

International Journal of Statistics and Applied Mathematics

ISSN: 2456-1452

NAAS Rating (2025): 4.49

Maths 2026; 11(8): 25-35

© 2025 Stats & Maths

<https://www.mathsjournal.com>

Received: 06-05-2026

Accepted: 09-06-2026

Sanjay Karande

Assistant Professor, Department
of Statistics, Sathaye College,
Mumbai, Maharashtra, India

Dr. Ramkrishna Lahu Shinde

Senior Professor, Department of
Statistics, School of
Mathematical Sciences,
Kavayitri Bahinabai Chaudhari
North Maharashtra University,
Jalgaon, India

Corresponding Author:

Sanjay Karande

Assistant Professor, Department
of Statistics, Sathaye College,
Mumbai, Maharashtra, India

State-wise statistical analysis of infant, child and under-five mortality in India: Evidence from NFHS-5

Sanjay Karande and Ramkrishna Lahu Shinde

DOI: <https://www.doi.org/10.22271/math.2026.v11.i8a.2660>

Abstract

The present study examines the state-wise distribution of Infant Mortality Rate (IMR), Child Mortality Rate (CMR), and Under-Five Mortality Rate (U5MR) in India using data from the National Family Health Survey-5 (NFHS-5), 2019-21. State-specific mortality estimates were obtained from complete birth history data and compared across selected socio-economic, demographic, and maternal healthcare characteristics using descriptive statistical analysis. Mortality estimates were analysed according to place of residence, religion, caste, household wealth, maternal education, maternal age, birth order, antenatal care visits, place of delivery, and sex of the child. In addition, thematic maps were prepared to examine the spatial distribution of IMR across Indian states. The analysis revealed substantial interstate heterogeneity in all three mortality indicators. At the national level, IMR declined by 48.1% from 44.68 per 1,000 live births among poor households to 23.18 among rich households and by 46.3% from 35.27 among mothers with no antenatal care visits to 18.93 among those receiving four or more visits. Children born at home recorded an IMR of 51.78 compared with 33.17 for institutional deliveries, while IMR increased from 35.45 for first-order births to 50.56 for birth order four and above. Considerable interstate variation was observed, with Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, Odisha, and Chhattisgarh consistently exhibiting higher mortality estimates, whereas Kerala, Tamil Nadu, Goa, Himachal Pradesh, and Puducherry recorded comparatively lower mortality. In Uttar Pradesh, IMR declined from 58.53 among mothers with no education to 33.54 among mothers with higher education, demonstrating a strong educational differential. Thematic maps further revealed distinct regional clustering of IMR, with northern and central states showing persistently higher mortality than southern states. The study demonstrates that state-level mortality estimation and comparative statistical assessment provide a robust framework for identifying interstate heterogeneity and socio-economic differentials in child mortality using nationally representative survey data.

Keywords: Infant Mortality Rate, Child Mortality Rate, Under-Five Mortality Rate, State-wise Estimation, Comparative Analysis, Spatial Distribution, NFHS-5

Introduction

Child mortality remains one of the most important indicators of population health and socio-economic development. The survival of children during the first five years of life reflects the combined influence of maternal health, nutritional status, healthcare services, education, sanitation, environmental conditions, and household living standards. Although remarkable progress has been achieved in reducing child deaths worldwide, preventable mortality among infants and young children continues to be a major public health concern, particularly in developing countries. Therefore, improving child survival has become a global priority under the Sustainable Development Goals (SDGs), which emphasize reducing preventable deaths and ensuring healthy lives for all children. ^[1-3]

Infant Mortality Rate (IMR), Child Mortality Rate (CMR), and Under-Five Mortality Rate (U5MR) are widely used demographic indicators for assessing child health and monitoring the performance of healthcare systems. IMR measures the number of deaths among infants before reaching one year of age per 1,000 live births, while CMR represents the probability of dying between one and five years of age. U5MR measures the overall probability of dying before completing five years of age and is internationally recognized as one of the most comprehensive indicators of child survival.

Together, these indicators provide valuable information on the health status of a population and help evaluate the effectiveness of maternal and child health programmes. [2, 4, 5]

India has made substantial progress in reducing child mortality over the past three decades through improvements in maternal and child healthcare services, expansion of immunization programmes, increased institutional deliveries, better nutritional interventions, and implementation of various national health initiatives. Data from successive rounds of the National Family Health Survey (NFHS) and the Sample Registration System (SRS) indicate a continuous decline in child mortality. However, this progress has not been uniform across the country. Significant differences persist among states because of variations in socio-economic development, maternal education, healthcare infrastructure, utilization of health services, and environmental conditions. As a result, national estimates often mask considerable regional disparities in child survival. [6-8]

Several studies have investigated child mortality in India by examining mortality trends, socio-economic differentials, and associated risk factors. Most previous research has focused either on infant mortality or under-five mortality and has primarily emphasized the identification of determinants using demographic or regression-based approaches. While these studies have improved the understanding of child mortality, relatively limited attention has been given to a comprehensive state-wise assessment of IMR, CMR, and U5MR using recent nationally representative data. Such an analysis is important for understanding regional variations and identifying states that require greater policy attention and public health interventions. [4, 6, 9]

The present study addresses this gap by examining the state-wise distribution of Infant Mortality Rate, Child Mortality Rate, and Under-Five Mortality Rate in India using data from the National Family Health Survey-5 (2019-21). The study compares mortality patterns according to selected socio-economic, demographic, and maternal healthcare characteristics and presents their geographical distribution across Indian states. The findings are expected to provide updated evidence on regional disparities in child mortality and support the formulation of targeted strategies for improving child survival.

Objectives

The objectives of the present study are:

1. To examine the state-wise distribution of Infant Mortality Rate (IMR), Child Mortality Rate (CMR), and Under-Five Mortality Rate (U5MR) in India using NFHS-5 data.
2. To compare mortality patterns according to selected socio-economic, demographic, and maternal healthcare characteristics across Indian states.
3. To examine the geographical distribution of child mortality indicators and identify regional variations in mortality across India.

2. Materials and Methods

2.1 Data Source

The study was based on data from the fifth round of the National Family Health Survey (NFHS-5), conducted during 2019-21 by the International Institute for Population Sciences (IIPS), Mumbai, under the Ministry of Health and Family Welfare, Government of India. NFHS-5 is a nationally representative survey that provides information on fertility, mortality, maternal and child health, nutrition, and other health-related indicators for all states and union territories of

India. The survey employed a stratified multistage sampling design to generate reliable estimates at both the national and state levels. Detailed information on the survey design and sampling procedures is available in the NFHS-5 report. [10]

2.2 Mortality Indicators and Study Variables

The study examined three standard child mortality indicators: Infant Mortality Rate (IMR), Child Mortality Rate (CMR), and Under-Five Mortality Rate (U5MR). IMR represents the number of deaths before one year of age per 1,000 live births, CMR denotes the probability of dying between one and five years of age, and U5MR represents the probability of dying before reaching five years of age. These indicators were analysed according to selected background characteristics, including place of residence, religion, caste, maternal education, household wealth index, maternal age at birth, birth order, sex of the child, antenatal care visits, and place of delivery. [3]

2.3 Statistical Analysis

State-wise estimates of IMR, CMR, and U5MR were obtained from the NFHS-5 birth history data using standard direct estimation procedures. Mortality patterns were compared across Indian states according to the selected socio-economic, demographic, and maternal healthcare characteristics. The results are presented using tables and thematic maps to illustrate the geographical distribution and regional variation in child mortality. Statistical analyses were performed using Stata version 14.1.

2.4 Ethical Considerations

The study used anonymized secondary data obtained from the Demographic and Health Surveys (DHS) programme with prior permission. Since the dataset contains no personally identifiable information, no additional ethical approval was required for the present analysis. The original NFHS-5 survey received ethical clearance from the appropriate national ethics committees, and informed consent was obtained from all participants before data collection. [10]

3. Results

3.1 State-wise Distribution of Mortality

The state-wise analysis revealed substantial variation in child mortality across India, indicating that the burden of mortality remains uneven despite considerable improvements in child survival over recent decades. Across most background characteristics, Uttar Pradesh, Bihar, Madhya Pradesh, Odisha, Rajasthan, and Chhattisgarh consistently reported higher mortality, whereas Kerala, Tamil Nadu, Puducherry, Himachal Pradesh, and Sikkim generally recorded comparatively lower mortality. These interstate differences suggest that improvements in child survival are closely linked to variations in socio-economic development, maternal characteristics, and access to quality healthcare services.

A marked socio-economic gradient was observed across the states. Maternal education emerged as one of the strongest determinants of child mortality. States with high mortality consistently showed substantially lower mortality among children born to educated mothers than among those whose mothers had no formal education. For example, in Uttar Pradesh, the Infant Mortality Rate (IMR) declined from 58.53 among mothers with no education to 33.54 among mothers with higher education. A similar pattern was observed in Odisha, where IMR decreased from 57.43 to 10.01, and in Tamil Nadu, where the corresponding values declined from

37.40 to 12.81. In contrast, Kerala maintained comparatively low mortality across all educational categories, indicating that better healthcare infrastructure and higher overall social development may reduce educational disparities in child survival.

Household economic status also showed a clear association with mortality. Children belonging to poor households experienced consistently higher mortality than those from economically better-off families. At the national level, IMR decreased from 44.68 among poor households to 23.18 among rich households, representing nearly a 48% reduction. Similar gradients were evident across several large states. In Uttar Pradesh, mortality declined from 58.76 among poor households to 37.41 among rich households, while in Madhya Pradesh, the corresponding values were 57.87 and 33.81. These findings indicate that economic disadvantage continues to be an important barrier to child survival, particularly in states with relatively weaker health systems.

Differences according to social group were also evident across the country. In many states, children belonging to Scheduled Castes (SC) and Scheduled Tribes (ST) experienced higher mortality than those from Non-SC/ST communities. The disparity was particularly noticeable in Madhya Pradesh, where IMR among SC children was 57.72 compared with 42.08 among Non-SC/ST children, and in Uttar Pradesh, where the corresponding estimates were 72.67 and 61.21, respectively. Although the magnitude of these differences varied across states, the overall pattern suggests that socially disadvantaged communities continue to experience poorer child survival outcomes.

The rural-urban differential remained another important feature of the state-wise distribution of mortality. Rural areas generally recorded higher mortality than urban areas, particularly in states such as Uttar Pradesh (67.23 vs. 53.70), Madhya Pradesh (51.64 vs. 36.56), and Odisha (40.37 vs. 31.45). However, the differences were relatively small in a few states, indicating that the influence of place of residence is closely associated with the overall level of socio-economic development and accessibility of maternal and child healthcare services rather than urbanization alone.

Maternal characteristics also showed a strong association with child mortality across the states. Birth order exhibited a consistent positive relationship with mortality, with higher-order births generally experiencing poorer survival than first- or second-order births. At the national level, IMR increased from 35.45 among first births to 50.56 among births of order four and above. This pattern was particularly evident in Kerala, where IMR increased from 6.15 for first births to 70.47 for fourth and higher-order births, although the latter estimate should be interpreted cautiously because of the relatively small number of higher-order births in the state. Similarly, high mortality among fourth and higher-order births was observed in Punjab (54.19), Odisha (50.42), Bihar (47.86) and Uttar Pradesh (62.12). These findings suggest that increasing birth order remains an important risk factor for child mortality, particularly in states where fertility levels continue to be relatively high.

Maternal age at childbirth also influenced child survival. In general, children born to mothers aged 25-34 years experienced lower mortality than those born to younger (15-24 years) or older (35-49 years) mothers. For instance, in Bihar, IMR declined from 31.51 among younger mothers to 29.10 among mothers aged 25-34 years but increased to 41.68 among mothers aged 35-49 years. A similar pattern was observed in Uttar Pradesh, where mortality was 62.93, 46.01,

and 50.52, respectively. These results indicate that births occurring during the optimum reproductive age are generally associated with better child survival, whereas adolescent and late-age pregnancies remain relatively more vulnerable.

The utilization of maternal healthcare services showed one of the strongest associations with mortality. Antenatal care (ANC) was consistently associated with improved child survival across most states. Nationally, IMR declined from 35.27 among mothers who received no ANC visit to 18.93 among those who received four or more visits, representing a reduction of approximately 46%. States with high mortality demonstrated similar improvements. In Uttar Pradesh, IMR decreased from 62.74 among mothers without ANC to 28.50 among those receiving four or more visits, while Odisha recorded a decline from 37.91 to 21.07. Although mortality remained relatively high in a few states despite adequate ANC coverage, the overall findings emphasize the importance of regular antenatal care in improving pregnancy outcomes and reducing child deaths.

Place of delivery exhibited a similar pattern. Children born at home generally experienced higher mortality than those delivered in health institutions. At the national level, IMR was 51.78 for home deliveries compared with 33.17 for institutional deliveries. Large differences were observed in states such as Andhra Pradesh (84.03 vs. 28.62), Telangana (58.05 vs. 25.54), Odisha (60.03 vs. 34.05) and Madhya Pradesh (85.51 vs. 44.10). These findings indicate that institutional delivery, supported by skilled birth attendance and timely newborn care, contributes substantially to improved child survival.

The differences according to the sex of the child were comparatively modest. Male children generally recorded slightly higher mortality than female children in many states. At the national level, IMR was 37.40 among males compared with 32.82 among females. Similar patterns were observed in states such as Bihar (37.35 vs. 25.14), Jharkhand (20.18 vs. 12.77) and West Bengal (24.80 vs. 18.52). However, the magnitude of these differences was much smaller than those observed for socio-economic and maternal healthcare factors, indicating that biological sex alone explains only a limited proportion of the interstate variation in child mortality.

Mortality patterns according to religion were less consistent across the country. While some states reported relatively higher mortality among Hindu children and others among Muslim or other religious groups, no uniform national trend was evident. The observed differences appeared to reflect regional socio-economic conditions and disparities in healthcare access rather than religious affiliation itself.

Overall, the state-wise analysis demonstrates that child mortality in India continues to exhibit substantial geographical and socio-economic inequalities. States characterized by lower maternal education, poorer household economic conditions, higher birth order, inadequate antenatal care, and a greater proportion of home deliveries consistently experienced higher mortality. In contrast, states with better maternal healthcare utilization and stronger socio-economic development generally recorded more favourable child survival outcomes. These findings highlight the need for state-specific public health strategies that strengthen maternal healthcare services while addressing the broader social and economic determinants of child health.

3.2 Spatial Distribution of Infant Mortality Rate across Indian States

Figure 1 illustrates the spatial distribution of the Infant Mortality Rate (IMR) across Indian states according to selected socio-economic, demographic, and maternal

healthcare characteristics. Although the magnitude of IMR varied across background characteristics, the geographical pattern remained largely consistent. States located in the northern and central regions of India generally exhibited higher infant mortality, whereas southern states recorded comparatively lower mortality under most background characteristics.

The maps consistently identified Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan, Odisha, and Chhattisgarh as high-mortality states. These states remained in the higher mortality categories across several socio-economic and maternal health characteristics, indicating that infant mortality is concentrated in regions with relatively lower socio-economic development and weaker maternal and child healthcare services. In contrast, Kerala, Tamil Nadu, Puducherry, Himachal Pradesh, and Goa consistently appeared in the lower mortality categories, reflecting better healthcare utilization and improved living conditions.

Clear geographical disparities were observed according to maternal healthcare indicators. States with lower utilization of antenatal care and higher proportions of home deliveries generally showed higher IMR. Conversely, states with better antenatal care coverage and higher institutional delivery rates were predominantly classified into lower mortality categories. These patterns highlight the important contribution of maternal healthcare services to improved infant survival.

The spatial distribution also demonstrated marked socio-economic inequalities. Higher mortality among children born

to mothers with no formal education, children from poor households, and those belonging to socially disadvantaged communities was concentrated primarily in the northern and central states. Southern and some western states showed comparatively lower mortality across these population groups, suggesting that improvements in education, household economic conditions, and healthcare accessibility contribute substantially to reducing infant mortality.

Differences according to demographic characteristics, including maternal age, birth order, and sex of the child, showed relatively smaller geographical variation compared with socio-economic and healthcare characteristics. Nevertheless, higher-order births and births to younger or older mothers tended to be concentrated in states already experiencing higher levels of infant mortality, indicating that these factors may further increase the risk of infant deaths in vulnerable populations.

The spatial analysis demonstrates that infant mortality in India is not randomly distributed but exhibits clear regional clustering. States with persistent socio-economic disadvantage and limited access to quality maternal and child healthcare consistently experienced higher infant mortality, whereas states with better health infrastructure and socio-economic development recorded substantially lower mortality. These geographical disparities emphasize the need for region-specific public health interventions and continued investment in maternal and child healthcare services to reduce interstate inequalities in infant survival.

Table 1: State-wise Infant Mortality Rate by Selected Background Characteristics in India, NFHS-5 (2019-21)

Background Characteristics		India/State	AP	AR	AS	BR	CH	CG	GA	GJ	HR	HP	J&K	JH	KA	KL	MP	MH
ANC visits	No visit	35.2651	68.17	14.75	32.11	40.08		40.18		22.88	32.59	31.91	15.64	45.86	30.17	0.00	38.17	14.69
	1-3 visits	28.9208	23.14	11.34	30.79	31.16	48.50	24.33	0.00	23.45	24.67	7.95	13.25	27.65	15.78	9.42	29.87	9.95
	4+ visits	18.9306	21.43	6.55	16.68	28.98	15.21	25.04	7.08	18.65	16.19	13.50	11.59	23.22	14.69	2.93	24.00	16.57
Birth order	1	35.449	39.58	8.76	27.32	57.43	0.00	45.95	0.00	29.36	32.53	18.88	13.27	46.26	26.72	6.15	44.09	22.65
	2-3	31.2061	22.49	10.67	31.43	39.94	32.03	41.07	13.85	27.28	32.86	26.29	17.80	30.42	19.73	3.43	37.18	23.99
	4 and above	50.5621	44.69	28.70	47.86	49.28	0.00	40.53	0.00	46.63	39.30	64.98	28.93	39.20	70.47	3.52	47.05	29.03
Caste	Non-SC/ST	32.7976	24.59	16.16	28.94	46.55	12.71	32.31	5.54	27.05	30.86	25.20	17.08	32.73	24.23	4.82	38.12	22.94
	SC	40.6779	33.20	1.91	36.76	47.34	26.84	50.77	0.00	45.14	37.80	27.24	14.42	45.23	30.54	1.09	48.47	22.24
	ST	41.6452	89.95	12.36	31.41	57.62		57.17	0.00	28.51	81.38	15.19	32.38	42.93	29.17	31.13	41.93	30.60
Education	No education	49.2035	46.94	18.70	38.99	54.45	0.00	65.81	0.00	44.07	56.90	14.30	19.98	39.79	36.54	0.00	48.69	12.08
	Primary	43.1467	15.20	21.83	44.44	46.39	57.39	33.25	0.00	41.87	44.86	36.27	12.57	48.31	38.59	0.00	47.58	43.10
	Secondary	31.9348	34.14	9.67	27.30	43.91	28.73	40.61	0.00	23.47	29.75	30.25	17.83	36.63	25.24	6.17	39.53	22.44
	Higher	19.6777	15.86	4.55	17.93	21.55	0.00	32.85	17.76	22.26	20.44	11.06	8.55	22.52	13.01	2.79	24.30	23.82
Mother age	15-24	40.3085	40.04	12.07	31.51	54.16	75.61	48.74	0.00	36.26	37.82	26.65	20.23	39.80	28.75	6.56	43.98	27.34
	25-34	32.2422	23.97	10.95	29.10	40.97	2.50	39.70	0.00	28.78	32.30	19.76	15.09	36.11	23.58	5.25	37.86	23.03
	35-49	36.8355	17.60	18.60	41.68	54.22	20.56	48.52	20.29	19.89	26.59	62.21	20.59	35.26	28.82	0.00	56.18	13.50
Place of delivery	Home	51.7788	84.03	23.05	43.14	50.25	0.00	70.12		45.44	50.80	44.53	15.11	41.45	71.03		68.43	33.37
	Institutional	33.165	28.62	9.91	29.16	46.27	18.33	38.36	5.76	29.10	32.50	22.22	16.66	36.26	24.08	4.41	38.20	23.22
Religion	Hindu	35.9566	31.40	16.53	31.27	46.56	10.07	42.54	3.28	31.37	32.52	24.61	14.55	38.47	26.93	7.06	41.13	22.55
	Muslim	33.3164	17.76	25.63	30.87	50.28	92.80	20.54	0.00	23.82	40.74	57.87	17.55	26.48	19.03	2.93	39.27	31.66
	Others	28.4095	34.11	11.39	43.22	61.80	0.00	74.05	17.62	0.00	35.39	5.85	11.21	45.27	15.91	1.47	38.99	19.48
Residence	Rural	26.5564	30.75	11.85	32.66	47.68		46.78	0.00	34.58	35.89	26.28	16.86	40.70	27.95	5.49	43.12	23.84
	Urban	38.3579	30.00	17.84	21.12	44.19	16.35	27.30	9.31	22.44	27.55	15.29	15.51	22.13	21.49	3.64	33.76	23.65
Sex of child	Female	32.8156	24.73	9.48	25.14	44.44	38.75	41.49	7.53	30.31	31.06	23.06	12.77	33.46	20.84	5.98	36.50	22.43
	Male	37.4009	35.91	15.85	37.35	49.77	0.00	44.27	4.25	29.83	35.61	26.66	20.18	41.15	30.06	3.28	45.26	24.98
Wealth	Poor	44.6848	35.61	15.08	35.44	48.64	0.00	51.75	0.00	43.01	60.86	40.27	21.09	42.88	37.26	4.61	47.26	33.68
	Middle	33.6596	32.04	12.86	22.93	51.39	38.37	39.03	0.00	27.95	43.43	32.25	9.88	26.45	27.47	7.59	33.20	22.13
	Rich	23.1814	26.36	4.79	11.77	32.53	17.62	25.62	7.03	21.36	26.39	17.16	16.43	19.21	16.75	4.01	32.20	19.46
Background Characteristics			MN	ML	MZ	NL	DL	OD	PY	PB	RJ	SK	TN	TS	TR	UP	UK	WB
ANC visits	No visit		25.31	36.07	10.98	26.66	23.87	37.91	0.00	14.97	28.00	15.99	22.46	55.35	24.62	62.74	46.83	29.22
	1-3 visits		19.19	12.00	34.07	20.96	25.43	26.28	4.28	18.51	19.37	3.01	25.03	22.97	12.92	40.03	22.25	20.94
	4+ visits		14.25	23.15	5.00	14.13	14.61	21.07	0.89	15.35	21.55	13.30	10.17	19.23	21.07	28.50	25.33	13.19
Birth order	1		22.85	30.39	22.70	20.04	28.38	37.57	3.71	26.41	28.60	4.61	15.31	28.64	33.77	54.59	33.16	20.29
	2-3		21.71	23.77	17.03	24.74	19.12	32.64	2.35	26.39	28.26	11.95	19.15	24.55	35.69	43.97	31.28	22.19
	4 and above		42.87	42.62	30.41	33.28	39.04	50.42	0.00	54.19	40.88	112.09	76.02	32.03	75.30	62.12	93.50	30.84
Caste	Non-SC/ST		26.58	28.98	37.02	0.00	24.03	23.86	3.14	22.56	24.17	10.21	14.85	23.89	40.04	47.70	39.80	19.91

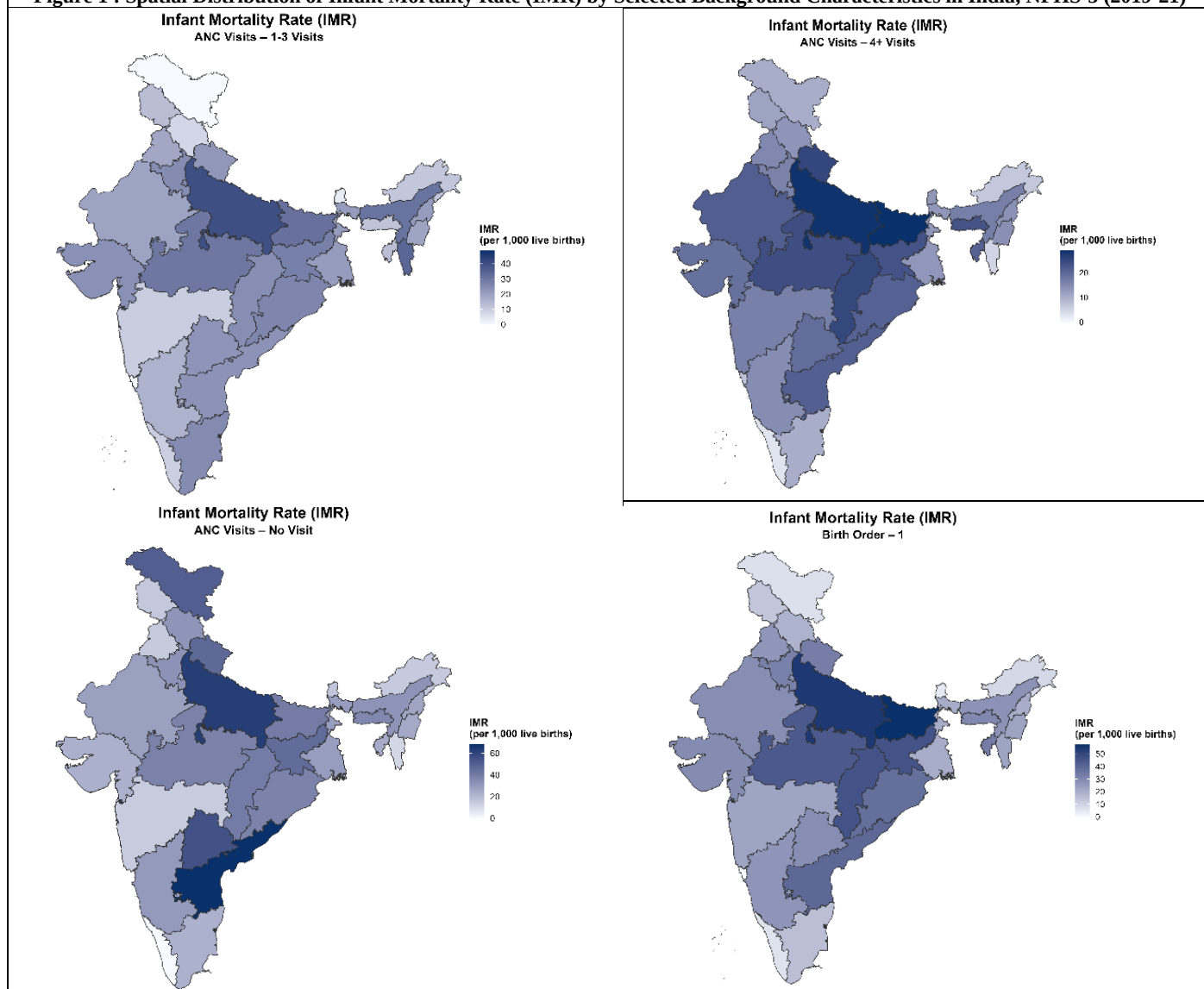
Education	SC		44.36	14.23	0.00	10.93	24.87	36.33	2.71	33.24	38.04	8.20	24.75	29.59	18.11	58.06	42.52	24.78
	ST		23.05	32.13	21.68	25.34	18.87	54.65	0.00	15.72	41.36	15.46	31.26	38.45	46.70	59.89	16.39	24.31
	No education		54.35	47.98	9.20	39.19	37.78	57.43	71.43	29.16	37.06	19.16	37.40	47.37	35.55	58.53	90.13	23.02
	Primary		17.26	35.68	22.26	16.68	52.64	40.76	9.77	50.51	30.16	44.16	25.89	50.32	46.75	58.52	29.52	27.41
	Secondary		27.50	27.28	24.95	23.93	23.79	31.24	4.96	29.35	27.10	5.68	20.67	24.02	38.14	49.74	39.00	22.10
Mother age	Higher		7.39	6.89	3.09	24.13	7.90	10.01	0.00	9.48	23.15	0.84	12.81	13.52	0.00	33.54	10.46	7.25
	15-24		28.24	46.08	18.26	25.12	42.12	41.43	8.69	36.11	32.11	10.09	17.74	21.17	37.43	62.93	29.89	24.78
	25-34		23.91	24.68	19.71	20.62	19.66	34.18	2.15	27.00	29.01	4.44	18.57	28.77	35.25	46.01	42.71	17.57
Place of delivery	35-49		25.38	36.25	26.94	37.20	21.03	31.70	0.00	20.52	27.50	47.05	14.54	39.79	40.03	50.52	38.87	31.21
	Home		41.97	43.47	20.27	26.49	50.07	60.03		37.90	43.46	30.78	161.77	58.05	62.11	59.68	55.69	23.22
Religion	Institutional		20.86	23.64	21.51	22.43	22.50	34.05	3.00	27.42	29.22	10.45	17.49	25.54	33.45	49.09	35.95	21.59
	Hindu		28.64	2.82	100.51	0.00	23.04	34.13	3.21	23.86	30.94	12.41	18.26	27.38	36.53	52.12	31.88	19.20
	Muslim		21.03	4.27		58.93	36.83	70.48	0.00	72.58	22.62	0.00	14.41	21.55	42.21	45.54	66.23	25.59
Residence	Others		23.86	33.58	20.79	25.57	0.00	58.29	0.00	29.34	17.78	11.18	17.64	25.65	29.27	40.12	56.33	36.08
	Rural		31.28	33.86	22.84	27.10	31.65	37.07	0.00	32.91	31.90	18.33	21.62	28.73	39.99	53.19	40.02	22.21
Sex of child	Urban		12.17	19.62	19.90	17.95	24.54	30.24	4.17	19.15	22.08	0.00	13.69	23.11	25.08	41.95	37.55	20.37
	Female		22.37	26.14	21.43	21.07	28.87	30.79	3.41	26.20	27.13	10.20	15.20	28.41	27.35	49.27	35.96	18.52
	Male		27.79	37.67	21.25	28.03	21.00	40.71	2.58	29.68	32.46	12.95	20.59	24.85	45.81	52.39	42.72	24.80
Wealth	Poor		32.62	37.69	17.88	23.65	60.99	46.46	16.23	59.75	35.80	28.02	32.94	35.35	43.31	58.76	49.01	23.08
	Middle		11.63	14.85	23.20	22.79	41.60	17.61	0.00	32.59	36.45	13.99	19.31	28.96	16.70	50.60	46.94	20.32
	Rich		20.57	2.21	22.20	30.55	19.94	20.12	1.94	24.21	20.93	0.00	13.33	21.63	33.53	37.41	31.53	17.68

Table 2: State-wise Under-Five Mortality Mortality Rate by Selected Background Characteristics in India, NFHS-5 (2019-21)

Background Characteristics / States		A&N	AP	AR	AS	BR	CH	CG	GA	GJ	HR	HP	JK	JH	KA	KL
ANC visits	No visit	0.00	68.17	29.06	32.11	60.40		55.11		25.71	38.48	31.91	37.84	45.86	30.17	0.00
	1-3 visits	9.44	36.05	16.56	33.30	43.68	48.50	33.16	0.00	29.73	29.93	7.95	13.25	34.40	21.41	9.42
	4+ visits	19.13	28.43	8.04	26.98	34.98	15.21	29.40	14.22	24.64	16.83	13.50	14.21	32.44	17.30	3.21
Birth order	1	25.52	48.96	11.93	40.24	64.56	0.00	49.56	10.19	33.29	41.32	18.88	13.27	52.57	30.86	6.15
	2-3	14.72	31.76	20.93	36.47	52.22	32.03	52.13	13.85	37.32	37.38	31.27	22.84	41.67	25.01	3.79
	4 and above	71.56	44.69	49.81	50.69	68.10	0.00	61.61	0.00	54.55	53.81	64.98	37.16	46.33	70.47	3.52
Caste	Non-SC/ST	27.05	31.34	19.00	39.47	57.17	12.71	43.70	5.54	31.80	34.63	27.52	17.49	34.98	28.09	4.82
	SC		49.70	1.91	43.27	64.38	26.84	53.54	0.00	60.98	51.23	30.27	21.72	70.10	36.76	1.09
	ST	26.90	95.38	24.27	50.78	65.07		66.91	51.04	41.20	108.70	15.19	39.97	55.53	36.16	44.59
Education	No education	0.00	77.04	29.55	42.85	70.91	0.00	79.32	0.00	56.08	65.55	14.30	25.45	52.17	45.96	0.00
	Primary	74.28	15.20	33.62	53.71	60.96	57.39	36.66	0.00	51.13	51.50	57.74	12.57	59.04	42.16	0.00
	Secondary	16.53	41.53	19.42	36.84	51.13	28.73	51.89	9.02	29.16	39.79	31.05	20.07	43.19	29.52	6.50
	Higher	23.64	15.86	4.55	23.78	22.08	0.00	32.85	17.76	25.68	21.08	11.06	14.27	27.94	14.83	2.79
Mother age	15-24	18.86	40.84	12.92	48.18	61.95	75.61	50.27	0.00	38.84	43.92	26.65	20.23	51.30	34.94	6.56
	25-34	20.71	34.47	20.94	34.82	51.33	2.50	49.19	0.00	35.47	39.71	22.85	18.97	43.21	27.96	5.54
	35-49	27.52	48.81	32.70	45.36	85.45	20.56	67.48	36.69	37.41	31.44	62.21	23.07	46.23	28.82	0.00
Place of delivery	Home	0.00	84.03	54.55	46.60	67.53	0.00	81.19		51.25	62.92	44.53	25.69	50.20	89.88	
	Institutional	21.55	38.19	12.78	38.44	56.65	18.33	47.40	11.19	36.61	39.50	25.01	19.15	45.06	28.05	4.59
Religion	Hindu	24.16	41.85	17.37	42.28	59.73	10.07	52.20	11.06	39.14	39.42	27.11	19.48	48.88	31.98	7.47
	Muslim	0.00	17.76	25.63	36.06	58.28	92.80	20.54	0.00	29.21	50.77	57.87	20.15	27.01	21.10	2.93
	Others	21.56	38.24	23.22	43.22	61.80	0.00	74.05	17.62	0.00	41.67	5.85	11.21	52.09	15.91	1.47
Residence	Rural	8.78	40.08	19.82	40.62	59.96		54.67	14.87	44.85	39.40	28.96	20.14	49.39	32.90	5.85
	Urban	35.88	38.28	36.19	30.26	56.25	16.35	41.39	9.31	25.06	43.75	15.29	18.87	31.33	25.25	3.64
Sex of child	Female	19.81	34.52	17.18	32.98	60.45	38.75	45.17	7.53	40.46	40.41	23.06	15.85	40.34	24.91	6.36
	Male	22.80	44.22	26.87	45.70	58.67	0.00	58.71	14.24	34.43	40.96	30.90	23.56	51.65	34.98	3.28
Wealth	Poor	12.57	60.80	25.12	43.25	63.07	0.00	60.91	0.00	57.06	72.00	45.33	26.97	50.37	44.63	8.95
	Middle	31.82	34.99	18.58	33.93	56.56	38.37	48.06	47.94	35.39	50.61	35.70	12.56	46.45	30.12	7.59
	Rich	20.07	30.11	16.46	18.30	38.11	17.62	35.32	7.03	23.51	32.96	18.05	18.22	24.75	20.63	4.01

Background Characteristics / States		MP	MH	ML	MZ	NL	DL	OD	PY	PB	RJ	TN	TS	TR	UP	UK	WB
ANC visits	No visit	48.60	14.69	40.56	12.61	79.78	23.87	37.91	30.22	24.23	38.68	22.46	55.35	28.72	98.30	46.83	29.22
	1-3 visits	36.81	13.17	14.25	34.07	31.83	25.43	27.23	4.28	23.95	24.80	25.03	27.67	12.92	51.98	32.72	20.94
	4+ visits	28.10	22.39	31.40	9.40	18.90	19.03	21.87	0.89	20.01	27.95	16.05	22.04	24.55	34.21	44.03	15.62
Birth order	1	51.12	26.72	38.18	22.70	25.83	30.16	40.07	3.71	31.17	30.84	16.68	31.15	41.56	60.73	53.08	22.97
	2-3	43.11	29.05	26.81	19.88	49.38	24.71	34.69	5.30	32.03	34.74	25.55	27.15	37.14	57.68	34.56	23.27
	4 and above	60.11	35.22	50.54	33.23	61.88	43.89	62.22	0.00	59.12	58.68	102.04	32.03	75.30	87.64	108.51	58.65
Caste	Non-SC/ST	42.08	26.69	28.98	37.02	0.00	28.01	25.55	5.17	26.88	31.11	19.03	25.33	40.04	61.21	50.27	23.27
	SC	57.72	29.58	37.50	0.00	10.93	29.63	37.96	2.71	39.40	43.00	29.52	34.27	30.95	72.67	54.78	31.60
	ST	55.77	36.54	36.86	23.68	45.50	18.87	61.07	0.00	15.72	47.81	31.26	43.96	52.47	61.31	36.97	24.31
Education	No education	62.39	13.92	61.05	9.20	47.80	49.31	63.71	71.43	36.41	46.90	37.40	53.14	58.35	81.81	108.38	28.98
	Primary	53.08	47.58	41.85	33.59	47.70	56.27	46.87	9.77	63.05	34.04	25.89	58.40	46.75	66.86	29.52	38.44
	Secondary	44.83	27.24	31.10	25.64	45.58	27.12	32.07	4.96	34.21	33.46	27.32	25.73	41.95	59.52	43.54	23.35

	Higher	29.08	29.81	6.89	3.09	24.13	9.16	13.04	2.85	9.65	23.77	13.51	13.91	0.00	39.48	41.26	7.25
Mother age	15-24	48.91	31.62	48.87	18.26	45.82	46.64	43.08	8.69	45.36	35.23	20.95	25.24	37.43	71.21	37.52	28.64
	25-34	45.06	28.26	33.35	22.28	43.29	24.13	36.90	4.22	31.43	35.04	23.54	30.81	43.58	57.86	55.66	21.01
	35-49	70.97	14.23	37.96	28.28	45.52	21.03	37.60	0.00	26.58	43.70	14.54	39.79	40.03	76.79	38.87	31.21
	50+	85.51	42.54	52.31	21.78	47.37	60.68	74.12		42.54	55.48	161.77	58.05	72.70	85.21	63.85	35.23
Place of delivery	Home	85.51	42.54	52.31	21.78	47.37	60.68	74.12		42.54	55.48	161.77	58.05	72.70	85.21	63.85	35.23
	Institutional	44.10	27.68	27.43	23.50	39.02	25.82	36.05	4.48	32.69	35.20	21.75	28.12	37.19	59.67	47.77	24.24
Religion	Hindu	48.69	25.36	2.82	100.51	0.00	27.40	37.24	4.80	28.23	38.03	22.89	30.36	42.56	64.72	44.28	21.96
	Muslim	41.99	40.55	40.23		58.93	39.37	70.48	0.00	83.79	22.89	14.41	21.55	42.21	63.62	73.26	30.65
	Others	38.99	36.36	38.84	22.72	45.64	0.00	60.18	0.00	34.94	17.78	17.64	25.65	29.27	40.12	56.33	36.08
Residence	Rural	51.64	27.54	40.73	25.23	46.09	31.65	40.37	4.90	39.31	36.92	24.76	32.64	46.09	67.23	46.55	25.97
	Urban	36.56	29.65	19.62	21.34	36.56	28.64	31.45	4.17	22.23	33.65	19.26	23.42	25.08	53.70	59.23	23.32
Sex of child	Female	42.96	25.17	31.29	23.14	33.45	35.69	33.95	6.49	33.96	32.71	22.38	29.83	33.06	63.71	48.21	19.40
	Male	53.12	31.51	44.38	23.38	53.70	22.49	43.52	2.58	32.63	39.45	22.47	28.28	49.54	65.14	52.34	30.95
Wealth	Poor	57.87	43.58	42.99	21.03	46.04	69.90	50.51	16.23	65.83	41.04	49.23	41.79	50.12	74.71	65.07	28.12
	Middle	37.14	25.78	26.91	24.16	24.21	41.60	17.61	0.00	37.87	42.82	24.02	31.76	16.70	67.79	51.07	21.49
	Rich	33.81	21.97	2.21	23.93	50.77	24.26	22.32	3.78	29.35	28.35	13.49	22.33	33.53	44.58	43.84	17.68

Figure 1 : Spatial Distribution of Infant Mortality Rate (IMR) by Selected Background Characteristics in India, NFHS-5 (2019-21)

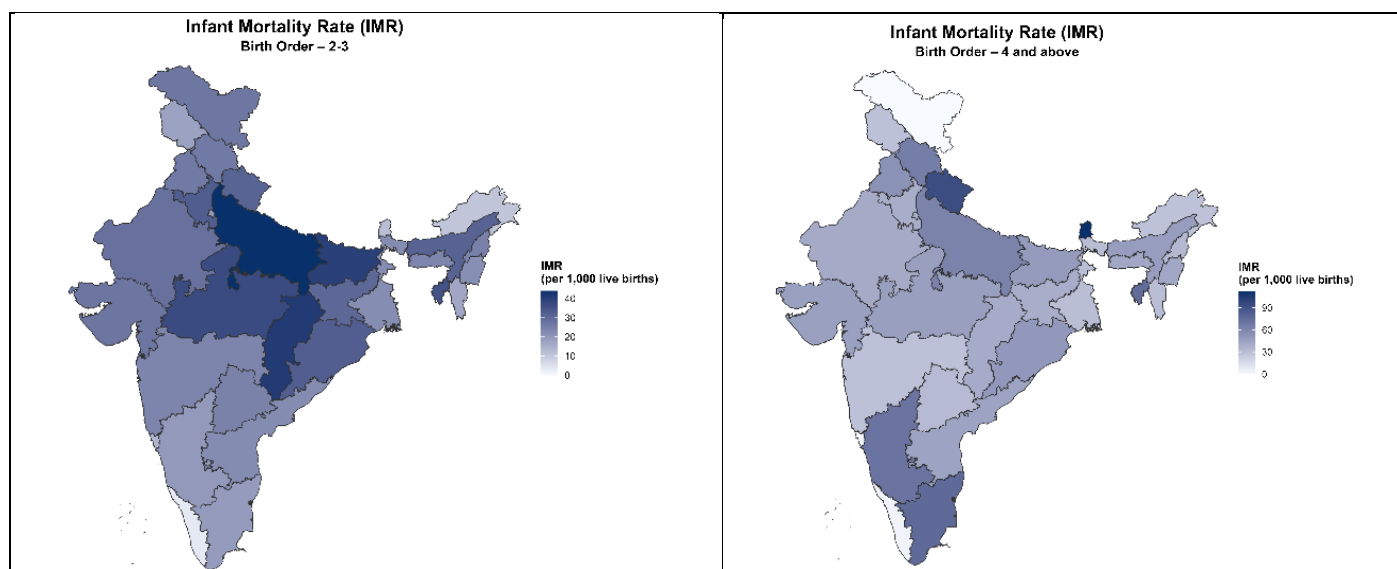
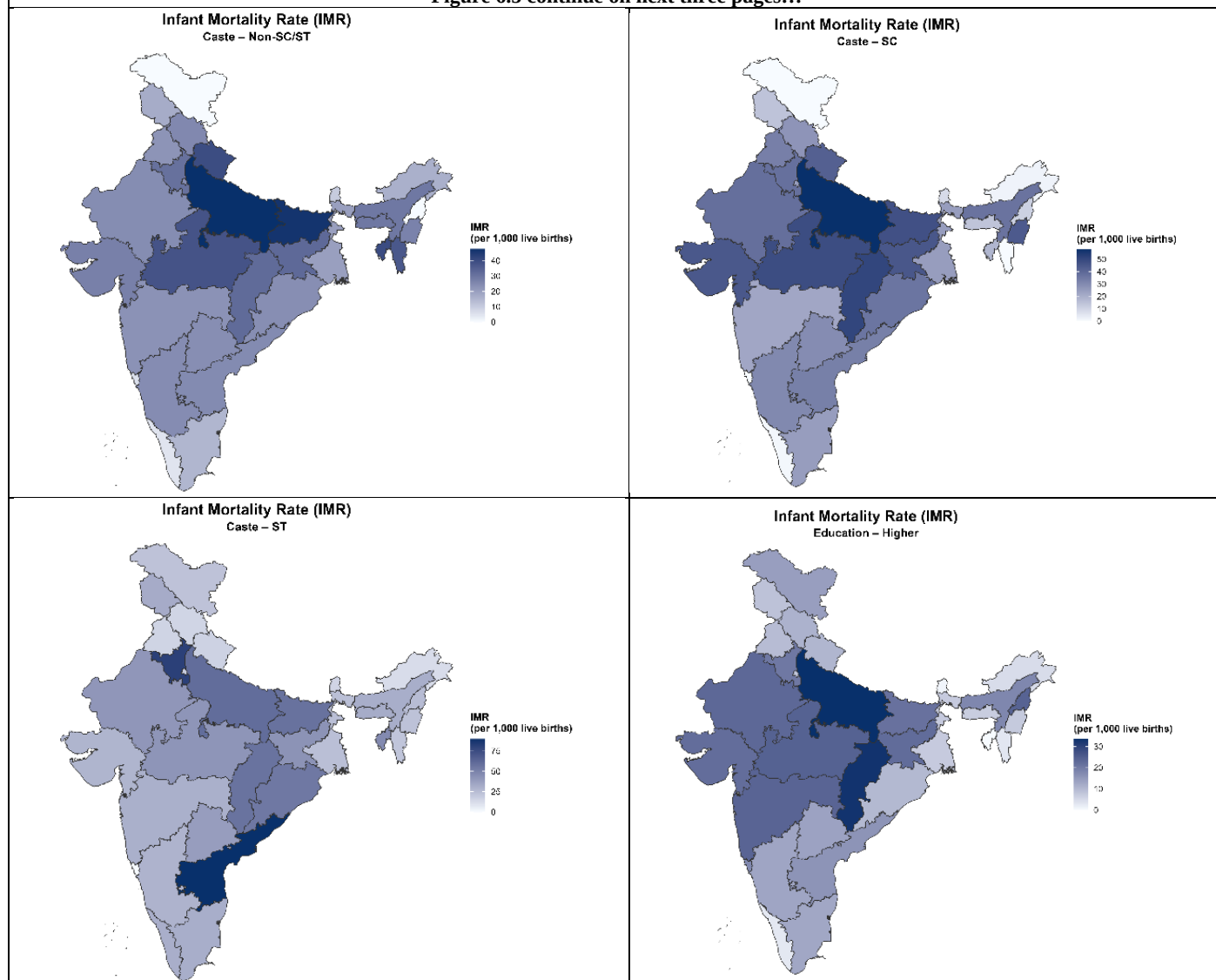
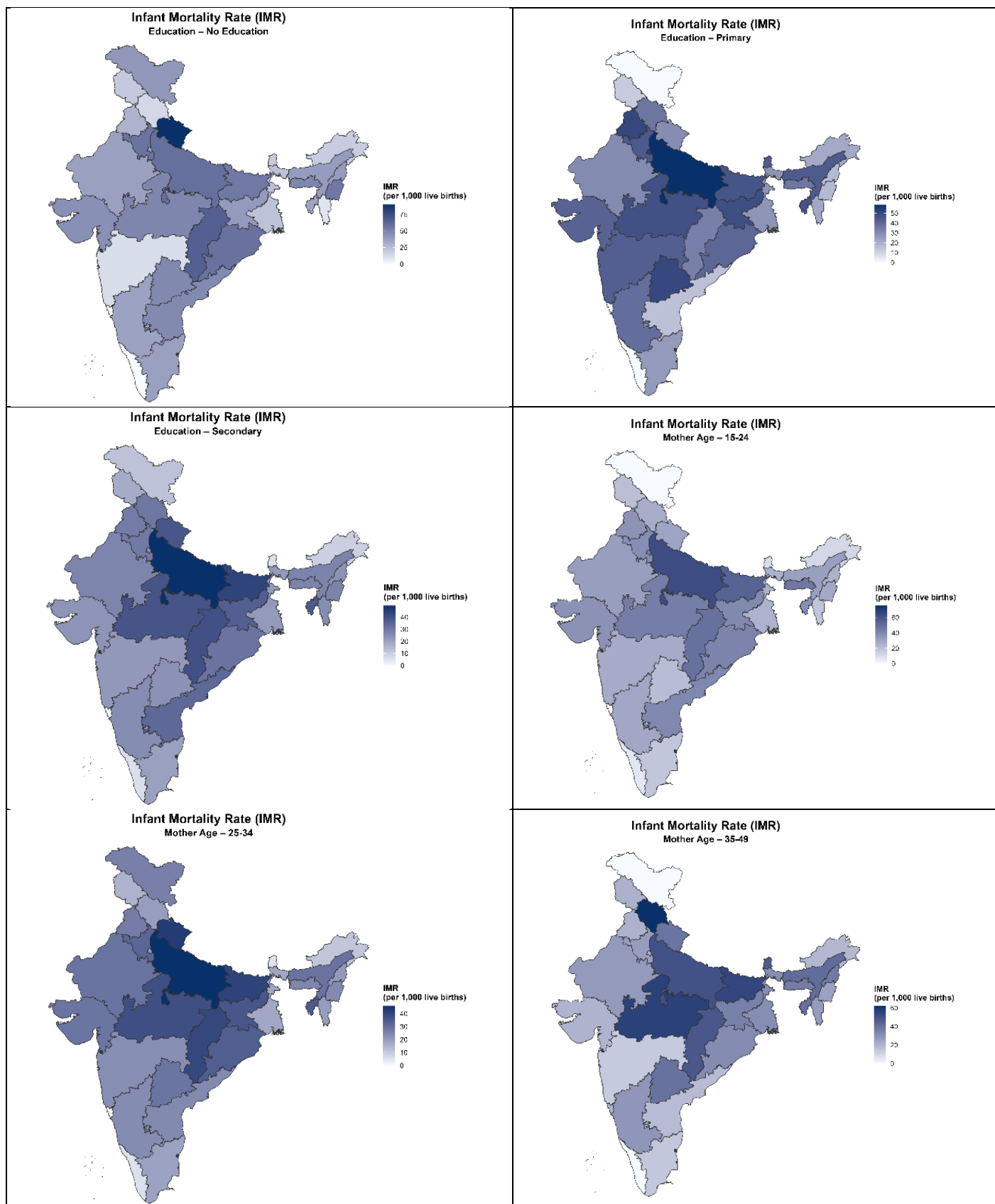
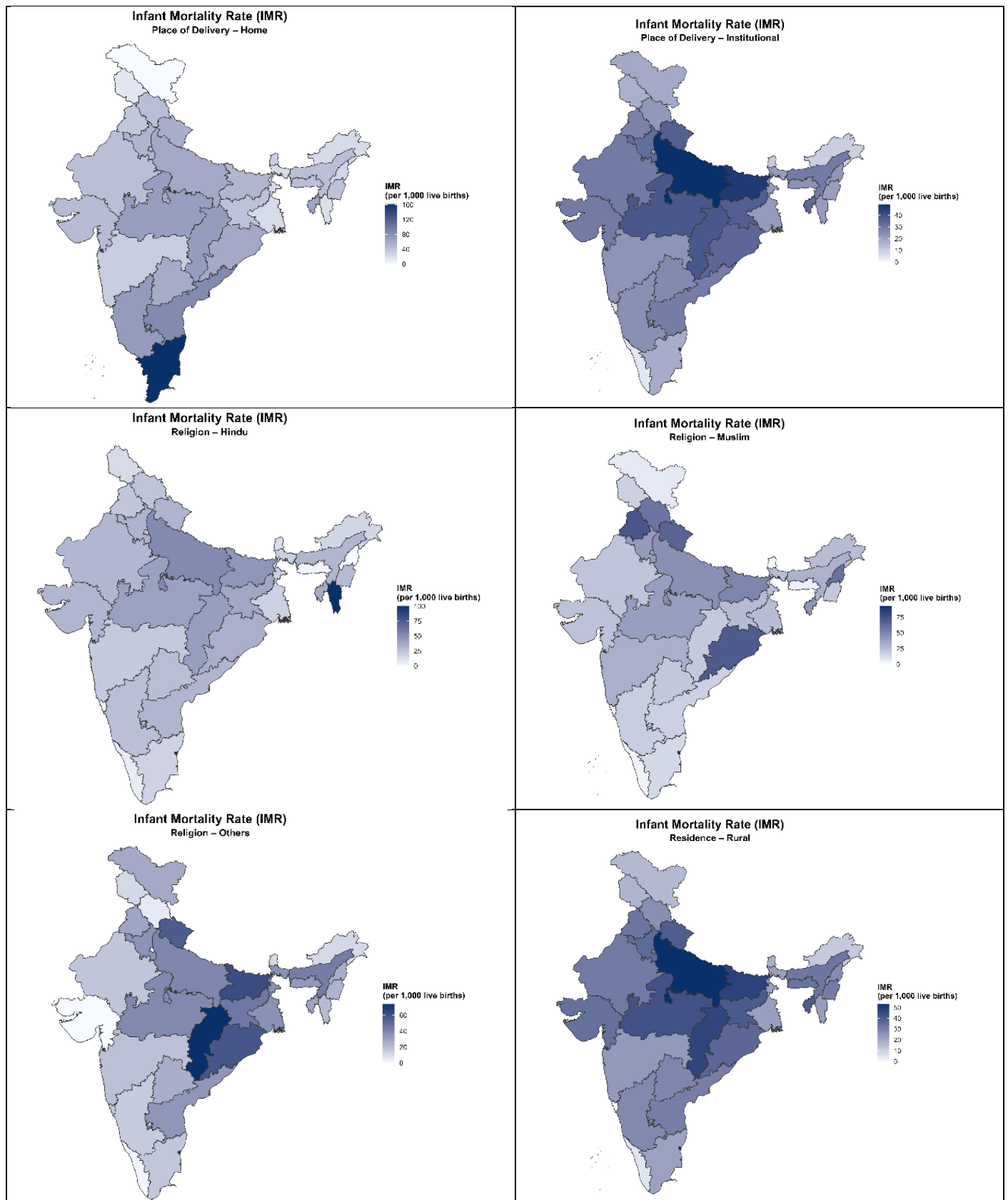
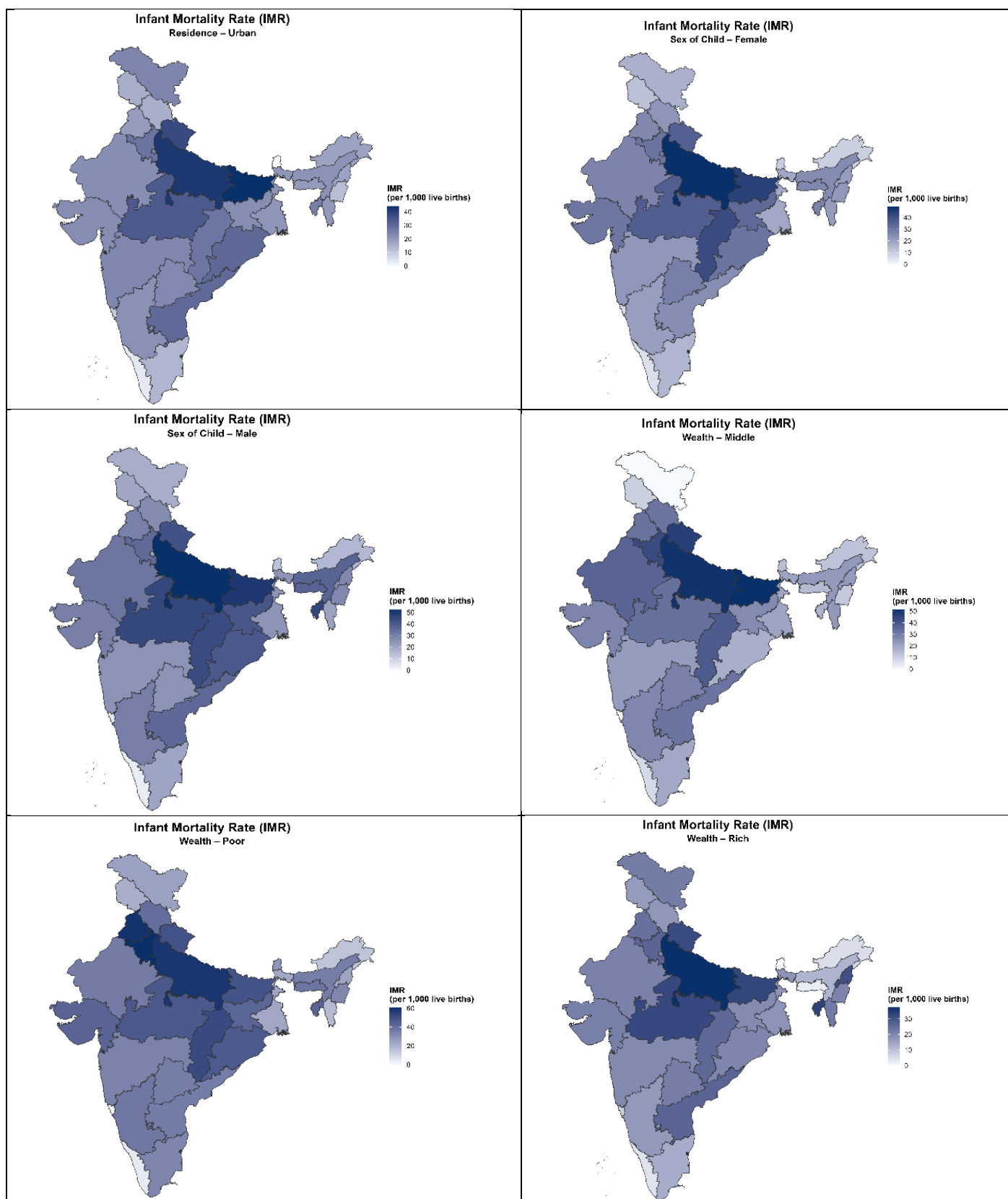


Figure 6.5 continue on next three pages...









4. Conclusion

This study examined the state-wise distribution of Infant Mortality Rate (IMR), Child Mortality Rate (CMR), and Under-Five Mortality Rate (U5MR) in India using data from the National Family Health Survey-5 (NFHS-5, 2019-21). The findings revealed substantial interstate variation in child mortality across different socio-economic, demographic, and maternal healthcare characteristics. Although India has achieved considerable progress in reducing child mortality over recent decades, important disparities continue to exist

across states and population groups, consistent with previous national and global evidence on child survival inequalities [11, 12].

Higher mortality was consistently observed among children from poor households, mothers with no formal education, higher birth orders, inadequate antenatal care, and home deliveries. In contrast, lower mortality was generally associated with better maternal education, improved household economic status, adequate antenatal care, and institutional delivery. These findings reinforce existing

evidence that social determinants and access to quality maternal healthcare remain fundamental drivers of child survival in low- and middle-income countries^[13, 14].

The spatial distribution of IMR further demonstrated clear regional disparities, with several northern and central states continuing to experience relatively higher infant mortality than many southern states. These geographical differences suggest that national averages may conceal substantial interstate inequalities and highlight the importance of state-specific planning and resource allocation to address local health challenges.

Overall, the study emphasizes that further reductions in child mortality require integrated strategies that combine improvements in maternal and child healthcare with broader socio-economic development. Strengthening antenatal care services, promoting institutional deliveries, improving female education, reducing household poverty, and ensuring equitable access to quality healthcare should remain key priorities for achieving the Sustainable Development Goal (SDG) targets related to child survival and reducing avoidable mortality among children under five years of age^[15].

References

1. United Nations. Transforming our world: the 2030 agenda for sustainable development. New York: United Nations; 2015.
2. World Health Organization. World health statistics 2023: monitoring health for the SDGs. Geneva: World Health Organization; 2023.
3. United Nations Inter-agency Group for Child Mortality Estimation (UN IGME). Levels and trends in child mortality 2024. New York: UNICEF; 2024.
4. Mosley WH, Chen LC. An analytical framework for the study of child survival in developing countries. *Popul Dev Rev*. 1984;10(Suppl):25–45.
5. Preston SH, Heuveline P, Guillot M. Demography: measuring and modeling population processes. Oxford: Blackwell Publishers; 2001.
6. International Institute for Population Sciences (IIPS), ICF. National Family Health Survey (NFHS-5), 2019–21: India report. Mumbai: IIPS; 2021.
7. Office of the Registrar General and Census Commissioner, India. Sample Registration System statistical report. New Delhi: Government of India; 2024.
8. International Institute for Population Sciences (IIPS), ICF. National Family Health Survey (NFHS-4), 2015–16: India report. Mumbai: IIPS; 2017.
9. Black RE, Cousens S, Johnson HL, *et al*. Global, regional, and national causes of child mortality in 2008: a systematic analysis. *Lancet*. 2010;375(9730):1969–1987.
10. International Institute for Population Sciences (IIPS), ICF. National Family Health Survey (NFHS-5), 2019–21: India report. Mumbai: IIPS; 2021.
11. United Nations Children's Fund (UNICEF). Levels and trends in child mortality: report 2024. New York: UNICEF; 2024.
12. United Nations Children's Fund. The state of the world's children 2023: for every child, vaccination. New York: UNICEF; 2023.
13. World Health Organization. Social determinants of health. Geneva: World Health Organization; 2008.
14. World Bank. Disease control priorities, third edition. Volume 2: reproductive, maternal, newborn, and child health. Washington (DC): World Bank; 2016.

15. United Nations. Transforming our world: the 2030 agenda for sustainable development. New York: United Nations; 2015.