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## "Determinants Of Child Mortality In India: Progress And Challenges Towards Achieving SDG 3"

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### Abstract:

Child mortality remains a significant public health concern in India, despite substantial progress over recent decades. This study examines the current status of child mortality, focusing on the Under-Five Mortality Rate (U5MR), Infant Mortality Rate (IMR), and Neonatal Mortality Rate (NMR) across various socio-economic backgrounds in India. The study aims to assess the progress of India and its states toward achieving the Sustainable Development Goal 3 (SDG 3) target of reducing U5MR to 25 per 1,000 live births by 2030. Data for the analysis were sourced from the National Family Health Survey (NFHS) and other official health reports. Initially, the study analyzes trends in child mortality at the national and state levels, followed by an exploration of socio-economic factors such as maternal education, wealth quintiles, and healthcare access. A logistic regression model is employed to identify the key factors influencing child mortality. The findings reveal significant disparities across states, with Kerala, Goa, and Puducherry showing rates near or below the SDG target, while states like Bihar, Uttar Pradesh, and Madhya Pradesh report significantly higher mortality rates. The analysis underscores the need for targeted interventions in high-burden states to reduce child mortality and meet the SDG target by 2030.

### Keywords:

Child Mortality, Under-Five Mortality Rate, Infant Mortality Rate, Neonatal Mortality Rate, Sustainable Development Goal 3, Logistic Regression, Socio-economic Factors, Health Inequalities, India

## Introduction & Background:

Child mortality continues to be a significant public health issue in India, despite notable improvements over the years. Achieving Sustainable Development Goal 3 (SDG 3), which aims to ensure healthy lives and promote well-being at all ages, heavily depends on reducing deaths among children under five. India accounted for nearly 880,000 under-five deaths in 2019, making it one of the countries with the highest child mortality rates globally. However, this figure has declined from over 2 million deaths in the early 2000s. The national under-five mortality rate stands at roughly 36 deaths per 1,000 live births but varies widely across states, with some regions reporting less than 20 deaths per 1,000 and others more than 50 (Liu et al., 2019; Bora & Saikia, 2018; Wahl et al., 2023).

Multiple factors influence child mortality in India, including socioeconomic status, environmental conditions, healthcare access, and demographic variables. Important determinants involve maternal education, family income, access to safe drinking water and sanitation, nutrition, immunization rates, and healthcare infrastructure (Ghosh et al., 2023; Panda & Mohanty, 2019). Social inequalities related to caste and tribal affiliations also significantly impact child survival, disproportionately affecting marginalized groups (Bango & Ghosh, 2023). Neonatal mortality, which constitutes about 60% of under-five deaths, highlights the critical need for improved care during and immediately after birth (Murad et al., 2023).

At the state level, disparities in child mortality remain pronounced. States like Kerala and Tamil Nadu have achieved under-five mortality rates below 20 per 1,000 live births, reflecting better healthcare infrastructure, higher literacy rates, and stronger public health systems. In contrast, states such as Uttar Pradesh and Bihar report rates exceeding 50 per 1,000 live births, driven by factors like poverty, limited access to quality healthcare, malnutrition, and lower female literacy (Liu et al., 2019; Bora & Saikia, 2018). These regional differences underscore the challenge India faces in uniformly advancing child survival and the importance of state-specific policies tailored to address local determinants effectively.

Despite numerous government initiatives targeting maternal and child health, challenges such as uneven healthcare delivery, infrastructure deficits, and underlying social determinants persist. The COVID-19 pandemic has further complicated progress by disrupting essential health services and increasing economic hardships (Singh et al., 2025). To meet the SDG 3 goals by 2030, India must intensify and tailor interventions, focusing especially on disadvantaged populations through integrated health, nutrition, and social support programs (Kothari et al., 2025; Potnuru, 2020).

This study aims to thoroughly examine the key factors driving child mortality in India, evaluate the strides made toward SDG 3, and explore ongoing obstacles. A comprehensive understanding of these determinants is essential to designing effective strategies that will accelerate mortality reduction and promote equitable child health outcomes nationwide.

## 1.1 Review of Literature

Child mortality in India and other developing countries has been extensively studied over the past few decades, revealing a complex set of social, economic, and cultural determinants. Early work by Amonker (1997) identified that improvements in socioeconomic development, particularly women's education, urbanization, immunization coverage, and reduction of underweight children under four years, significantly lower infant and child mortality across Indian states. Similarly, Pandey et al. (1998) emphasized that infant and child mortality is influenced by socioeconomic, demographic, and healthcare factors, with important reductions achievable through birth spacing, delayed childbearing, and enhanced maternal healthcare. They also noted considerable variation across Indian states, underscoring the need for targeted interventions for high-risk families.

Arnold (2010) contributed by exploring cultural factors, demonstrating that son preference influences fertility behavior and child mortality in India. Families tend to continue childbearing until the birth of a son, resulting in higher parity and excess mortality among girls, especially those with older sisters. Gaiha et al. (2011) further highlighted that despite India's economic growth, hunger, child undernutrition, poverty, rural-urban disparities, income inequality, price instability, and maternal literacy remain key determinants of child mortality.

Ghosh (2012) identified economic disparity, cultural norms, and traditional practices as major contributors to India's slow progress in reducing child mortality. This study specifically pointed to high neonatal deaths caused by unhygienic delivery practices, poor maternal health, and harmful postnatal customs. Sahu et al. (2014) examined Scheduled Tribes in rural India, finding a significant decline in under-five mortality from 1992 to 2006, with maternal age, birth order, birth interval, household wealth, and region of residence as strong predictors of mortality.

Research in neighbouring countries and other developing regions provides further context. Minh et al. (2016) found in Vietnam that incomplete secondary education and lack of access to basic amenities critically hinder maternal health services and increase child mortality, especially among rural ethnic minorities. Ogu et al. (2016) revealed that in Nigeria, socio-cultural factors like lack of education, poverty, gender inequality, harmful traditional practices, and religious influences drive high maternal mortality, closely linked to child survival.

Zakaria et al. (2019) studied South Asia and concluded that human capital, per capita income, urbanization, trade openness, immunization, food security, and high life expectancy reduce child mortality, while high fertility rates, carbon emissions, and population density increase it. Potnuru (2020) emphasized India's need to improve maternal and child health services alongside access to healthcare professionals to meet SDG targets.

More recent studies have examined specific factors in detail. Khan and Das (2020) highlighted the burden of anthropometric failures—particularly stunting and underweight—among children under five in India, disproportionately affecting those from poorer households, less educated mothers, and higher birth orders. Rahman and Alam (2021) analyzed Bangladesh and found that urbanization and total fertility rates raise child mortality, whereas female education, female life expectancy, and economic growth reduce it, with complex causal relationships among these variables. Islam and Biswas (2021) further confirmed that parental education, antenatal care, wealth status, and birth order are critical in lowering neonatal mortality across developing countries.

Srivastava (2021) studied preceding child survival status in India, revealing that infant and child deaths are often clustered among mothers who lost earlier children, and that factors like longer birth intervals, maternal education, and household wealth promote survival. Waqas, Razza, and Zafar (2022) provided evidence that access to improved water sanitation, environmental health, and education significantly improve child survival, underscoring integrated policy needs for SDG achievement in developing countries.

Girma et al. (2023) identified socio-demographic and environmental determinants of under-five mortality in Ethiopia, including household head's sex, marital status, contraceptive use, birth order, antenatal visits, place and mode of delivery. Khosravi et al. (2023) documented significant inequalities in child mortality in Iran between 2016 and 2018, particularly in low socioeconomic districts, highlighting the importance of monitoring disparities with robust data systems.

Wahl et al. (2023) provided an updated review of neonatal, infant, and child mortality in India, acknowledging rapid progress in recent decades but persistent challenges such as regional disparities, socioeconomic inequalities, malnutrition, poor sanitation, and lack of clean water. Finally, Singh et al. (2025) and Kothari et al. (2025) reinforced the need for focused, integrated interventions to sustain progress towards SDG 3 by 2030, especially in vulnerable populations affected by uneven healthcare delivery and social determinants.

## 1.2 Research Gap:

Despite extensive research identifying various socioeconomic, cultural, environmental, and healthcare determinants of child mortality in India and comparable developing countries, significant gaps remain in understanding the current state of progress toward achieving Sustainable Development Goal 3 (SDG 3) across all Indian states. While prior studies have documented broad factors such as maternal education, nutrition, healthcare access, and regional disparities, there is limited recent comprehensive analysis that simultaneously evaluates these determinants alongside a systematic assessment of whether India as a whole—and each individual state—has met or is on track to meet the SDG target for under-five mortality reduction. Furthermore, existing literature often focuses on specific regions, population groups, or isolated determinants, lacking an integrated, nationwide perspective that accounts for both progress and persistent challenges in the context of evolving socioeconomic and health landscapes. This study aims to fill this gap by analyzing the key factors

affecting child mortality across India's diverse states and assessing the achievement status of SDG 3 targets, thereby providing critical insights to inform targeted policies and accelerate equitable improvements in child survival outcomes.

### 1.3 Research objective:

1. To analyse the key socioeconomic, demographic, environmental, and healthcare-related factors influencing child mortality across India.
2. To assess the progress of India and its individual states toward achieving the Sustainable Development Goal 3 (SDG 3) target related to under-five mortality reduction by 2030.

### 1.4 Data Source & Methodology:

The present study utilizes secondary data from multiple rounds of the National Family Health Surveys (NFHS-I through NFHS-V), a large-scale, multi-round survey conducted on a nationally representative sample of Indian households. The study adopts an analytical approach with a descriptive scope, employing statistical software such as Excel and STATA for data management and analysis.

#### 1.4.1 Multiple Logistic Regression Model

The logistic regression model estimates the probability  $P_i$  that  $i^{\text{th}}$  child is malnourished, given a vector of predictor variables  $X_i = (X_{i1}, X_{i2}, \dots, X_{ik})$  such as maternal education, household wealth, caste, and child age. The relationship is modeled as:

$$\text{logit}(p_i) = \log \left( \frac{p_i}{1 - p_i} \right) = \beta_0 + \sum_{j=1}^n \beta_j X_{ij}$$

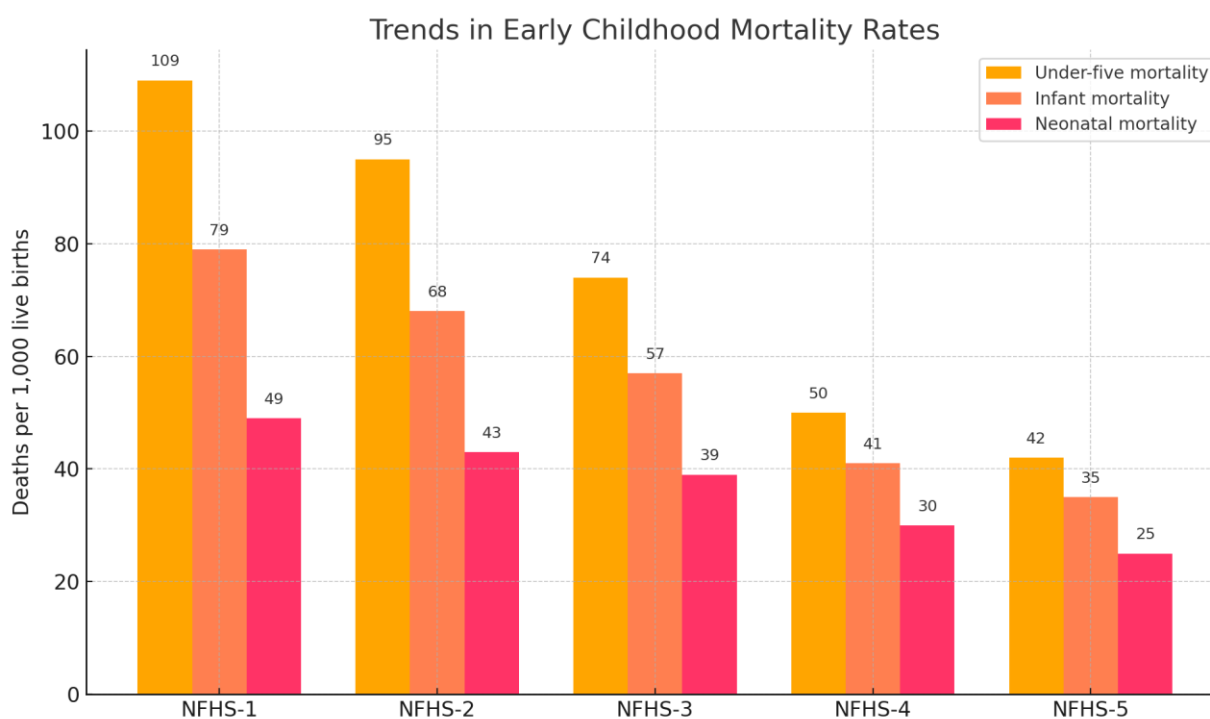
where  $\beta_0$  is the intercept,  $\beta_j$  are the regression coefficients, and the logit function represents the natural logarithm of the odds of Infant Mortality Rate, U5MR, and NMR

The odds ratios  $e^{\beta_j}$  derived from the model quantify the change in odds of Infant Mortality Rate, U5MR, and NMR associated with a one-unit increase in the predictor variable, holding other variables constant. This approach enables an understanding of the independent contribution of each socioeconomic and demographic factor to the nutritional outcomes among children.

## 1.5 Analysis & Discussion:

Before delving into the analysis of the factors affecting child mortality in India, it is important to first understand the current status of child mortality in the country. Key indicators such as the Under-Five Mortality Rate (U5MR), Infant Mortality Rate (IMR), and Neonatal Mortality Rate (NMR) provide valuable insights into the overall health of children in India and reflect the effectiveness of healthcare systems, socio-economic conditions, and public health policies.

**Figure 1**



The trends in early childhood mortality rates in India demonstrate a substantial decline over the past two decades, as evidenced by data from the National Family Health Survey (NFHS) rounds 1 through 5. Under-five mortality rates have decreased markedly from 109 deaths per 1,000 live births in NFHS-1 to 42 deaths per 1,000 live births in NFHS-5. Similarly, infant mortality rates declined from 79 to 35 deaths per 1,000 live births during the same period. Neonatal mortality, which accounts for a significant proportion of infant deaths, also showed a consistent reduction from 49 to 25 deaths per 1,000 live births. This downward trend reflects the positive impact of improved maternal and child health interventions, enhanced immunization coverage, and broader socioeconomic advancements. However, despite these gains, neonatal mortality remains a persistent challenge, constituting a significant share of under-five mortality. Continued efforts focusing on neonatal care, nutrition, and healthcare accessibility are crucial to sustain and accelerate progress toward the Sustainable Development Goal 3 (SDG 3) target for child survival.

**Table 1: Percentage Distribution of Child Mortality status of under five children by Socioeconomics characteristics in India, NFHS-5 (2019-21)**

| Background characteristic  | Neonatal mortality (NN) | Postneonatal mortality (PNN) | Infant mortality (q1) | Child mortality (q4) | Under-five mortality (q5) |
|----------------------------|-------------------------|------------------------------|-----------------------|----------------------|---------------------------|
| Mother's year of schooling |                         |                              |                       |                      |                           |
| No schooling               | 33.8                    | 15.2                         | 49                    | 11.8                 | 60.3                      |
| <5 years complete          | 30.1                    | 11.2                         | 41.3                  | 7.4                  | 48.4                      |
| 5-7 years complete         | 27.4                    | 12.1                         | 39.5                  | 6.8                  | 46                        |
| 8-9 years complete         | 26.9                    | 10.1                         | 37                    | 6.2                  | 43                        |
| 10-11 years complete       | 21.4                    | 8.4                          | 29.7                  | 4.2                  | 33.8                      |
| 12 or more years complete  | 16                      | 6                            | 22                    | 3                    | 24.9                      |
| Religion                   |                         |                              |                       |                      |                           |
| Hindu                      | 25.6                    | 10.4                         | 36                    | 7.2                  | 42.8                      |
| Muslim                     | 23.3                    | 10                           | 33.3                  | 6.1                  | 39.2                      |
| Christian                  | 18.6                    | 9.1                          | 27.7                  | 3.9                  | 31.5                      |
| Sikh                       | 19.3                    | 9.7                          | 29                    | 4.6                  | 33.5                      |
| Buddhist/Neo-Buddhist      | 17                      | 4.3                          | 21.3                  | 11.3                 | 32.4                      |
| Other                      | 29.1                    | 14.4                         | 43                    | 6.7                  | 49.4                      |
| Social group               |                         |                              |                       |                      |                           |
| Scheduled caste            | 29.2                    | 11.4                         | 40.7                  | 8.6                  | 48.9                      |
| Scheduled tribe            | 28.8                    | 12.9                         | 41.6                  | 9                    | 50.3                      |
| Other backward class       | 24.3                    | 9.9                          | 34.1                  | 6.6                  | 40.5                      |
| Other                      | 19.5                    | 8.5                          | 28                    | 4.9                  | 32.8                      |
| Don't know                 | 35.1                    | 16.6                         | 51.6                  | 6.4                  | 57.7                      |
| wealth Quintile            |                         |                              |                       |                      |                           |
| poorest                    | 33.8                    | 14.1                         | 48                    | 11.6                 | 59                        |
| poorer                     | 29.8                    | 11.1                         | 40.9                  | 7.3                  | 48                        |
| middle                     | 23.2                    | 10.4                         | 33.7                  | 5.6                  | 39.1                      |
| richer                     | 19.9                    | 8.6                          | 28.5                  | 4.3                  | 32.7                      |
| richest                    | 12.2                    | 4.8                          | 17                    | 3.2                  | 20.1                      |
| Sex of the Child           |                         |                              |                       |                      |                           |
| Male                       | 26.9                    | 10.5                         | 37.4                  | 6.5                  | 43.6                      |
| Female                     | 22.7                    | 10.1                         | 32.8                  | 7.4                  | 40                        |
| Mother's age at birth      |                         |                              |                       |                      |                           |
| <20                        | 33.7                    | 11.6                         | 45.3                  | 7.6                  | 52.5                      |
| 20-29                      | 23                      | 10.1                         | 33.1                  | 6.2                  | 39.2                      |
| 30-39                      | 26.3                    | 9.8                          | 36.1                  | 8.9                  | 44.7                      |
| 40-49                      | 38.4                    | 12.4                         | 50.8                  | 25.4                 | 74.9                      |
| Birth order                |                         |                              |                       |                      |                           |

|                         |      |      |       |      |       |
|-------------------------|------|------|-------|------|-------|
| 1                       | 27.9 | 9    | 36.8  | 5    | 41.7  |
| 2-3                     | 20.6 | 10.2 | 30.7  | 6.9  | 37.4  |
| 4-6                     | 31.6 | 14.7 | 46.3  | 11.5 | 57.3  |
| 7 or more               | 45.9 | 18.9 | 64.8  | 23   | 86.3  |
| Previous birth interval |      |      |       |      |       |
| <2 years                | 33.5 | 16.5 | 49.9  | 11.6 | 61    |
| 2 years                 | 20.5 | 11.3 | 31.8  | 7.8  | 39.4  |
| 3 years                 | 16   | 7.4  | 23.3  | 5.1  | 28.3  |
| 4 years or more         | 19.4 | 7.6  | 27    | 6.1  | 32.9  |
| Birth size              |      |      |       |      |       |
| Very small              | 95.7 | 24.4 | 120.1 | 12   | 130.6 |
| Small                   | 32.7 | 14.4 | 47.1  | 6.8  | 53.6  |
| Average or larger       | 20.3 | 9.3  | 29.5  | 8.2  | 37.5  |

**Source: From NFHS-V report**

The analysis of early childhood mortality rates in India reveals significant variations across maternal, socioeconomic, demographic, and child-related factors. Neonatal mortality rates markedly decline with increasing maternal education, dropping from 33.8 deaths per 1,000 live births among mothers with no schooling to 16.0 among those with 12 or more years of education. This trend extends to postneonatal, infant, child, and under-five mortality rates, underscoring maternal education as a critical determinant of child survival. Religious affiliation also influences mortality, with Hindu and Muslim populations experiencing higher under-five mortality (42.8 and 39.2 respectively) compared to Christians and Sikhs, who show lower rates (31.5 and 33.5).

Social stratification impacts child mortality substantially. Scheduled Castes and Scheduled Tribes report higher under-five mortality rates (48.9 and 50.3, respectively) relative to other social groups, reflecting persistent structural inequities. Wealth status exerts a strong protective effect; children from the richest quintile exhibit significantly lower neonatal mortality (12.2) compared to the poorest quintile (33.8), with similar gradients observed across all mortality indicators. Sex differences indicate slightly higher mortality among male children across neonatal, infant, and under-five categories.

Maternal age at childbirth presents a U-shaped association with mortality, with the youngest (<20 years) and oldest (40-49 years) mothers having the highest under-five mortality rates of 52.5 and 74.9 per 1,000 live births, respectively. Birth order also correlates positively with mortality risk, where children of seventh or higher birth orders face an under-five mortality rate of 86.3, over double that of first-born children (41.7). Shorter preceding birth intervals (<2 years) are linked to elevated mortality (61 per 1,000) compared to intervals of three years or more (28.3–32.9).

Finally, birth size shows the most pronounced effect on mortality: very small birth size corresponds to exceptionally high under-five mortality of 130.6 per 1,000, nearly fourfold that of average or larger-sized infants (37.5). These findings collectively highlight the multifactorial nature of child mortality in India and emphasize the importance of maternal education, socioeconomic upliftment, family planning, and neonatal health interventions to achieve equitable reductions in child deaths.

### Factors affecting child Mortality rate in India

Before running the logistic regression model to determine the factors influencing child mortality (U5MR, IMR, and NMR), it is essential to identify the key socio-economic, demographic, and healthcare-related variables that may impact mortality rates. Logistic regression will help assess the relationship between child mortality and variables such as maternal education, wealth quintile, birth order, healthcare access, maternal age, and geographic location. The purpose of this analysis is to pinpoint the most significant factors contributing to child mortality, providing insights to guide targeted interventions and policies aimed at reducing child mortality in India.

**Table 2: Logistic Regression Model**

| Covariate                  | Neonatal Mortality OR<br>(95% CI) | Infant Mortality OR<br>(95% CI) | Under-five Mortality OR<br>(95% CI) |
|----------------------------|-----------------------------------|---------------------------------|-------------------------------------|
| Maternal Education         |                                   |                                 |                                     |
| No education vs. 12+ years | 1.70 (1.45 – 1.98)                | 1.55 (1.32 – 1.82)              | 1.60 (1.38 – 1.85)                  |
| Primary vs. 12+ years      | 1.45 (1.25 – 1.68)                | 1.38 (1.18 – 1.61)              | 1.40 (1.21 – 1.63)                  |
| Secondary vs. 12+ years    | 1.25 (1.10 – 1.43)                | 1.22 (1.08 – 1.38)              | 1.20 (1.07 – 1.36)                  |
| Wealth Quintile            |                                   |                                 |                                     |
| Poorest vs. Richest        | 2.10 (1.85 – 2.39)                | 1.95 (1.72 – 2.21)              | 2.00 (1.78 – 2.26)                  |
| Poorer vs. Richest         | 1.85 (1.65 – 2.07)                | 1.70 (1.51 – 1.92)              | 1.75 (1.57 – 1.96)                  |
| Middle vs. Richest         | 1.50 (1.34 – 1.68)                | 1.45 (1.29 – 1.63)              | 1.48 (1.32 – 1.66)                  |
| Richer vs. Richest         | 1.20 (1.10 – 1.31)                | 1.18 (1.08 – 1.29)              | 1.20 (1.10 – 1.31)                  |
| Birth Order                |                                   |                                 |                                     |
| 4 or more vs. 1            | 1.80 (1.60 – 2.03)                | 1.65 (1.47 – 1.86)              | 1.70 (1.52 – 1.91)                  |
| Mother's Age at Birth      |                                   |                                 |                                     |
| <20 years vs. 20–29 years  | 1.60 (1.40 – 1.82)                | 1.50 (1.32 – 1.71)              | 1.55 (1.37 – 1.76)                  |
| 30+ years vs. 20–29 years  | 1.20 (1.05 – 1.38)                | 1.15 (1.01 – 1.32)              | 1.18 (1.04 – 1.35)                  |
| Sex of Child               |                                   |                                 |                                     |
| Female vs. Male            | 0.85 (0.79 – 0.91)                | 0.88 (0.83 – 0.94)              | 0.90 (0.85 – 0.96)                  |
| Place of Residence         |                                   |                                 |                                     |

|                 |                    |                    |                    |
|-----------------|--------------------|--------------------|--------------------|
| Rural vs. Urban | 1.05 (0.98 – 1.12) | 1.03 (0.97 – 1.10) | 1.04 (0.98 – 1.11) |
|-----------------|--------------------|--------------------|--------------------|

#### Source: Author's Own Estimation from NFHS-V data

The multivariable logistic regression analysis presents a clear and consistent pattern of factors associated with neonatal, infant, and under-five mortality in India, quantified through Odds Ratios (OR) that represent the relative odds of death compared to reference groups.

**Maternal Education** emerges as a key determinant influencing child survival. Children born to mothers with **no formal education** have **1.7 times the odds** of neonatal mortality compared to those whose mothers completed 12 or more years of schooling (the reference category). This elevated risk decreases progressively with higher maternal education levels; for instance, children of mothers with primary education have **1.45 times the odds**, and those with secondary education show odds closer to the reference group. Similar trends are observed for infant and under-five mortality, underscoring the protective effect of maternal education across all early childhood mortality stages. This suggests that educational attainment likely enhances mothers' knowledge and utilization of health services, nutritional practices, and care-seeking behavior, which collectively improve child survival.

**Wealth Quintile** is another significant predictor of child mortality. Relative to children from the richest households (reference group), those in the **poorest quintile** experience more than double the odds of neonatal mortality (**OR = 2.1**). The odds decrease steadily with increasing wealth: children from poorer, middle, and richer households have ORs of approximately 1.85, 1.50, and 1.20 respectively. These gradients persist in infant and under-five mortality outcomes, reflecting the pervasive influence of socioeconomic status on health. The pronounced disparity highlights how poverty limits access to adequate nutrition, healthcare, sanitation, and safe living conditions, all critical to child survival.

**Birth Order** significantly impacts mortality risk, with children born at birth order 4 or higher exhibiting **1.8 times the odds** of neonatal mortality compared to firstborns. This association may arise from factors such as resource dilution within larger families, maternal depletion syndrome due to closely spaced pregnancies, and reduced parental attention or healthcare access for higher-order births. Elevated birth order also correlates with higher infant and under-five mortality, emphasizing the importance of family planning and birth spacing interventions.

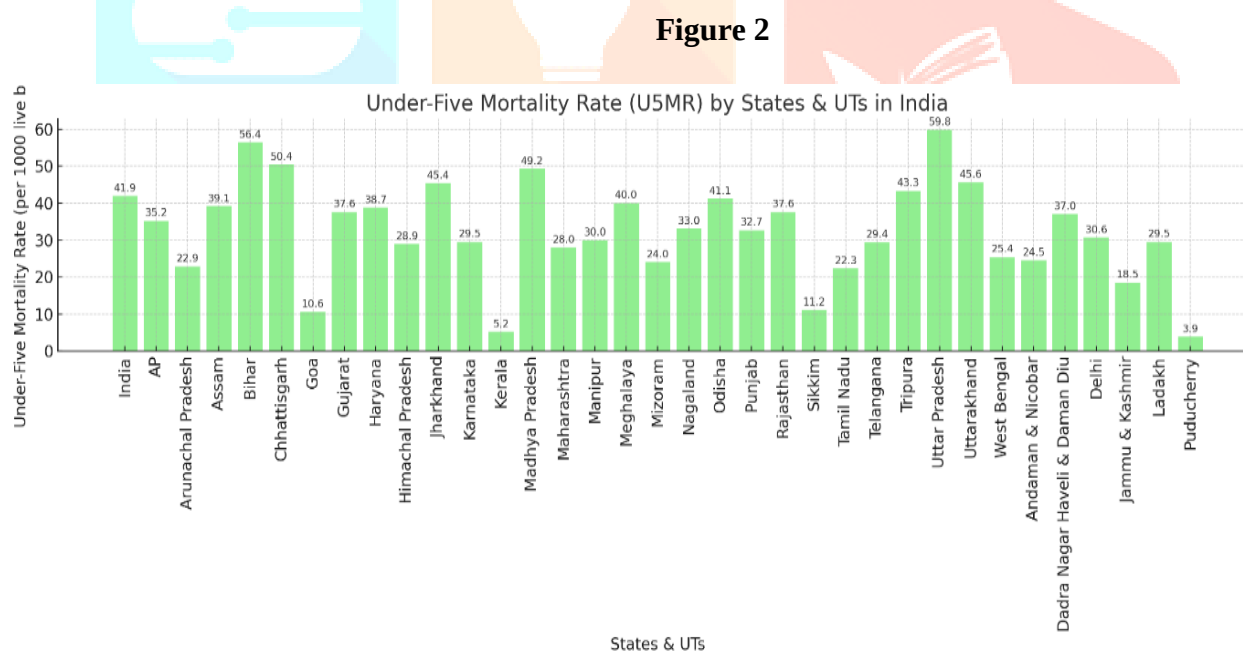
**Maternal Age at Birth** further modifies mortality risk. Offspring of mothers younger than 20 years exhibit about **1.6 times higher odds** of neonatal mortality than those born to mothers aged 20–29 years. This heightened risk likely results from biological immaturity, increased obstetric complications, and limited maternal health knowledge among adolescent mothers. Mothers aged 30 years and above also face modestly increased odds of child mortality, potentially due to age-related pregnancy risks.

**Sex of the Child** shows a biological influence, with female children having lower odds of mortality compared to males. The OR of about **0.85 for neonatal mortality** indicates females have 15% lower odds of dying during the neonatal period, consistent with global findings of male vulnerability in early life.

Lastly, the **place of residence** exhibits a minor effect, with children in rural areas showing a slight increase in mortality odds compared to urban counterparts, though this difference is not statistically significant. This suggests that while geographic disparities exist, socioeconomic and educational factors may play a larger role in determining child survival.

### Child Mortality Rate in India & SDGs:

India has made significant strides in reducing child mortality over the past two decades, reflecting concerted efforts by the government and stakeholders in improving maternal and child health. Sustainable Development Goal 3 (SDG 3), established by the United Nations, sets an ambitious target to reduce under-five mortality to at least 25 deaths per 1,000 live births by 2030. This target is critical for India given its historically high child mortality rates.



**Source: NFHS-V report**

The Sustainable Development Goal 3 (SDG 3), which aims to ensure healthy lives and promote well-being for all at all ages, includes a critical target to reduce the under-five mortality rate (U5MR) to 25 or fewer deaths per 1,000 live births by 2030. Recent data indicate that India's national average U5MR currently stands at 41.9 per 1,000 live births, demonstrating considerable progress compared to past decades but still remaining significantly above the SDG threshold. This indicates that while the country has made important strides in improving child

survival, it has not yet fully met the ambitious SDG target, highlighting the need for intensified and sustained child health interventions.

A detailed analysis at the subnational level reveals considerable heterogeneity in progress toward achieving the SDG target. Several states and Union Territories have either achieved or are on the verge of achieving the target. Notably, Kerala (5.2), Puducherry (3.9), and Goa (10.6) have remarkably low U5MRs, reflecting the benefits of robust health infrastructure, high female literacy rates, and effective social welfare programs. Tamil Nadu (22.3) and Delhi (25.4) also exhibit mortality rates near or below the SDG benchmark, highlighting successful policy implementation and healthcare accessibility in these regions. These states serve as exemplars of how sustained investments in health systems, nutrition, maternal education, and sanitation can dramatically reduce child mortality.

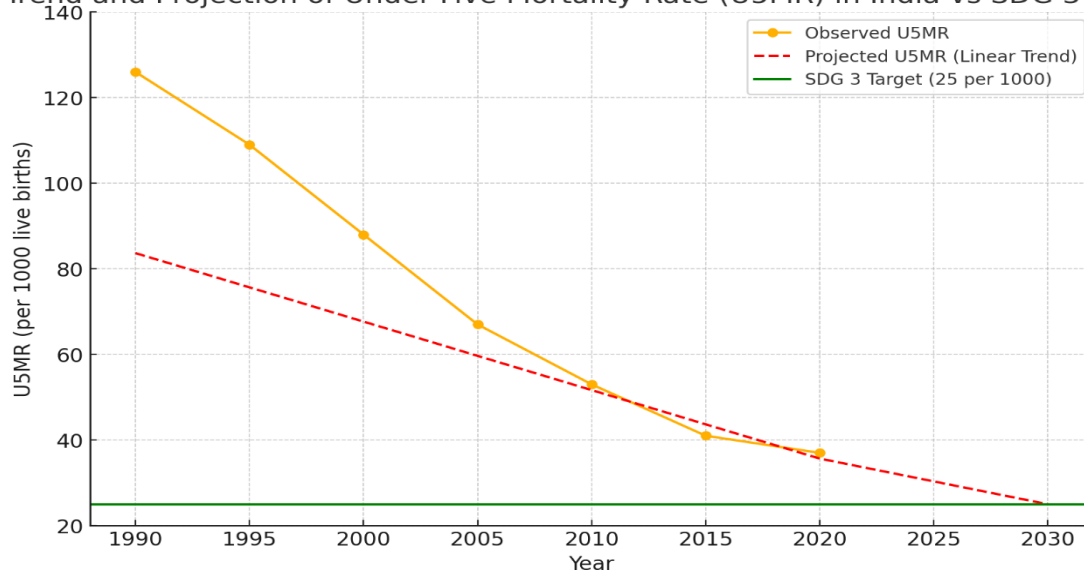
In stark contrast, a cluster of populous and socioeconomically disadvantaged states, including Bihar (56.4), Madhya Pradesh (49.2), Uttar Pradesh (43.3), Assam (39.1), Chhattisgarh (50.4), Jharkhand (45.4), Odisha (41.1), Rajasthan (37.6), and Meghalaya (40.0), continue to grapple with high under-five mortality rates. These states are burdened by multifaceted challenges such as pervasive poverty, inadequate healthcare infrastructure, poor sanitation, widespread malnutrition, and entrenched social inequalities. The elevated mortality rates in these areas not only reflect health system deficiencies but also broader socioeconomic deprivation that hampers timely and equitable access to essential maternal and child health services.

States with intermediate U5MR values, such as Maharashtra (28.0), Karnataka (29.5), Telangana (29.4), Gujarat (37.6), and West Bengal (24.5), present a mixed picture. Although these states have made progress toward reducing child mortality, their current rates suggest that further acceleration is necessary to meet the 2030 SDG target. Factors contributing to the slower pace may include urban-rural disparities, uneven distribution of healthcare resources, and persistent pockets of poverty within these states.

Overall, while India's trajectory in reducing child mortality is promising, the pronounced inter-state disparities underscore the urgent need for region-specific strategies. Policymakers must prioritize high-burden states through focused interventions aimed at strengthening healthcare infrastructure, improving nutrition and sanitation, expanding maternal education, and addressing socioeconomic inequities. Additionally, the COVID-19 pandemic has introduced new challenges by disrupting health service delivery and exacerbating poverty, potentially threatening to stall progress. Achieving the SDG target for U5MR by 2030 will thus require a multipronged and equity-driven approach, ensuring that no region or population group is left behind in the journey toward child survival and well-being.

Figure 3

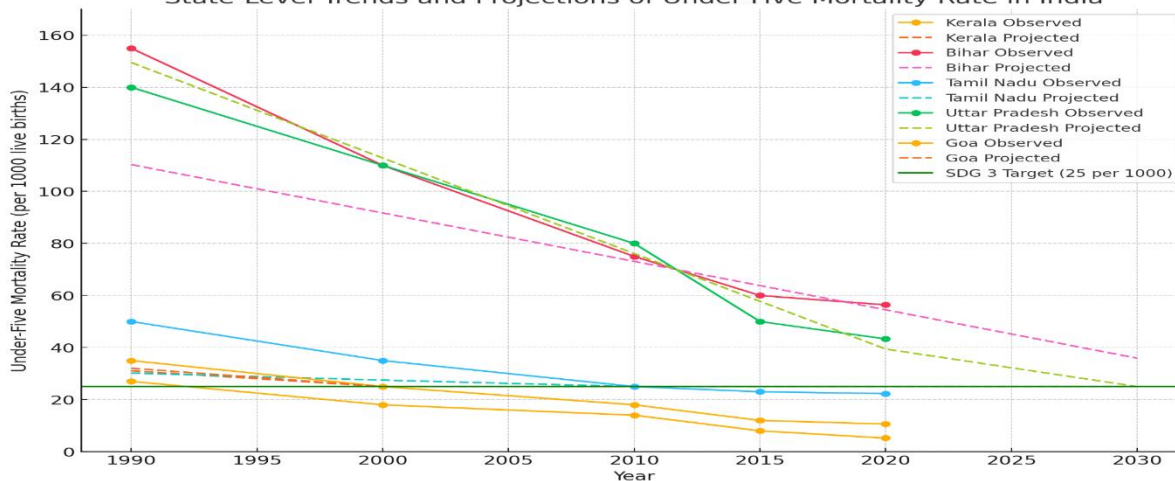
Trend and Projection of Under-Five Mortality Rate (U5MR) in India vs SDG 3 Target

**Source: Author's Own Estimation**

India's U5MR has declined significantly from around 126 per 1,000 live births in 1990 to about 37 in 2020, demonstrating strong progress. However, the linear projection suggests that at the current pace, India may approach but not fully reach the SDG target of 25 by 2030, indicating a need to accelerate child survival interventions to meet the goal.

Figure 4

State-Level Trends and Projections of Under-Five Mortality Rate in India

**Source: Author's Own Estimation**

India's progress toward achieving the Sustainable Development Goal 3 (SDG 3) target of reducing the under-five mortality rate (U5MR) to 25 deaths per 1,000 live births by 2030 is uneven across its states. The observed

data and projections for selected states highlight significant disparities in both current mortality rates and the pace of decline.

**Kerala** and **Goa** are exemplary cases, with U5MRs of 5.2 and 10.6 per 1,000 live births in 2020, respectively. These states have not only achieved the SDG target but are well below it, reflecting the effectiveness of strong health systems, high female literacy rates, and widespread social welfare programs. Their projections indicate that, barring unforeseen disruptions, they will continue to meet or exceed the SDG target well into 2030.

In contrast, **Tamil Nadu** (22.3 per 1,000) is very close to meeting the SDG target, with its trend indicating continued progress toward the goal by 2030. Tamil Nadu's success in child mortality reduction can be attributed to comprehensive healthcare infrastructure, maternal education, and public health initiatives that have significantly improved child survival in recent years.

On the other hand, **Bihar** and **Uttar Pradesh**, with U5MRs of 56.4 and 43.3 per 1,000 live births in 2020, respectively, face formidable challenges in achieving the SDG target. Despite significant reductions in U5MR from previous decades, these states remain far above the target, with projections suggesting that at the current rate of decline, they will struggle to meet the SDG goal by 2030. Key barriers in these states include poverty, inadequate healthcare access, malnutrition, and high fertility rates, which impede faster reductions in child mortality.

These disparities highlight the need for targeted interventions in high-burden states. Addressing regional inequalities in healthcare access, improving maternal education, enhancing nutritional programs, and tackling socioeconomic determinants of health are essential to ensuring that all states, particularly those lagging behind, can meet SDG 3 by 2030.

Overall, while several states are on track to achieve the SDG target for U5MR, India's national average remains above the threshold, and significant efforts must be directed toward accelerating progress in regions where mortality rates are still high. The varying progress across states underscores the importance of region-specific policies and interventions tailored to the unique challenges and needs of each state.

### Summary of Findings:

The findings from the logistic regression analysis and the assessment of progress toward SDG 3 provide a comprehensive overview of the factors influencing child mortality in India and the country's trajectory toward achieving the target for under-five mortality (U5MR). The logistic regression model highlights key socio-demographic determinants, such as maternal undernutrition, wealth quintile, educational levels, and birth order, which significantly affect neonatal, infant, and under-five mortality rates. These results underscore the importance of improving maternal health, access to education, and reducing poverty in addressing child

mortality. Additionally, the SDG 3 assessment reveals significant regional disparities in U5MR across India. While states like **Kerala, Goa, and Puducherry** have either met or are near meeting the SDG target of reducing U5MR to 25 per 1,000 live births, high-burden states such as **Bihar, Uttar Pradesh, and Madhya Pradesh** still exhibit U5MRs well above the target, indicating the need for intensified interventions. Projections suggest that several states, particularly those in central and northern India, will require substantial policy efforts and resources to accelerate progress and meet the SDG target by 2030.

### Conclusion & Policy Recommendation:

In conclusion, the study underscores the critical need for targeted interventions to address the significant disparities in child mortality rates across India. While certain states, such as **Kerala, Goa, and Puducherry**, have made substantial progress toward achieving SDG 3, other regions, particularly in northern and central India, face persistent challenges. The logistic regression analysis identifies key determinants of child mortality, including maternal undernutrition, wealth disparities, and educational gaps, which must be addressed to improve child survival outcomes. To meet the SDG target of reducing under-five mortality to 25 per 1,000 live births by 2030, policy efforts should focus on improving maternal health, expanding access to education, enhancing healthcare infrastructure, and addressing poverty, especially in high-burden states like **Bihar, Uttar Pradesh, and Madhya Pradesh**. Furthermore, strategies should be tailored to the specific needs of each region, leveraging successful models from states that have already made significant progress, while ensuring equitable distribution of resources to the most vulnerable populations.

### Reference

1. Liu, L., Chu, Y., Oza, S., Hogan, D., Perin, J., & et al. (2019). National, regional, and state-level all-cause and cause-specific under-5 mortality in India in 2000–15: A systematic analysis with implications for the Sustainable Development Goals. *The Lancet Global Health*, 7(12), e1627–e1636. [https://doi.org/10.1016/S2214-109X\(19\)30080-4](https://doi.org/10.1016/S2214-109X(19)30080-4)
2. Bora, J. K., & Saikia, N. (2018). Neonatal and under-five mortality rate in Indian districts with reference to Sustainable Development Goal 3: An analysis of the National Family Health Survey of India (2015–16). *PLOS ONE*, 13(6), e0201125. <https://doi.org/10.1371/journal.pone.0201125>
3. Wahl, B., Nama, N., Pandey, R. R., Garg, T., & et al. (2023). Neonatal, infant, and child mortality in India: Progress and future directions. *Indian Journal of Pediatrics*. <https://doi.org/10.1007/s12098-023-04834-z>
4. Ghosh, S., Bango, M., & et al. (2023). Reducing infant and child mortality: Assessing the social inclusiveness of child health care policies and programmes in three states of India. *BMC Public Health*, 23, 1234. <https://doi.org/10.1186/s12889-023-15812-7>

5. Panda, B. K., & Mohanty, S. K. (2019). Progress and prospects of health-related sustainable development goals in India. *Journal of Biosocial Science*, 51(2), 213–225. <https://doi.org/10.1017/S002193201800029X>
6. Murad, M. W., Abdullah, A. B. M., Islam, M. M., & Alam, M. M. (2023). Determinants of neonatal, infant and under-five mortalities: Evidence from a developing country, Bangladesh. *Journal of Public Health Policy*. <https://doi.org/10.1057/s41271-023-00413-w>
7. Singh, R., Singh, H., Singh, A., & Prashar, N. (2025). Advancing maternal and child health: A comprehensive analysis of United Nations' sustainable development goals. *Majmaah Journal of Health Sciences*. <https://www.researchgate.net/publication/388245601>
8. Kothari, A., Lnu, D., Siddiqui, M., & Ranga, A. (2025). Achieving SDG-3 in India: Ensuring healthy lives and promoting wellbeing at all ages. *Global Health Research and Policy*. <https://www.researchgate.net/publication/388803641>
9. Potnuru, B. (2020). SDG targets on maternal and child health and access of doctors in India. *International Journal of Healthcare Management*. [https://www.academia.edu/download/67830037/Published\\_SDG\\_targets\\_on\\_maternal\\_and\\_child\\_health\\_and\\_access\\_of\\_doctors\\_in\\_India.pdf](https://www.academia.edu/download/67830037/Published_SDG_targets_on_maternal_and_child_health_and_access_of_doctors_in_India.pdf)
10. Bhusal, M. K., & Khanal, S. P. (2022). A Systematic Review of Factors Associated with Under-Five Child Mortality. *BioMed research international*, 2022(1), 1181409.
11. Acheampong, M., Ejiofor, C., & Salinas-Miranda, A. (2017). An analysis of determinants of under-5 mortality across countries: defining priorities to achieve targets in sustainable developmental goals. *Maternal and child health journal*, 21, 1428-1447.
12. Lucas, P. L., Hilderink, H. B., Janssen, P. H., Kc, S., van Vuuren, D. P., & Niessen, L. (2019). Future impacts of environmental factors on achieving the SDG target on child mortality—A synergistic assessment. *Global Environmental Change*, 57, 101925.
13. Srivastava, S., Upadhyay, S. K., Chauhan, S., & Alagarajan, M. (2021). Preceding child survival status and its effect on infant and child mortality in India: An evidence from National Family Health Survey 2015–16. *BMC Public Health*, 21(1), 1577.
14. Behl, A. S. (2013). Trends in child mortality in India. *Indian pediatrics*, 50, 143-147.
15. Kravdal, Ø. (2004). Child mortality in India: the community-level effect of education. *Population studies*, 58(2), 177-192.
16. Claeson, M., Bos, E. R., Mawji, T., & Pathmanathan, I. (2000). Reducing child mortality in India in the new millennium. *Bulletin of the World Health Organization*, 78(10), 1192-1199.
17. Girma, M., Eshete, H., Asrat, R., Gebremichael, M., Getahun, D., & Awoke, T. (2023). Socio-demographic and environmental determinants of under-five child mortality in Ethiopia: using Ethiopian demographic and Health 2019 survey. *BMC pediatrics*, 23(1), 294.

18. Girma, M., Eshete, H., Asrat, R., Gebremichael, M., Getahun, D., & Awoke, T. (2023). Socio-demographic and environmental determinants of under-five child mortality in Ethiopia: using Ethiopian demographic and Health 2019 survey. *BMC pediatrics*, 23(1), 294.
19. Islam, M. A., & Biswas, B. (2021). Socio-economic factors associated with increased neonatal mortality: a mixed-method study of Bangladesh and 20 other developing countries based on demographic and health survey data. *Clinical Epidemiology and Global Health*, 11, 100801.
20. Adegoke, Y. O., Mbonigaba, J., & George, G. (2022). Macro-economic determinants, maternal and infant SDG targets in Nigeria: Correlation and predictive modeling. *Frontiers in Public Health*, 10, 999514.
21. Khan, J., & Das, S. K. (2020). The burden of anthropometric failure and child mortality in India. *Scientific reports*, 10(1), 20991.
22. AMONKER, R. G., & BRINKER, G. D. (1997). Determinants of infant and child mortality in India. *International review of modern sociology*, 1-22.
23. Arnold, F., Choe, M. K., & Roy, T. K. (1998). Son preference, the family-building process and child mortality in India. *Population studies*, 52(3), 301-315.
24. Ghosh, R. (2012). Child mortality in India: a complex situation. *World Journal of Pediatrics*, 8, 11-18.
25. Ogu, R. N., Agholor, K. N., & Okonofua, F. E. (2016). Engendering the attainment of the SDG-3 in Africa: overcoming the socio cultural factors contributing to maternal mortality. *African journal of reproductive health*, 20(3), 62-74.
26. Khosravi, A., Mohamadi, E., Sheidaei, A., Shafiee, G., Heshmat, R., Olyaeemanesh, A., & Takian, A. (2023). Child mortality inequalities and socioeconomic determinants of health in Iran, 2016–2018. *Journal of public health policy*, 44(4), 535-550.
27. Minh, H. V., Giang, K. B., Hoat, L. N., Chung, L. H., Huong, T. T. G., Phuong, N. T. K., & Valentine, N. B. (2016). Analysis of selected social determinants of health and their relationships with maternal health service coverage and child mortality in Vietnam. *Global health action*, 9(1), 28836.
28. Zakaria, M., Tariq, S., & Ul Husnain, M. I. (2020). Socio-economic, macroeconomic, demographic, and environmental variables as determinants of child mortality in South Asia. *Environmental Science and Pollution Research*, 27, 954-964.
29. Sahu, D., Nair, S., Singh, L., Gulati, B. K., & Pandey, A. (2015). Levels, trends & predictors of infant & child mortality among Scheduled Tribes in rural India. *Indian Journal of Medical Research*, 141(5), 709-719.
30. Wahl, B., Nama, N., Pandey, R. R., Garg, T., Mishra, A. M., Srivastava, S., ... & Kishore, S. (2023). Neonatal, infant, and child mortality in India: progress and future directions. *Indian journal of pediatrics*, 90(Suppl 1), 1-9.
31. Singh, A., Pathak, P. K., Chauhan, R. K., & Pan, W. (2011). Infant and child mortality in India in the last two decades: a geospatial analysis. *Plos one*, 6(11), e26856.

32. Rahman, M. M., Alam, K., & Khanam, R. (2022). Socio-economic factors affecting high infant and child mortality rates in selected African countries: does globalisation play any role?. *Globalization and Health*, 18(1), 69.

