MCH Status Rankings of 36 States/UTs and 706 Districts of India: Factor Scores Based on 15 Indicators, NFHS-5

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Abstract

Maternal and Child Health (MCH) care utilization and medical conditions diversities over States and Districts across India have resulted into huge regional variations in maternal, neonatal, infant and child mortality and morbidity. MCH status in 36 States/UTs and 706 districts has been analyzed using 15 key indicators representing three crucial dimensions viz. healthcare utilization, health status and medical conditions of mothers and children from NFHS-5, 2019-20, all India survey. Principal Factor Solution-based on Kaiser Criterion of Eigen Values greater than unity facilitated the 3 Factor Solution representing the three dimensions. Thereby Oblique Rotated Factor Structural Coefficients were utilized for eliciting the factor scores representing the three dimensions, and which in turn, were utilized for weighted factor score representing the MCH Status of all the units. MCH Status situation analysis can facilitate focused regional health initiatives towards improvements in MCH Status across India. Alleviation of regional inequalities in MCH-Status through regional policy initiatives are necessitated under the constrained resource regime towards optimal results at National and Sub-National levels. Focused attention on MCH-Care Policy Initiatives since ICPD's conference have resulted into improvements in outcome and process indicators of MCH but still further improvements to desirable levels are necessitated towards achievement of SDGs and improvements in the quality of life in India.

Key words: MCH Status, Women's Empowerment, Factor Scores, Oblique Rotation, Anemia

Introduction

Paradigm shifts in India's population and health policies got witnessed following Cairo's International Conference on Population and Development (ICPD) in 1994, in which India was also a signatory to the Plan of Action endorsed by 179 participating countries in the Conference. The Cairo's conference Plan of Action (PoA) centered on considerations like population policies should not have the sole concern of fertility reduction but also of reproductive health, reproductive rights and gender equity. The concerns over education of girls, gender equity and empowerment of women; infant, child and maternal mortality reduction; and the provision of universal access to reproductive health services, including family planning and sexual health were raised during the Cairo conference.

Following Cairo's ICPD conference in 1994, Government of India (GoI) initiated process of re-orienting the Mother and Child Health (MCH) and Family Planning programmes into newer Reproductive and Child Health (RCH) initiatives encompassing most of the recommendations of ICPD. The reoriented RCH programmes of 1997 added further interventions, to those of its earlier Child Survival and Safe Motherhood (CSSM) program of 1992, like treatment of reproductive tract infections (RTIs)/sexually transmitted diseases

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(STDs), establishment of blood-storage units, referral transport, and access to safe abortion. To provide skilled care at birth, the RCH programme incorporated additional and retaining of nursing staff for the PHCs for round-the-clock maternal and child health services and staff incentives for night-time institutional deliveries.

Prioritization of MCH services since 1994 ICPD conference got reflected in India's National Population Policy official document released in 2000 and its preamble enshrined 12 socioeconomic and demographic goals to be achieved by 2010. The RCH targets comprised goals like 80 percent Institutional deliveries, 100 percent safe deliveries, reduction in maternal deaths per 100,000 live births (MMR) well below 100 and infant deaths per 1000 live births (IMR)below 30, meeting the unmet need of contraception, etc. alongwith social targets like women empowerment, enactment of minimum age at marriage act, etc., to be achieved by 2010.

India adopted several flagship programs for MCH care like Janani Suraksha Yojana (JSY) in 2005 and Janani and Shishu Suraksha Yojana (JSSY) in 2011, which entitled all pregnant women delivering in public health institutions to absolutely free and no expense delivery including caesarean section. The initiatives stipulated free drugs, diagnostics, blood and diet, besides free transport from home to institution, between facilities in case of a referral and drop back home. Similar entitlements have been put in place for all sick new-born accessing public health institutions for treatment till 30 days after birth. In 2013, this has been subsequently expanded to sick infants and antenatal and postnatal complications. Furthermore, Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) was launched in 2016 to carry forward the vision by our Hon'ble Prime Minister to ensure quality antenatal care and high-risk pregnancy detection in pregnant women on 9th of every month. Newer initiatives and interventions like Comprehensive Abortion Care, Midwifery Services, Maternal Death Review, Maternal Death Surveillance and Response, etc. have also been formulated, implemented and institutionalized by all the states since 2017 for furthering the vision of safe motherhood and child survival strategies. Nevertheless, still lot more concerted efforts are necessitated to make maternity and child-survival significantly safer in India.

However, concerted efforts at national and sub-national levels has resulted into declines in MMR from 254 in 2004-06 to 178 in 2010-12 to recent levels of 130 in 2014-16 and 103 in 2019 (SRS, 2021). Still huge state level variations in MMR are discerned ranging from 30 in Kerala to 58 in Tamil Nadu to 167 in Uttar Pradesh and to maximum of 205 in Assam. Similarly, IMR declined from 72 in 1998 to 47 in 2010 and to 30 only in 2017 (SRS, 2022). Again, IMR at state level ranges from 3 in Mizoram and Nagaland to 6 in Kerala to 41 in Uttar Pradesh and maximum of 46 in Madhya Pradesh in 2019. Similar strides in mother and child health status process indicators like institutional and safe deliveries, children immunization, etc. have also been made. But, overall, we find that targets set long back in 2000 in National Population Policy and postponement of the enshrined goals in subsequent official documents like National Rural Health Mission in 2005,

National Health Policy in 2012, and National Health Mission of 2017, have not been realized till date (NPP 2000, NRHM 2005; NHP 2012, NHM 2017).

Major causes of maternal deaths in India have often been identified as hemorrhage, obstructed labor, sepsis and higher prevalence of anemia among pregnant women (Prakash, 1991) Hemorrhage, mostly postpartum hemorrhage, is responsible for 38% of maternal deaths (Kranti et.al, 2009). The Institutional-deliveries are still reported to be around 88.6% for India (NFHS-5, 2021). Anemia, another major cause of maternal deaths, is discerned to be around 52 percent amongst pregnant women in India, with extensive inter-state variations ranging from 23 percent in Kerala to 62 percent in Bihar. Similarly, percent-children aged 6-59 months found anemic are 67 percent for India varying from 35 percent in Kerala to 80 percent in Gujarat (NFHS-5, 2021). Maternal deaths due to sepsis and obstructed labor are also quite substantial and possibly could be attributed to still substantial proportion of deliveries at home. Despite a liberal law on abortion in India, abortion-related complications cause an estimated 8 percent of all maternal deaths (Kranti, 2009).

Overall, major causes of newborn deaths in India have often been identified as pre-maturity, neonatal infections, intra-partum related complications or birth asphyxia and congenital malformations (Bassani, 2010). Furthermore, major causes of infant and child deaths are pneumonia, prematurity & low birth weight, diarrheal diseases, neonatal infections and birth trauma (SRS, 2017). Child-health indicators in NFHS-5 bulletin also does not portray rosy picture. Child-health indicators like children aged (12-23) months being fully vaccinated are still 76 percent, children less than 5 years found stunted (height for age) are 36 percent, children wasted (weight for height) are 19 percent, children underweight (weight for age) are 32 percent. Children aged (6-59) months being anemic are still 67 percent for India, ranging from 35 percent in Kerala to 80 percent in Gujarat (IIPS, 2021). However, geographical vastness and socio-cultural diversity across India is also presumed to be contributing to accessibility and utilization of MCH care facilities and services resulting into lots of regional variations in maternal and child mortality and morbidity in India.

Need and Objectives of the Study

MCH Status being multidimensional cannot be captured by any single catch all variable. We need to have a composite index encompassing key dimensions like healthcare utilization, health status and medical conditions of mothers and children for different States/UTs to facilitate proper budgetary allocations and prioritization of different healthcare services to alleviate regional differences and bring about overall optimal results at national and sub-national levels. However, several attempts in the past towards identification of backward states and districts based on socioeconomic and demographic parameters have been made for the purpose (Neeti Aayog, 2019; Gulati, 2021).

Key Indicators of underlying dimensions of MCH Status have been well covered by the National Family Health Survey 2019-20 (NFHS-5) for 36 States/Union Territories and 706 Districts of India. Around 104 key MCH indicators cover all the crucial dimensions like maternal and

delivery care, child immunization, treatment of children, medical conditions like anemia, blood pressure, hypertension, nutritional status of adult women and children, biometrics like height and weight by age, etc. This study proposes to select key MCH indicators and elicit composite indices for MCH Status of 36 States/UTs and 706 districts of India. The composite indices would be elicited using factor analysis eliciting factor scores based on selected MCH indicators and medical conditions depicting extent of MCH Status of states and districts of India.

Database for the Study

Selection of the 15 key indicators relevant for MCH Status and its underlying key dimensions has primarily been drawn from the all India survey conducted over 36 States/UTs and 706 districts of India in 2019-20 (NFHS-5). The selected indictors are in reference to MCH care utilization, Medical conditions and Nutritional status depicting health status of mother and children. Selection of especially 6 health status indicators of children, women and pregnant women viz. children less than five years who are underweight, stunted and wasted (%) & women whose BMI is below normal (%), and children aged 6-59 months who are anemic (%) and pregnant women aged 15-49 being anemic (%), have also been listed in the Indicator Framework toward achievement of Sustainable Development Goals (SDG), especially ending hunger and improvement of nutrition under SDG-Goal 2 to be achieved by 2025 by the Ministry of Health and Family Welfare (GoI, 2021). The selection of 15 variables was primarily based on the theoretical and empirical relevance and linkages detailed earlier and also on scanning of correlation matrix of the 55 MCH indicators from the NFHS-5 Fact Sheets. Abbreviated names in the Appendices and text tables have been kept similar to numbers of key indicators as in the fact sheets.

It would be pertinent to mentions that missing data for many districts on several indicators, which was indicated in the fact sheets on criterion like either less than 25 unweighted cases marked as (*) or between 25 to 49 unweighted cases marked as ( ). The missing values were substituted by the values of the indicators for STs/UTs to which the districts belong, which possibly are more realistic than being substituted by the averages. The treatment of missing data in the SPSS package has an easy option of being substituted by the averages for using factor analysis for eliciting the factor scores.

Selected list of the 15 indicators and definitions under the purview of the present study is provided in Appendix-Table-1. The variables obviously refer to extent of utilization of MCH Care utilization viz. antenatal, institutional and safe delivery, children immunization, exclusive breastfeeding upto six months, adequate diet for children between 6-23 months, utilization of health facilities for ARI amongst children; extent of anemia amongst pregnant women and children, medical conditions of children like stunted, wasted and underweight children.

The Descriptive-Statistics of the 15 selected variables for 36 States/UTs and 706 Districts of India are provided in Appendix Table 2 and 3, respectively. In general, we find that MCH care utilization and Health-status indicators are generally

poor among 8 empowered action group (EAG) states and most of the northeastern states. However, the districts over western and southern states depict relatively better situation in terms of the indictors. This study would provide rankings of states/UTs and districts based on composite factor scores elicited from the 15 key indicators.

Methodology for the Study

MCH status, encompassing MCH care utilization aspects and maternal and child medical conditions, is a multi-dimensional phenomenon and would be difficult to capture by any single MCH care indicator. A vector of 15 MCH status variables, indicating key dimensions like maternal and child healthcare utilization and medical conditions impacting the and health status of mothers and children.

In the study, the Principal Component Method has been utilized for eliciting the factor structures with number of factors based on the Kaiser Criterion of Eigen Value greater than unity (Harry, 1960). The evolved factor structure thereafter is subjected to Oblique Rotation to get the simple structure to reflect the true nature of underlying dimensions. The simple structure implies factor loading of each variable to be much higher on one than on other factors. The rotated factor structural coefficients and standardized variables are utilized to elicit the factor scores as composite measures of the underlying dimensions. Thereby the overall composite measure for MCH Status is elicited as the weighted average of the factor scores with Eigen Values as weights (Kim, 1978). The analysis is carried out separately for the 36 States/UTs and 706 districts of India, for eliciting factor scores and rankings based on composite factor scores.

State Level Oblique-Rotated Factor Structure of 15 Selected Variables

Factor Structural coefficients other parameters like Eigen Values and Communalities pertaining to the 3 oblique rotated factors elicited out of the 15 selected variables for 36 States/UTs is presented in Table 1.

The First Factor (F-I) can be identified as extent MCH Care Utilization as the nature of primary constituents of the factor depict extent of utilization of ANC, Delivery and Postnatal Care. Variables depicting high factor-loadings on the first factor are extent of utilization of ANC and Delivery care for births during 5 years prior to the survey such as variables loading high are i) Mothers who had checkup in the Ist Trimester (%), iii) Mothers who got protected by Neonatal Tetanus (%), iv) Mothers who received postnatal care within 2 days (%), v) Children who got postnatal care within 2 days (%), and vi) Institutional Deliveries (%). Also, we find that variables indicating childcare depict higher factor loading on Ist Factor such as variables i) children 12-23 months who are fully vaccinated (%), ii) children who had Diarrhea (%) or iii) ARI, were taken to Hospital Facility for treatment (%).

The Second Factor (F-II) can identified as Health Status of Women and Children as Variables loading high on this Factor are i) %Children aged less than 5 years who are i) Stunted (Height for Age), ii) Wasted (Weight for Height), and iii) Under-weight (Weight for Age). Also, we find, percent women whose Body Mass Index (BMI) is below normal (BMI <18.5 kg/m2) is also depicting higher factor loading on IInd

Factor. The nature of variables clearly indicates Health status of women and children. The Third Factor (F-III) can be identified as Medical Conditions of Mothers and Children such as variables loading high on this factor are i) Children aged 15-59 months being anemic (<11.0 g/dl) and ii) pregnant women aged 15-49 years being anemic (<11.0 g/dl). It may be of interest to mentions that anemia levels have gone up, between NFHS-4 and NFHS-5 survey period, for Children aged 6-59 months, Non-Pregnant and Pregnant and all women aged 15-49 years, and also among women aged 15-19 years, at the national level and most of the States/UTs levels (NFHS-5, 2019-20).

Rankings of States/UTs on the MCH-Status Scale

The MCH Status Score (FS) is weighted average of the 3 Factor Scores with weights as Eigen Values of the Oblique Rotated Factor Structure. Categorization of 36 States/UTs into five categories such as Very Low (VL), Low (L), Average/Moderate (A/M), High (H) and very high (VH) falling into the five quintiles. Though the inbuilt properties of factor scores with zero mean and unity standard deviation have been obviated for categorization as the distribution of sample or States/UTs may not be normal but skewed so the distribution as per the inbuilt parameters may not provide the realistic picture, Thus, categorization of States/UTs as per quintiles and rankings as per ordering on Factor Score (FS) scale, are brought under discussion. The composite factor scores and ranking of each State/UT is provided in Table 2.

Table1 State Level Oblique Rotated Factor Structure Based on 15 MCH Variables for 36 States/UTs of India, NFHS-5

Variable	State Level Factor Structural Coefficients of Selected MCH-Variables			Communality
	Factor-1	Factor-2	Factor-3	
v40MANCFT	0.792	-0.25	-0.167	.693
v41MANCFC	0.833	-0.281	-0.108	.775
v42MLBNNT	0.671	0.102	-0.356	.498
v46MPNCW2d	0.937	-0.079	-0.207	.885
v49CPNCW2D	0.931	0.07	-0.244	.872
v50IB	0.903	-0.143	-0.319	.861
v57C(12-23)FV	0.735	0.002	-0.462	.639
v72CWDTIHF	0.725	0.178	-0.106	.566
v74CWARITIHF	0.749	0.408	0.038	.819
v81CL5S	-0.337	0.846	-0.148	.834
v82CL5W	0.059	0.799	-0.355	.675
v84CLS5UW	0.026	0.969	-0.293	.946
v86WWBMIBN	0.086	0.891	-0.286	.808
v92C(6-59)AN	0.216	0.415	-0.869	.812
v94PWAN	0.393	0.46	-0.795	.776
Eigen Value	6.286	3.855	2.299	

Extraction Method Principal Component
Number of Factors Retained are based on Kaiser Criterion of Eigen Value>1
Rotation Method: Oblimin with Kaiser Normalization.

Table 2 MCH-Status Rankings of 36 States/UTs, NFHS-5

	State/UT	Factor Scores			Weighted Factor Score	Rank	MCH Status Category
EAGW	NAME	FS1	FS2	FS3	FS		
	EAG States	(1)	(2)	(3)	(4)		
1	Bihar	-1.657	1.496	-1.192	-0.594	32	VL
2	Uttar Pradesh	-0.908	0.427	-0.553	-0.429	31	VL
3	Madhya Pradesh	0.004	0.717	-0.561	0.121	16	M/A
4	Rajasthan	0.29	0.32	-0.736	0.11	18	M/A
5	Jharkhand	-1.04	1.49	-0.333	-0.125	25	L
6	Uttarakhand	0.023	-0.841	-0.591	-0.358	30	VL
7	Chhattisgarh	-0.184	0.619	-0.73	-0.036	21	M/A
8	Odisha	0.601	0.537	-0.14	0.444	7	VH
	Other Larger States						
9	Assam	-0.803	1.333	0.868	0.168	13	H
10	West Bengal	0.263	0.683	-0.572	0.239	12	H
11	Punjab	0.172	-0.985	-0.268	-0.268	28	L
12	Haryana	0.558	-0.69	-0.788	-0.078	24	L
13	Jammu & Kashmir	0.837	0.511	1.091	0.783	3	VH
14	Himachal Pradesh	0.294	-0.224	-0.279	0.028	19	M/A
15	Gujrat	0.289	1.909	-0.875	0.576	4	VH
16	Maharashtra	0.121	1.427	-0.422	0.426	8	H
17	Karnataka	0.354	0.65	-0.253	0.334	10	H
18	Andhra Pradesh	0.51	-0.122	-0.407	0.144	15	M/A
19	Telangana	0.556	0.845	-0.407	0.468	6	VH
20	Tamilnadu	0.922	-0.572	0.363	0.356	9	H
21	Kerala	1.154	-1.249	-0.191	0.161	14	H
	Smaller STs/UTs						
22	Delhi	0.439	-0.907	-0.601	-0.171	26	L
23	Chandigarh	0.684	-1.534	-0.285	-0.182	27	L
24	Goa	1.067	0.035	-0.28	0.498	5	VH
25	Lakshadweep	1.269	0.206	0.935	0.878	2	VH
26	Puducherry	1.072	-1.169	0.52	0.275	11	H
27	A&N Islands	0.747	-1.017	0.283	0.114	17	M/A
28	DNH and DD	0.494	0.341	-2.338	-0.077	23	L
29	Sikkim	-0.082	-0.702	1.026	-0.07	22	M/A
30	Tripura	-0.427	0.591	0	-0.033	20	M/A
31	Mizoram	-1.123	-1.507	1.679	-0.724	33	VL
32	Manipur	-0.314	-1.634	2.133	-0.271	29	L
33	Meghalaya	-2.31	-1.152	-1.06	-1.72	36	VL
34	Arunachal Pradesh	-1.764	-1.033	1.511	-0.932	34	VL
35	Nagaland	-2.988	-0.108	2.691	-1.046	35	VL
36	Ladakh	0.88	1.309	0.761	0.991	1	VH

Perusal of Table 2 reveals that seven states categorized as Very Low are mostly among the EAG states and Northeastern States of India. We find Bihar, Uttar Pradesh and Uttarakhand among the EAG states and Mizoram, Nagaland and Arunachal Pradesh stretched over the Northeastern region and Meghalaya depict very low MCH Status.

Low MCH-Status States/UTs are Punjab, Haryana, and Jharkhand among larger states, and Delhi NCT, Chandigarh, Manipur and Dadra Nagar Haveli among smaller states/union territories. Among the average/moderate MCH Status category States/UTs are Rajasthan, Madhya Pradesh, Chattisgarh, Madhya Pradesh, Himachal Pradesh and Andhra Pradesh among the larger states and Sikkim, Tripura and Andaman Nicobar Islands among the smaller states and union territories. In the High MCH status category we find Kerala, Tamil Nadu, Karnataka, Maharashtra, West Bengal and Assam among the larger states and Puducherry among the union territory. On the other end in Very High MCH-Status category are larger states like Gujarat, Odisha, Telangana, and Jammu and Kashmir and among the smaller states/union territories we find Goa, Lakshadweep and Ladakh.

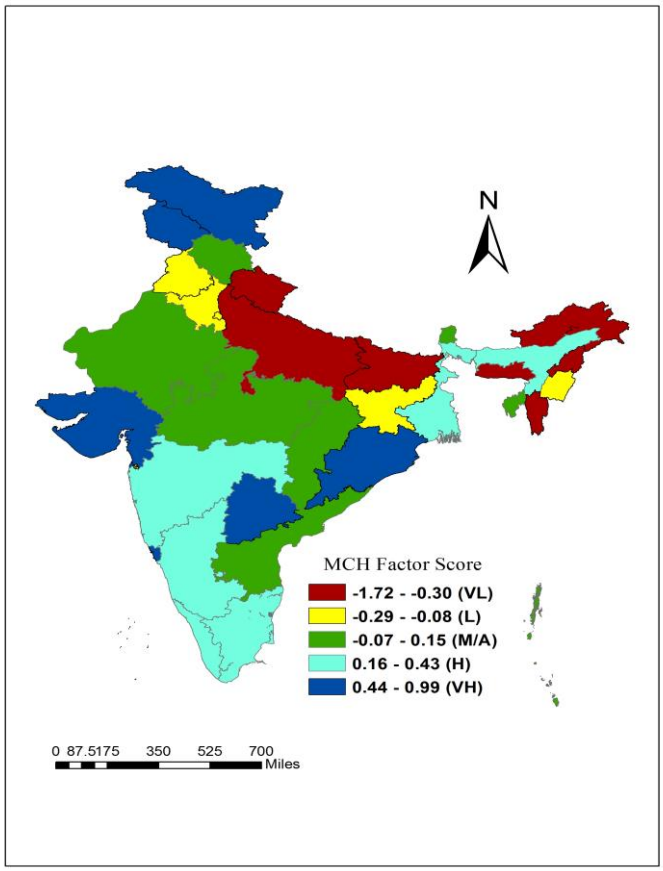
Mapping of 36 States/UTs by MCH Status category

Mapping of States/UTs by 5 MCH status categories from Very-Low to Very High viz. Very-Low (VL), Low (L), Average/Moderate (A/M), High (H) and Very-High (VH); is provided in Map 1. The category wise color scheme for the map is Dark Red for Very-Low (VL), Yellow for Low (L), Green for Moderate/Average (A), Light Blue for High (H) and Dark Blue for Very-High (VH). Very Low and Low MCH Status category states & union territories form almost a contiguous belt comprising of Bihar, Uttar Pradesh, Uttaranchal, Punjab and Haryana in the Northern region and Assam, Nagaland, Arunachal Pradesh over the Northeastern Region and Meghalaya. Average Status category states form another contiguous belt over western parts by Rajasthan, Madhya Pradesh, Himachal Pradesh and Chattisgarh over the Northern and Central parts of India. Also, we find Tripura and Sikkim over the Northeastern regions and isolated Andaman and Nicobar Islands.

Most of the Southern States viz. Kerala, Karnataka, Tamil Nadu, and Telangana constitute a contiguous belt of High and Very High MCH Status category region. Another belt constituted by Gujarat and Maharashtra in the Western India and Assam and Odisha in Eastern India constitute contiguous belts of High and Very High MCH-Status categories. Also, we find Jammu and Kashmir and Ladakh in the Northern India, and Goa and Lakshadweep as isolated entities on the High and Very High MCH-Status category pockets in India.

Overall we find Very High and High MCH-Status category States/UTs are located over Southern, Western and Northern parts of India whereas Very Low and Low Status category States/UTs are located mostly in Northern India and Northeastern region of India. Another contiguous belt depicting average MCH-Status categories are Rajasthan, Madhya Predesh, Chattisgarh and Andhra Pradesh.

Map 1 36 States\UTs on MCH Status Categories, NFHS 5



District Level Oblique Rotated Factor Structure of 15 selected variables for 706 Districts of India

Factor Structural coefficients and other parameters like Eigen Values and Communalities pertaining to the 3 oblique rotated factors elicited out of the 15 selected variables for 706 districts of India is presented in Table 3.

The First Factor (F-I) can be identified as extent MCH Care Utilization as the nature of primary constituents of the factor depict extent of utilization of ANC, Delivery and Postnatal Care. Variables depicting high factor-loadings on the first factor are extent of utilization of ANC and Delivery care for births during 5 years prior to the survey such as variables loading high are i) Mothers who had checkup in the first Trimester (%), iii) Mothers who got protected by Neonatal Tetanus (%), iv) Mothers who received postnatal care within 2 days (%), v) Children who got postnatal care within 2 days (%), and vi) Institutional Deliveries (%). Also, we find variable indicating childcare viz. Children 12-23 months who are fully vaccinated, also depict higher loading on this factor.

The Second Factor (F-II) can be identified as Medical Conditions of Children and Women as variables loading high on this factor are i) Percent of Children aged less than 5 years who are a) Stunted (Height for Age), b) Wasted (Weight for Height), and c) Under-weight (Weight for Age), and d) Children aged 15-59 months being anemic (<11.0 g/dl). Also, we find variables like a) pregnant women aged 15-49 years being

anemic (<11.0 g/dl) and b) percent women whose Body Mass Index (BMI) is below normal (BMI <18.5 kg/m2), also depict much higher loadings on this factor.

The Third Factor (F-III) can identified as Children-Disease Treatment as two variables viz. i) %children who had Diarrhea or ii) who had ARI, in 2 weeks prior to the survey were taken to Hospital Facility for treatment, depict much higher factor loadings on this factor.

State wise Distribution of 706 Districts in MCH-Status Categories

The MCH Status Score (FS) is weighted average of the 3 Factor Scores with weights as Eigen Values of the Oblique Rotated Factor Structure. Categorization of 706 districts into five categories such as Very Low (VL), Low (L), Average/Moderate (A/M), High (H) and very high (VH) has been according to its position into five quintiles. As per general expectations we find that most of the districts stretched over EAG states viz. Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan, Jharkhand, Uttarakhand, excepting Chhattisgarh and Odisha, depict Low and Very Low MCH Status. Most of the districts in Southern States are found to be in the High and Very- High MCH-Status categories. We find that 69 districts out of 106 districts of Andhra Pradesh, Karnataka, Telangana, and Tamil Nadu, are discerned to be in the high and very high Status categories.

In Smaller States and Union Territories we find Chandigarh, Daman & Diu, Puduchery, Lakshadweep and Goa depict very high status. Similarly, 6 out of 9 districts of Delhi are also in very high category. Similarly, some of the districts over Northeastern states like Imphal West in Manipur; South Garo Hills in Meghalaya; Kalasik in Mizoram; North District in Sikkim; West Tripura and Dadra Nagar Haveli are categorized in High Status Category. Overall districts over Northeastern region depict low status.

Table 3 District Level Oblique Rotated Factor Structure Based on 15 Variables for 706 Districts of India, NFHS-5

Variable	Structural Coefficients Factors			Communalities
	F-1	F-2	F-3	
v40MANCFT	.814	-.099	-.316	.672
v41MANCFC	.840	-.143	-.260	.723
v42MLBNNT	.596	.244	-.211	.420
v46MPNCW2d	.903	-.027	-.525	.862
v49CPNCW2D	.897	.035	-.561	.870
v50IB	.794	-.071	-.546	.717
v57C(12-23)FV	.714	.007	-.138	.527
v72CWDTIHF	.295	.070	-.890	.794
v74CWARITIHF	.415	.195	-.793	.664
v81CL5S	-.402	.693	.048	.634
v82CL5W	.051	.666	.052	.470
v84CLS5UW	-.120	.910	-.013	.841
v86WWBMIBN	-.072	.843	-.125	.719
v92C(6-59)AN	.123	.641	-.218	.442
v94PWAN	.121	.638	-.173	.429
Eigen Values	4.957	3.420	2.637	

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

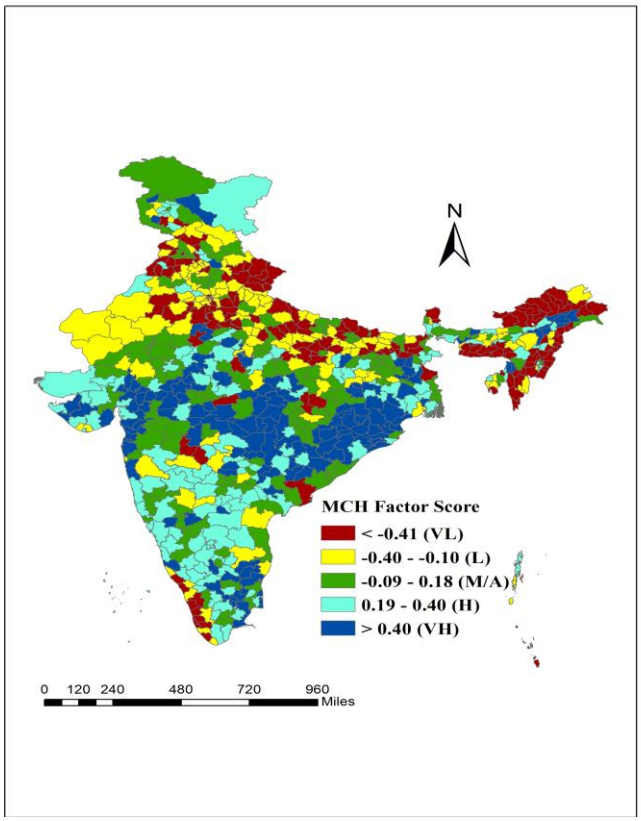
Table 4 MCH-Status Wise Distribution of 706 Districts in States/UTs

Number	State/UT Name	Very Low	Low	Average	High	Very High	Total
	EAG States						
1	Bihar	12	9	11	3	2	37
2	Uttar Pradesh	26	35	13	1	0	75
3	Madhya Pradesh	1	2	13	12	23	51
4	Rajasthan	5	10	10	4	4	33
5	Jharkhand	0	4	6	6	8	24
6	Uttarakhand	10	3	0	0	0	13
7	Chhattisgarh	2	2	14	4	5	27
8	Odisha	0	0	1	3	26	30
	Other Larger States						
9	Assam	0	8	6	8	11	33
10	West Bengal	0	2	5	10	3	20
11	Punjab	11	7	4	0	0	22
12	Haryana	4	10	6	2	0	22
13	Jammu & Kashmir	2	4	5	7	2	20
14	Himachal Pradesh	1	5	3	2	1	12
15	Gujrat	0	1	3	10	19	33
16	Maharashtra	2	5	10	9	10	36
17	Karnataka	0	2	6	18	4	30
18	Andhra Pradesh	1	3	5	4	0	13
19	Telangana	0	1	10	12	8	31
20	Tamilnadu	0	2	7	11	12	32
21	Kerala	9	5	0	0	0	14
	Smaller STs/UTs						
22	Delhi	3	6	1	1	0	11
23	Chandigarh	0	1	0	0	0	1
24	Goa	0	0	1	1	0	2
25	Lakshadweep	0	0	0	1	0	1
26	Puducherry	0	0	2	2	0	4
27	Andaman and Nicobar	1	1	0	1	0	3
28	DNH and DD	0	1	0	1	1	3
29	Sikkim	2	1	1	0	0	4
30	Tripura	2	3	1	2	0	8
31	Mizoram	5	3	0	0	0	8
32	Manipur	5	1	1	2	0	9
33	Meghalaya	11	0	0	0	0	11
34	Arunachal Pradesh	18	1	1	0	0	20
35	Nagaland	7	2	0	2	0	11
36	Ladakh	0	0	0	1	1	2
37	India	140	140	146	140	140	706

Mapping of 706 Districts by MCH Status Category

Mapping of 706 districts, stretched over 36 States/UTs of India, by MCH Status Category, based on District Level weighted factor scores, is provided in the Map 2. The category wise color scheme is similar to that of state level map viz. Dark Red for Very Low (VL), Yellow for Low (L), Green for Moderate/Average (A/M), Light Blue for High (H) and Dark Blue for Very High (VH) status categories. . Overall pattern of categories of MCH Status at districts is obviously quite similar to that of the State/UT in which these are located. Nevertheless, status of some of the districts is quite dissimilar to that of the State/UT, which are being highlighted and discussed here. These anomalous districts within each State/UT can be discerned with different colors within boundaries of the State/UT in the Map.

Map 2 706 Districts Categorized into Very-Low to Very-High based on Rankings of Composite Factor Score Elicited from 15 Key MCH Indicators



Source: Author's Calculations of Composite Factor-Scores (FSs) for 706 districts based on weighted average of 3-Factor-Scores elicited from 15 Key district-level MCH Indicators, NFHS-5, 2019-20. List, Rankings, and Factor Scores of 706 Districts can be made available by Authors On request

Anamolous Districts with MCH-Statuses different than the State/UT of Origin

Some of the glaring dissimilarities have been highlighted in Table-5, in which anomalous districts with different MCH-Statuses compared with the State/UT over which these are stretched have been indicated. Table-5 provides illustration of districts within state depicting anomalous nature of MCH-Status. Like Rohtas and Banka depict very high MCH-Status within very low status of Bihar Thus, districts within each state depicting anomalous nature of status compared with the state of origin, highlighted in the Map and listed in this table, like Siddipet in Telangana and Gir Somath in Gujarat, which are lagging behind, necessitates get focused attention towards improvement in the MCH-Status.

Surprisingly, we discern some aberrations in the sense that some of the districts even in these Very-Low MCH Status category States depict higher MCH status. Such as 5 districts in Bihar viz. Rohtas (VH), Banka (VH), Gaya (H), Munger (H) and Bhabua (H); 1 in Uttar Pradesh viz. Banda (H), and 2 in Nagaland viz. Dimapur and Kohima, are discerned to be have very high MCH-Status stretched over States/UTs of Very-Low MCH-Status category states.

Again, we discern some aberrations in the sense that some of the districts even in Very-High MCH Status category States like Siddipet (L) in Telangana, Gir Somath

(L) and Banaskantha (A/M) in Gujarat, Punch (L), Kathua (L), Baramula (L) and Doda (VL) of Jammu and Kashmir are discerned to be of low or very-low status categories.

Alternatively, some of the districts stretched over average status states depict altogether different status category. Like 4 districts in Rajasthan viz. Karauli, Dausa, Baran and Jhabua are found to be in Very-High Status category, Similarly 5 districts of Chattisgarh viz. Rajnandgaon, Uttar Bastar, Dandewala, Kodagaon and Sukma, are discerned to belong to very high status category, Similarly 14 districts in Madhya Pradesh viz. Gwalior, Tikamgarh, Ratlam, Ujjain, Indore, Jhabua, Seoni, Narsimhpur, Jabalpur, Kanti, Betul, Vidisha and Barmer, are found to be in the Very-High MCH Status category.

Many More aberrations characterizing districts to be of different MCH-Status categories compared with the State of their belonging gets highlighted in the District Level Map and list of all the 706 districts with rankings and composite factor scores can be made available on request. Thus identification of districts in Very-Low MCH-Status categories in all the States/UTs can facilitate focused attention to improve the MCH Care utilization and Medical Conditions.

Table 5 Anomalous Districts Within States/UTs on the MCH-Status

MCH-Status	States/UTs	Anomalous Districts
Very Low	Bihar, Uttar Pradesh, Uttarakhand, Mizoram, Meghalaya, Nagaland, Arunachal Pradesh	**Bihar**: Rohtas(VH), Banka (VH) **UP**: Banda (H) **Nagaland**: Dimapur (H), Kohima (H)
Low	Punjab, Haryana, Jharkhand, Delhi, Chandigarh, DNH, Manipur	**Haryana**: Rohtak (H), Hissar (H) **Jharkhand**: Ranchi (H), Gumla (H), Dumka (H), Godda (H), Purbi & Pashchimi Singhbhum (H), Lohardaga (H)
Average/ Moderate	Madhya Pradesh, Rajasthan, Chhattisgarh, Himachal Pradesh, Andhra Pradesh, A&N Islands, Sikkim, Tripura	**MP**: Jhabua (VH), Berhampur, Dindori, Seoni, Harda, Katni, Dhar, Ujjain, Khandwa, Ratlam, Narsimhpur, Agar Malwa, Barwani, Shajapur, Indore, Betul, Jabalpur, Tikamgarh, Gwalior, Vidisha, Mandla (VH) **Rajasthan**: Karauli VH), Dausa (VH), Baran (VH), Jhalawar (VH) **Chattisgarh**: Rajnandgaon (VH), Uttar Bastar (VH), Dandawala (VH), Kodaigaon (VH) **HP**: Sirmaur (VH) **Andhra Pradesh**: Ernakulum (VL)
High	Assam, WB, Mhst., Karnataka, TN, Kerala, Pudducherry	**Mhst**.: Nanded (L), Mumbai-Suburban (L), Bid (L), Pune (L) **Karnataka**: Bijapur (L), Yadgir (L) **Kerala**: Alappuzha (VL), Thiruvanthapuram (VL), Palakkad (VL), Pathanamthittta (VL), Thrissur (VL), Kozikode (VL), Kannur (VL), Ernakulum (VL)
Very-High	Odisha, J&K, Gujarat, Telangana, Goa, Lakshadweep, Ladakh	**J&K**: Doda (VL), Reasi (VL) **Gujarat**: Gir Somath (L) **Telangana**: Siddipet (L)

Policy Imperatives of The Study

Given the geographical vastness and socioeconomic and cultural diversity across 706 districts stretched over 36 States/UTs in India, strategic options for improvements across regions, possibly, cannot be an overall universal prescription. Categorization of 706 districts into five categories viz. very-low, low, moderate, high and very-high; of MCH Status by the elicited composite indices based on 15 selected indicators from NFHS-5 data, would facilitate strategic options to be adopted for each category towards faster and further improvements in MCH status in India. The five MCH Status categories of districts have been based on weighted factor score of the three factor scores elicited from 15 key indicators. The overall MCH status for 36 states/union-territories and 706 districts is based on the three underlying dimensions viz. MCH Care Utilization, Health Indicators and Medical conditions.

The Principal Axis method of factoring facilitated factor solution and thereby structural coefficients of the Oblique Rotated Factor Structure were utilized for eliciting three factor scores of each State/UT and District using State/UT and District level data, respectively, for 15 indicators data representing the three underlying dimensions of MCH Status. Thereby the weighted index using Eigen Values as weights for the three factor scores provided the MCH Status composite indices (FSs) for all the 36 States/UTs and 640 districts of India.

The MCH Status scores provided basis for categorization of 36 States/UTs and 640 districts into 5 categories viz. Very-Low, Low, Moderate, High and Very-High.

Proper scanning of the overall status and its three constituents through factor scores would further help in concentrating over the relevant dimension of the overall status at district and state/UT level for better results.

Overall southern and western states depict relatively much higher MCH Status whereas EAG states, Assam and State & Union Territories over the Northeastern region depict lower statuses. Nevertheless, district level scores reveal that some of the districts over lower status states depict much better status and vice versa as some of the districts over higher status states depict lower status. Thus, state and district specific focused health initiatives will facilitate overall faster improvements in the MCH status at regional and national level.

Way forward towards improvement in the MCH status across India

Geographical vastness and regional inequalities in MCH status and its main constituent's viz. healthcare utilization, health and medical conditions; of women and children across India calls for extensive state and district level studies to highlight regional health initiatives to curtail mortality and morbidity towards improvement in the quality of life of women and children. Furthermore, strong structural inter-linkages between MCH Status and socioeconomic and cultural factors necessitate extensive study to prioritize the holistic package comprising of socioeconomic and cultural factors and supply and demand side constraints of healthcare utilization and other MCH components as they are discerned to reinforce each other (Gulati, 2018).

Thus, region specific holistic mix-package of health and socioeconomic initiatives would not only help in reduction in maternal, neonatal and under-five mortality and morbidity, but also enhance the overall quality of life of families and individual women, adolescents and children.

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Appendices

Appendix Table1 List of Selected Variables and Definitions

Abbreviated Name*	**MCH Care Indicators: Nature and Definition of Variables**
	Antenatal Care for Last Birth in 5 years before the Survey)
v40MANCFT	40. Mothers who had an antenatal check-up in the first trimester (%)
v41MANCFC	41. Mothers who had at least 4 antenatal care visits (%)
v42MLBNNT	42. Mothers whose last birth was protected against neonatal tetanus9 (%)
	Delivery and Postnatal Care for last birth in 5 Years before the Survey
v46MPNCW2d	46. Mothers who received postnatal care from a octor/nurse/LHV/ ANM/midwife/ other health personnel within 2 days of delivery (%)
v49CPNCW2D	49. Children who received postnatal care from a doctor/nurse/LHV/ANM/ midwife/ other health personnel within 2 days of delivery (%)
v50IB	50. Institutional births (%)
	Children's Vaccinations and Healthcare Utilization
v57C(12-23)FV	57. Children age 12-23 months fully vaccinated based on information from either vaccination card or mother's recall (%)
v72CWDTIHF	72. Children with diarrhea in the 2 weeks preceding the survey taken to a health facility or health provider (%)
v74CWARITIHF	74. Children with fever or symptoms of ARI in the 2 weeks preceding the survey taken to a health facility or health provider (%)
	Mother's and Children's Health Status Indicators
v81CL5S	81. Children under 5 years who are stunted (height-for-age)18 (%)
v82CL5W	82. Children under 5 years who are wasted (weight-for-height)18 (%)
v84CLS5UW	84. Children under 5 years who are underweight (weight-for-age)18 (%)
v86WWBMIBN	86. Women whose Body Mass Index (BMI) is below normal (BMI <18.5 Kg/m2)21(%)
	Anemia among Children and Adults (age 15-49 years)
v92C(6-59)AN	92. Children age 6-59 months who are anemic (<11.0 g/dl) (%)
v94PWAN	94. Pregnant women age 15-49 years who are anemic (<11.0 g/dl) (%)

Appendix Table 2 State Level Descriptive Statistics of the 15-Selected Variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation
v40MANCFT	36	49.5400	99.6000	73.4867	11.3675
v41MANCFC	36	20.6600	93.0000	65.8542	17.9889
v42MLBNNT	36	76.9200	99.3600	90.9164	4.75488
v46MPNCW2d	36	43.8700	95.4000	79.7169	13.6916
v49CPNCW2D	36	36.8700	96.6900	79.1444	15.4746
v50IB	36	45.6700	99.7600	89.3614	11.5815
v57C(12-23)FV	36	57.8800	94.8800	77.5128	8.1799
v72CWDTIHF	36	31.4800	86.9100	67.2953	10.8781
v74CWARITIHF	36	30.8500	90.6500	66.4225	12.0566
v81CL5S	36	19.9800	46.5400	31.2225	6.2276
v82CL5W	36	8.4100	25.6000	16.8539	4.4255
v84CLS5UW	36	2.3400	10.9400	6.6878	2.1327
v86WWBMIBN	36	4.3600	26.2000	14.5683	6.4309
v92C(6-59)AN	36	39.4000	92.4600	62.0925	12.1949
v94PWAN	36	22.1500	78.0700	49.2225	11.1841
Valid N (listwise)	36				

Appendix Table 3 District Level Descriptive Statistics of the Selected Variables

State Level Numbers	N	Minimum	Maximum	Mean	Std. Deviation
v40MANCFT	706	26.0	100.0	71.837	13.5188
v41MANCFC	706	4.0	99.0	60.521	20.2536
v42MLBNNT	706	55.0	100.0	91.224	6.0380
v46MPNCW2d	706	25.0	99.0	78.987	14.5281
v49CPNCW2D	706	22.0	100.0	78.973	14.8159
v50IB	706	21.0	100.0	88.691	11.9911
v57C(12-23)FV	706	38.0	100.0	77.713	12.0316
v72CWDTIHF	706	27.0	95.0	67.813	10.9049
v74CWARITIHF	706	14.0	97.0	65.841	12.4674
v81CL5S	706	13.0	61.0	33.481	8.4768
v82CL5W	706	4.0	48.0	18.513	6.4953
v84CLS5UW	706	7.0	62.0	29.497	9.6638
v86WWBMIBN	706	1.0	44.0	17.883	7.4407
v92C(6-59)AN	706	25.0	95.0	65.794	12.1011
v94PWAN	706	2.0	88.0	50.211	13.6140
Valid N (Listwise)	706				