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Original Article

Geospatial Differences in Utilization of Maternal Health Care Services in the Urban India

Dr. Anil Jagan Hiwale
Associate Professor, Department of Geography, Bhusawal Arts, Science and P. O. Nahata Commerce College, Bhusawal Jalgaon, Maharashtra. INDIA
Email: hiwaleanil@gmail.com

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Abstract

Maternal health care utilization remains uneven across India despite substantial improvements in service coverage. This study examines the geospatial differences in the utilization of maternal health care services among urban women across the natural regions of India. The analysis is based on data from the National Family Health Survey (NFHS-4), 2015–16, covering 46,889 urban women aged 15–49 years who had a live birth during the five years preceding the survey. Three indicators of maternal health care utilization—full antenatal care (ANC), institutional delivery, and postnatal care (PNC)—were analyzed. ArcGIS 10.5 and Stata 13.0 were used to assess regional variations and construct a composite index for ranking natural regions. The findings reveal substantial geographical disparities in maternal health service utilization within urban India. While institutional delivery was relatively high (90.3%), the utilization of full ANC remained low (31.1%). Lakshadweep, Goa, and Kerala recorded the highest composite index scores, whereas Nagaland, Bihar, Arunachal Pradesh, and parts of Uttar Pradesh exhibited the lowest levels of utilization. The study highlights the need for geographically targeted interventions to address regional inequalities and improve maternal health outcomes in underserved urban regions.

Keywords: *Maternal Health Care; Urban India; Geospatial Differences; Composite Index.*

Introduction

Geographical influences on women's sexual and reproductive health are significant. "Geographical distribution is usually an important dimension because regions, as well as individuals, can be multiply deprived and because there are usually significant variations in the ill health and in the avoidable or remediable ill health of regions" (Culyer, 2001). UNPF has reported that geographical remoteness is associated with higher probability of dying and disability during pregnancy and childbirth, which has strong association with socioeconomic status, and cultural norms and values of the pregnant women and the communities they live in (United Nations Population Fund, 2012). Most of the studies were undertaken to address the issue of accessibility of the hospital's location and its impact on utilization of maternal healthcare utilization. Some studies also attempted to understand the pattern of utilization of healthcare utilization according to administrative and political regions of a country (Kumar, Singh, & Rai, 2013; Singh, Kumar, Rai, & Singh, 2014). But studies of utilization of maternal healthcare in the different geographical (or natural regions) are few (Liu, Gao, & Yan, 2014a; Mari Bhat and Francis, 1999; Tang, Wang, Hu, Wang, & Li, 2015). India is a country rich natural in diversity—geographically, socially, and culturally. An understanding of influence of diversity on utilization of services in the different regions would be of interest to policymakers as well as academia. India has a diverse landmasses and features which include ice-covered mountain ranges of the Himalayas in the North, the vast and fertile Indo-Gangetic plain with fertile soil to the south of the Himalayas, the arid Thar Desert in the west, an uneven plateau in the south which is surrounded by Coastal Plains in the East and the West (Khullar, 2005). The question whether there are any Geographical differences in the utilization of maternal healthcare utilization among women according to urban residence is an important one.

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Address for correspondence:
Dr. Anil Jagan Hiwale Associate Professor, Department of Geography, Bhusawal Arts, Science and P. O. Nahata Commerce College, Bhusawal Jalgaon, Maharashtra. INDIA

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This is because it has been observed that there were wide gaps in the coverage of maternal and child healthcare services in the regions of Eastern, Central and North-eastern India during the period from 1992 to 2006 (Kumar et al., 2013). With this context, the paper explores the geographical differences in utilization of maternal healthcare services in relation to urban regions in India. The paper contributes in understanding the geographical differences of utilization of maternal healthcare services with urban residence.

Materials and Methodology

We have used the fourth round of National Family Health Survey-4 (2015-16). NFHS-4 is a nationally representative survey of a sample of 6, 01,509 households from the 640 districts of the country. The survey included interviews of 6, 99,686 eligible women aged 15 – 49 years. The analyses were performed using statistical software Stata 13.0. Regional variations in utilization of antenatal care were with the help of ArcGIS 10.5. Responses to each of the variables Full ANC, Institutional Delivery and Post Natal Care were obtained in the binary form ('Yes / No).

Operational Definitions

Full ANC: Full antenatal care includes at least four antenatal visits, at least one tetanus toxoid (TT) injection, and iron folic acid supplement [taken as] tablets or syrup for 100 or more days (IIPS, 2016). *Institutional Delivery:* Institutional deliveries are deliveries that take place in a health facility (International Institute for Population Sciences (IIPS), 2017). *Post Natal Care (PNC):* Women who got a medical check-up within the first 48 hours (within two days) after delivery are considered to have had a postnatal health check.

Composite Index

Composite index was used for assessing objectives. The composite considered the three indicators of maternal healthcare: full ANC, institutional delivery and post-natal care (Hiwale, 2022). It was constructed using the following **formula**

$$\frac{\text{Observed value - Minimum value}}{\text{Maximum value - Minimum value}}$$

Result

Table 1 shows the Sample Distribution, Utilization of Maternal Healthcare Services, Composite Index Scores and Ranking of Geographical Region of Urban women, aged 15 – 49 years who had a live birth in the five years preceding the survey (2015-16). In the sample of 1,87,632 women, 46,889 from urban areas.

Differences in the utilization of MHC services in among Urban women in the natural regions

Table 1 shows Urban women were present in the samples from eighty-eight natural regions. Overall, out of ten women from urban areas, just over three (31.1%) received full ANC services; nearly nine delivered their babies in a hospital (90.3%); and slightly over seven (73.2%) used post-natal care services.

Full ANC

Utilization of full ANC services among urban women ranged between 4% to 67%. The lowest utilization was seen in Arunachal Pradesh (4%). Other regions with utilization of ANC services among urban women included Nagaland (4.8%), Southern Uttar Pradesh (5.5%), Northern Bihar (5.8%), and Central Bihar (7.2%). Utilization was ten percent and above in Tripura (10%), Vindhya region of Madhya Pradesh (11.5%), Southern Upper Ganga Plains and Northern Upper Ganga Plains of Uttar Pradesh (12% and 12.6% respectively), Northern Rajasthan (13.3%), Northern Madhya Pradesh (14.4%), Central Uttar Pradesh (15%), and Western Rajasthan (15.1%).

High rates of utilization of full ANC services were seen among urban women in Lakshadweep (67%) and Andaman and Nicobar Island (66.5%), Northern Kerala (64.9%), Goa (64.2%), Southern Kerala (61.2%), Puducherry (59.4%), Mountainous region of Jammu & Kashmir (53.2%), Inland Tamil Nadu (52.7%) and Trans Himalayan & Southern Himachal Pradesh (52.1%).

Institutional Delivery

In Lakshadweep and Northern Kerala utilization of institutional delivery facilities was universal among urban women. Utilization was near-universal in Southern Kerala (99.8%), Puducherry (99.8%), Coastal Northern, Inland and Coastal Tamil Nadu (99.8%, 99.8%, and 99.3% respectively), Coastal and Ghats and Inland Eastern Karnataka (99.1% each), and the Jhelum Valley region of Jammu & Kashmir (also 99.1%). In sixty of the eighty-eighty regions, utilization of institutional delivery facilities exceeded 90% among urban women. Nagaland had the lowest utilization among the regions (57.7%). Other regions with low utilization of institutional delivery facilities among urban women were Northern Bihar (65.8%), Northern Upper Ganga Plains and Southern Upper Ganga Plains of Uttar Pradesh (69.9% and 71% respectively), Manipur Hills (71.2%), Eastern Uttar Pradesh (77.5%), Eastern and Western Plains of West Bengal (77.8% and 78.1% respectively), and Northern Chhattisgarh (79.7%).

PNC

Utilization of PNC services among urban women is between 36.7% to 94.4%. Urban women from the Nagaland showed lowest of utilization PNC services (36.7%). Other regions with low utilization were Arunachal Pradesh (37.6%), Northern Bihar (47.9%), Dry Areas and the Kachchh region of Gujarat (52.3% and 57.1% respectively), Ranchi Plateau of Jharkhand (57.6%), Central Madhya Pradesh (59.3%), Northern Chhattisgarh (60.2%),

Southern Uttar Pradesh (60.5%) and Central Bihar (60.8%). The utilization of PNC services among urban women was highest in Inland North-Eastern Telangana (94.4%) followed by Lakshadweep (93%), Goa (92.9%), Chandigarh (91.8%), Ladakh (91.4%), Mountainous region of Jammu & Kashmir (90.7%), and Northern Punjab (90.2%).

Ranking of natural regions of India according to their Composite Index Scores of utilization of maternal healthcare services among urban women (2015-16)

Table 1 shows the rankings of natural regions of India according to the Composite Index scores of utilization of maternal healthcare services in 2015-16. The highest region was Lakshadweep (CI=85.99490) followed by, in the decreasing order of composite index scores, Goa, Northern Kerala, Puducherry, Southern Kerala, Andaman and Nicobar Island, Mountainous region of Jammu & Kashmir, Inland North Eastern Telangana, Inland Tamil Nadu and Trans Himalayan & Southern region of Himachal Pradesh (CI=76.44157) accordingly. With a CI score of 32.38157, Nagaland was ranked the lowest. Above Nagaland were, in ascending order of CI scores, Northern Bihar, Arunachal Pradesh, Southern Upper Ganga Plains, Southern and Northern Upper Ganga Plains regions of Uttar Pradesh, Central Bihar, Central, and Eastern Uttar Pradesh, and Manipur Hills (CI=52.43157).

Discussion

Nagaland was the lowest user of maternal health care services. Above Nagaland were, in ascending order, Northern Bihar, Arunachal Pradesh, Southern Upper Ganga Plains, Southern and Northern Upper Ganga Plains regions of Uttar Pradesh, Central Bihar, Central, and Eastern Uttar Pradesh, and Manipur Hills. Rai et al. studied the gap in cover of maternal and newborn childcare across districts in India (Rai, Kumar, & Singh, 2012). They found a wide gap in between north and south India and stressed on the need for focused intervention in 210 districts which had a gap in cover of $\geq$ 50 percent. A study by Parchure et al. in 2012 found that interstate differences in the utilization of healthcare was due to variations in policy implementation, as well as differences in availability and accessibility of healthcare facilities across states (Parchure, Basu, Adak, & Bharati, 2012). The authors found that at the community level, the odds of utilizing maternal healthcare were lower in rural areas and in communities with a higher concentration of poor and illiterate women. There is also a significant relationship between being poor and less access to ANC services, which is independent of caste category or residence (Saxena, Vangani, Mavalankar, & Thomsen, 2013). Effective implementation of NRHM and other government schemes among the rural and poor women will contribute to reducing the burden of maternal mortality and associated morbidities. The disproportionate burden of maternal mortality and morbidity, which are attributable to lack of utilization of maternal healthcare services among women those living in rural areas.

Conclusion

Urban geographical regions of Nagaland, Bihar, Arunachal Pradesh, Uttar Pradesh, Manipur and Vindhya region of Madhya Pradesh using very less amount of all kind of maternal health care services as compare to other part of the country. The Indo-Gangetic plain regions of the country used very less amount of MHCS.

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Table 1 Sample Distribution, Utilization of Maternal Healthcare Services, Composite Index Scores and Ranking of Urban Geographical Region among women, aged 15 – 49 years who had a live birth in the five years preceding the survey (2015-16)

State	Natural Region	Urban Sample	Total Sample	Full ANC	Instit. Deli.	PNC	CI	Rank
Jammu & Kashmir	Jhelum Valley	519	2,694	22.3	99.1	87.1	68.7782	32
	Ladakh	150	545	19.5	96.0	91.4	68.2616	34
	Outer Hills	144	2,275	32.4	86.3	77.0	64.5782	45
	Mountainous	139	703	53.2	97.8	90.7	79.8749	7
Himachal Pradesh	Trans Himalayan & Southern	88	1,295	52.1	90.9	88.5	76.4416	10
	Central	42	973	43.5	95.1	84.9	73.7982	14
Punjab	Northern	674	1,822	39.8	92.0	90.2	73.2782	18
	Southern	834	2,250	30.4	90.0	86.7	68.3549	33
Chandigarh	Chandigarh	143	149	34.8	93.2	91.8	72.5616	22
Uttarakhand	Uttarakhand	1,236	4,253	15.6	81.4	67.8	54.2449	74
Haryana	Eastern	1,375	3,716	21.3	80.8	67.5	55.8349	70
	Western	418	1,948	22.0	92.4	78.0	63.4416	50
Delhi	Delhi	1,218	1,240	39.0	87.1	65.7	63.2316	53
Rajasthan	Western	792	3,041	15.1	88.8	73.0	58.2849	64
	North-Eastern	986	3,808	18.6	92.5	70.1	59.7049	61
	Northern	455	1,774	13.3	89.3	69.1	56.5382	68
	Southern	123	1,316	26.3	98.5	84.5	69.0749	30
	South-Eastern	462	1,904	20.7	94.5	76.5	63.2282	54.5

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State	Natural Region	Urban Sample	Total Sample	Full ANC	Instit. Deli.	PNC	CI	Rank
Uttar Pradesh	Northern Upper Ganga Plains	2,204	5,402	12.6	69.9	71.3	50.5616	83
	Central	551	2,851	15.0	81.2	61.3	51.7949	81
	Southern Upper Ganga Plains	2,155	7,760	12.0	71.0	68.7	49.8516	85
	Southern	441	1,924	5.5	86.2	60.5	50.0349	84
	Eastern	1,153	10,480	17.5	77.5	62.7	51.8749	80
Bihar	Northern	674	9,108	5.8	65.8	47.9	39.1349	87
	Central	1,090	7,545	7.2	86.8	60.8	50.9082	82
Sikkim	Sikkim	231	884	37.3	95.8	79.8	70.2616	29
Arunachal Pradesh	Arunachal Pradesh	712	3,781	4.0	82.9	37.6	40.7882	86
Nagaland	Nagaland	765	3,020	4.8	57.7	36.7	32.3816	88
Manipur	Plains	1,226	2,672	47.1	89.1	79.5	71.2149	26
	Hills	140	1,652	21.5	71.2	66.6	52.4316	79
Mizoram	Mizoram	1,415	3,213	49.0	97.8	76.6	73.7516	15
Tripura	Tripura	282	1,144	10.0	93.2	73.4	58.1549	66
Meghalaya	Meghalaya	399	2,890	37.9	90.0	78.3	68.0549	35
Assam	Central Brahmaputra Plains	94	1,620	33.3	92.3	72.0	65.1582	44
	Plains Eastern	210	2,003	44.8	96.5	74.8	71.3249	25
	Cachar Plain	168	1,606	20.0	87.7	68.1	57.9082	67
	Plains Western	356	3,184	24.3	93.5	72.2	62.6149	57

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State	Natural Region	Urban Sample	Total Sample	Full ANC	Instit. Deli.	PNC	CI	Rank
West Bengal	Himalayan	127	594	21.3	95.2	82.1	65.4982	41
	Eastern Plains	256	1,551	22.8	77.8	63.4	53.9549	76
	Southern Plains	290	641	22.4	86.4	67.8	58.1616	65
	Central Plains	287	627	28.7	90.6	75.1	64.1249	49
	Western Plains	105	990	34.0	78.1	71.7	60.5816	58
Jharkhand	Hazaribagh Plateau	1,093	5,176	17.0	81.2	62.5	52.8482	77
	Ranchi Plateau	647	3,627	19.4	87.0	57.6	53.9649	75
Orrisa	Northern	699	2,815	35.7	92.8	80.1	68.8482	31
	Coastal	435	2,502	25.8	86.3	70.4	60.1049	59
	Southern	348	3,544	20.0	93.3	78.7	63.3216	52
Chhattisgarh	Northern Chhattisgarh	296	860	26.3	79.7	60.2	54.6849	72
	Mahanadi Basin	1,141	4,104	29.5	84.4	77.9	63.2282	54.5
	Southern Chhattisgarh	209	1,719	28.6	95.4	78.2	66.7249	39
Madhya Pradesh	Northern	772	2,852	14.4	96.4	71.1	59.9282	60
	Vindhya	464	2,966	11.5	87.2	61.5	52.6849	78
	Central	544	1,779	16.0	94.0	59.3	55.7216	71
	Malwa	1,417	4,372	22.0	95.7	72.9	62.8482	56
	South Western	805	2,918	21.8	96.2	74.3	63.4216	51
	South	472	2,294	31.9	95.9	67.0	64.2449	48

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State	Natural Region	Urban Sample	Total Sample	Full ANC	Instit. Deli.	PNC	CI	Rank
Gujarat	Kachchh	106	233	20.5	88.2	57.1	54.5882	73
	Dry Areas	81	516	27.3	92.1	52.3	56.5282	69
	Plains Northern	484	1,293	46.5	97.1	71.6	70.9949	27
	Saurashtra	628	1,452	37.3	95.4	62.3	64.3049	47
	South Eastern	673	2,236	38.5	93.0	74.2	67.8716	36
Daman & Diu	Daman & Diu	198	328	26.0	90.9	64.2	59.6882	62
Dadra & Nagar Haveli	Dadra & Nagar Haveli	104	239	23.2	93.2	62.9	59.0682	63
Maharashtra	Inland Northern	275	888	24.6	94.9	83.2	66.8916	38
	Inland Eastern	544	1,441	40.1	95.2	84.5	72.5716	21
	Eastern	140	695	46.8	97.0	79.1	73.6182	16
	Inland Central	559	1,964	21.2	96.4	81.0	65.5082	40
	Coastal	499	901	38.6	96.0	82.2	71.5816	23
	Inland Western	375	1,116	40.6	97.7	83.5	73.2382	19
Telangana	Inland North Weste	458	1,114	48.7	96.4	83.0	75.3382	13
	Inland North Easte	150	636	42.7	98.0	94.4	77.6749	8
Andhra Pradesh	Coastal Northern	159	786	47.7	98.2	83.9	75.9249	11
	Coastal Southern	217	659	42.7	98.2	88.4	75.7482	12
	Inland Southern	247	785	46.4	92.8	82.0	73.0682	20

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State	Natural Region	Urban Sample	Total Sample	Full ANC	Instit. Deli.	PNC	CI	Rank
Karnataka	Inland Northern	979	3,074	37.9	93.4	64.4	64.5082	46
	Coastal and Ghats	183	521	37.3	99.1	79.7	71.3549	24
	Inland Eastern	175	649	28.4	99.1	70.6	65.3482	43
	Inland Southern	578	1,547	33.7	97.4	67.1	65.3749	42
Goa	Goa	170	344	64.2	97.6	92.9	84.2116	2
Lakshadweep	Lakshadweep	234	260	67.0	100.0	93.0	85.9949	1
Kerala	Northern	426	1,085	64.9	100.0	89.6	84.1616	3
	Southern	386	1,023	61.2	99.8	86.1	81.6849	5
Tamil Nadu	Coastal Northern	625	1,351	49.2	99.8	73.6	73.4982	17
	Inland	754	1,638	52.7	99.8	82.0	77.4316	9
	Southern	802	1,564	35.6	98.4	69.6	67.1782	37
	Coastal	459	1,528	43.5	99.3	70.2	70.3149	28
Puducherry	Puducherry	668	872	59.4	99.8	88.3	81.8049	4
Andaman and Nicobar Island	Andaman and Nicobar Island	82	518	66.5	97.9	81.3	81.2216	6
India		46,889	1,87,632	31.1	90.3	73.2		

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Figure 1 Utilization of full ANC services among Urban Women in the Natural Regions of India, 2015-16

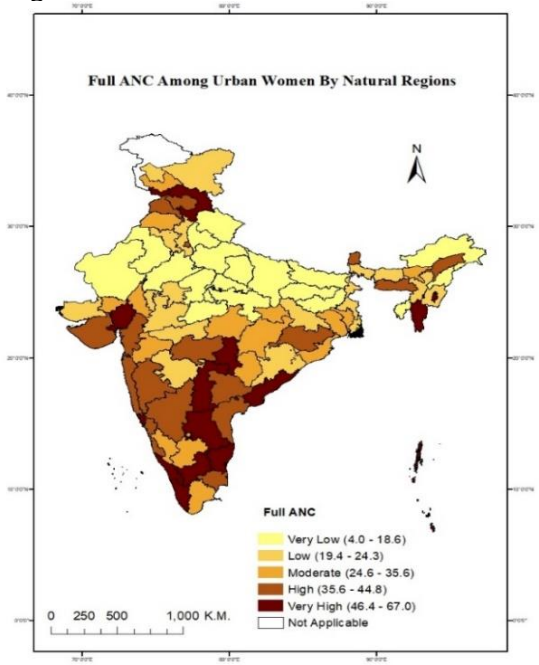

Figure 2 Utilization of Institutional Delivery services among Urban Women in the Natural Regions of India, 2015-16

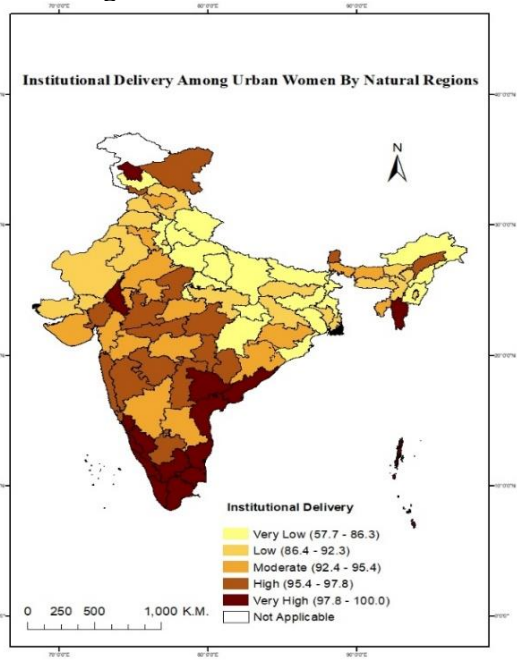

Figure 3 Utilization of PNC services among Urban Women in the Natural Regions of India, 2015-16

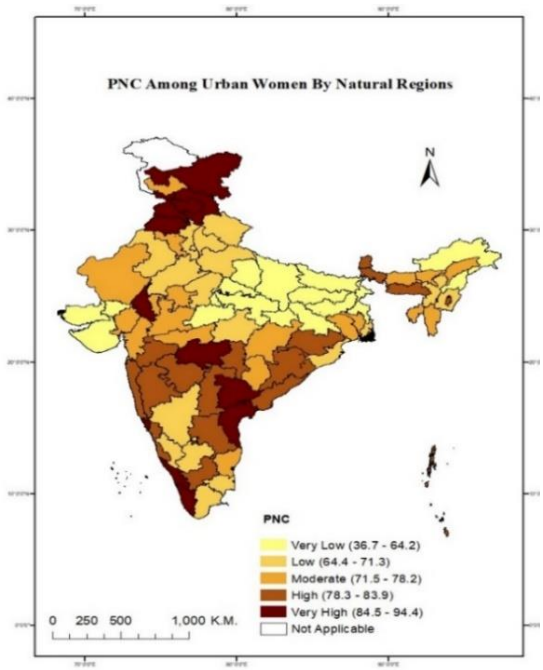
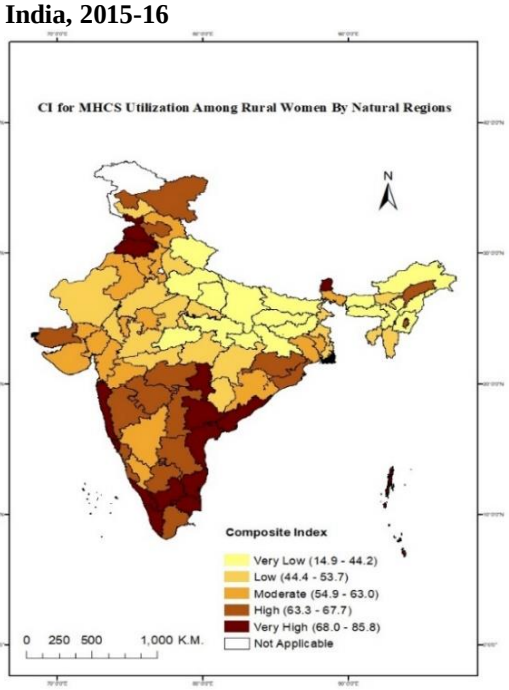
Figure 4 Composite Index scores of utilization of Maternal Healthcare Services Among Urban Women by Natural Regions of India, 2015-16