INTRODUCTION:

Primary health care has been officially recognized as the universal solution for improving world health since the Alma Ata Conference in 1978 (WHO/UNICEF, 1978). Prior to the Declaration the initiation in this regard had already been taken by India in the form of various committees set up from time to time to review the health status of India. The first such committee was set up prior to Independence in 1943 and was called the Health Survey and Development Committee, popularly known as the Bhore Committee, after its Chairman. The Committee submitted its report in 1946 and laid emphasis on the necessity to integrate public and curative health services with an outreach to the rural areas through the Primary Health Centers (PHCs) and Sub Centers (SCs).

However, limited physical access to primary health care continues to be a major impediment to achieving the goal of 'Health for All'. Primary health care, as the source of first resort care, is an important constituent of the health care system. It is regarded as the key to attaining an acceptable level of health for all as means of removing widespread inequities in health services, more particularly in the backward areas. It is the prerogative of the State to ensure equal access to health facilities for all its citizens, which should also form one of the most important health policy concerns of the State. Health centers have therefore been established to meet the basic health needs of communities residing in well-defined geographical areas.[1]

Distance, whether from a town, an educational facility or a health facility seems to play a prominent role in the various decision making processes of the family in the utilization of the best available health care and in improving their health status. Distance-decay effects (whereby rates of use of a facility decrease with increasing distance from its location) have been detected for various types of medical

[1] Dutt, P.R. (1963): *Rural Health Services in India, Primary Health Center*, Central Health Education Bureau, Ministry of Health and Family Planning, Govt. of India, New Delhi.

care and in various countries.[2] Ensuring physical accessibility or the potential for provider/consumer links to be formed is a key concern. Physical distance between provider and consumer has been recognized as an important barrier to care for several decades and studies have shown that people will not travel farther than 5 km to basic preventive and curative care.[3]

In general the most under-serviced population are in the rural areas which are characterized by low resource base and low incomes which make it uneconomical to provide tertiary and usually even secondary care and hence, primary care becomes all the more important with its various health centers. The very nature of rurality - a dispersed population and a scattered pattern of small service centers – endows considerable importance upon the spatial dimension of access to medical care in rural areas. Patients are frequently forced to journey considerable distances for medical care. Limited physical access to primary health care is a major factor contributing to poor health of population in rural areas.

Apart from the characteristic dispersed population of the rural areas and their relative backwardness, the rural infrastructure in itself is not well developed which hinders the utilization of health centers located far away especially during cases of emergency and also increases the travel time. Distance, from the patient's home is thus an important explanatory variable in influencing utilization. Increasing distance is not only a hindrance for seeking health care but is also associated with rising information costs, which would furthermore reduce access by limiting the patient's awareness of availability of various health care services.

Only a few studies have examined the relationship between distance to medical care and the use of health care services. In general, these studies have

[2] Joseph, A.E., and Phillips, D.R. (1984): 'Accessibility and Utilization: Geographical Perspectives on Health Care Delivery', Harper and Row, London.
[3] Stock, R. (1983): 'Distance and Utilization of Health Facilities in Rural Nigeria', *Social Science and Medicine*, vol. 17, pp. 563-570.

examined the effect of distance on patient's utilization of medical facilities. Though physical accessibility has been regarded as being important not much work has been done in this regard especially in the Indian context. It is, however, important to know whether accessibility is the major reason for the under-use of these facilities, so that the construction of basic health units for the rural population can be planned appropriately. This study is thus an attempt to fill this gap and attempts to examine how access variables influence the utilization of family and maternal and child health services.

In this paper, the main objective is to examine if distance to a health facility affects the health outcomes. Health outcomes are measured in terms of immunization, treatment for fever, antenatal care and safe delivery. Further an attempt has been made to study the impact of distance on health utilization for different types of health facilities, that is, Sub Center, Primary Health Center and Community Health Center.

DATA SOURCE, METHODOLOGY AND STUDY AREA

The analysis is based on data from India's 1998-99 National Family Health Survey (NFHS-2). International Institute of Population Sciences (IIPS) and ORC-Macro conducted this survey in two phases (phase-1 in 1998 and phase-2 in 1999).[4] The NFHS2 covered a representative sample of 89,199 ever-married women of the age group of 15-49 years residing in 91,196 households in all over India. This sample population represents 99 per cent of population living in India and 26 states including Delhi.

NFHS-2 has used three types of questionnaires, ***(1). Household Questionnaire, (2). Woman's Questionnaire and, (3). Village Questionnaire.*** The household questionnaire provides basic demographic and socio-economic information on household. The woman's questionnaire administered to the ever-

[4] IIPS and ORC-Macro, 2000.

married woman of reproductive age (15-49 years) obtains data on the socio-economic and demographic characteristics, reproductive history, quality care, contraceptive behaviour, antenatal, natal and postnatal care, immunization and health, fertility preference, status of women, husband's background and woman's work, knowledge about AIDS and so on. The village questionnaire collected information on various amenities available in sampled villages, such as, electricity, water, transportation, and education and health facilities.

For the purpose of analysis in this study the Woman's Questionnaire and the Village Questionnaire are used and the data in these two data sets are merged using appropriate programming for the purpose to get the required data. By merging these two files we can see the relationship between physical accessibility to health facilities and health outcomes.

The objectives of the study have been empirically tested using certain bivariate and multivariate statistical techniques. To find out the sole impact of distance on the utilization of services the technique of logistic regression is used since the response variables are dichotomous.

The selection of the study area is based on the performance of the health system in the different states and for this complete immunization is considered. In this way, two states in each category of high, medium and low level of achievement of complete immunization are selected. These states are Tamil Nadu and Himachal Pradesh in the category of high level of complete immunization, West Bengal and Gujarat as states with medium performance in complete immunization and finally Bihar and Rajasthan as states achieving a low level of complete immunization.

CONCEPTUAL FRAMEWORK OF THE STUDY

Health care utilization and outcomes are affected not just by distance but also by several other socio-economic factors, which gain relevance in the Indian setup. The dynamics of rural society affects the extent to which people are able to reach the

centers or seek redressal for their problems. Among the various socio-economic aspects, caste/tribe status, religion, educational status of women, their age, standard of living and level of exposure to mass media have been included as other determining variables in the analysis.

The dependent or the response variables in this study are the various maternal and child health services provided by the different health care facilities such as immunization, treatment for fever, antenatal care and safe delivery. These are considered to be the "health outcomes", the utilization of which depends on the physical distance from the health facilities (Fig:1).

(i) Immunization :

Immunization is a major focus of the child survival programmes throughout the world. The vaccination of children against six potentially deadly but preventable diseases (tuberculosis, diphtheria, pertussis, tetanus, poliomyelitis and measles) has been the cornerstone of the child health care system in India. For analysis in this study polio has been excluded and only partial immunization is considered since the intensive efforts against polio eradication has led to a wider coverage of areas including the backward areas and this as a whole might distort the impact of distance on the other immunization programmes. Therefore, children aged 12 to 23 months who have received some of the recommended immunizations, that is, one dose each of BCG and measles, and three doses each of DPT are considered.

(ii) Treatment for fever :

Mothers of children born during the three years preceding the survey were asked if their children suffered from fever during the two weeks preceding the survey, and if so, the type of treatment given.

(iii) Antenatal Care :

Antenatal care is named as one of the four pillars of the Safe Motherhood Initiative,[5]. Antenatal care consists of various components, which are first antenatal check-up within three months of the pregnancy confirmation, at least three pregnancy related visits to a health facility, adequate supply of iron and folic acid tablets for three months and two doses of tetanus toxoid injections during the period of pregnancy.

(iv) Safe Delivery :

Here for the analysis a delivery is considered to be safe if it is assisted by any of the health professional, that is, a doctor, a nurse or a midwife, auxiliary midwife, trained birth attendant, CS health professional or other health professional.

RESULTS

To analyze the main objective of the study which is to look at the effect of distance on the health outcomes firstly we look at results of the cross tabulations.

(a) CHILD CARE UTILIZATION

IMMUNIZATION

In almost all the states at the SC level a similar trend is observed. In general the utilization of the facility, i.e., SC, show a decreasing trend with increase in distance especially in the states of Bihar and Rajasthan. In Bihar the utilization has decreased from about 45 percent when the SC is in the village to about 25 percent when it is located 6 to10km further (Table 1). The same is the case with Rajasthan. In the rest of the states too a decline in the utilization is observed if the facility is in the village and between 1 to 5km. Beyond 5km the number of cases are also very few and hence not a clear picture can be observed.

[5] Bloom., S.S. et al., (1997): ' Dose Antenatal Care make a Difference to Safe Delivery? A study in urban Uttar Pradesh, India', *Health Policy and Planning*, vol.14 (1): pp. 38-48

Table 1: Level of Immunization by Distance to Health Facilities

Distance	Bihar	Rajasthan	Gujarat	West Bengal	Himachal Pradesh	Tamil Nadu
SUB CENTER						
Facility Present	44.9	54.3	82.7	78.9	93.7	92.4
1 – 5	39.4	50.9	76.0	70.5	93.8	93.6
6 – 10	26.1	42.0	90.6	75.0	100.0	100.0
Above 10	33.3	57.2	100.0	100.0	90.0	87.0
PRIMARY HEALTH CENTER						
Facility Present	42.7	58.7	82.9	76.5	100.0	93.9
1 – 5	39.1	52.2	81.8	73.0	96.3	90.0
6 – 10	39.4	47.9	88.2	76.9	89.2	94.4
Above 10	35.7	54.0	78.0	79.2	93.3	93.5
COMMUNITY HEALTH CENTER						
Facility Present	40.4	69.2	92.9	82.4	90.0	89.0
1 – 5	42.1	46.7	100.0	75.0	97.7	100.0
6 – 10	33.8	58.8	90.5	73.4	93.8	96.3
Above 10	39.3	50.6	77.5	75.4	92.9	92.5

***Source*:** Computed from NFHS 2, 98 – 99.

Going to the higher order facility of primary health care, that is, PHC, again in Bihar there is a clear decline in the percentage of children getting immunized, as there is increase in the distance. The decline is from 43 percent if the facility is within the village to about 35 percent if it is located beyond 10km. Rajasthan and Himachal Pradesh also reveal a similar trend. Distance does not seem to make a profound influence on the utilization of the service in the three states of Gujarat, West Bengal and Tamil Nadu.

A CHC being of the highest order in the hierarchy of primary health care also shows some decline in the service utilization with an increase in distance except in the case of Tamil Nadu. Fewer children are immunized as distance increases from CHC. This can be seen in the states of West Bengal and Gujarat. In Tamil Nadu again distance does not seem to cause much effect. In the case of Bihar and Rajasthan too the distribution is somewhat skewed.

TREATMENT FOR FEVER

The treatment seeking behaviour for fever in Bihar showed a decline with the SC being located at a greater distance (Table 2). The decline is from 65 percent with the facility in the village to 55 percent with the facility beyond 10km. Not a very smooth trend, though, can be seen in the rest of the states. In West Bengal and Rajasthan too some decline is observed but in Tamil Nadu again the effect of distance in utilization of the service is negated with almost an equal number of children seeking treatment form a SC located at varying distances.

Table 2: Treatment for Fever by Distance to Health Facilities

Distance	Bihar	Rajasthan	Gujarat	West Bengal	Himachal Pradesh	Tamil Nadu
SUB CENTER						
Facility Present	63.1	55.1	64.8	67.7	92.5	80.6
1 – 5	65.5	60.7	63.8	68.8	89.3	79.0
6 – 10	62.6	51.1	73.7	66.7	94.7	80.0
Above 10	55.7	50.0	100.0	00.0	100.0	90.0
PRIMARY HEALTH CENTER						
Facility Present	60.0	63.4	56.5	73.9	95.5	69.4
1 – 5	70.2	59.3	66.7	74.7	93.4	80.3
6 – 10	65.3	54.6	73.8	59.5	91.7	86.0
Above 10	51.2	54.0	61.5	57.6	89.5	83.9
COMMUNITY HEALTH CENTER						
Facility Present	59.5	73.9	63.6	80.8	90.0	76.7
1 – 5	70.7	63.0	66.7	71.4	92.9	78.6
6 – 10	63.9	63.8	70.2	70.0	93.0	88.0
Above 10	60.6	52.8	64.9	62.6	92.1	81.4

***Source*:** Computed from NFHS 2, 98 – 99.

When we look at the utilization of a PHC with regard to treatment for fever a clear decline is observed in the states of Rajasthan and Himachal Pradesh. The facility seems to be less utilized when it is beyond 10km than when it is present within the village in these two states. The decline is from 63 percent to 54 percent and from 96 percent to 90 percent in Rajasthan and Himachal Pradesh respectively. In the rest of the states of Bihar, Gujarat, West Bengal and Tamil Nadu distance does not seem to cause much difference in seeking treatment for fever.

A clear decline in the percentage of children taken to a CHC for seeking treatment for fever is seen in the states of Rajasthan and West Bengal. In Rajasthan only 53percent of the children are treated for fever if the facility is located beyond 10km than when it is located within the village (74 percent). In West Bengal also about 81 percent of the children received treatment in the health center if it is located within the village and about 62 percent when located further. In the case of CHC again distance has no effect in Tamil Nadu. In the other three states of Himachal Pradesh, Gujarat and Bihar an equal number of children seek treatment for fever irrespective of distance.

(b) MATERNAL CARE UTILIZATION

ANTENATAL CARE

Table 3 shows the percentage of women who received antenatal care in a SC or a PHC or a CHC according to distance. There is marked decline in the percentage of women getting antenatal care with distance in the state of Bihar. Here 71 percent of the women get some antenatal care in the form of visits to doctor, iron and folic acid tablets or tetanus toxoid injections, if the facility is within the village and it declines to about 52 percent if it is outside the village. But distance in Tamil Nadu shows no barrier with regards to the attainment of antenatal care; where above 90 percent of the women seek antenatal care irrespective of distance. A marked decline in the utilization of service is seen in Himachal Pradesh also. A decline of about 50 percent is observed in West Bengal if the facility is located beyond 10km. In the rest of the states though a decline is observed, it is not prominent enough to derive at any conclusion.

Considering the PHC in table 3 a decline in service utilization is observed in almost all the states except Tamil Nadu. In Bihar, the trend is the same as in the case of the SC. Rajasthan, Gujarat and Himachal Pradesh also show decline in the percentage of women getting antenatal care with increase in the distance. For instance in Rajasthan three-fourth of the women get antenatal care if the health center is in the village and only 58 percent get some type of antenatal care if it is located outside the village.

Table 3: Antenatal Care by Distance to Health Facilities

Distance	Bihar	Rajasthan	Gujarat	West Bengal	Himachal Pradesh	Tamil Nadu
SUB CENTER						
Facility Present	70.9	65.0	84.1	92.0	92.5	92.1
1 – 5	67.0	60.0	85.6	92.5	91.7	94.5
6 – 10	52.6	48.7	87.6	100.0	73.0	100.0
Above 10	51.7	62.8	88.9	50.0	81.3	94.0
PRIMARY HEALTH CENTER						
Facility Present	70.2	75.4	91.3	90.0	96.5	94.2
1 – 5	68.3	66.9	80.0	94.3	97.0	89.4
6 – 10	61.8	58.3	87.8	93.0	85.2	96.0
Above 10	58.1	58.5	83.2	87.0	79.9	94.4
COMMUNITY HEALTH CENTER						
Facility Present	65.6	67.8	88.7	95.6	97.3	95.1
1 – 5	69.8	59.3	88.1	97.2	95.9	90.9
6 – 10	64.2	69.5	84.0	93.0	87.6	93.5
Above 10	62.7	59.9	84.8	89.3	87.5	92.5

***Source*:** Computed from NFHS 2, 98 – 99.

At the CHC level, though a decline is observed but it is not prominent across all the states. In Gujarat some decline is observed from 89 percent when a CHC is in the village to 85 percent when it is beyond 10 km. In Himachal Pradesh also 10 percent decline from 97 percent to 87 percent when the facility is in the village and 10 km further respectively. In the other states of Bihar, Rajasthan and West Bengal some decline is evident. Tamil Nadu as has been the case earlier shows no impact of distance on the utilization of antenatal care.

SAFE DELIVERY

A clear decline in the percentage of women having safe delivery for births during three years preceding the survey is observed in all the states (Table 3). Though the overall situation of safe delivery is poor in Bihar the decline is very sharp as the distance is increasing, fewer women (8.5 percent) have a safe delivery if the facility is at a greater distance. In all the states roughly 10 to 15 percent decline is

observed in the percentage of women having a safe delivery if a SC is located within the village and if it is located beyond 10 km.

The decline is even more prominent in some of the states at the PHC level especially in Rajasthan and Gujarat. In Gujarat about 54 percent of the women have a safe delivery if they are in the village having a PHC and about 37 percent have a safe delivery if they are residing 10 or more km away from a PHC. In Rajasthan also 49 percent women have a safe delivery if they are in close proximity of the PHC and only about 25 percent travel beyond 10 km to have a safe delivery. In the rest of the states the trend is more or less the same.

Table 4: Safe Delivery by Distance to Health Facilities

Distance	**Bihar**	**Rajasthan**	**Gujarat**	**West Bengal**	**Himachal Pradesh**	**Tamil Nadu**
SUB CENTER						
Facility Present	24.1	31.2	43.5	36.2	41.2	77.0
1 – 5	21.7	28.7	38.7	44.0	35.7	84.4
6 – 10	16.1	22.2	41.0	55.6	22.2	79.2
Above 10	8.5	29.2	30.6	25.0	37.5	52.0
PRIMARY HEALTH CENTER						
Facility Present	19.7	48.8	53.9	27.1	61.6	75.5
1 – 5	26.6	35.2	39.5	36.8	39.6	78.0
6 – 10	16.8	24.7	41.4	40.6	26.7	80.6
Above 10	13.8	25.0	37.1	31.5	34.0	75.2
COMMUNITY HEALTH CENTER						
Facility Present	16.0	48.3	56.6	45.6	56.8	77.8
1 – 5	29.7	39.2	46.3	38.3	41.3	80.3
6 – 10	26.4	34.8	41.3	42.1	33.0	81.7
Above 10	14.1	26.0	39.4	29.5	36.0	76.6

***Source*:** Computed from NFHS 2, 98 – 99.

The location of a CHC does not seem to make much impact on the women in having a safe delivery in almost all the states. The pattern observed is not smooth enough to arrive at any conclusion.

LOGIT REGRESSION ANALYSIS

Though the bivariate analysis discussed in the previous section, throws light on the relationship between physical accessibility and the utilization of health facilities, it does not control for the influence of the other predictor variables, as discussed in the conceptual framework, for instance, religion, caste, education, age of the mother, standard of living and exposure to mass media. These predictor variables along with distance influence the behaviour pattern of the women in seeking certain services provided in the different health care facilities. Therefore, logistic regression is used for analyzing the sole influence of distance on health care utilization as the response variables are dichotomous and their distribution is skewed.

The exponential parameter in the table exp(b) is called the odds ratio. It represents a proportional increase if the odds is greater than 1.0 or decrease if it is less than 1.0 for odds of utilizing the health facility compared with the reference category which in this case is facility present in the village. Thus, here the sole effect of distance is analysed. Here the odds ratio only for distance from an SC, PHC and CHC are presented since the basic objective is to analyse the impact of distance on the utilization of services. The purpose to include the other variables was only to control for them.

IMMUNIZATION

Table 5 shows the odds ratio for the effect of distance on the level of attainment of immunization in the different study states. Though a decline in immunization levels with distance is observed in almost all the states, this decline is prominent in few states. In Bihar, at the SC level we find that, children aged 12-23 months, residing 6 to 10 km from a SC are 57 percent (odds ratio 0.430) less likely to be taken for immunization when compared with children residing in a village having a SC and this is statistically significant at 1 percent level of confidence. Similar is the case with Rajasthan where children are 54 percent (odds ratio 0.463) less likely to be immunized when a SC is located 6 to 10 km further than when located in the village, which is again statistically significant. In Bihar and Rajasthan children are 20 percent

and 10 percent less likely to be immunized if a SC is located further than 10 km. The respective odds ratio being 0.804 and 0.915.

Table 5: Results of the Logistic Regression Analysis for Immunization

Distance	Bihar	Rajasthan	Gujarat	West Bengal	Himachal Pradesh	Tamil Nadu
SUB CENTER						
Facility Present[1]						
1 – 5	0.849	0.778	0.486	0.632	0.593	1.327
6 – 10	0.430**	0.463*	3.501	0.867	4460.148	3029.781
Above 10	0.804	0.915	3839.765	647.901	1.609	2.283
PRIMARY HEALTH CENTER						
Facility Present[1]						
1 – 5	0.795	0.842	1.265	0.475	0.000	0.257
6 – 10	0.805	0.738	1.806	0.781	0.000	0.273
Above 10	0.698	0.976	0.799	0.763	0.000	1.346
COMMUNITY HEALTH CENTER						
Facility Present[1]						
1 – 5	0.955	0.389*	968.968	0.445	22.712*	2167.206
6 – 10	0.682	0.663	0.348	0.427	8.342	10.948
Above 10	0.998	0.522	0.130*	0.404	4.586	2.797*

Source: Computed from output tables

1: Reference category

* Significant at 5 per cent level of confidence

** Significant at 1 per cent level of confidence

The location of the PHC also seems to have an effect on the utilization of the service with increase in distance. In Bihar, again the effect of distance seems to be more profound where children are 30 percent (odds ratio 0.698) less likely to go for immunization with a PHC beyond 10 km than when located in the village. In the case of Rajasthan, Gujarat and West Bengal also, distance seem to cause some effect on the likelihood of using the service provided in the facility if it is located beyond the accessible range. In Rajasthan about 27 percent (odds ratio 0.738) less likelihood is there for children being immunized if a PHC is located 6 to 10 km than when it is in very close proximity. In West Bengal also children are approximately 22 per cent and 24 per cent less likely to get immunization when a PHC is between 6 to 10 km and

beyond 10 km than when present within the village. The respective odds ratio being 0.781 and 0.763. The location of a SC in Tamil Nadu does not seem to cause much influence on the utilization of the facility but in the case of PHC a profound influence is seen when it is located between 1 to 5km or 6 to 10 km. Here children are 75 percent and 73 percent less likely to be immunized when the facility is between 1 to 5 km and 6 to 10 km than when present in the village. The odds ratio for 1 to 5 km and 6 to 10 km being 0.257 and 0.273 respectively.

Considering the effect of distance in the case of higher order facility, which is a CHC it is seen that in Rajasthan children are 61 per cent less likely to be immunized (odds ratio 0.389) when it is located between 1 to 5 km than when located in the village, and this is statistically significant. Here again, 34 percent (odds ratio 0.663) and 48 percent (odds ratio 0.522) less likelihood is there for children being immunized when a CHC is located between 6 to 10 km and beyond 10 km respectively than when located in the village. In Gujarat there is 65 percent (odds ratio 0.348) less likelihood to get immunized when it is located between 6 to 10 km and about 87 percent (odds ratio 0.130) less likely when it is beyond 10 km, which is statistically significant. In West Bengal, at all the three categories of distance a marked decline in the likelihood of using the facility is seen. The likelihood of children getting immunized is less by 55 percent (odds ratio 0.445), 57 percent (odds ratio 0.427) and 60 percent (odds ratio 0.404) for a CHC located at 1 to 5 km, 6 to 10 km and beyond 10 km respectively than when the facility is located within the village. In the states of Himachal Pradesh and Tamil Nadu distance does not seem to cause an influence on the utilization of the service.

TREATMENT FOR FEVER

The relationship between distance and the utilization of the different health facilities for the treatment of fever, as in the case of immunization does not seem to be very significant, though there is some decline in the utilization of the service in some of the states.

Table 6: Results of the Logistic Regression Analysis for Treatment of Fever

Distance	Bihar	Rajasthan	Gujarat	West Bengal	Himachal Pradesh	Tamil Nadu
SUB CENTER						
Facility Present[1]						
1 – 5	1.053	1.196	0.953	1.074	0.760	1.306
6 – 10	1.034	0.864	2.057	0.982	1.173	0.980
Above 10	0.939	0.889	4566.881	0.000	1223.255	3.596
PRIMARY HEALTH CENTER						
Facility Present[1]						
1– 5	1.417*	0.919	1.601	1.013	1.714	1.721
6 – 10	1.197	0.884	2.461	0.558	2.644	2.741*
Above 10	0.702	0.799	1.284	0.377	1.083	3.417
COMMUNITY HEALTH CENTER						
Facility Present[1]						
1 – 5	1.499*	0.759	0.834	0.526	4.368	1.290
6 – 10	1.213	0.844	1.252	0.560	6.782	1.927
Above 10	1.122	0.541	0.791	0.349*	2.887	1.086

Source: Computed from output tables

1: Reference category

* Significant at 5 per cent level of confidence

** Significant at 1 per cent level of confidence

At the SC level in Rajasthan children are 11 percent (odds ratio 0.889) less likely to be treated for fever if the SC is located beyond 10 km as compared to children having the facility in the village. In the rest of the states distance does not seem to influence the treatment seeking behaviour for fever.

Again looking from table 6 in most of the states distance does not have much impact on the treatment-seeking pattern for fever. It is only in Bihar, West Bengal and Rajasthan that some decline is observed. In Rajasthan especially, children are nearly 20 percent (odds ratio 0.799) less likely to be treated for fever if the facility, that is, a PHC in this case is located beyond 10 km compared to when it is located in the village and 12 per cent less likely when it is located between 6 to 10 km. In West Bengal, distance to PHC has a great impact on the service utilization. About 45 percent (odds ratio 0.558) less likelihood is there for the children being taken to a

PHC located between 6 to 10 km and 63 percent (odds ratio 0.377) less likely when it is located beyond 10 km as compared to the location of a PHC within the village. In the rest of the states more or less a similar pattern is observed with distance having less influence on the treatment seeking behaviour.

For a CHC again, a clear decline in the likelihood for treatment of fever is seen in the two states of Rajasthan and West Bengal. In Rajasthan about one fourth less likelihood is seen among children to utilize a CHC for the treatment of fever than children with a CHC in the village. The odds ratio of this is 0.759. Children when compared to those having a CHC within the village are half as likely to use the facility when it is beyond 10 km. In West Bengal children are 65 percent (odds ratio 0.349) less likely to use the CHC when it is located beyond 10 km and this is statistically significant at 1 percent level of confidence. The odds ratio being 0.526 and 0.560 for distances between 1 to 5 km and 6 to 10 km respectively. In Gujarat children are 20 percent (odds ratio 0.791) less likely to avail the treatment when a CHC is located above 10 km than when it is present in the village.

ANTENATAL CARE

Coming to the utilization of maternal care we first of all look at the utilization of antenatal care. A significant decline is observed in the percentage of women utilizing the service with an increase in the distance (table 7), as regards the SC especially in the three states of Bihar, Rajasthan and Himachal Pradesh. In Bihar about slightly more than half of the women are less likely to go for any type of antenatal care if the SC is located 6 to 10 km than when it is located in the village. The odds ratio being 0.476 and it is highly significant. Again a very significant decline of 48 percent (odds ratio 0.541) in availing antenatal care is observed among women if the SC is located further than 10km. Women with a SC between 1 to 5 km are also 15 percent (odds ratio 0.858) less likely to have some antenatal care than the women who have a SC in the village. In Rajasthan also the propensity to use the service significantly decline with increase in the distance. About one fourth of women (odds ratio 0.748) are less likely to have antenatal care when the SC is

between 1 to 5 km and 47 percent (odds ratio 0.525) less likely when the SC is between 6 to 10 km. About 14 percent are less likely when it is even beyond 10 km or so. And this is highly significant. In Himachal Pradesh also, women are 75 percent (odds ratio 0.256) show a less likelihood in getting antenatal care when the SC is located between 6 to 10 km and about 36 percent are less likely to use the facility when it is beyond 10 km when compared to women having the facility in the village.

As regards the PHC, we can see from table 7 that in most of the study states significant decline is observed when the facility is not located within close proximity.

Table 7: Results of the Logistic Regression Analysis for Antenatal care

Distance	**Bihar**	**Rajasthan**	**Gujarat**	**West Bengal**	**Himachal Pradesh**	**Tamil Nadu**
SUB CENTER						
Facility Present[1]						
1 – 5	0.858	0.748**	1.123	1.176	0.923	1.633
6 – 10	0.476**	0.525**	1.316	653.551	0.256**	3067.702
Above 10	0.541**	0.860	1.644	0.031**	0.642	1.435
PRIMARY HEALTH CENTER						
Facility Present[1]						
1 – 5	0.851	0.724*	0.513*	1.624	1.258	0.466
6 – 10	0.654**	0.576**	0.815	1.410	0.235*	1.376
Above 10	0.628**	0.555**	0.660	0.654	0.202*	1.092
COMMUNITY HEALTH CENTER						
Facility Present[1]						
1 – 5	1.085	0.819	0.699	1.764	1.203	0.390
6 – 10	0.874	1.246	0.594	0.645	0.328	0.663
Above 10	0.927	0.899	0.717	0.399	0.341*	0.452

Source: Computed from tables AI to AVI

1: Reference category

* Significant at 5 per cent level of confidence

** Significant at 1 per cent level of confidence

In Bihar, women are, 35 percent (odds ratio 0.654) less likely to have some sort of antenatal care when it is between 6 to 10 km than when it is in the village.

This is statistically significant. Women show 37 percent (odds ratio 0.628) less likelihood to use a PHC when they are residing 10 km away and this is highly significant. In Rajasthan also, women are 25 percent (odds ratio 0.748) less likely to have antenatal care if the PHC is between 1 to 5 km and 42 percent (odds ratio 0.576) less likely if it is between 6 to 10 km and 45 percent less likely if it is beyond 10 km when compared to the presence of a PHC in the village. And all these are statistically significant. Gujarat also shows a similar trend where women are half (odds ratio 0.513) as likely to get antenatal care if the PHC is not located in the village and this shows a significant result. In Gujarat women residing 6 to 10 km and beyond 10 km are 20 percent and 34 percent less likely to receive antenatal care respectively when compared to women residing in the village with a PHC. The respective odds ratio is 0.815 and 0.660. In Himachal Pradesh highly significant decline of 76 percent is seen in the likelihood of women having antenatal care if a PHC is between 6 to 10 km. The odds ratio being 0.235. And women are 80 percent (odds ratio 0.202) less likely to get antenatal care when the PHC is beyond 10 km. This is also statistically significant.

A CHC being far inaccessible than the SC or PHC show marked declines in its utilization with increasing distance. In Bihar women are 13 percent less likely to go for antenatal care if it is between 6 to 10 km. In Gujarat, a decline is very prominent with increasing distance, women are 30 percent less likely to avail the service if it is located between 1 to 5 km, 40 percent (odds ratio 0.594) less likely when located between 6 to 10 km and 30 percent (odds ratio 0.717) when it is beyond 10 km. Tamil Nadu, as seen earlier also does not seem to have much impact of distance on the utilization of services but in the case of CHC a decline in the utilization of the service is observed. Women are 60 percent (odds ratio 0.390) less likely to utilize the CHC when it is located between 1 to 5 km. If a CHC is located even beyond 10 km, women are 55 percent (odds ratio 0.452) less likely to use the facility when compared to women who reside in a village having a CHC, and this is statistically significant. Thus distance seems to have a great impact on the utilization

of antenatal care services, again in the lesser developed states like Bihar and Rajasthan.

SAFE DELIVERY

In Bihar women residing 1 to 5 km away from a SC are 10 percent (odds ratio 0.899) less likely to have a safe delivery compared with women residing in a village having a SC (Table 8). Similarly, women residing 6 to 10 km and more than 10 km from a SC are 27 percent and 60 percent les likely to have a safe delivery. The corresponding odds ratio being 0.725 and 0.406 respectively which is statistically highly significant. In Rajasthan women residing between 1 to 5 km away from a SC are 25 per cent less likely to have a safe delivery. The odds ratio of which is 0.748. Women in Rajasthan are 37 percent (odds ratio 0.6290) less likely to go for safe delivery when the SC is 6 to 10 km further from their place of residence which is also significant (Table 8).

Table 8: Results of the Logistic Regression Analysis for Safe Delivery

Distance	**Bihar**	**Rajasthan**	**Gujarat**	**West Bengal**	**Himachal Pradesh**	**Tamil Nadu**
SUB CENTER						
Facility Present[1]						
1 – 5	0.899	0.848	0.747	0.785	0.830	1.683*
6 – 10	0.725*	0.629*	0.935	2.060	0.474*	1.565
Above 10	0.406**	0.908	0.628	0.520	1.179	0.226**
PRIMARY HEALTH CENTER						
Facility Present[1]						
1 – 5	1.432*	0.600**	0.704	0.948	0.489*	1.347
6 – 10	0.836	0.402**	0.670	1.186	0.280**	1.506
Above 10	0.748	0.404**	0.567*	0.709	0.534**	1.025
COMMUNITY HEALTH CENTER						
Facility Present[1]						
1 – 5	2.072**	0.799	0.437*	0.580	0.940	1.156
6 – 10	1.916**	0.613*	0.339**	0.745	0.754	1.534
Above 10	0.933	0.448**	0.393**	0.430**	0.946	0.901

Source: Computed from tables AI to AVI * Significant at 5 per cent level of confidence

1: Reference category ** Significant at 1 per cent level of confidence

In Gujarat women residing further than 10 km from a SC are 47 percent (odds ratio 0.628) less likely to have a safe delivery. In West Bengal the corresponding percentage for 10 km and above is 48 percent (odds ratio 0.520) and in Tamil Nadu for the same category it is 77 percent (odds ratio 0.226) and this is statistically highly significant. In Himachal Pradesh women residing 6 to 10 km away from a SC show 53 percent (odds ratio 0.474) less likelihood to have a safe delivery than women who reside in the village with a SC.

In Rajasthan highly significant declines are seen in the likelihood of women have a safe delivery if a PHC is located further from their residence. Here women who reside 1 to 5 km away from a PHC are 40 percent (odds ratio 0.600) less likely to have a safe delivery, showing a highly significant result. The decline becomes further prominent with increasing distance, where women residing 6 to 10 km and beyond 10 km from a PHC are less likely to have safe delivery than women who reside in the village having a PHC. The respective odds ratios are 0.402 and 0.404, which are also statistically highly significant. In Gujarat women are 30 percent (odds ratio 0.704) less likely to have a safe delivery when they are residing 1 to 5 km away from a PHC and 43 percent when they are residing beyond 10 km from a PHC, this shows a high significance statistically. Himachal Pradesh also shows marked declines in the percentage of women having a safe delivery. About 51 percent (odds ratio 0.480), 72 percent (odds ratio 0.280) and 47 percent (odds ratio 0.534) less likelihood is seen among women residing 1 to 5, 6 to 10 and beyond 10 km respectively are les likely to use the facility for safe delivery than women residing in the village having a PHC. And these are statistically highly significant.

In a CHC, especially in Rajasthan and Gujarat the impact of distance is highly significant. In Rajasthan women are 39 percent less likely to have a safe delivery when the facility is located between 6 to 10 km than the women residing in the village. The odds ratio of the same being 0.613 which is statistically significant. About 56 percent (odds ratio 0.448) less likelihood is observed among the women of

Rajasthan to have a safe delivery when the facility is beyond 10km. This is highly significant at 1 percent level of confidence.

In Gujarat also a prominent decline is observed. About 57 percent less likelihood is seen among women residing 1 to 5 km from the health facility to have a safe delivery than the women residing in the village having a facility. This is statistically significant. A less likelihood of 66 percent (odds ratio 0.339) and 61 percent (odds ratio 0.393) is seen among women to have a safe delivery when they are residing 6 to 10km and beyond 10 km respectively. And these are highly significant. In the other states though a decline is there with increasing distance it is not very significant.

It is seen from the results of the logistic regression analysis that distance does have an impact on the utilization of the services even when the other predictor variables are controlled.

CONCLUSION

Access in any form plays an important role in the utilization of medical care facilities. Historically, improving access has been widely accepted as a primary strategy for increasing the utilization of medical care especially in the rural areas.

The findings of the study also reveals that distance has strong impact on the utilization and outcome of health care in the states that are less developed socially and economically. In Bihar and Rajasthan a decline with distance is observed in the utilization of maternal and child health care, especially maternal care - antenatal care and safe delivery. The states of Gujarat, Rajasthan and Himachal Pradesh also fairly conform to the hypothesis. It is in Tamil Nadu alone that the impact of distance on the utilization of these services does not show a profound impact. As is well known, the coverage of the health services in Tamil Nadu is near universal and even the remote areas have also been covered by some form of health services. Further, the

public transportation system in the state is also well developed and a large number of buses run which have linked all the villages to the urban centers.[6] The improved access to urban centers facilitates the utilization of health services by people residing in far-flung areas. In contrast, in states where the health outcomes are poor such as the northern states, the coverage of health services is restricted to the immediate vicinity of the health centers and the distance decay effect is profound.

The study also reveals that wherever distance shows an impact on the utilization of services the impact is more on maternal health care than on child health care. Maternal health care measured through antenatal care and safe delivery shows a marked decline in utilization with increasing distance especially in the less developed states of Bihar and Rajasthan. Traditionally, in rural India pregnancy is considered a natural state rather than a condition requiring some kind of medical care and attention. Hence, such kind of perceptions and beliefs constitute the 'lay health culture' which has substantial effects on the utilization of the services provided and distance plays the role of an intervening factor in the attainment of maternal care. This is more prominent in states where poverty and illiteracy are widespread.

In the case of child health care, that is, immunization and treatment for fever, the study finds that distance has less impact. This could be attributed to the fact that in case of immunization the Universal Immunization Programme (UIP) initiated in 1985 has had immense success since then. The programme has a wide coverage even in the backward states, and essential care at the community level is being implemented in all the districts of the country. And since one of the goals of the National Population Policy is to immunize all children by the year 2010 the programme has been intensified further with an even wider coverage.

As for the treatment for fever, the private health care providers who provide most of the curative health care probably distorts the distance decay effect found in

[6] Ramasundaram S, (1995): 'Causes for the Rapid Fertility Decline in Tamil Nadu: A Policy Planner's Perspective', *Demography India*, vol.24 (1), pp.13-21.

the case of other health care services such as antenatal care. Mahal et al.,[7] found that the share of the private sector in the out patient care is around 82 percent whereas that of public is only 18 percent which clearly explains why distance does not have much impact on the attainment of medical care for the treatment of fever, since the study only focused on the public health care facilities. On the other hand 50 percent of the antenatal care is provided by the public health sector and 40 percent by the private.

The findings also show better health outcomes in villages which have a PHC or a CHC compared with villages which have a SC. Studies have shown that a large fraction of sub-centers are not functional because of lack of proper buildings and resident health workers. For instance, a study by Iyer et al.,[8] reports that one half of all the SCs operate from either makeshift or rented accommodations. Again the non-residence of the health workers in the health facilities further constraints their utilization. Verma and Roy[9] in their study reported that only about 11 percent of the health workers reside in the staff quarters. All these factors together contribute to the low effectiveness of SC's in improving the health outcomes of the population in their service areas.

A major goal of this study has been to bring to the notice of programme managers and policy makers the potential effects of improved physical accessibility on the attainment of proper child and maternal care in the rural areas through the Primary Health Care.

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[7] Mahal, et al., (2000): *Who Benefits from Public Health Spending in India*, NCAER.

[8] Iyer, A, and A., Jesani, (1999): Barriers to Quality of Care: The Experience of Auxiliary Nurse Midwives in Rural Maharashtra, in M.A.,Koeing and M.E., Khan (eds), *Improving Quality of Care in India's Family Welfare Programme: The Challenge Ahead*, The Population Council, New York, pp.210-237.

[9] Verma, R.K., and T.K., Roy, (1999): Accessing the Quality of Family Planning Service Providers in Four Indian States, in M.A.,Koeing and M.E., Khan (eds), *Improving Quality of Care in India's Family Welfare Programme: The Challenge Ahead*,The Population Council, New York , pp.210-237.

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Fig: 1 A Framework for Analysis of Impact of Physical Accessibility on Health Care Utilization