also more use of iodized salt in the backward districts of West Bengal for improving child health care.

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