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ASSESSMENT OF CHILD HEALTH STATUS OF INDIAN STATES USING GROUP DIMENSIONAL INDEX

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ABSTRACT

Health encompasses the overall condition of mental, physical and social wellbeing, and it goes beyond simply being free from illness or disease. Children's health is a complex topic. With the use of NFHS 4th and 5th round data, the child health profile is examined with the support of number of dimensions and parameters to examine degree of disparity that prevails across states and Union Territories of India. It has been discovered that the rates of infant mortality, malnourished children and under-five mortality have declined noticeably over time. The creation and validation of an Indian Composite Dimension Index (CDI) are the main topics of this research. This index, which is prepared using dimensions like child health dimension and Nourishment dimension. Child health Dimension includes parameters like Infant Mortality Rate and Under five mortality rate. Nutritional Dimension includes Anaemia, underweight children, wasting, stunted and severely wasted parameters. Pregnancy among underage women impact on the infant mortality rate, while programs for maternity care, Child vaccination programme, vitamin-A supplementation, greater literacy rate of women and childhood treatment diseases significantly lower the infant mortality rate. As therefore, it could be leveraged by legislators, healthcare professionals, and other child welfare stakeholders to track and enhance child health across time as well as place.

Introduction

Children who are healthy have a higher chance of becoming healthy adults. Since health is a fundamental aspect of human development, it influences the well-being of society. As a result, concerns pertaining to children and enhancing their health have received more attention in recent years. The development of composite health indices which are composed of multiple variables is a recent advancement

in the assessment of population health. Compared to assessing health using individual indicators like mortality and morbidity rates, these composite measures offer a more comprehensive picture of population health. The low income countries, particularly India has received no advantage from the many health indicators that have been generated primarily in prosperous nations. Vital statistics such as infant Death rate, life expectancy at birth, crude birth and death rate serve as the foundation for data on a state's human development

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and overall health (Sengupta 2016). Because it allows for stable employment, increases productivity, and eases the demographic transition, availability to health care protects, prevents improves the rights of the underprivileged poor. The indicator of Child Mortality is a comprehensive indicator created by Satyanarayana et al. (1995) in India. The Index was created to track children's health for long-term evaluation and state-to-state comparison.

Although creating health index is interesting, it is especially crucial in India due to the substantial incidence of poor health of child and differences in health of child across various economic, social and geographic areas. Furthermore, major studies performed in this field utilised data from the US and Europe (Rigby et al., 2003; Köhler, 2016; Rigby, 2005; Köhler & Eriksson, 2018; Moore et al., 2007). As various parameters influences health of child, a comprehensive Index pertaining to health created to apply in a developed nation would not be appropriate for use in a low income nation like India.

In a nation like India, where reformation in the health of children is a difficult undertaking, the consequences of neglecting the issue appear to be catastrophic. Our policymakers do not see a bright future for India's child health situation at this moment. The condition of mental, physical, and social well-being is known as health, and it goes beyond simply being free from unwellness or disease. The basic human rights includes right to have the accessibility to potable water and proper sanitation. Every child is entitled to prompt and appropriate access to healthcare services. The process of assessing a nation's or state's health is complicated. Bhatia et al. (2006) suggested a competitive voucher program be piloted as a method for RCH (Reproductive & Child Health) services in India. The proportional importance of household and personal conditions influencing the likelihood of using the programmer's services is estimated by Borooah et al. (2014).

The percentage of underweight, wasting and stunted children has declined in all regions which had greater literacy rates of women. concentrations of Aanganwadi Centres. (Maity et al. (2019). According to Ganotra Komal (2016), India loses children because it institutionalises children below 14 years of age as a labour in various dangerous jobs. Maitra P. and Ranjan Ray (2013) conducted an analysis of four parameters pertaining to health of child in West Bengal, viz. malnourishment in child (wasting and stunting rates), child death rates, infant and prenatal death rates, further suggested that policy interventions for health of child and mother should be independent. (Maity et al. (2019) identified specific immunisations required to battle with major illnesses faced by children and also observed that proportion of children receiving such children vaccination in West Bengal has recently increased. Sinha Dipa (2015) highlighted that Survey on Children executed in 2005-06 and 2013-14 concluded that there was increase in child and

maternal health parameters also stated further investments in nutritional and health aspect as part of more holistic strategy.

Current material primarily centralised upon newborn and child death rates. Some of them focused upon a specialised immunisation regimen for child health. The majority of them emphasised the gender gap, which refers to discrimination against girls because they lack access to enhanced health facilities and nutritional support. However, they did not place sufficient emphasis over the other critical component of health of child. A rigorous explanatory review of children's health condition in relation to family health throughout Indian states has not been completed satisfactorily. It is critical to do a comprehensive state-level study that covers all of the fundamental aspects of health of child. Therefore, current research attempts to rectify few of the aforementioned shortcomings in the previous work. Additionally, idea of health of child might contain multidimension. Consequently, in this article, the health condition of children is examined utilising a variety of dimensions and indicators. In order to explore the intensity and inequalities indicating children's health status across Indian states, we investigated two indices of children's multidimensional health status.

Child Death

- Infant Mortality Rate (IMR)
- Under-Five Mortality Rate (U5MR)

Nourishment

- Percentage of stunted children under 5 years .
- Percentage of wasted children under 5 years.
- Percentage of severely wasted children under 5 years.
- Percentage of underweight children under 5 years.
- Percentage of anaemic Children below age 6-59 months.

Objectives

- a) To calculate health Index using mortality and nutritional parameters of child health.
- b) To show the trend of existing mortality and nutritional inequality across the Indian States and union territories.

Database

Current research relies primarily based upon secondary type of data. Data was gathered from NFHS-5 surveyed and published between 2019-21 and NFHS-4 surveyed and published between 2015-16 (NFHS- National Family and Health Surveys). State fact sheet was used from NFHS 4 and NFHS-5 across Indian states and union territories in this two-round survey. The parameters which were selected were totally context based. As significant variations amongst the states and union territories is noticeable in terms of health of child throughout the country. NFHS-5, which is a latest

national level representative survey. NFHS-5 was carried out in Indian States and Union Territories (International Institute for Population Sciences, 2021).

Methodology

Data analysis process is straightforward. The data has been effectively analysed using the necessary statistical methods. The following are specifics about the study's methodology. The Dimension Index (DI) Studies on human development have made great use of it. Arithmetic average of all dimension index of a each indicator is used to create the Group Dimensional Index (GDI) (Das Pinaki et al., 2020) DI is computed for each parameter of Dimension. Lowest and highest values had been chosen for every parameter across states and union territories of India for the computation of the DI. Using the generic formula below, performance in each dimension is represented as a number between 0 and 1. Each indicator's Dimensional Index (DI) is determined as follows:

$$DI = (\text{Actual value of parameter} - \text{Minimum value of parameter}) / (\text{Maximum value of parameter} - \text{Minimum value of parameter})$$

$$\text{Group Dimensional Index (GDI)} = \text{Summation of all DIs} / \text{Total No. of Indicators}$$

Level of Child Health in India's States

The infant mortality rate (IMR), stunted, underweight children, wasted and severely wasted children, under-five mortality rate (U5MR), anaemia are used to assess the profile of health of children in every Indian states and Union Territories.

Infant mortality Rate (IMR)

The fundamental indicators of children's health in a certain area is IMR. The total number of deaths of children (< one year) per 1000 live births has been measured. The total number of deaths of less than one year children per thousand live births is known as infant mortality. The incidents of infant deaths is rather high within the span of few days or months. In the year 2016-21, The lowest IMR is in Kerala is

6 and the highest IMR is in Uttar Pradesh (64). In the year 2019-21, The highest IMR was in Uttar Pradesh (50.36) and lowest IMR was in Lakshdweep (0). The states which have IMR more than national average(28.77) are Uttarakhand, Odisha, Madhya Pradesh, Bihar, Chhattisgarh.

The U5MR, or under-five mortality rate

The under-five mortality rate is another crucial measure of health of children. The total number of deaths of children per 1000 live births below the age of five years is known as the under-five mortality rate. The U5MR among children in 2015-16 varied between 3.8 in Puducherry to 78 in Uttar Pradesh. In 2015-16, Uttar Pradesh was at the top position with 78 of U5MR Goa had the lowest U5MR. U5MR ranged between 0 in Lakshdweep to 59.84 in Uttar Pradesh in the year 2019-21. overall, Uttar Pradesh continuously remained on top among the states. The trend of U5MR has declined. The major change was observed in Lakshadweep and Uttar Pradesh as there was significant decrease of 30 death per 1000 live births of U5MR in last five years.

Stunted, wasted, and severely wasted

The proportion of child between the ages of 0 and 59 months who are shorter than average for their age is known as stunting. When a teenage girl who becomes a mother is malnourished and anaemic, stunting begins before conception and gets worse when the infant's food is poor and sanitation and cleanliness are inadequate. The nourishment profile of children in 2015-16 represents that 48.3% of total children in Bihar were stunted. 29% of children below five years were wasted in Jharkhand and Daman & Diu and Dadra & Nagar Haveli accounted for 11.9% of severely wasted children below five years of age. In the year 2019-21, 20% were of children in India were wasted, 6% were underweight, and 48% of children under five were stunted. The state of Meghalaya is with the highest percentage of stunting (46.54%). On the contrary, Maharashtra has the highest percentage of severely wasted children (10.94%) and it also has the higher percentage of has the highest percentage of wasting(25.6%). It is also noted that there was significant increase in percentage of severely wasted children in the span of five years in the states of Himachal Pradesh, Ladakh and Telanagana. (Table 1)

States/UTs	Infant mortality rate (per 1000 live births) 2015-2016	Infant mortality rate (per 1000 live births) 2019-21	Under-five mortality rate (per 1000 live births) 2015-16	Under-five mortality rate (per 1000 live births) 2019-21
Andaman and Nicobar	9.8	20.6	13	24.5
Andhra Pradesh	35	30.25	41	35.19

Arunachal Pradesh	23	12.87	33	18.82
Assam	48	31.93	56	39.12
Bihar	48	46.76	58	56.44
Chhattisgarh	54	44.24	64	50.4
Dadra & Nagar Haveli, Daman & Diu	33.4	31.8	39.9	37
NCT of Delhi	31.7	24.5	42.2	30.6
Goa	13	5.6	13	10.6
Gujarat	34	31.22	43	37.64
Haryana	9.3	33.34	3.8	38.71
Himachal Pradesh	34	25.63	38	28.94
Jammu & Kashmir	32	16.26	38	18.53
Jharkhand	44	37.88	54	45.44
Karnataka	28	25.4	32	29.51
Kerala	6	4.42	7	5.19
Ladakh	35.3	20	40.6	29.5
Lakshadwip	27	0	30.2	0
Madhya Pradesh	51	41.29	65	49.2
Maharastra	24	23.22	29	28.03
Manipur	22	24.99	26	30.03
Meghalaya	30	32.26	40	39.96
Mizoram	40	21.3	46	24.04
Nagaland	29	23.44	37	33.03
Odisha	40	36.31	49	41.08
Punjab	29	28.03	33	32.74
Puducherry	15.7	2.9	16.2	3.9
Rajasthan	41	30.25	51	37.55
Sikkim	29	11.18	32	11.18
Tamil Nadu	21	18.64	27	22.31
Telangana	28	26.44	32	29.39
Tripura	27	37.56	33	43.28
Uttar Pradesh	64	50.36	78	59.84
Uttarakhand	40	39.1	47	45.55
West Bengal	27	21.98	32	25.35
MEAN	31.52	26.05	37.71	31.21
SD	12.87	12.27	16.23	14.25
MAX	64	50.36	78	59.84
MIN	6	0	3.8	0

Source: National Family & Health Survey-4,5

Underweight Children

A more accurate picture of children's nutritional status may be obtained by combining the indicators of underweight

(weight for age), stunting (height for age), wasting (weight for age), and severely wasted (weight for height). There are significant nutrition issues in each Indian state. The percentage of underweight children each state is shown in Table 2. It varied between 12 percent in Mizoram to 41 percentage in Bihar in 2019-21. Bihar and Jharkhand had the

greatest underweight rates among the states. The proportion of underweight children in 2015–16 ranged from 11.9% in Mizoram to 47.8% in Jharkhand. Despite the fact that Goa and Kerala had the lowest rates of wasted and stunted children the proportion of underweight children in Kerala was comparatively greater.

Anaemia

A low level of haemoglobin in the blood is the hallmark of anaemia. In addition to increasing the risk of infectious illness morbidity, anaemia in young children can lead to deficiencies in cognitive function, behavioural development, language

acquisition, coordination, and academic performance. Consequently, the prevalence of anaemia is seen as a sign to evaluate children's nutritional condition. The proportion of anaemic children in India increased significantly from 58.4% in 2015–16 to 67.1% in 2019-21. In 2015–16, Mizoram had a comparatively lower percentage, while Haryana had the highest. In 2019-21, The Highest Anaemia was recorded in Ladakh (92.5%). The percentage of anaemic patients declined in every state. Over the course of the decade under consideration, the percentage of anaemic children decreased in every state with the exception of Rajasthan, Tripura, Delhi and Gujarat, where the rate increased by 10%. (Table 2)

Table. 2 Stunted, wasted and severely wasted children across states of India, 2015-16 & 2019-21

States/UTs	under 5 years who are stunted (%) 2015-16	Children under 5 year who are stunted (%) 2019-21	Children under 5 years who are wasted (%) 2015-16	Children under 5 years who are severe wasted (%) 2015-16	Children under 5 years who are severe wasted (%) 2019-21	Children under 5 year who are severe-wasted (%) 2015-16	Children under 5 years who are under-weight (%) 2015-16	Children under 5 years who are under-weight (%) 2019-21	Children below 3 years breastfed under one hour of birth ¹⁵ (%) 2015-16	Children below 3 years breastfed under one hour of birth ¹⁵ (%) 2019-21
Andaman and Nicobar	23.3	22.5	18.9	16	7.5	4.8	21.6	23.7	49	40
Andhra Pradesh	31.4	31.16	17.2	16.06	4.5	5.98	31.9	29.63	58.6	63.2
Arunachal Pradesh	29.4	27.98	17.3	13.08	8	6.51	19.5	15.41	54.2	56.6
Assam	36.4	35.29	17	21.73	6.2	9.05	29.8	32.78	35.7	68.4
Bihar	48.3	42.94	20.8	22.89	7	8.83	43.9	41.03	73.1	54.6
Chhattisgarh	37.6	34.6	23.1	18.88	8.4	7.54	37.7	31.33	41.6	32.24
Dadra & Nagar Haveli, Daman & Diu	37.2	39.4	26.7	21.6	11.5	4.3	35.8	38.7	82	75.8
NCT of Delhi	31.9	30.9	15.9	11.2	4.6	4.9	27	21.8	59.7	69.2
Goa	20.1	25.77	21.9	19.12	9.5	7.54	23.8	24	48.3	53.2
Gujarat	38.5	39.02	26.4	25.1	9.5	10.57	39.3	39.68	62.6	79.7
Haryana	34	27.49	24.2	11.53	9	4.36	29.4	21.45	71.1	70.4
Himachal Pradesh	26.3	30.84	13.7	17.39	3.9	6.88	21.2	25.5	53.7	55.4

Jammu & Kashmir	27.4	26.86	12.7	18.98	5.6	9.65	16.6	20.97	53.8	72.7
Jharkhand	45.3	39.58	29	22.41	11.4	9.12	47.8	39.4	69.9	67.5
Karnataka	36.2	35.43	26.1	19.52	10.5	8.4	35.2	32.94	60.9	65.5
Kerala	19.7	23.41	15.7	15.75	6.5	5.77	16.1	19.67	35.6	39.4
Ladakh	30.9	30.5	9.3	17.5	5.1	9.1	18.7	20.4	91.4	92.5
Lakshadwip	26.8	32	13.7	17.4	2.9	8.7	23.6	25.8	53.6	43.1
Madhya Pradesh	42	35.67	25.8	18.95	9.2	6.47	42.8	33	68.9	72.7
Maharashtra	34.4	35.24	25.6	25.6	9.4	10.94	36	36.12	53.8	68.9
Manipur	28.9	23.43	6.8	9.94	2.2	3.41	13.8	13.32	23.9	42.8
Meghalaya	33.8	46.54	15.3	12.1	6.5	4.71	29	26.64	48	45.1
Mizoram	28	28.86	6.1	9.78	2.3	4.9	11.9	12.66	19.3	46.4
Nagaland	28.6	32.71	11.2	19.14	4.2	7.93	16.8	26.88	26.4	42.7
Odisha	34.1	31.01	20.4	18.06	6.4	6.08	34.4	29.69	44.6	64.2
Punjab	25.7	24.49	15.6	10.57	5.6	3.65	21.6	16.92	56.6	71.1
Puducherry	23.7	20	23.6	12.4	7.8	3.7	22	15.3	44.9	64
Rajasthan	39.1	31.78	23	16.77	8.6	7.56	36.7	27.61	60.3	71.5
Sikkim	29.6	22.33	14.2	13.65	5.9	6.63	14.2	13.13	55.1	56.4
Tamil Nadu	27.1	25.04	19.6	14.61	7.9	5.47	23.8	21.96	50.7	57.4
Telangana	28	33.12	18.1	21.7	4.8	8.49	28.4	31.82	60.7	70
Tripura	24.3	32.3	16.8	18.21	6.3	7.33	24.1	25.6	48.3	64.3
Uttar Pradesh	46.3	39.71	17.9	17.32	9	7.31	26.6	32.14	63.2	66.4
Uttarakhand	33.5	27.04	19.5	13.18	6	4.71	39.5	20.95	59.8	58.8
West Bengal	32.5	33.78	20.3	20.33	6.5	7.14	35.7	32.21	54.2	69
MEAN	32.00	31.39	18.55	17.09	6.86	6.81	27.89	26.28	54.1	60.88
SD	6.99	6.23	5.67	4.24	2.41	2.02	9.44	7.981	15.05	13.25
MAX	48.3	46.54	29	25.6	11.5	10.94	47.8	41.03	91.4	92.5
MIN	19.7	20	6.1	9.78	2.2	3.41	11.9	12.66	19.3	32.24

Source: National Family & Health Survey-4,5

Group Dimension Index of Child deaths in States and Union Territories of India

The Dimension Index (DI) of each indicator of child deaths and nutrition is computed for 2015-16 and 2019-21. While stunted, wasted, severely wasted, underweight, and anaemic are indications of nutrition, IMR and U5MR were markers

of child mortality as previously indicated. The Group Dimension Index (GDI) is obtained by averaging all of the dimensions' DI. We were able to determine the rankings of states and territories in 2019-21 and 2015-16 with the aid of the GDI value. In this case, a higher GDI value indicates that the states had a larger percentage of undernourished children and child mortality, whereas a lower value indicated that the states had a lesser percentage of these issues. According to Table 3, the highest value is associated with rank 1.

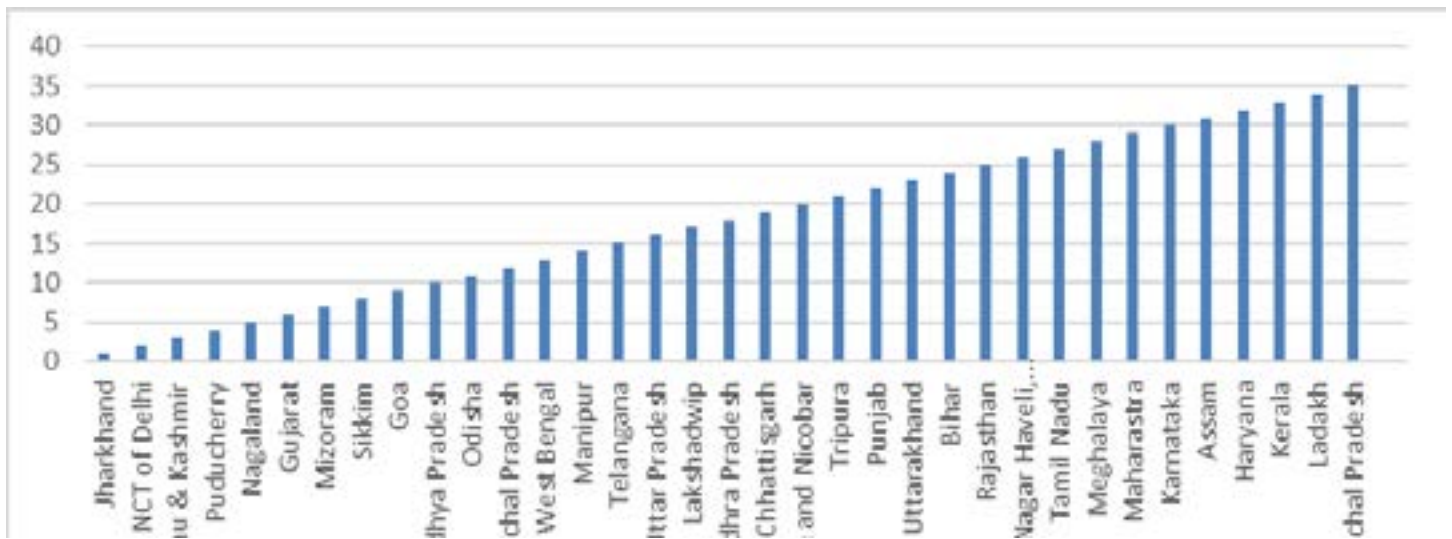
TABLE. 3 Group Dimensional Index for 2015-16, 2019-21

States/Uts	TOTAL MOR- TALITY 2015- 16	TOTAL NOUR- ISHMENT 2019- 21	GDI 2015- 16	TOTAL MOR- TALITY 2019-21	TOTAL NOURISH- MENT 2019-21	GDI 2019- 21
Andaman and Nico- bar	0.09	0.39	0.24	0.41	0.24	0.32
Andhra Pradesh	0.50	0.45	0.47	0.59	0.45	0.52
Arunachal Pradesh	0.34	0.43	0.39	0.29	0.28	0.28
Assam	0.71	0.44	0.58	0.64	0.68	0.66
Bihar	0.73	0.76	0.74	0.94	0.76	0.85
Chhattisgarh	0.82	0.61	0.72	0.86	0.47	0.66
Daman & Diu, Dadra & Nagar Haveli	0.48	0.81	0.64	0.62	0.65	0.64
NCT of Delhi	0.48	0.42	0.45	0.50	0.33	0.41
Goa	0.12	0.44	0.28	0.14	0.42	0.28
Gujarat	0.51	0.74	0.62	0.62	0.88	0.75
Haryana	0.03	0.65	0.34	0.65	0.29	0.47
Himachal Pradesh	0.47	0.30	0.38	0.50	0.44	0.47
Jammu & Kashmir	0.45	0.31	0.38	0.32	0.53	0.42
Jharkhand	0.67	0.92	0.79	0.76	0.76	0.76
Karnataka	0.38	0.71	0.55	0.50	0.63	0.56
Kerala	0.02	0.24	0.13	0.09	0.24	0.16
Ladakh	0.50	0.41	0.45	0.45	0.58	0.51
Lakshadwip	0.36	0.29	0.33	0.00	0.46	0.23
Madhya Pradesh	0.80	0.79	0.79	0.82	0.59	0.71
Maharastra	0.32	0.66	0.49	0.46	0.80	0.63
Manipur	0.29	0.09	0.19	0.50	0.07	0.28
Meghalaya	0.45	0.45	0.45	0.65	0.41	0.53
Mizoram	0.58	0.06	0.32	0.41	0.15	0.28
Nagaland	0.42	0.20	0.31	0.51	0.47	0.49
Odisha	0.6	0.5	0.6	0.7	0.5	0.6
Punjab	0.4	0.4	0.4	0.6	0.2	0.4
Puducherry	0.2	0.4	0.3	0.1	0.2	0.1
Rajasthan	0.6	0.7	0.6	0.6	0.5	0.6
Sikkim	0.4	0.3	0.4	0.2	0.2	0.2
Tamil Nadu	0.3	0.4	0.4	0.4	0.3	0.3
Telangana	0.4	0.4	0.4	0.5	0.6	0.6
Tripura	0.4	0.4	0.4	0.7	0.5	0.6
Uttar Pradesh	1.0	0.6	0.8	1.0	0.6	0.8
Uttarakhand	0.6	0.6	0.6	0.8	0.3	0.5
West Bengal	0.4	0.5	0.5	0.4	0.6	0.5

Source: Computed by Author

Note- Chandigarh is omitted due to unavailability of IMR and U5MR data.

Fig 1. Group Dimension Index Ranks with the states and UTs of India (NFHS -4, 2015-16)



Group Dimensional Index, 2015

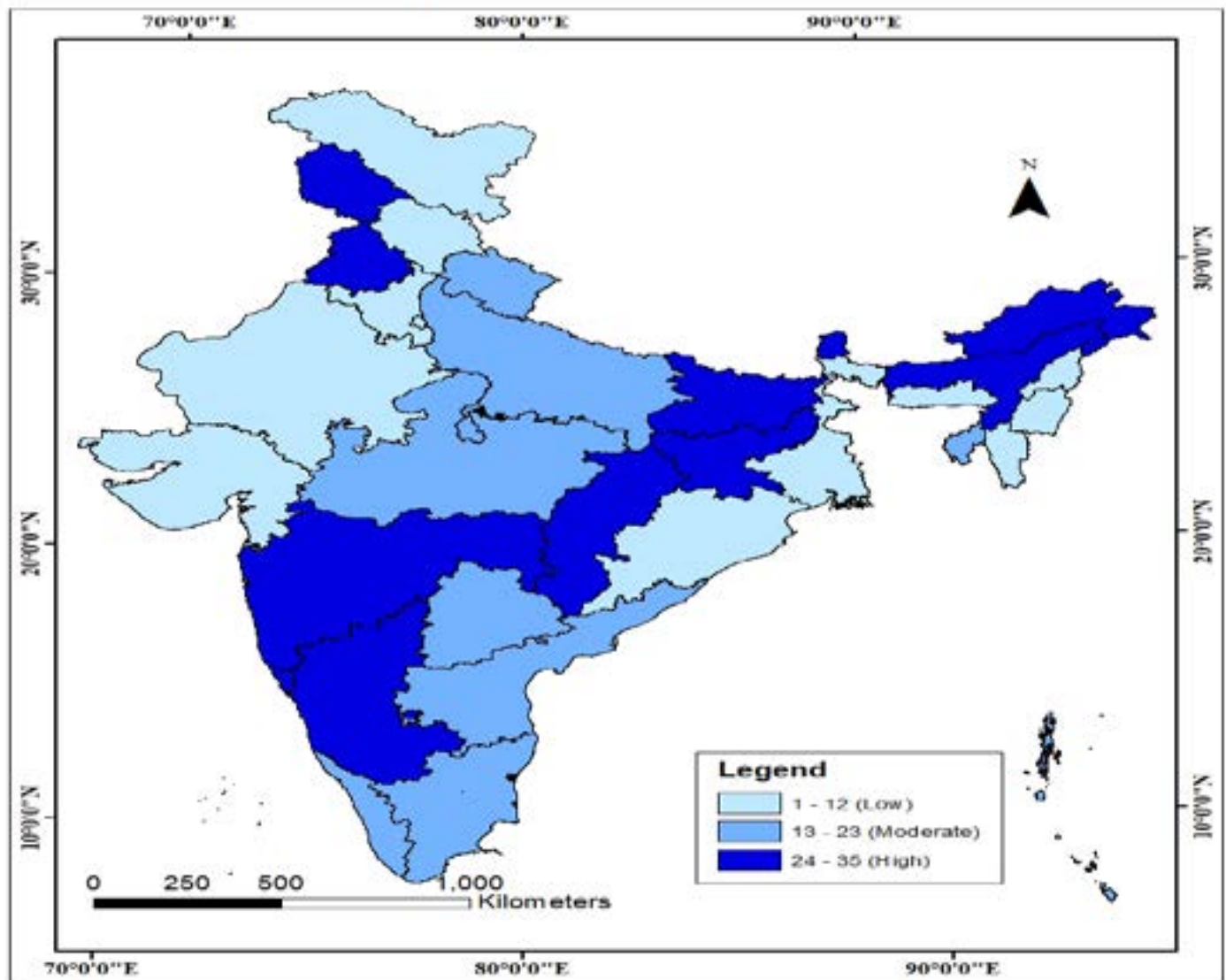
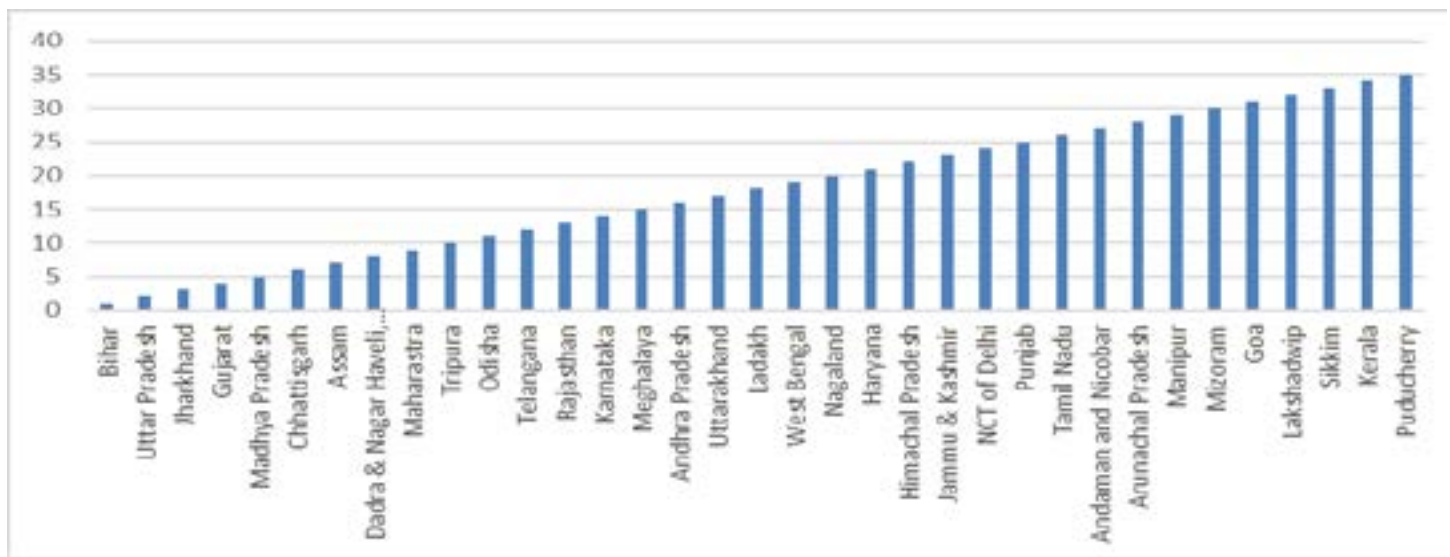
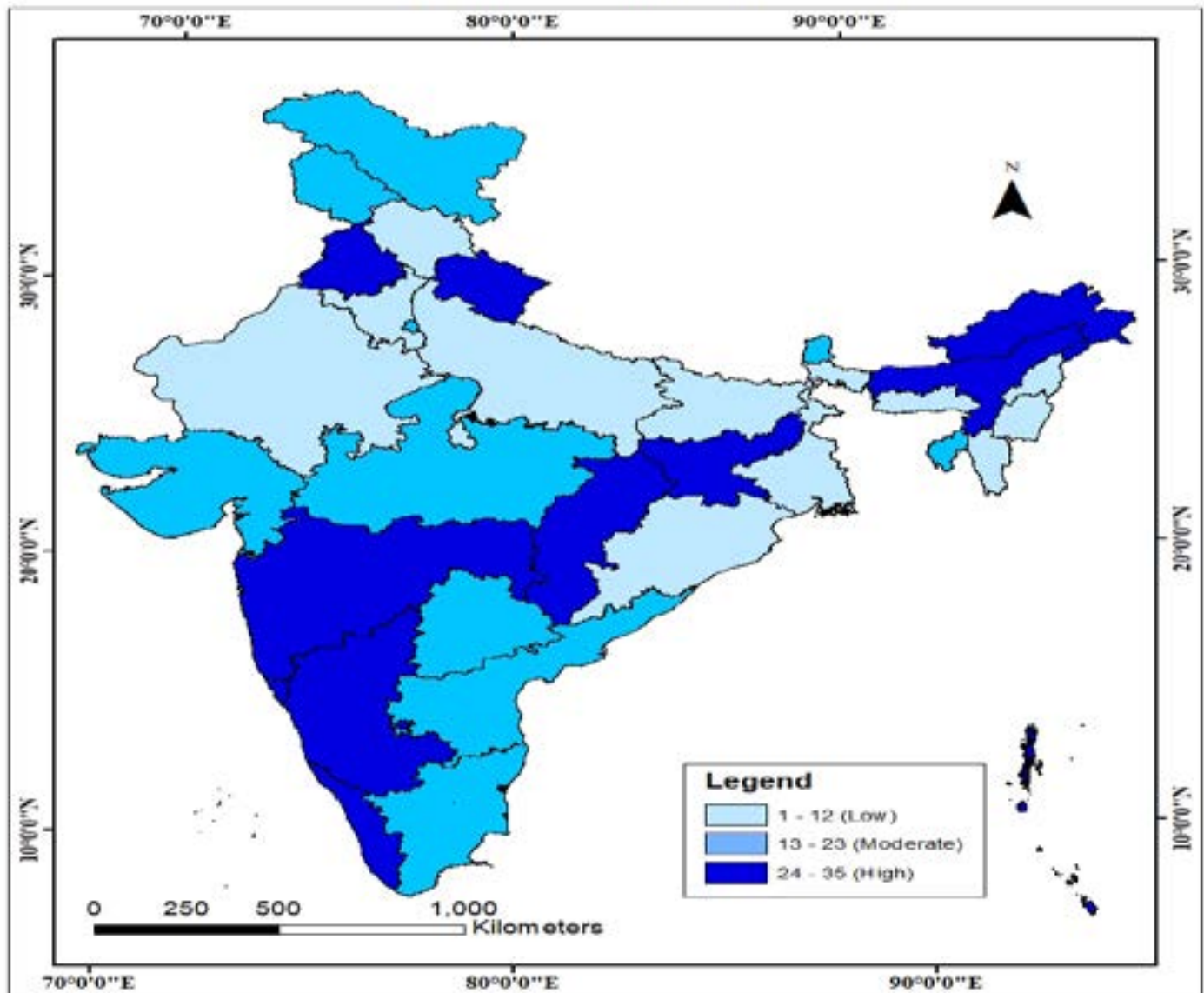


Fig 2. Group Dimension Index Ranks of the states and UTs of India (NFHS -5, 2019-21)



Group Dimensional Index, 2019



Result

Figures. 1 depicts ranks the states according to their percentages of child mortality and nutrition in 2015–16. In 2015-16, Jharkhand, NCT of Delhi, Jammu & Kashmir Pondicherry and Nagaland were the first few states which had the higher percentage of infant and child death and malnourished children. Arunachal Pradesh, Ladakh, Kerala, Haryana and Assam were the states with lesser percentage of mortality and mal nourished child percentage Fig 2. depicts ranks the states according to their percentages of child mortality and nutrition in 2019-21, Chhattisgarh, Delhi, Jammu & Kashmir, Pondicherry and Nagaland were the first few states with highest rates of child deaths and malnutrition. In 2019-21, Bihar, Uttar Pradesh, Jharkhand, Gujarat, Madhya Pradesh were the top five states with the highest rates of child mortality and malnutrition. Jharkhand and Gujarat were the states that continued to rank in the top five in terms of child mortality and malnourishment. Pondicherry was replaced by Chhattisgarh, implying that Chhattisgarh position in comparison has declined. In 2019-21, Kerala, Goa, Manipur, Pondicherry and Mizoram were the last five states. Lakshadweep, Punjab, NCT Of Delhi and Himachal Pradesh have dropped from their ranking 2019-21. The rank of Karnataka, Uttar Pradesh, Andhra Pradesh, Odisha has increased from their past performance. The states which have secured low rank; kerala, Goa, Pondicherry had significant access to Under-five ages vaccination programmes for child, vitamin supplement programs, maternal care service and women literacy rate and recorded lesser percentage of child deaths below 5 years of age.

Conclusion

The major disparities in child health performance between states show that, even within a single state, there can be significant differences in utilization and quality of health services specifically targeted for child and including all various factors that affect a child's health. Policymakers and health authorities may prioritise better allocation of resources and put policies into place to meet the unique problems encountered by various areas by identifying regions with best and poorer outcomes of child health. Promoting fair. Long-lived improvements in children's health throughout India requires lowering inequities across states and union territories in the field of health profile of child. Consequently, even in states where districts have fairly comparable ranks, the Group Dimension Index might allow for better decisions making and intervention in policy framing and efficient execution of those policies and schemes in targeted areas.. Addressing interstate disparities in India, child health necessitates a focused and multifaceted strategy. Addressing

the basic root cause health issues related to child and providing inclusive, convenient services related to healthcare should be major goals of policy initiatives. Undernourishment and untimely mortality should be addressed through clean cooking fuel, postnatal care, women's literacy, institutional delivery, better lavatory facilities. According to our study's findings. Implementing laws that combat such societal problems can improve the health of children in the long run.

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