Maternal Health Care Utilization in India: Role of Surface Road Networks

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Abstract:

Geographical diversity in India has been important factor in differentiating diffusion of developmental forces over space. Accessibility in this context plays a vital role in the utilization of reproductive health care. Geographical barriers like mountainous terrain or poor road conditions lead to poor utilization of maternal health care services. The present paper examines the role of surface road network on maternal health care use in India. By classifying the country into various surface road density zones an attempt has been made to examine the varying impact of accessibility on maternal health in different road density zones. Road networks in the country are denser in the plains of the north while it is moderately dense in the southern plateau region with poor road connectivity characterizing the hills. Based on the data available in NFHS-III (2005-2006) on maternal health in India, this study tests the hypothesis that better road connectivity influence performance of maternal health care utilization.

Key words: surface road density, antenatal care, health facility, delivery, postnatal care, region, relationship*.*

Introduction: According ICDP Programme of Action para.7.2 "Reproductive Health is a state of complete physical, mental and social well-being, and not merely absence of disease or infirmity, in all matter relating to the reproductive system and its functions and processes. Reproductive health therefore implies that people are able to have a satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so". It includes *Antenatal Care* (ANC) which refers to pregnancy-related health care provided by a doctor or a health worker in a medical facility or at home. Ideally, antenatal care should monitor a pregnancy for signs of complications, detect and treat pre-existing and concurrent problems of pregnancy, delivery care and provide advice and counselling on preventive care, diet during pregnancy, and postnatal care and related issues. Another important thrust of reproductive health is *Delivery Care*. Place of delivery is extremely important- deliveries under proper hygienic conditions under

supervision of trained health professionals and improper treatment during delivery makes a difference. *Postnatal Care* is also one important components of reproductive health. The health of the mother and her new born child depends not only on the health care she receives during her pregnancy and delivery, but also on the care she and the infant receive during the first few weeks after delivery. Postpartum check-up usually indicates medical check-up received by mother during the first two months after delivery.

Background: The amazing diversity of ethnic and racial characteristics evident in India has its roots in the manner the sub-continent has been peopled. The geography has played a significant role in all aspects of life of the people. The physical landscape and the magnitude of spatial variations are likely to contribute for differentiations of reproductive health status. In India the rates of infant mortality and maternal mortality are alarming. Seven of every 100 children born in India die before reaching age one and approximately five of every 1,000 women who become pregnant die of causes related to pregnancy and childbirth. Worldwide, India accounts for more than one-fifth of all maternal deaths from causes related to pregnancy and childbirth (Sugarthi, Mishra, and Retherford 2001). According to National Family Health Survey-3(2005-2006) more than 50 percent of pregnant mother attend at least three antenatal cares for their last birth. Only 48.3 percent received professional assistance during their last birth while around 36 percent get postnatal care from health professional. It is highly expected that diversify topography with its associations of road networks connection played substantial role in the process of maternal health as distance to the nearest health centre, lack of transportation, and perceived quality of services are all thought to be associated with the use of modern health care and seeking assistance from trained medical personnel (Noor Ali et al., 1999; Paul, 1992; Paul and Rumsey, 2002; Sundari, 1992). Paul and Rumsey (2002) note that lack of access to health care facilities refers to economic and socio-cultural distance as well as physical distance. It is likely to be found an association between frequency of maternal health care use and region of residence in Kenya, Magadi et al.(2000). Glei et al (2003) also found large differences in the likelihood of obtaining pregnancy care across region in Guatemala, perhaps due to regional variations socially and geographically. It is likely true that access to skilled

assistance and well equipped health institutions during delivery can reduce maternal mortality and morbidity and improve pregnancy out comes. Geographical barriers such as mountainous terrain or poor road conditions also delay access to maternal health care. In Haiti road conditions and geography constrain access to both prenatal care and delivery care for women living in rural areas (Guttmacher Institute, 2007). In the line of the above conceptual literatures pertaining maternal health an attempt has been made to explore role of surface road network connection on reproductive health in India. (table1)

Objectives: This study has two objectives: *first*, to divide all India states into surface road density regions and analyze its relationship with utilization of maternal health care services including - received all antenatal care during pregnancy, birth delivered in health facility, delivery assisted by health personnel & delivery with postnatal check-up, delivery with postnatal check-up within 2 days of birth; and *second,* to make a comparative study among the five surface road density regions on the utilization of maternal health care services to find out the relationship between road infrastructure and utilization of maternal health services.

Data and Methods: The study is based on the data from India's National Family Health Survey-3(NFHS-3) conducted during 2005-2006, Census of India and Year books-1995. NFHS-3 collected information from a nationally representative sample of 124,385 ever- married women of age 15-49 years. The survey covered 99 percent of India's population living in all twenty-eight states. This survey has been conducted by International Institute of Population Studies (IIPS), Mumbai. Road density data is available from India year book-1998 and other substantial informations from census of India-2001.Therefore; India has been divided into five surface road density regions such as (see figure 1)-

(1) Very high surface road density region *(>50km per 100km2 areas)* consists the states of Delhi, Punjab, Haryana, Kerala, Goa and Tamil Nadu.

(2) High surface road density region *(35-50km per 100km2 areas)* includes the states of Manipur, Tripura, Orissa, Maharashtra, Karnataka, Gujarat and Nagaland

(3) Medium surface road density (20-35km per 100km2 area) region include the states of Uttaranchal, Uttar Pradesh, West Bengal, Sikkim and Andhra Pradesh.

(4) Low surface road density (10-20km per 100km2 areas) region consists of the states of Assam, Bihar, Madhya Pradesh, Himachal Pradesh and Rajasthan.

(5) Very low surface road density region (< 10 km per 100km2 areas) contains the states of Arunachal Pradesh, Meghalaya, Mizoram and Jammu & Kashmir.

Influence of road networks on maternal health care utilization have been examined base on these road density regions. It is likely to be found the relationships of road density of particular regions with mother's health seeking behaviour and utilization of maternity services throughout reproductive process. It is assumed that highly road density region provides better access for mother to visit health care facilities that will, in turn leads to greater utilization of health services than those who belongs to low road density regions.

Besides, bivariate statistical analysis is conduct between predictor variable (surface road density) and five response variables (received all antenatal care, birth delivered in health facility, delivery assisted by health personnel, delivery with postnatal check-up, and delivery with postnatal check-up within 2 days of birth) by using SPSS (Statistical Package for Social Sciences). Even though some of the background variables are related to each other and relationships among the intervening variables may also exist, the study is restricted to surface road density and its impact on maternal health care utilization since surface road are available and differ from plain, mountaineous and plateau region. It is also well established from various studies that utilization of maternity services are influence by other factors like mother's education, mother's exposure to mass media, place of residence and background characteristics(G.Debarchana 2006, Retherford and Mishra, 1997, Mosley and Chan 1984; Monteith et al.1987). It appears that little research has been done in India on the effect of accessibility or road network connections on utilization of maternal health services.

Unfortunately, the NFHS does not include questions on road network connection or accessibility level in detail, data has been acquired from other sources like year books and planning commissions. This study stressed the magnitude of access to health services as accessibility variable effecting the utilization of health services. Historically, improving access to services has been a primary strategy for increasing health service utilization in developing countries (Sartia and Touminen 1993; Kumar, Singh, and Kaur

1997). Studies by Elo (1992) and Sawhney (1993) have presented evidence that the effects of inadequate access to services on utilization are greater than the effects of socioeconomic f actors.

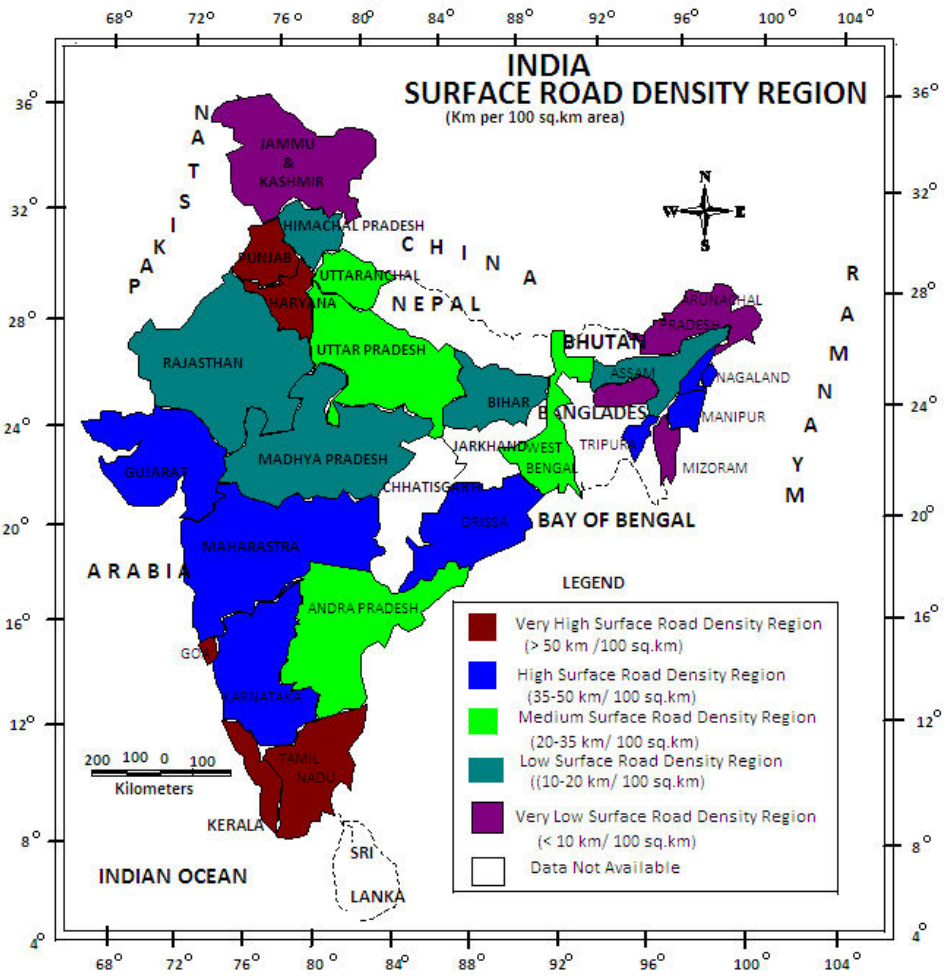

Figure 1.

Discussion and Results

1. Very High Density Surface Road Region (>50km per 100km^2 areas): This region consists of six highest density of surface road states-three from the northern plain areas of Delhi, Punjab and Haryana, three from peninsular coastal region including Goa, Tamil Nadu and Kerala. (table1). The region with overall average of 243 percent surface road density (243 km per 100 km^2 areas) achieved more than 36 percent of mother received all antenatal care (ANC) during pregnancy, 70.88 percent birth delivered in health facility, 77.53 percent delivery assisted by health personnel, 73.95 percent delivery received postnatal check-up and 70.65 percent received postnatal check-up within two days of birth. It is found that within

this region there exist inter-states variations in several variables. The common characteristics, however, is that higher road density provides greater number of mother utilized health facility except in the case of country's capital Delhi, which showed a perplexing results may be due to the influence of other potential socioeconomic variables.

Table 1. Very High Density Surface Road Region (>50km per 100km² areas)

Name of States	Surface Road Density #	% Received all ANC@	%Institutional Delivery	Delivery assisted by health personnel	% Any postnatal check-up	% Postnatal check-up within 2 days of birth
Delhi	1006	29	58.9	64.1	60.9	58.4
Goa	123	55.7	92.3	94	82.8	75.5
Punjab	94	19.6	51.3	68.2	63.7	62
Tamil Nadu	91	34	87.8	90.6	91.3	87.2
Kerala	84	63.6	99.3	99.4	87.4	84.9
Haryana	60	14.7	35.7	48.9	57.6	55.9
Average	**243**	**36.1**	**70.88**	**77.53**	**73.95**	**70.65**
@For the last live birth in the five years preceding the survey, mother received three or more antenatal check-ups (with the first check-up within the first trimester of pregnancy), received two or more tetanus toxoid injections, and took iron and folic acid tablets or syrup for three or more months. #km per 100sq.km area						

Source: NFHS-3, and data given in India-1995 Year Book

2. High Density Surface Road Region (35-50km per 100km² areas):

This region consists of seven Indian states in spatially diverse areas. From the Deccan plateau- Maharashtra, Orissa, Karnataka and Gujarat plain form high density surface road region in association with Manipur plain and Tripura plain in the North East India (table 2). As having average surface road density of 42.38 km/100sq.km, utilization of maternity health services are low compared with very high surface road density region. The relationship of road density and utilization of maternity health services are not strong and disparities prevail when we looked at inter-states performances. This puzzling situation reveals that there are other determinant factors in the region. In overall, 17.1 percent of pregnant women received all antenatal care, 40.94 percent birth delivered in health facility, 52.11 percent delivery assisted by health personnel and 48.24 received postnatal care.

Table 2. High Density Surface Road Region (35-50km per 100km² areas)

Name of States	Surface Road Density #	% Received all ANC@	%Institutional Delivery	%Delivery assisted by health personnel	%Any postnatal check-up	% Postnatal check-up within 2 days of birth
Maharashtra	48	21.6	64.6	68.7	64	58.7
Manipur	46.7	12	10.5	45.9	59	50.1
Karnataka	45	29.6	64.7	69.7	66.9	58.5
Tripura	42	10.6	46.9	48.8	33.7	30.3
Nagaland	41	1.9	11.6	24.7	11.8	10.6
Gujarat	37	25.6	52.7	63	61.4	56.5
Orissa	37	18.4	35.6	44	40.9	33.3
Average	**42.38**	**17.1**	**40.94**	**52.11**	**48.24**	**42.57**

@For the last live birth in the five years preceding the survey, mother received three or more antenatal check-ups (with the first check-up within the first trimester of pregnancy), received two or more tetanus toxoid injections, and took iron and folic acid tablets or syrup for three or more months. #km per 100sq.km area

Source: NFHS-3, and data given in India-1995 Year Book

3. Medium Density Surface Road Region (20-35km per 100km² area):

Medium surface road density region consists of northern plain states of Uttaranchal and Uttar Pradesh with Chhotanagpur belt of west Bengal states as well as the Himalayan foothill of Sikkim (table 3). The region has average surface road density of 30 km/100sq.km area revealed more or less same characters regarding utilization of maternity health services compared with high surface road density region. Around 17 percent of pregnant women received all types of recommended antenatal care, a slightly more than 41 percent delivered in health facility and 48.38 percent birth were assisted by health personnel while 44.14 percent and 39.08 percent received postnatal care at any time after delivery and received postnatal care within two days of delivery respectively.

Table 3. Medium Density Surface Road Region (20-35km per 100km² area)

Name of States	Surface Road Density #	% Received all ANC@	%Institutional Delivery	Delivery assisted by health personnel	%Any postnatal check-up	% Postnatal check-up within 2 days of birth
West Bengal	32	12.3	42	47.6	44.3	40.7
Uttaranchal	31	16.1	32.6	38.5	35.8	32.4
Uttar Pradesh	31	4.1	20.6	27.2	14.9	13.3
Andhra Pradesh	30	28.2	64.4	74.9	73.3	64.1
Sikkim	26	27.2	47.2	53.7	52.4	44.9
Average	**30**	**17.58**	**41.36**	**48.38**	**44.14**	**39.08**

@For the last live birth in the five years preceding the survey, mother received three or more antenatal check-ups (with the first check-up within the first trimester of pregnancy), received two or more tetanus toxoid injections, and took iron and folic acid tablets or syrup for three or more months. #km per 100sq.km area

Source: NFHS-3, and data given in India-1995 Year Book

4. Low Density Surface Road Region (10-20km per 100km² areas):

States having surface road density between 10-20km/100km² area are falls under low density region that consists of Bihar plain, Assam plain, Rajasthan desert, Himachal Himalaya and Deccan plateau of Madhya Pradesh. It is interesting to note that while high and medium surface road density showed a weak relationship with utilization of maternity health services, low surface road density portrayed significant association with utilization of maternity health services. However, this relationships again, depicted differences from one states to another within the region.(table 4).This region has average surface road density of 16.6 percent and 9.72 percent of pregnant women received all antenatal care while a little over 28 percent delivered in health facility. More than 36 percent delivery were assisted by health personnel, 29.98 percent received postnatal care at any time after delivery and only 26.08 percent received postnatal care after two days of birth.

Table 4. Low Density Surface Road Region (10-20km per 100km² areas)

Name of States	Surface Road Density #	% Received all ANC@	%Institutional Delivery	%Delivery assisted by health personnel	%Any postnatal check-up	% Postnatal check-up within 2 days of birth
Bihar	20	5.8	19.9	29.3	17.8	15.9
Rajasthan	18	8.6	29.6	41	31.8	28.9
Madhya Pradesh	18	7.2	26.2	32.7	33.8	28.5
Assam	14	9.6	22.4	31	15.9	13.9
Himachal Pradesh	13	17.4	43	47.8	50.6	43.2
Average	**16.6**	**9.72**	**28.22**	**36.36**	**29.98**	**26.08**
@For the last live birth in the five years preceding the survey, mother received three or more antenatal check-ups (with the first check-up within the first trimester of pregnancy), received two or more tetanus toxoid injections, and took iron and folic acid tablets or syrup for three or more months. #km per 100sq.km area						

Source: NFHS-3, and data given in India-1995 Year Book

5. Very Low Density Surface Road Region (<10km per 100km² area):

Very low surface road density region consist of three Himalayan mountainous states of Jammu & Kashmir, Mizoram and Arunachal Pradesh including Meghalaya plateau (table 5). This region shows a peculiar and vague association between road network and utilization of maternity services. Variables of maternal care indicators in the region generally depicted comparatively better results even though bad road network connections prevailed. While only 6.5km surface road density, antenatal receiving rate is 10.2 percent and institutional delivery is as high as 41.87 percent respectively, which are higher than medium and low density road regions. Besides, the region scores as high as 45.8 percent delivery assisted by health personnel and a high 40.5 percent postnatal care respectively, which are higher than low density surface road region. This may be due to the intervening effects of other socio-economic factors like mother education, mass media exposure and background characteristics which are varied widely within this region.

Table 5. Very Low Density Surface Road Region (<10km per 100km2 area)

Name of States	Surface Road Density #	% Received all ANC@	%Institutional Delivery	%Delivery assisted by health personnel	%Any postnatal check-up	% Postnatal check-up within 2 days of birth
Meghalaya	13	8.1	29	31.1	33.2	28.8
Mizoram	6	8.7	59.8	65.4	53.5	50.6
J & K	4	17.5	50.2	56.5	51.6	48.4
Arunachal Pradesh	3	6.5	28.5	30.2	23.7	22.7
Average	**6.5**	**10.2**	**41.87**	**45.8**	**40.5**	**37.62**
@For the last live birth in the five years preceding the survey, mother received three or more antenatal check-ups (with the first check-up within the first trimester of pregnancy), received two or more tetanus toxoid injections, and took iron and folic acid tablets or syrup for three or more months. #km per 100sq.km area						

Source: NFHS-3, and data given in India-1995 Year Book

Relationship between Surface Road Density and Utilization of Maternal Health Services

The first part of this section deals with relationship of surface road density and utilization of maternity health services from the median outcomes of each region. Table 6 shows that surface road density has substantial influence on mother health seeking behaviours and utilization of health facilities. It reveals that better road network connection leads to greater utilization of health facilities (Fig 2) Very high surface road density region (243km/100 sq.km) has 36.1 percent women received all types of recommended antenatal care while high surface road density regions (42.38 km/100 sq.km) has 17 percent women received all type of recommended antenatal care. Medium and low surface road density regions show that more than 17 percent and 9 percent of women received all types of recommended antenatal care. While high and medium surface road density region display more or less similar results throughout the whole process of utilization of maternal health care facility, very low surface road density, contradictorily, distinguishing itself by depicting higher utilization of maternity health services rather than low surface road density regions as a whole and medium density region in certain indicators.

Table 6 reveals that institutional delivery, professional assisted deliver and postnatal care are related with surface road density. While more than 70 percent recorded institutional delivery in very high surface road density region only a little over 52 percent and 48 percent institutional delivery occurred in high and medium surface road density regions respectively. Even though very low surface road density region show poor accessibility, institutional delivery is as high as 41 percent while only about 28 percent in a better accessibility area of low surface road density region. These perplexing results are mainly due to intervention of multiple factors which can cause utilization of maternity services.

Table 6. Relationship between surface road density and utilization of maternal health services

Road density regions(in average)	Surface Road Density#	% Received all ANC@	%Institutional Delivery	%Delivery assisted by health personnel	% Any postnatal check-up	% Postnatal check-up within 2 days of birth
Very high	243	36.1	70.88	77.53	73.95	70.65
High	42.38	17.1	40.94	52.11	48.24	42.57
Medium	30	17.58	41.36	48.38	44.14	39.08
Low	16.6	9.72	28.22	36.36	29.98	26.08
Very low	6.5	10.2	41.87	45.8	40.5	37.62
@For the last live birth in the five years preceding the survey, mother received three or more antenatal check-ups (with the first check-up within the first trimester of pregnancy), received two or more tetanus toxoid injections, and took iron and folic acid tablets or syrup for three or more months. #km per 100sq.km area						

Source: NFHS-3, and data given in India-1995 Year Book

Besides, postnatal cares portrayed positive relationships with surface road network except in the very low surface road density region. Substantial positive relationship of higher surface road network connection with greater number of women received postnatal care found in all regions except very low surface road density region. This baffling result may be due to other intervening variables, most probably mother's education, income and unique background characteristics.

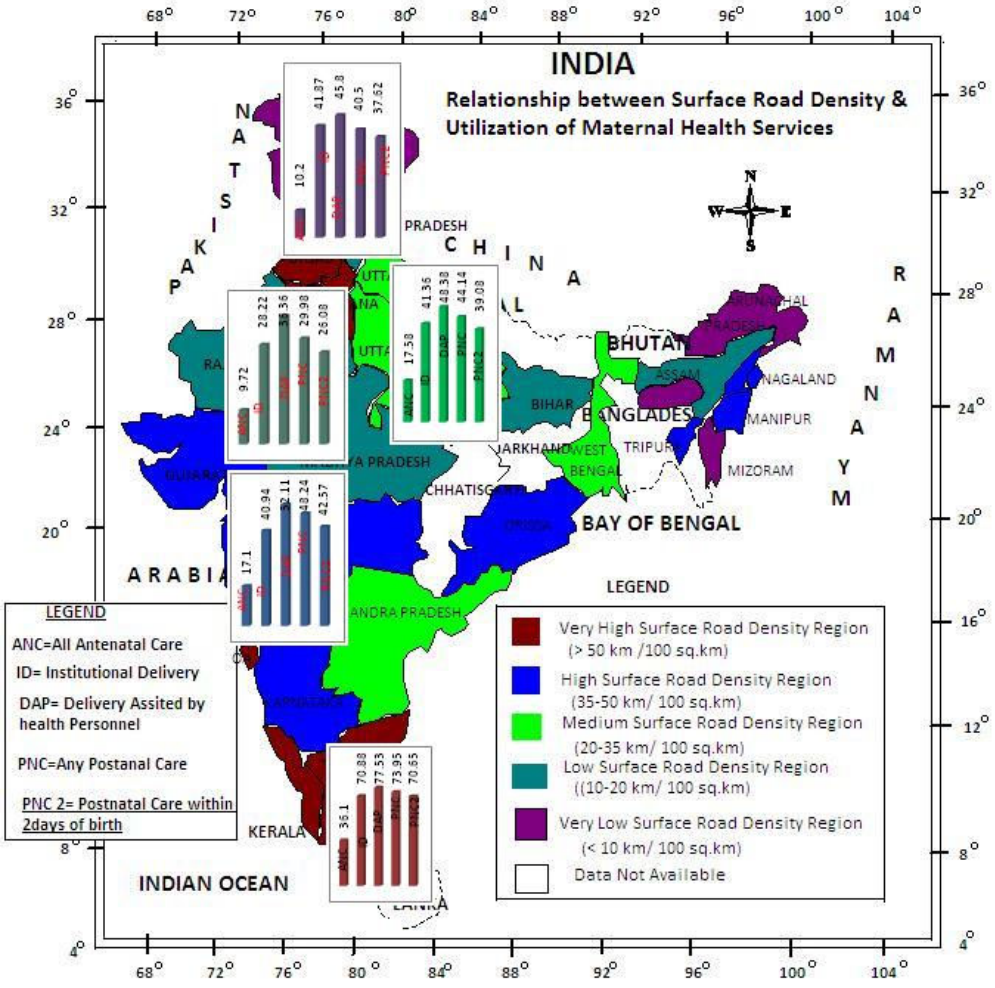

Fig 2.

Correlation between surface road density and maternal health indicators of different regions in India:

To concisely proves of the existence of the relationship of surface road and maternal health care present paragraphs discuss detailed results of statistically test correlation between the surface road density (predictor) and response variables like mother who received full antenatal care, institutional delivery, delivery assisted by health personnel and number of postnatal cares.

Table 7 reveals that surface road density played critical role for maternal health from pregnancy to lactating period. Full antenatal care and surface road density have a very high positive relationship (r=0.971) with 0.01significant level. There were positive correlations between surface road density and all the indicators of utilization of maternity services at a high 0.05significant level, which are ranges

from(r=0.936) for institutional birth, (r=0.950) for delivery assisted by health personnel, (r=0.939) for any postnatal check-up and (r=0.947) for postnatal check-up within two days of birth.

Table 7. Correlation between Surface road density and maternal health indicators of different regions

	Surface Road Density#	% Received all ANC@	% Birth delivered in Health Facility	delivery assisted by health personnel	Delivery with postnatal check-up	% Delivery with postnatal check-up within 2 days of birth
Surface Road Density	1	0.971**	0.936*	0.950*	0.939*	0.947*
% Received all ANC		1.000	0.946*	0.973**	0.972**	0.967**
% Birth delivered in Health Facility			1.000	0.986**	0.982**	0.992**
Delivery assisted by health personnel				1.000	0.999**	0.999**
Delivery with postnatal check-up					1.000	0.998**
% delivery with postnatal check-up within 2 days of birth						1

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). @For the last live birth in the five years preceding the survey, mother received three or more antenatal check-ups (with the first check-up within the first trimester of pregnancy), received two or more tetanus toxoid injections, and took iron and folic acid tablets or syrup for three or more months. #km per 100sq.km area

Another interesting observation is that full antenatal care is strongly associated with more institutional delivery (r=0.946) at 0.05 significant level as well as professional assisted delivery (r=0.972) and postnatal check- up (r=0.972) at a very high 0.01 significant level respectively. Table 7, again, portrayed that most of institutional delivery received professional help resulting more chance of postnatal check-ups. This stamen clearly shows that there exist significant relations among institutional delivery, professional assistance and postnatal check-ups, in which surface road network plays important role and associated with them all.

Conclusions and policy implications:

Present study shows that in spite of the Ministry of Health and Family Welfare's vigorous maternal health care programme, which have been about a decade, mother's utilization of health care facilities remains limited. According to NFHS-3 for only 15 percent pregnant women during the five years preceding the survey, received all types of recommended antenatal care in the country.

Undoubtedly, in some areas of India the many benefits associated with full antenatal care services have not reached a considerable proportion of the population especially in regions where accessibility become a problem. The special programme for maternal health like Reproductive and Child Health (RCH) has not achieved expected results. Though the country using uniform programme designed throughout, present analysis reveals that there is considerable regional diversity in the utilization of maternity services.

Here the role of road networks becomes very important. The surface road density based regionalisation clearly shows that accessibility play a very critical role for the success of any health care programme especially maternity health care services.

After making full analysis it is evident that there is a relationship between surface road density and maternal health care utilization. It is observes that good road connection with higher number of antenatal care, institutional delivery and postnatal care in each region. It is also established that mother who delivered in health facilities has more chance to received postnatal care than those who did not delivered in health facilities. It is common that assisted by health professional happened among mother who delivered in health facilities than who delivered in home. Therefore, it is interesting to note that geographical factors like relief and accessibility played significant role on reproductive health in India.

These results are very important for policy maker because there are the regions or states that require better road connection for greater utilization of maternity services. It may be mentioned here that any health care programme should incorporated accessibility data or sufficiency of road network connection to enhance client satisfactions as well as for the success of programme implementations. This clearly indicates that understanding of spatial variations and geographical diversity is a must for the success of health care programme in India.

References:

Ali. A (2000): "Role of Marital Status on Human Fertility Differential in Uttar Pradesh", *Hill Geographer*, Vol.XVI (2000) no.1&2.pp28-36.

Bhatia, J.C. and J. Cleland (1995): **"**Determinants of maternal care in a region of South India". *Health Transition Review* 5, 1995, pp. 127 – 142. Date of download 5/3/2008/pdf.

Census of India (2001): "Mizoram-Administrative Atlas". Registrar General & Census Commissioner, India.

Elo, I.T (1992): "Utilization of maternal health-care services in Peru: the role of women's education*" Health Transition Review* Vol. 2 , no. 1, 1992.pp1-20. Date of download 5/32008/pdf.

G. Debarchana (2006): "Effect of Mothers' Exposure to Electronic Mass Media on Knowledge and Use of Prenatal Care Services: A comparative Analysis of Indian States". *The Professional Geographer*, vol.58 no.3, pp278-293.

Kumar, R.M., M.Singh, and M.Kaur(1997): "Impact of health centre availability opn utilization of maternity care and pregnancy outcome in a rural is of Haryana". *Journal of the Indian Medical Association,* vol. 95, no. 8, pp448-450.

Mahmood. A (1998): "Statistical Methods in Geographical Studies", Rajesh Publication, New Delhi.1998.

Matthews Stephan. A & Bina Gubhaju. (2004): Contextual Influences on the Use of Antenatal Care in Nepal, *DHS Geographic Studies-2*, Calverton, Maryland USA: ORC Macro.

Muller. R.D (2007): "Sexual and Reproductive Transitions of Adolescents in Developing Countries", *International Union for the Scientific Studies of Population (IUSSP) - Policy & Research Papers no*. 20 2007,.Pp5-16.Paris cedex 20.France

Narayanan, P., Sharma, A., Vemuri, M.D (2000): "Adolescent fertility in India: An analysis based on National family Health Survey (NFHS) Data. p14.)"

Nayak D.K (2004): "Spatial Patterns of Health Care in the Khasi Hills of Meghalaya", *The Deccan Geographer*, Vol.42, no.1, June 2004, pp 81-96.

NFHS-2(1998-1999): Maternal and Reproductive Health Survey. *IIPS,* Mumbai.

NFHS-3 (2005-2006), IIPS, Mumbai.

NFHS-3 (2005-2006): Fact Sheets, North Eastern States (Provisional).*IIPS,* Mumbai.

on infant mortality in Indonesia, *Health Transition Review* Vol. 5, 1995, pp143 – 163. *Date* of download 5/3/2008/pdf.

Rani . M, Bonu. S and Harvey S(2007): "Differentials in the quality of antenatal care in India" *International Journal for Quality in Health Care Advance* Access published online on November 17, 2007. (Hptt://intqhc.oxfordjournals.org. date 2/5/2008).

Retherford, R.D., and M.Kim Choe(1993): "Media exposure increase contraceptive use". *National Family Health Survey Bulletin No. 7*. Mumbai: International Institute of Population Sciences; Honolulu: East-west Centre, Programme on Population.

Sartia, P.T., and R.Touminen(1993) "Use of health care services in two rural communities in Tanzania". *The Community Dentistry and Oral Epidemiology*, vol. 21. No. 3, pp133-135.

Sawhney, N(1993): "Management of family Welfare programme in Utter Pradesh: Infrastructure utilization, quality of services, supervision and MIS*". In Family Planning and MCH in Utter Pradesh (a review of studies),* ed. M.K.Premi, pp50-67. New Delhi: Indian Association for the Study of Population.

Short, Susan E. ans Zhai Fengying(2004): "Use of Maternal health services in rural China". *Population Studies*, Vol.58, No.1. pp3-19.

Sugarthi, K.S., V.K.Mishra, and R.D Retherford(2001): "Promoting institutional delivery in rural India: The role of prenatal care services". *National Family Health Survey Bulletin* No. 20. Mumbai: International Institute for population Sciences (IIPS) Honolulu (USA): East-west Centre. Population and Health Studies.