Extended Abstract

Investigating Access to Health Services Using Spatial Dimension: Proximity to Services and Its Utilization for Institutional Births in Rural India

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Introduction:

In India utilization of health facilities for institutional delivery is not satisfactorily improving particularly in the northern regions. This is in spite of the Governments' effort to strengthen health facilities and skilled manpower through implementation of various programs over the period after independence and reorientation of the health system on the principle of 'top-to-bottom' approach to improve the maternal care. In recent past National Rural Health Mission (HRHM) has been launched in year 2005 to provide support to states to strengthen system of health care in rural areas through provision of physical infrastructure, human resources, equipment, emergency transport, drugs, diagnostics and other support through the adoption of "bottom to top" approach. The NRHM seeks to provide accessible, affordable and quality health care to the rural population, especially the vulnerable sections. In keeping with the principles of primary health care, the NRHM seeks to address the structural issues rooted in the health system and promote policies that strengthen public health management and service delivery in the country. Component of service utilization include spatial proximity, variety, cost, and quality of services (Hermalin and Entwisle, 1987).

The level of maternal mortality is a sensitive index of the prevailing health conditions and general socioeconomic development of a community. The most populous state of the country, Uttar Pradesh where very high MMR (440) comparatively national average (254). Near proximity represents practical access, meaning low cost in terms of time and energy which would increase utilization for institutional births and reduce the maternal mortality especially in rural area where choices are rare. Near proximity represents practical access, meaning low cost in terms of time and energy which would increase utilization for institutional births especially in rural area where choices are rare. This study tried to make a relationship by taking distance and road connectivity with institutional births by the use of spatial analysis, rather only to study the extent of utilization of services. Social policy decisions regarding this call for knowledge of the locations of patients' residences, physicians' locations, and the transportation network linking them with hospitals. Voluntary health planning organizations and State agencies can consider suggested alternative locations of hospitals in relation to present and expected future population distributions. This should also facilitate the selection of appropriate locations for specialized services.

Need for the study:

Effective planning for health facilities in our increasingly developing society requires that planning agencies anticipate the demand for facilities, rather than merely react to present gaps in services or instances of unnecessary duplication. Both the convenience of the patients and the dispersion of physicians throughout a community should be considered in the spacing of facilities to encourage rational personal health service patterns. It is with this assumption that distance is used as a proxy for access to health services.

This study examines the accessibility for institutional births by women in rural Uttar Pradesh, the most populous state of India where institutional births are only 24 percent. How does health centres accessibility affect institutional births? In this paper we use technique of spatial analysis to develop measures of institutional births accessibility, and evaluate the effects of these geographically derived measures to the multivariate statistical model in Uttar Pradesh. In our analysis we combine spatial data maps by reading with socio-demographic data from surveys and administrative records. The few measures reveal (1) important travelling distance effects institutional births; (2) independent effect of all weather road availability.

Hypothesis:

1. Physical proximity to health service facilities would be positively associated with institutional births.
2. Distance is spatially affecting accessibility to health centre for the institutional delivery of births.

Objectives:

1. To find whether accessibility or individual characteristics of women determine the institutional delivery for the births.
2. To study the spatial pattern with the road connectivity and manpower available at the health facilities.

Data source:

Third round of District Level Household Survey (DLHS 2007-08) which provides information on distance and all weather road connectivity to health centres at micro level (Sub Centres as well as Primary Health Centres). This study focused on rural women for selected districts in Uttar Pradesh where the choices are limited. Rural women are selected purposively to see improvement through the focused program.

Janshankhya Sthirta Kosh website : http\www.jsk.gov.in where states and district maps are available with lowest level heath facilities i.e. Sub Centres(SC) and Primary Health Centres (PHC) locations.

Methodology:

As a first stage of the analysis, the following background variables were selected:

Individual level: age, educational level, partner's educational level, ethnicity, religion, birth order, any anti-natal care visit, wealth quintile, region. Village (macro) level: average distance to sub-centre, average distance to primary health centre, all weather road availability, female work participation. Theoretical considerations and availability determined a variable's selection for analysis.

The second stage of the analysis employed a univariate logistic regression analysis for institutional births. Each variable that added significance at the 0.20 level or higher based on the likelihood ratio test in the univariate analysis was advanced to the multivariate analysis.

In the third stage, multivariate logistic regression models were estimated using backward selection at most the 0.1 level of significance with institutional births as the dependent variable and one distance variable in addition to background characteristics. Due to co-linearity among the distance variables, the four distance variables significant at the 0.01 level were run in separate models.

Before doing further analysis, need to create a GIS that incorporates selected survey data but that also includes spatial data obtained from a variety of other sources. A GIS is an automated system for the capture, storage, retrieval, analysis and display of spatial data (Clarke 1990:11). Additionally, spatial analysis has been captured using GeoDa. Maps are the key to the display of descriptive results.

Results:

Bivariate frequency distributions of the facility data revealed that the majority of distance variables were significantly associated with institutional births using Pearson's chi-square test. However, large portions of the population lived far away from some services. Univariate logistic regression analysis showed that all the three distance variables were significant at 0.01 level, namely, distance to health facilities with doctor, nurse (ANM) and with doctor/nurse both (Table 1).

Table 1: Odds Ratios and confidence intervals from univariate logistic regression models for institutional births to women (N=14,554)

	Odds ratio	95.0% C.I.	
		Lower	Upper
distance to Sub-centre with nurse			
<1 km	1.00	..	..
1-5 km	0.84**	0.81	0.87
5.1-10 km	0.76**	0.71	0.81
>10 km	0.76**	0.68	0.84
Constant	0.39**	..	..
distance to Sub-centre with lady doctor			
<1 km	1.00	..	..
1-5 km	0.76**	0.66	0.89
5.1-10 km	0.58**	0.45	0.74
>10 km	0.60**	0.41	0.88
Constant	0.35	..	..
distance to Sub-centre with nurse and lady doctor both			
<1 km	1.00	..	..
1-5 km	0.76**	0.63	0.91
5.1-10 km	0.65*	0.47	0.92
>10 km	0.53*	0.33	0.87
Constant	0.42	..	..

Note: * p <0.01, ** p < 0.001

These three distance variables that were significant at the 0.01 level; were retained in the multivariate models. Model one shows that, when controlling for background characteristics (regions, age, educational level, partner's educational level, ethnicity, religion, wealth quintile, birth order, any ANC, average distance to PHC, all weather road availability and female work participation) women who lived near facilities were more likely to have gone for institutional births (Table 2).

Univariate moron's and LISA shows the high-high and low-low auto-correlation for institutional births significantly. Moron's statistics (0.40) showed fine spatial clustering with its neighbours.

Bivariate Moron's and LISA showed low-high and high-low auto-correlation to institutional births with average distance to Primary Health Centres by means of low institutional delivery with more distance to heath centres and vice-versa significantly. Bi-variate Moron's statistics (-0.075) showed clear negative spatial clustering with its neighbours, however that is not stronger in this line of approach.

Furthermore, spatial variation through spatial analysis will be explored at micro level (district level) which shows the institutional deliveries are centred around road availability, health facility or institutional level itself. Additionally, in case if hospitals are there in the village then possible relationship may be established that why too many villages are accessing the same hospital with enough man powers (doctors/nurse etc.) and equipments even at nearby.

Table 2: Odds Ratios Confidence Intervals from Multivariate Logistic Regression of institutitonal births to Women by Background Characteristics (N=14,554)

background characteristics		Exp(B)	95.0% C.I		Exp(B)	95.0% C.I.		Exp(B)	95.0% C.I.	
			Lower	Upper		Lower	Upper		Lower	Upper
Distance to sub centre with lady doctor										
	<1 km®									
	1-5 km	0.88**	0.76	1.02						
	5.1-10 km	0.86**	0.70	1.04						
	>10 km	0.84	0.55	1.29						
Distance to sub centre with nurse (ANM)										
	<1 km®									
	1-5 km				1.18*	1.09	1.27			
	5.1-10 km				1.13*	1.05	1.22			
	>10 km				0.97	0.84	1.12			
Distance to sub centre with doc & nurse (ANM)										
	<1 km®									
	1-5 km							1.14	0.96	1.37
	5.1-10 km							1.08	0.84	1.38
	>10 km							0.74	0.41	1.35
state in Regions	Eastern®									
	Central	0.88*	0.78	1.00	0.81	0.74	0.88	0.81	0.74	0.88
	Bundelkhand	1.54*	1.34	1.77	1.23	1.12	1.35	1.23	1.12	1.35
	Western	0.86*	0.77	0.96	0.79	0.74	0.84	0.79	0.74	0.84
Age	15-19®									
	20-24	1.07	0.93	1.22	1.12	1.01	1.25	1.13	1.02	1.25
	25-29	1.19	1.02	1.39	1.30	1.16	1.46	1.30	1.16	1.46
	30-34	1.23	1.04	1.47	1.42	1.24	1.61	1.42	1.25	1.62
	35-39	1.22	0.99	1.50	1.42	1.22	1.66	1.43	1.23	1.67
	40-44	1.56	1.19	2.06	1.52	1.23	1.89	1.53	1.24	1.90
	45-49	1.19	0.72	1.98	1.39	0.95	2.04	1.41	0.96	2.07
Education	illiterate®									
	primary	1.20	1.01	1.43	1.27	1.11	1.45	1.27	1.12	1.45
	high school	1.23	1.12	1.35	1.34	1.25	1.44	1.34	1.25	1.44
	Inter & above	2.05	1.80	2.33	2.35	2.15	2.58	2.36	2.15	2.59
Partner's Education	illiterate®									
	primary	0.99	0.82	1.21	1.04	0.90	1.20	1.03	0.89	1.20
	high school	1.24	1.12	1.37	1.30	1.21	1.40	1.30	1.21	1.41
	inter and high	1.46	1.30	1.64	1.59	1.46	1.73	1.59	1.45	1.73
Ethnicity	SC/ST®									
	OBC	1.15	1.05	1.26	1.16	1.08	1.25	1.16	1.08	1.24
	Others	1.51	1.35	1.69	1.51	1.38	1.64	1.51	1.38	1.64
Religion	Hindu®									
	Muslim	1.06	0.96	1.18	0.97	0.90	1.04	0.97	0.90	1.04
	others	1.67	1.00	2.78	1.67	1.18	2.36	1.65	1.17	2.34

Table 2: Cont..

background characteristics		Exp(B)	95.0% C.I		Exp(B)	95.0% C.I		Exp(B)	95.0% C.I	
			Lower	Upper		Lower	Upper		Lower	Upper
Wealth Quintile	lowest®									
	lower	1.26	1.13	1.41	1.21	1.10	1.33	1.21	1.10	1.32
	middle	1.37	1.22	1.54	1.42	1.29	1.55	1.42	1.29	1.55
	higher	1.71	1.52	1.93	1.85	1.68	2.03	1.86	1.69	2.04
	highest	2.72	2.36	3.14	3.18	2.86	3.54	3.19	2.87	3.56
Birth Order	<2®									
	2-3	0.50	0.46	0.55	0.51	0.48	0.55	0.51	0.48	0.55
	3+	0.37	0.33	0.42	0.34	0.31	0.37	0.34	0.31	0.37
Any ANC	no®									
	yes	2.42	2.22	2.65	2.31	2.15	2.48	2.32	2.16	2.50
Average distance to SC from psu		0.86	0.80	0.92	0.86	0.80	0.93	0.86	0.80	0.92
Average distance to PHC from psu		0.99	0.98	0.99	0.91	0.90	0.93	0.92	0.90	0.93
Average distance to CHC from psu		1.08	1.04	1.12	1.08	1.04	1.12	1.08	1.04	1.12
All weather road to SC/PHC/CHC		1.02	0.93	1.12	1.05	0.97	1.13	1.06	0.98	1.14
Female Labor force participation		0.34	0.17	0.67	0.62	0.34	1.11	0.60	0.33	1.08
Constant		0.14			0.27			0.29		

Note: ®: reference category, * p< 0.01, ** p< 0.1

Figure 1: Univariate LISA (Institutional Births)

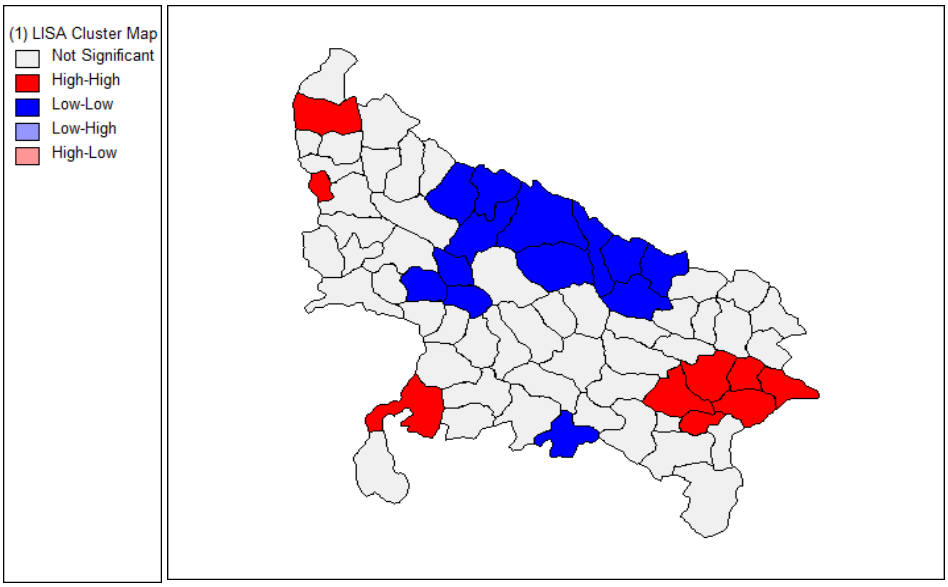

Figure 2: Univariate LiSA significant map

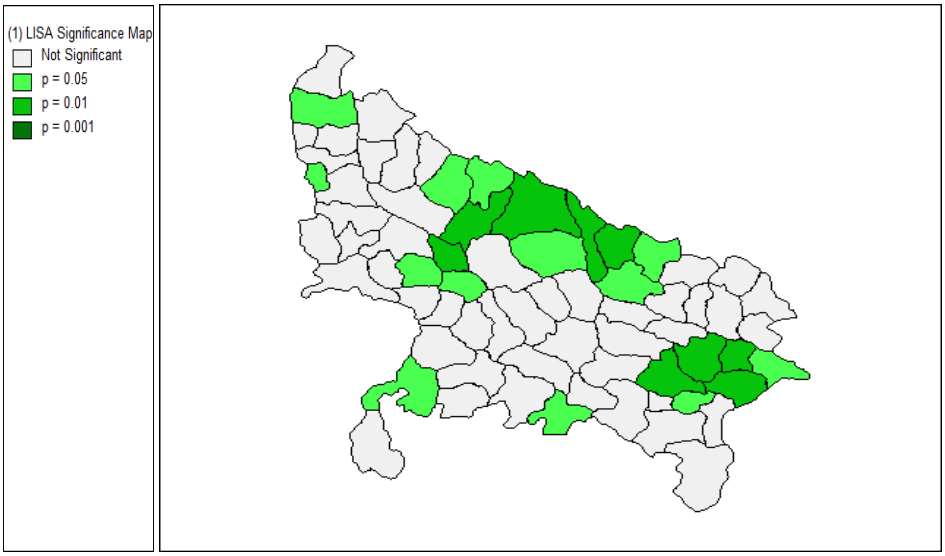

Figure 3: Univariate Moron's statistics

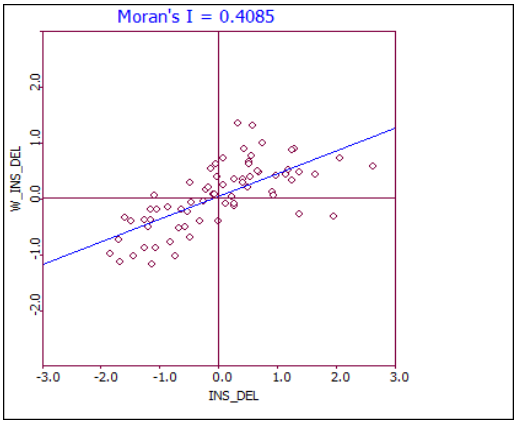

Figure 4: Bivariate LISA (Institutional Births with average distance to Primary Health Centre)

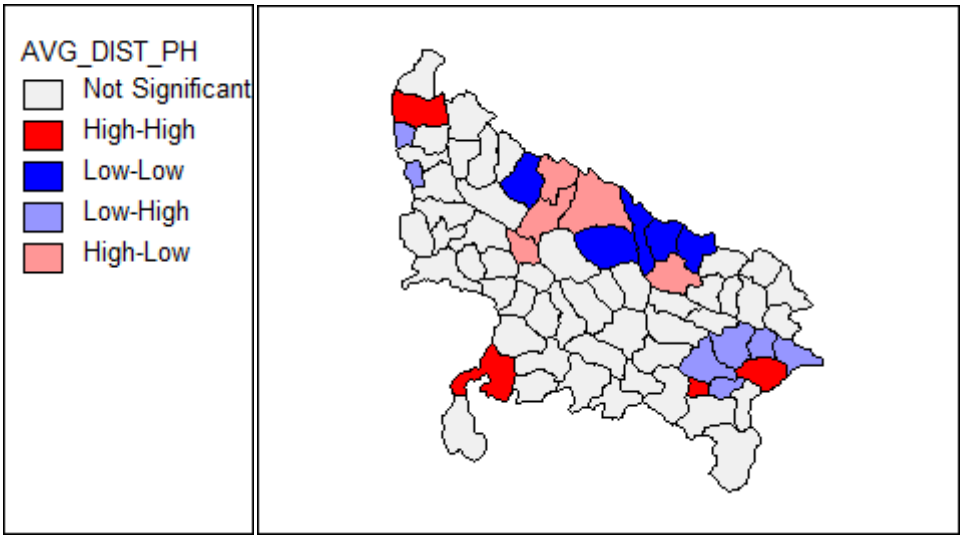

Figure 5: Bivariate LISA significant map

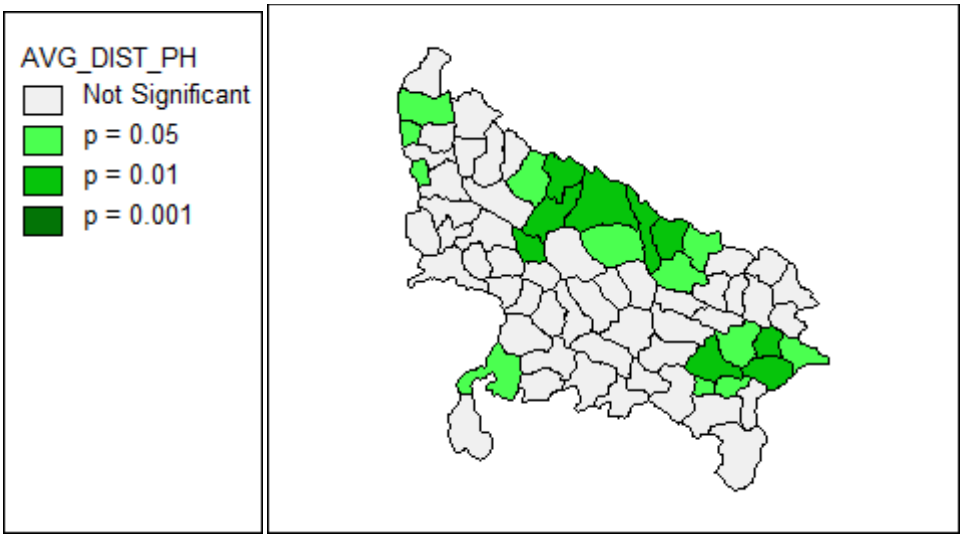

Figure 6: Bivariate Moron's plot