

BRIDGING THE GAP: A SOCIAL DETERMINANTS ANALYSIS OF CHILD MORTALITY IN RURAL INDIA

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in

Hospital and Health Management

By

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To Whomsoever It May Concern

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We thank her for her efforts and contribution during her tenure with us and wish her all the very best for her future endeavours.

For **BDO India LLP**

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DECLARATION BY STUDENT

I hereby declare that this dissertation titled "Bridging the Gap: A Social Determinant Analysis of Child Mortality in Rural India" is a Bonafide record of my original research work. I declare that it has not been submitted to any other institution or University for the award of any degree or diploma. Information derived from the published or unpublished work of others has been given due acknowledgement in the text.

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CERTIFICATE

This is to certify that dissertation titled **“Bridging the gap: A social determinants analysis of child mortality in rural India”** is a record of the research work undertaken by **Dr. Purva Prajapati** in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur under my guidance and supervision and her approach to the research study has been sincere, scientific, and analytical.

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ABSTRACT

Child mortality serves as a crucial indicator of a nation's overall health. India has made significant strides in reducing child mortality rates, with the under-five mortality rate (U5MR) decreasing from 45 per 1,000 live births in 2015 to 29.1 in 2022, and the infant mortality rate (IMR) dropping from 36.2 in 2015 to 25.7 in 2024. Despite this progress, substantial disparities persist, particularly between rural and urban areas. This dissertation, titled "Bridging the Gap: A Social Determinants Analysis of Child Mortality in Rural India," explores the persistent child mortality gaps in India and evaluates the impact of social determinants, healthcare accessibility, and nutrition on these outcomes.

In order to understand the role of medical services, nutritional status, and household conditions in determining child health, a quantitative study is conducted based on NFHS-5 and national health programs. It describes factors like; healthcare service provision, undernutrition among children, and household and community factors namely, water, sanitation, and maternal education distinguishing rural-urban differences.

An initial study carried out a quantitative assessment of the correlation between malnutrition, stunting, wasting in the states having the highest IMR and U5MR. Multiple regression analysis also suggested that improved health facility, which suggests the existence of accessible and effective facilities, should be associated with reduced mortality risk among children.

In this regard, the current dissertation illustrates that there is a need for policy innovations coupled with the intervention strategies aimed at bridging the loopholes and enhancing the general health of children in rural India. Thus, this study helps advance work on the implementation of the SDGs standards and the improvement of children's health in India by elucidating the relationships of social determinants to child mortality.

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ABBREVIATIONS

S.No.	Abbreviation	Full form
1.	SDG	Sustainable Developmental
2.	PHC	Primary Health Care
3.	CHC	Community Health centers
4.	SDH	Sub-Divisional Hospital
5.	SRS	Sample Registration System
6.	IMR	Infant Mortality Rate
7.	USMR	Under-five Mortality Rate

Chapter 1 | Introduction

Child mortality is a crucial indicator of a nation's overall health and well-being. “Consequently, India has greatly reduced child mortality rates with U5MR reducing from 45 per 1,000 in 2015 to 29.1 in 2022, and IMR dropping from 36.2 per 1000 live births in 2015 to 25.7 in 2024. This is further demonstrated by reduction of children under five that are stunted from 50% in 2000 to 31.7% in 2022.”

India has seen a steady decline in infant mortality rate (IMR), under-five mortality rate (U5MR), and neonatal mortality rate (NMR) since 2014. This progress puts us on track to meet the child mortality TARGET-3.2 set by the Sustainable Development Goals (SDGs) by 2030.

“According to NFHS-5 data, the full immunization drive among children aged 12-23 months has shown significant improvement nationwide, rising from 62% to 76%. Across 14 States/Union Territories, 11 have achieved a rate of more than three-fourths of children aged 12-23 months being fully immunized, with Odisha leading at 90%. Furthermore, India was able to successfully lower the number of children receiving zero-dose vaccines (ZD) from 2.7 million in 2021 to 1.1 million in 2022, providing an additional 1.6 million children with life-saving immunizations.”

In December 2023, data from the Poshan Tracker indicated that among the 89.1 million children under six years measured, 36 percent were found to be stunted, 17 percent were underweight, and 6 percent of children under five years were wasted.

“In the fiscal year 2023-2024, the budget allocated for children was estimated at 2.3%, down from 3.30% in 2017-2018, falling short of the 5% benchmark set by the National Plan of Action for Children in 2016. However, budgets for flagship schemes under the Ministry of Women and Child Development, including Mission Shakti, Mission POSHAN, and Mission Vatsalya, increased from 2022-23 to 2023-24. India's education investment stands at 4.64% of GDP, higher than the global average of 4.2%, while healthcare spending is at 2.96% compared to the global average of 10.89%.”

Healthcare accessibility and nutrition are critical factors impacting child mortality rates, especially IMR and U5MR, in rural India. Poor healthcare facility, improper feeding habits also put the infants and young children at a disadvantage since they are more likely to die than those in better off regions. These problems are worsened by socio-economic differences, which hamper attempts to enhance the health of children.

This paper applauds India's efforts in commensurate reduction of U5MR by more than 50% from 1992-93 to 2019-21 but analyses that even in 2019-21 rural area has slightly higher proportion of these deaths with decreasing approximately 1. 6% rural 2. 7 percent among Urban population (NFHS-5).

“Indian government has come out with a number of schemes towards tackling child mortality namely, National Health Mission (NHM)- RMNCH + A, Universal, Immunization Programme (UIP), National Rural Health Mission (NHM)- Facility Based Newborn Care, (FBNC), Janani Shishu Suraksha Karyakram (JSSK), Rashtriya Bal Swasthya Karyakram (RBSK).”

Even though global Under five mortality rates dropped significantly, India contributes to a quarter of the neonatal mortality. Every year, more than half a million newborns die within a 28- days-old period, as documented in a recent study by UNICEF known as “Every Child Alive.” The persistent challenge of ensuring equitable child health outcomes in India is highlighted by the ongoing rural-urban disparity in under-five mortality rates. Also, child mortality rates persistently remain elevated in rural areas. Targeted policies are needed to address this gap, but significant disparities persist across regions and socio-economic groups.



Infant Mortality Rate (IMR): Infant deaths (<1 year) per 1,000 live births.

Indicates- health care, nutrition, and sanitation quality.



Under-5 Mortality Rate(U5MR): Child deaths (<5 years) per 1,000 live births.

Indicates- survival rates and living conditions.



Neonatal Mortality Rate(NMR): Deaths within the first 28 days per 1,000 live births.

Indicates- newborn care quality.

Figure 1 IMR, U5MR & NMR

1.1 Factors accountable for decline in child mortality

A secondary analysis was conducted to find trends, patterns and predictive factors of infant and child mortality in India. In this study has identified the factors that contribute to the reduction in child mortality. These factors are classified into three categories:

- i. **Proximate factors** - This category includes medical and non-medical factors that play a crucial role in reducing child mortality. Medical factors such as access to quality healthcare services during antenatal and postnatal periods and care during childbirth are important. Non-medical factors such as accessibility to healthcare services also contribute significantly.
- ii. **Nutritional Status** - The second factor that affects child mortality is the nutritional status of children. Proper nutrition is essential for healthy growth and development, which, in turn, reduces the risk of mortality.
- iii. **Household and community-level factors** - The third category of factors includes aspects such as water, sanitation, housing, and maternal education. Access to clean water and proper sanitation, as well as adequate housing, are essential for the health of children.

Maternal education is also a critical factor as it enables mothers to make informed decisions regarding their child's health and well-being.

Significant advancements have been achieved in lowering child mortality rates. However, children belonging to impoverished or underprivileged families continue to be at a higher risk of harm in all developing regions. This dissimilarity in availability of healthcare services and nutritional requirements varies largely among rural and Urban India as well.

1.2 Rural-Urban Disparity in Child Mortality in India

“According to nationally representative data NFHS-5 (2019–2021), there is a considerable variation in the under-five mortality rate in different states of India. The highest under-five mortality rate per thousand is observed in Uttar Pradesh (60); Chhattisgarh (50); Madhya Pradesh (49); Jharkhand (45); Odisha (41); Rajasthan (37) and whereas the low under-five mortality rate states are Tamil Nadu (22); Kerala (5)”.

“According to the 2011 census of India, approximately 69% of the population lives in rural areas (Registrar General of India 2011 a). In the past eleven decades, the share of urban population has increased by only 13% (from 18% in 1901 to 31% in 2011)”. These gaps also exist in under-five mortality between various states of India are unacceptably wide. Rural Indians have a higher mortality rate than urban Indians. Despite the mortality rate, there are many differences in infant mortality rates between urban and rural areas across the country and state. The study found that large differences in socioeconomic status and social status were responsible for the difference in death rates between urban and rural areas. “From 1992 to 93 to 2019-21, the annual decrease in rural under-five mortality is 1.6%, whereas, in case of rural under-five mortality. It is 2.7% The rural-urban gap in under-five mortality has reduced from 44 per thousand in 1992-1993 to 40 per thousand in 2004-2005 which further decreased to 14 per thousand in 2019-2021.”

Despite a faster reduction in under-five mortality in rural than urban areas, it is still higher than in urban areas.

Hence, it is essential to examine the underlying causes of the increased child mortality rate in rural India. Additionally, it is crucial to investigate the relationship between child mortality and accessibility to healthcare services and proper nutrition in rural areas. This correlation holds significant importance.

1.3 Accessibility to Healthcare services in rural India

Accessibility is a complex triad of aspects of availability, supply and utilization of health services. Financial, organizational, social and cultural barriers to access can limit the use of services, even where they are 'available'. Access to health care is highly asymmetric between rural and urban India. While urban dwellers have a choice between public or private providers, rural dwellers have much less to choose from.

The latest rural health statistics data, which was released in 2022, has revealed a significant shortage of medical professionals such as surgeons, pediatricians, obstetricians, and gynecologists in community health centers located in rural areas. Additionally, there has been a decrease in the number of auxiliary nurse midwives at sub-centers and doctors at primary health centers in the year 2022.

This visible reduction in the availability of manpower and healthcare infrastructure could potentially have a negative impact on child mortality rates. It is therefore crucial to analyze the influence of healthcare services and infrastructure on child mortality rates in rural India, which is the focus of this study.

1.4 Nutritional Status in Rural India

Nutrition plays a vital role in determining a child's health. Undernutrition is not caused by a single factor but is rather a complex issue that is linked to several causes, ultimately resulting in stunting, and wasting.

These two factors are recognized risk factors for child mortality and morbidity. Several studies and surveys have been conducted in India to assess the prevalence of under-five malnutrition and associated factors. One notable survey is the National Family Health Survey. According to NFHS-5 data, 32.1% of children under five are underweight, 35.5% are stunted, and 19.3% are wasted. This significant burden of malnutrition is likely to affect child mortality and therefore deserves attention.

- The chart illustrates the trends in infant mortality rate, under-5 mortality rate, and neonatal mortality rate from the year 1992 to 2022.

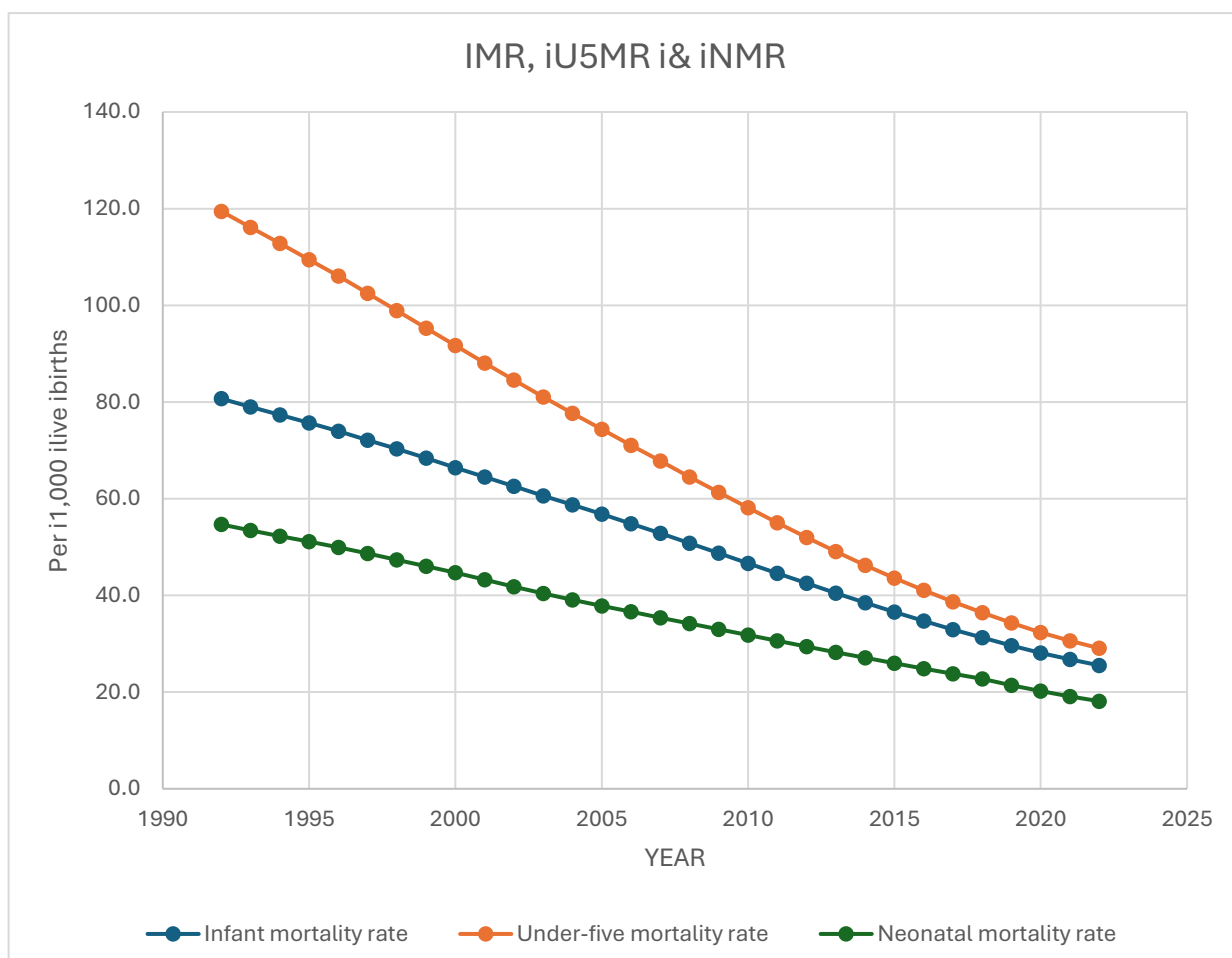


Figure 2 data.unicef.org

- From 1992-93 to 2019-21, the annual decline in under-five mortality is 1.6% in rural areas and 2.7% in urban areas. Nevertheless, the rural population still has a higher share of under-five deaths.
- The country's under-5 mortality rate (U5MR) showed a significant decrease of 3 points (annual rate of decrease: 8.6%) from 2019 (32 per 1000 live births in 2020 compared to 35 per 1000 live births in 2019). It ranges from 36 in rural areas to 21 in urban areas.

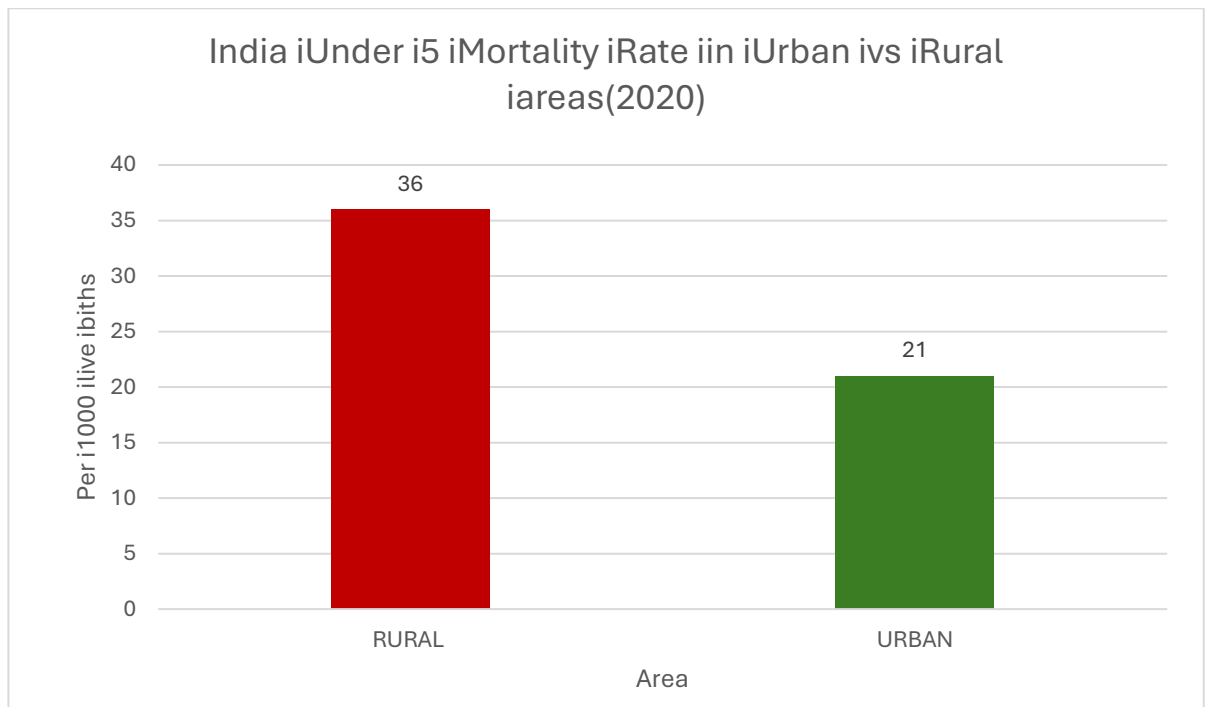


Figure 3 Ministry of Health and Family Welfare SRS 2020

Chapter-2 | Literature Review

Sl. No	Study Name	Year	Author	Location	Metho dology	Salient Features
1.	India achieves significant landmarks in reduction of child mortality	2023 Mar 23		Press Information Bureau		Highlights achievements in reducing child mortality rates in India.
2.	Rural Health Statics Report	2022 -23	Govt. of India	All States of India		Provides comprehensive health data from rural areas across India
3.	An update on explaining the rural-urban gap in under-five mortality in India.	2022 Nov 16	Kumar C. India Piyasa, Saikia N	India	Binary logisti c Regres sion analys is	The existing rural-urban gap in under-regression five mortality suggests that the social and health policies need to be needed to reach rural children from poor families and uneducated mothers.
4.	A study to assess undernutrition and its sociodemograp hic correlates in under-five children in urban and rural area of Rishikesh, Uttarakhand	2020	Singh M, Rehan A, Kishore S, Jain B, Reddy NK, Kumar D, et al.	Rishikesh, Uttarakhand	T test, Chi Squar e test	Sociodemographic factors such as religion, caste, parental education, father's occupation, and family size emerged as Significant predictors of under nutrition.
5.	Factors Affecting Infant Mortality Rate in India: An Analysis of Indian States.	2016 ; 707 -19	Suriyakal a V, Deepika MG, Amalend	All India	Regres sion analys is	This study Uses data from the year 2001 to 2011 from all states and UTs and then compared the

	Advances in Intelligent Systems and Computing		u J, Deepa G.			performance and growth rate of IMR to classify the states as good performers and laggards
6.	Child mortality in India: a complex situation	2012 Jan 27	Ghosh R	Articles from PubMed/ MEDLINE	Literature Review	Identified the proximate determinants of child mortality and their association with health seeking behavior, antenatal care, delivery practices and postnatal care of infants.
7.	Reducing child mortality in India in the new millennium	2000	Claeson M, Bose, Mawji T, Pathmanathan I	India	Literature Review	The present study documents the slowing decline in infant mortality rates in India; a departure from the longer-term trends
8.	Trends, patterns and predictive factors of infant and child mortality in well-performing and underperforming states of India: a secondary analysis using National Family Health Surveys	2019 Mar 20	Bhatia M. Dwivedi LK, Ranjan M, Dixit P. Putcha V.	India and its selected good-performing & states, namely Haryana, Kerala, Maharashtra, Punjab and Tamil Nadu, and selected poor-performing & states, namely Bihar, Chhattisgarh. Madhya Pradesh and Uttar Pradesh.	Three rounds of cross-sectional survey data	Attempts to reduce infant and child mortality rates in India are heading in the right direction. Even so, there is huge variation in performance between states.

Chapter-3 | Methodology

3.1 Research Question

What is the impact of the accessibility of healthcare services and nutrition on child mortality indicators, particularly the infant mortality rate, in rural India?

3.2 Research Objectives

- To evaluate the status of current Infant Mortality rate and Under-five Mortality Rate
- To assess the impact of nutritional status on child mortality rates.
- To determine the extent of correlation between rural healthcare infrastructure and child mortality rates, including, Infant Mortality Rate, and Under 5 Mortality Rate.

3.3 Research Design

This is a quantitative study that utilizes regression analysis to analyze the impact of healthcare infrastructure and nutritional status on child mortality rates. In addition, this study will employ a literature review approach to assess the current impact of nutrition and healthcare infrastructure on mitigating child mortality.

3.4 Research Procedure - Quantitative Analysis

The data analysis was conducted qualitatively using the Sample Registration System (SRS)

2020 Volume 55-1 data sets for Infant Mortality Rate. Also, Data sets for Under-five Mortality Rates were derived from NFHS-5 (2019-2021).

The parameters related to healthcare services and infrastructure were extracted from Rural Health Statistics 2022. These parameters included the availability of health workers, such as female ANMs at Sub Centers and PHs, as well as obstetricians, gynecologists, and pediatrician at CHCs. Other parameters considered were the number of PHCs with labor

rooms, those functioning on a 24x7 basis, and those with functional Stabilization Unit for Newborns.

Operational Definition of the Parameters:

1. Health Worker [Female]/ANM at Sub Centre in Rural Areas:

It is the number of Health worker (female) or Auxiliary Nurse Midwife working in a Sub-center in Rural areas, state wise. One ANM is required for each existing Sub Centre as per IPHS norms.

2. Health Worker (Female) / ANM at PHCs in Rural Areas:

It indicates the number of Health worker (Female) or Auxiliary Nurse Midwife working in the Primary Health center in each state. One ANM is required for each existing PHC as per IPHS norms.

3. Obstetricians & Gynecologists at CHCS:

It is the number of obstetricians and gynecologists in current position against the sanctioned posts at a Community Health Center in each state in the rural areas. One per Community Health Centre as per IPHS norms.

4. Pediatricians at CHCs:

This is ratio of the number of Pediatrician employed in current position and the number of sanctioned post in each of the state's Community Health Centre in rural areas. There would be one per Community Health Centre as prescribed by the Indira Paryavaran Mahila Kalyan Scheme (IPHS) norms.

5. Number of PHCs with labor room:

This indicator gives the total actual number of functioning rural Primary Health Centers (PHCs) with a labor room of all PHCs in a state.

6. PHCs functioning on 24X7 basis:

This indicator provides the numbers of the rural PHC with 24 hours working capacity in each state, among all rural PHCs in the respective state.

7. PHCs With functioning Stabilization Units for Newborn:

This indicator quantifies the count of rural Primary Health Centers (PHCS) within each state that possess a functional stabilization unit for newborns, out of the total number of PHCs across the state.

The data sets were analyzed using regression analysis in Microsoft Excel to calculate the Pearson's Coefficient of correlation and p-value to determine the significance of the correlation.

Additionally, Pareto charts illustrating the distribution of infant mortality rates across states were created using Microsoft Excel.

3.5 Research Type - Literature Review.

The Literature review included secondary research of both qualitative and quantitative studies published in peer-reviewed journals, government reports, and grey literature. Published studies were identified through searches of PubMed and Google Scholar. The search results were then sorted based on inclusion and exclusion criteria, and articles that did not meet the inclusion criteria were excluded.

Inclusion terms-

Articles with the key word - "Child Mortality Rates" AND/OR "Nutritional status" AND/OR "Healthcare infrastructure AND/OR "Infant mortality rate" AND/OR "access to public healthcare system" AND/OR "healthcare facilities accessibility"

In addition, the method of snowball article collection (citations from relevant journal articles) was also used.

Exclusion terms-

- Articles dated before 2000 were excluded from the study.
- Further the search was refined by limiting studies to India.

Chapter 4 | Results

4.1 Infant Mortality Rate - Data Analysis

Infant mortality rates for each state in the year 2020 were extracted from the Sample Registration

System (SRS) 2020 Volume 55-1 and analyzed using a Pareto chart.

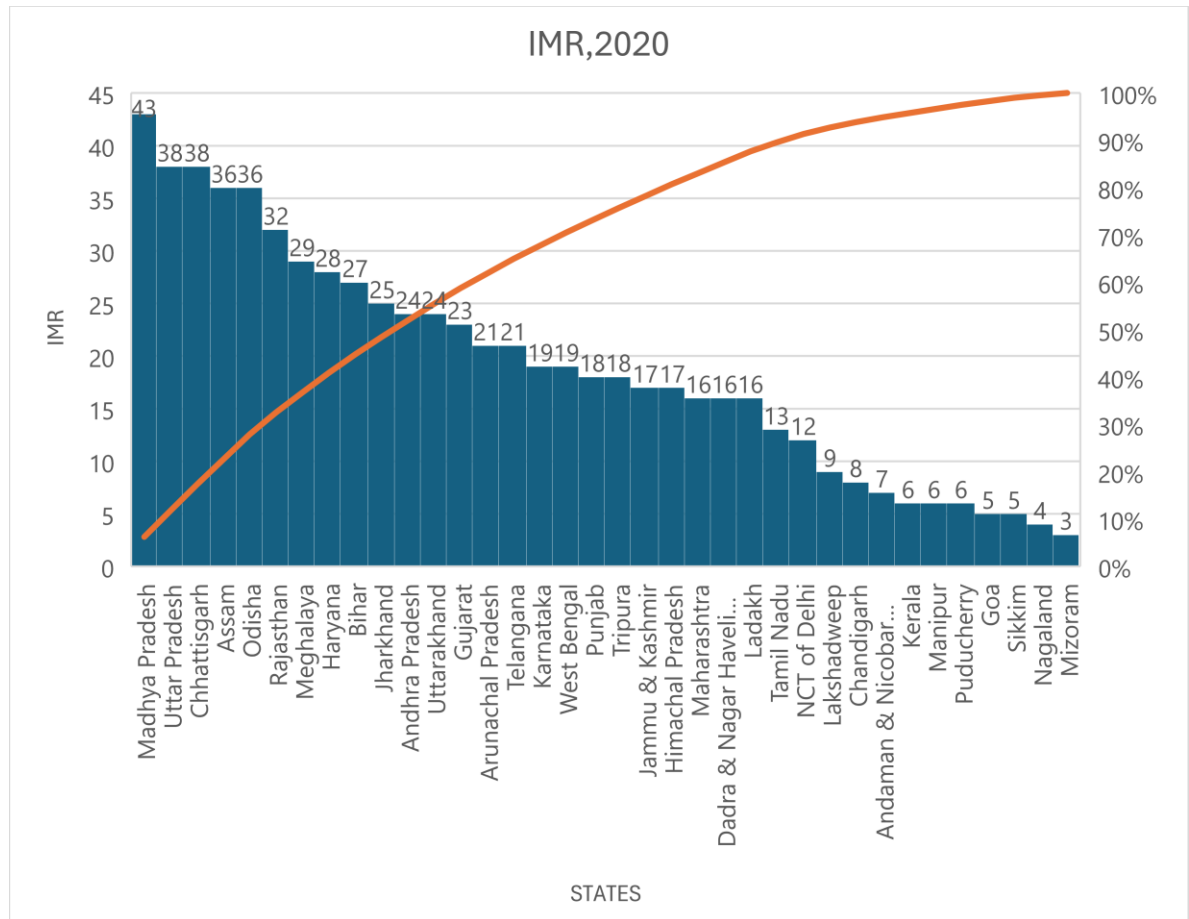


Figure 4 Pareto chart.

The chart revealed that five states account for 80% of the total infant mortality rate in India.

Specifically, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Assam, and Odisha were found to have the highest infant mortality rates.

4.2 Under-five Mortality Rate - Data Analysis

The National Family Health Survey-5, conducted from 2019-2022, provides state-wise data on Under-Five Mortality Rate. To identify the top five states that contribute the most to the overall Under-Five Mortality Rate in India, a Pareto chart was created based on this data analysis.

According to the chart above, the states with the highest Under-Five Mortality Rates are Uttar Pradesh, Bihar, Madhya Pradesh, Uttarakhand, and Jharkhand. These five states are responsible for 70-80% of the overall Under-Five Mortality Rate. Figure 2, Figure 3 and Figure 4, illustrate the states with the highest Infant Mortality Rate and Under-Five Mortality Rate. These states include Madhya Pradesh, Chhattisgarh, Bihar, Uttar Pradesh, Assam, Uttarakhand, Jharkhand, and Odisha. These findings suggest the need for targeted interventions to improve healthcare services and reduce mortality rates in these regions.

4.3 Prevalence of Malnutrition with respect to Child Mortality rates in Rural Area

The Comprehensive National Nutrition Survey (CNNS) from 2016-2018 reported that 35% of Indian children aged 0-4 years were stunted, with the highest rates in populous states like Bihar. Recent data from 2023-2024 indicates a decrease in stunting prevalence among children under five to 31.7%, though regional disparities persist. For instance, Bihar's stunting rate remains high at 42.9%.

The CNNS also highlighted that 17.3% of children were wasted, and 35.5% were underweight, contributing significantly to maternal and child mortality, with almost half of all deaths among children under the age of five linked to poor nutrition.

The Government of India's POSHAN Abhiyaan (National Nutrition Mission), launched in 2018, aims to improve nutrition among children, pregnant women, and lactating mothers through a multi-sectoral approach. Despite some progress, continued efforts and targeted interventions are necessary to further reduce malnutrition and achieve maternal and child health goals.

In 2023-2024, stunting among children under five decreased to 31.7% from 35.5% in the 2019-2021 NFHS. Nonetheless, states like Madhya Pradesh (37.8%), Rajasthan (42.7%), and Uttar Pradesh (42.9%) exhibit high rates, with rural areas (37%) more affected than urban areas (27%).

India's child wasting rate remains the highest globally at 18.7%, especially in Madhya Pradesh, West Bengal, Tamil Nadu, and Jharkhand. Additionally, 33.4% of children aged 0-4 are underweight, with the highest rates in Bihar (42.9%), Chhattisgarh (39.8%), Madhya Pradesh (39.5%), and Jharkhand (38.2%). Rural areas have a higher underweight prevalence (36%) compared to urban areas (26%).

These malnutrition challenges necessitate urgent and targeted interventions to enhance child nutrition, particularly in high-burden states and rural regions.

4.4 Correlation between rural healthcare infrastructure and child mortality rates

The level of accessibility to healthcare services can be ascertained by examining the availability of human resources and the number of healthcare infrastructures present at the Sub Center, Primary Healthcare Center, and Community Health Center. These parameters are elaborately presented in the Rural Health Statistics Report of 2022. Certain parameters of human resources and infrastructure were analyzed using regression

analysis to find its correlation with Child mortality Indicators that is Infant Mortality Rate and Under-five Mortality Rates.

After performing regression analysis, Pearson's correlation coefficient and P values were derived.

The interpretation of the Pearson correlation coefficient is that:

- A. Perfect: If the value is close to ± 1 , then it is said to be a perfect correlation: as one variable increases, the other variable tends to also increase (if positive) or decrease (if negative).
- b. High degree: If the value of the coefficient lies between ± 0.50 and ± 1 , then it is said to be a strong correlation.
- C. Moderate degree: If the value lies between ± 0.30 and ± 0.49 , then it is said to be a moderate correlation.
- d. Low degree: When the value lies below $+ 0.29$, then it is said to be a small correlation
- E. No Correlation: When the value is zero.

Table 1- Results of Regression analysis demonstrating pearson correlation coefficient and p-value.

Factors	Correlation with IMR	p-value	Correlation with U5MR	p-value
Number of Auxiliary Nurse Midwives (ANMs) at sub-centers	0.5608	0.0005	0.4728	0.00475
Number of obstetricians and gynecologists at Community Health Centers (CHCs)	0.5326	0.0012	0.5761	0.00036
Number of pediatricians at CHCs	0.4473	0.0080	0.6235	0.00008
Number of Primary Health Centers (PHCs) with a labor room	0.5132	0.0019	0.4603	0.00616
Number of PHCs functioning on a 24x7 basis	0.5037	0.0024	0.6135	0.00011
Number of PHCs with functioning stabilization units for newborns	0.4324	0.0107	0.6577	0.00002
Health Worker (Female) / ANM at PHCs	0.3389	0.00464	0.2050	0.24472

Table 1 indicates a strong positive correlation between the number of ANMs working at subcenters, the number of obstetricians and gynecologists at CHCs, and the number of PHCs with a labor room, with infant mortality rates. Consequently, the states with higher infant mortality rates need to enhance these three aspects of health infrastructure and human resources.

Furthermore, after analyzing the correlation between Under-five mortality rate and healthcare parameters, a strong positive correlation was found between the availability of Pediatricians at CHCs, PHCs functioning on a 24X7 basis, PHCs with functioning Stabilization Units for Newborns and Under-five mortality rate. This provides valuable insights for planning interventions in states with higher mortality rates.

Moreover, all the correlations were statistically significant, except for the association between Health Worker [Female] / ANM at PHCs and Under-five mortality rates.

KEY FINDINGS –

The states with the highest Infant Mortality Rate and Under-Five Mortality Rate include Madhya Pradesh, Chhattisgarh, Bihar, Uttar Pradesh, Assam, Uttarakhand, Jharkhand, and Odisha.

The prevalence of Malnutrition (stunting and wasting) was noticeably high in these states.

There is a strong correlation between the number of ANMs working at subcenters, the number of obstetricians and gynecologists at CHCs, and the number of PHCs with a labor room, with infant mortality rates.

There is a strong correlation between the availability of Pediatricians at CHCs, PHs functioning on a 24X7 basis, PHCs with functioning Stabilization Units for Newborns and Under-five mortality rate.

All the correlations were statistically significant except for the association between Health Worker [Female] / ANM at PHCs and Under-five mortality rates.

Chapter-5 | Discussion

This study presents the initial evidence of a significant connection between the amenities provided by healthcare centers and the accessibility of such centers to child mortality rates. Several factors contribute to reduce the mortality rates of infants and children under five years, including the presence of healthcare workers such as ANMs at sub-centers and primary health centers (PHCs), as well as the availability of obstetricians, gynecologists, and pediatricians at community health centers (CHCs). It is crucial that these human resources are adequately staffed at the designated healthcare facilities. Regarding infrastructure, the present study emphasizes the importance of PHCs equipped with labor rooms and functional Stabilization Units for Newborns, as they play a crucial role in promoting child health and reducing infant mortality.

In 2021, a study titled "A Critical Analysis on Rural Health Infrastructure in India" was published, conducting a thorough examination of the requirements of rural healthcare infrastructure. The study identified existing gaps in the infrastructure and proposed strategies to address these deficiencies in rural healthcare. The findings of the study indicated that all selected states and union territories were grappling with shortages in available sub-centers. In 2005, Uttar Pradesh exhibited the highest shortage of sub-centers with 38,437, followed by Maharashtra, Bihar, West Bengal, Tamil Nadu, Madhya Pradesh, Gujarat, Karnataka, and Rajasthan. This shortage trend persisted until 2019. The study recommended that particular attention should be given to highly populated states and union territories to alleviate these issues.

5.1 The Challenges of Healthcare Accessibility in Achieving the Desired Child Mortality Rates

Delivering healthcare to "everyone" including the socially disadvantaged, economically challenged, and systemically marginalized populations, as well as reaching "everywhere."

including remote areas such as the Himalayan region, faces several challenges. These challenges can be represented as five "As" for our consideration.

1. **Awareness or the lack of it:** The reasons for lack of awareness may lie in low educational status, poor functional literacy, low accent on education within the healthcare system, and low priority for health in the population, among others.
2. **Access or lack of it:** Access to healthcare is a crucial aspect that involves the right and opportunity to benefit from quality healthcare. Factors such as availability, supply, and utilization of healthcare services determine access. Physical reach, defined as the ability to access healthcare facilities within a 5 km distance, poses a challenge in rural areas where only a minority have such access. Even when physically accessible, the quality and availability of care may be lacking, as evidenced by the deficiency of basic infrastructural facilities in primary health centers. Encouraging discussions on access determinants and addressing barriers in financial, geographic, social, and systemic domains is vital for improving access to quality healthcare.
3. **Absence or the human power crisis in healthcare:** From 2005 to 2022, there has been a persistent shortage of workforce, particularly in Primary Health Centers (PHs) and Sub Centers (SCs). While this shortage has been gradually decreasing over the years, the rate of decrease has been quite slow. The available workforce is not distributed optimally, with most preferring to work in areas where infrastructure and facilities for family life and growth are higher. In general, the poorer areas of Northern and Central India have lower densities of health workers compared to the Southern states.
4. **Affordability or the cost of healthcare:** The healthcare sector in India is predominantly dominated by the private sector, with nearly 75% of healthcare expenditure being borne by households, leading to catastrophic healthcare costs and impoverishment. The lack of regulation in the private sector leads to varying quality and costs of services. The public sector, on the other hand, provides

healthcare at low or no cost but is perceived as unreliable and of indifferent quality, and is not preferred unless private care is unaffordable.

5. **Accountability or the lack of it:** Being accountable in the healthcare profession involves justifying and taking responsibility for one's activities. Healthcare professionals have responsibilities towards their clients, ensuring the delivery of the service they deserve.

They are also accountable to their employers, expected to maintain a certain standard of service. Additionally, peers and colleagues expect healthcare professionals to uphold a code of conduct that fosters professional growth and harmony within the profession.

To address the challenges in healthcare access and delivery, various intervention strategies can be implemented. These may include the issues of physical accessibility whereby there is need to enhance healthcare service provisions through the provision of more health facilities in these areas, increasing the numbers of health care givers and practitioners and the removal of socio-economic barriers that hitherto slow down the use of these health facilities. Further, to this, it is possible to try to minimize or control privatized health care providers, and augment the public spending and investment on health care, and paying more attention to the health inequality issues of the poor and deprived groups. With these strategies in place, there stands a possibility that better access and delivery of all forms of health care will be realized.

5.2 Existing strategies to achieve desired child mortality rate-

The Ministry of Health and Family Welfare of the Government of India has incorporated appropriate programmes to enhance the facility and use of programmes for child health services. They include:

1. The promotion of institutional deliveries is facilitated through cash incentives under the Janani Suraksha Yojana (JSY) and Janani Shishu

Suraksha Karyakaram (JSSK). These initiatives provide pregnant women delivering in public health institutions with various benefits, including free ante-natal check-ups, delivery services (including Caesarean sections), post-natal care, and treatment for sick infants up to one year of age.

2. India Newborn Action Plan (INAP) was launched in year 2014 to collectively and systematically work towards achievement of the vision set under “Single Digit Neonatal Mortality Rate” and “Single Digit Stillbirth Rate” by the year 2030.
3. At different levels, the focus is provided on facility-based newborn care as the means of decreasing the rates of child mortality. Establishing the Newborn Care Units (NBSUs) and Sick Newborn Care Units (SNCUs) is one of the components required and Newborn Care Corners (NBCCs), with the objective of prioritizing low-cost preventive and promotional strategies as a focus area under the National Health. 3. At different levels, the focus is provided on facility-based newborn care as the means of decreasing the rates of child mortality. This require setting up of centers to manage newborn illnesses SNCUs, NBSUs for example. and Newborn Care Corners (NBCCs), with the objective of prioritizing low-cost preventive and promotional strategies as a focus area under the National Health.

Mission (NHM). These facilities are designed to provide specialized care and support for newborns in need, aiming to improve their health outcomes and reduce infant mortality.

5.3 Nutritional Interventions for child health:

NUTRITIONAL REHABILITATION CENTERS

- Severe Acute Malnutrition (SAM) plays a significant role in the mortality of children affected by common childhood illnesses, such as diarrhea and pneumonia.
- However, these deaths can be prevented by taking timely and appropriate actions.
- To address this issue, Nutritional Rehabilitation Centres (NRCs) are being established within healthcare facilities to provide inpatient care for severely malnourished children.
- These centers also involve counseling mothers on proper feeding practices, and once the children are on the path to recovery, they are discharged with regular follow-up monitoring their progress at home.

5.4 Shortcoming in the existing programs of Child Health

- **Utilization of services** - The utilization of JSSK services in Chhattisgarh is considerably low, with only 40% of the population themselves of these services. This utilization rate is notably lower than the national average, indicating a significant gap in accessing and utilizing the benefits offered by the JSSK scheme.
- **Out-of-pocket expenses** - Despite the provision of free or low-cost services under various schemes, families of children often encounter out-of-pocket expenses, such as transportation costs, that are not covered.
- **Geographical disparities** - A study examining the disparities in service utilization between rural and urban areas revealed that the factors influencing respondents' utilization of services varied significantly. The study highlights the need for improvement in the services offered through the JSY and JSSK

schemes, particularly in terms of service availability and the public's awareness of their entitlements under these programs.

5.5 Future pathways for mitigating disparities and maximizing the effectiveness of child health strategies.

- **Intersectoral action is needed to tackle social determinants of health:**

These are other actions or approaches that are implemented by sectors like education, environment, or finance among others with or without the assistance of the health sector to enhance health related results. Those nations that have embarked on the development of intersectoral interventions on narrowing inequalities in the social determinants of child health have improved on the child mortality front three-fold.

- **Geographic coverage of services must be planned to match needs:**

Provision of services in child health should be used to coordinate with the coverage and plans in relation to the population needs of the society. It also becomes significant to have a geographical distribution of children and the health care needs that they may present to warrant right service delivery and reach out to the concerned individuals. This involves determination of the proportion and distribution of the population, spatial distribution of population and distribution of the health facilities.

- **Sustainable funding must reduce the burden on poor children's families.**

Insufficient funding allocated to child health programming contributes to inadequate public services, leading to substandard care and placing a disproportionate financial burden on impoverished families. The most significant disparities in access to healthcare affect interventions that necessitate round-the-clock availability of health facilities.

It is crucial for national policymakers to recognize and acknowledge that equity-focused policies, despite requiring higher implementation costs, yield

quicker improvements in coverage and more substantial reductions in child mortality compared to non-targeted approaches. Furthermore, such equity-focused strategies prove to be cost-effective in terms of the cost incurred per life saved.

- **Driving equity from the top-down and bottom-up**

Equity-oriented policies prioritize addressing the unequal distribution of health issues among disadvantaged groups. These policies specifically target the barriers related to geography, finances, and psychosocial factors that hinder access to healthcare services. They also include corrective activities that are conducted within the health system as well as interventions that are conducted in other sectors within the society with the aim of achieving equal and proper health. Thus, equity-oriented policies are focused on these areas to eliminate health differences and provide opportunities for all people as for the healthcare services usage and receipt.

Chapter-6 | Conclusion and Recommendations

Child mortality is commonly regarded as one of the most important measures that reflect the state of a particular nation's health. With regard to child mortality, India has recorded progress where the under-five mortality rate (U5MR) has decreased from 45 per 1000 live births in 2015 to 29.1 in 2022 and separately the infant mortality rate IMR falling from 36.2 per 1,000 live births in 2015 to 25.7 per 1000 by 2024. Also, stunting among children under five years has decreased from 50% in the year 2000 to 31.7% in 2022, yet the overall health of children in the country remains a challenge. Various factors contribute to these rates, including maternal health, nutrition, education, poverty, healthcare infrastructure, and human resources.

While accessibility, affordability, and awareness remain significant challenges in healthcare utilization, rural areas in India have witnessed a reduction in child mortality rates. However, this reduction is insufficient to meet the targets set for 2030 under Goal 3.2 of sustainable development.

Therefore, this study resulted with showing a strong positive correlation of healthcare services and infrastructure with that of Child Mortality Rates. States with the highest IMR and USMR were identified as Madhya Pradesh, Chhattisgarh, Bihar, Uttar Pradesh, Assam, Uttarakhand, Jharkhand, and Odisha. These states also showed a high prevalence of malnutrition, stunting, and wasting, indicating a connection between nutritional status and child mortality rates.

In conclusion, there is a strong correlation between the number of ANMs working at subcenters, the number of obstetricians and gynecologists at CHCs, and the number of PHCs with a labor room, with infant mortality rates. Also, a significant positive correlation was seen between the availability of Pediatricians at CHCs, PHCs functioning on a 24X7 basis, PHCs with functioning Stabilization Units for Newborns and Under-five mortality rate.

Adequate healthcare infrastructure plays a crucial role in providing essential medical services, including proper nutrition, to children. Accessible and well-equipped healthcare

facilities contribute to early detection, timely intervention, and effective management of nutrition-related issues, ultimately reducing child mortality rates.

Therefore, investing in healthcare infrastructure and nutrition programs is vital for improving child mortality rates and ensuring the well-being of future generations.

Chapter-7 | References

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