

Accessibility of Healthcare Facilities Across the Hill and Valley Districts of Northeastern States of India

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Abstract

Health is the state of complete physical, social and mental well-being. Health is important for wealth. Availability of good healthcare facilities helps in ensuring access to healthcare. However, mere availability does not guarantee access to healthcare. The health care facilities need to be accessible at first. This paper studies the patterns of accessibility at the hills and valley districts of the Northeastern states of India at Sub-centres (SC's), Primary Health Centres (PHC's) and Community Health Centres (CHC's) and accessibility of human resources from spatial and spatial point of view. Descriptive statistics is adopted for data interpretation while the unit-level data from DLHS-4 (2012-13) is used for the study. The patterns are shown in the choropleth maps with the help of Arc Gis software. The study found that both spatial and non-spatial plays an important role in ensuring accessibility to healthcare in the Northeastern states of India.

Keywords: *Accessibility, Sub-Centres, Primary Healthcare Centres, Community Healthcare Centres, Spatial factors, Non-Spatial factors.*

1. Introduction

Access to appropriate and adequate healthcare is of the essence for good health. According to Kumar (2004) "Access to healthcare services includes many geographic, economic, cultural and political factors. Among these, geographic access (generally measured in terms of travelling cost) is the most significant factor in the utilization of health services". Guagliardo (2004) defined access in 'stages and dimensions' which signifies the potential for healthcare and realized potential for healthcare. Healthcare can be realized only when all the barriers to healthcare are overcome. Here lies the crux of access to healthcare or accessibility which is often not actualized. Based on the literature studied, accessibility has been dominated by two main sub-themes which are spatial and non-spatial accessibility. Accessibility as a spatial concept means the geographical barrier (distance, topography) one needs to overcome to avail the healthcare facilities be it public, private or others and in turn, generating a geographical pattern. The spatial dimension plays a dominant role in the northeast as the

region is known for rough topography which in turn affects the location of healthcare facilities such as sub-centre, primary health centres, community health centres and district hospitals. Meanwhile, the non-spatial concept of accessibility can be simply defined as the non-geographic part comprising of culture, economic, social and political aspects of the people.

The present study tries to show the pattern of accessibility of healthcare facilities available in the hill and valley districts of the Northeastern states of India from the spatial and non-spatial point of view across the Sub-centres (SC's), Primary Health Centres (PHC's) and Community Health Centres (CHC's) and accessibility of human resources respectively.

The spatial dimension plays a dominant role in the northeast as the region is known for rough topography which in turn affects the location of healthcare facilities such as sub-centre, primary health centres, community health centres and district hospitals. Accessibility has always been hampered by the spatial relief of the region as healthcare facilities are unequally located across the space-based upon the favourability of the topography. This is manifested in the northeastern region comprising of 72 mountains, hills and plateau regions (Taher and Ahmed, 2012) posing hindrance to the development and construction of road network due to the high cost of construction as per the National Transport Development Policy Committee (NTDPC, 2012) in turn affecting the location and construction of buildings for public healthcare facilities. The absence of proper road itself again makes the process of construction difficult and expensive as the construction agencies are plaque by the problems of "accessing construction material, poor quality of roads and unavailability of rail links" (NTDPC, 2012). This is supported by the fact that a third of the villages in rural India were not able to access healthcare facilities due to problems of 'road connectivity and inadequate transport services'(Saikia and Das, 2014). This makes it very important to study the accessibility of healthcare facilities from the spatial point of view as geography plays a dominating role in the Northeastern region of India.

It is important to study the non-spatial factors affecting access to healthcare such as class, income, age, sex etc. as they may influence access to healthcare. This is especially true in the Northeastern states know for diverse ethnic tribes and cultural practices. Furthermore, these ethnic groups have different medicinal practices which may pose a hindrance in accessing modern healthcare services. So, the social component of the region posing a hindrance to accessibility is not surprising. Accessibility of non-spatial factors can also be studied from the point of view of the accessibility of human resources in the districts to determine how far the human resources are accessible in the study area which has been adopted in the study.

2. Objective

- i. To study the patterns of accessibility of physical healthcare facilities across the hills and valley districts of Northeastern states of India at Sub- Centres, Primary Health Centres and Community Health Centres.
- ii. To study the pattern of accessibility of human resources across the hills and valley districts of Northeastern states of India.

3. Methodology

Descriptive statistics are used for data analysis. Unit level data from DLHS-4 (2012-13) has been taken for calculating accessibility of healthcare facilities such as Sub-centres (SC), Primary Health Centres (PHC's) and Community Health Centres (CHC's). Variable such as percentage of villages with SC within 3 Kms, PHC within 10 Kms and CHC within 20 Kms are taken for determining the accessibility of healthcare facilities. The distance criteria have been adopted from the Directorate General of Health Services (DGHS) (2007 & 2012) for SC and PHC. As for CHC, the 20 Kms criteria has been taken for the convenience of the study.

Accordingly, for the convenience of analysis, the distances for each facility will be further categorized into three sub-categories. The sub-categories are given in Table 1.

The analysis is carried out by categorizing the percentages of accessibility at SC within 3 km, PHC within 10 km and CHC within 20 km. The rest of the categories in SC, PHC and CHC are used for supporting the argument for accessibility and inaccessibility of each service facility. Meanwhile, to find out human resources accessibility the service provider to population ratio is calculated for each district using the indicator 'availability of lady doctors in the village (staying/ visiting)'. This particular indicator has been taken from the village level data to highlight the actual accessibility of human resources in the villages as the mere availability of doctors on paper does not truly reflect the actual accessibility by villagers. This is especially true in regions like northeast India where the harsh topography coupled with lack of infrastructure makes it difficult to attract doctors to stay at the place of posting. The density of doctors staying/ visiting the villages is calculated per 10,000 populations to find region wise and district wise inequality in human resources accessibility.

Table 1 Categories of accessibility of healthcare services.

Sl.no.	Accessibility in distance (km)
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Sub-centre	1.	≤ 3
	2.	4-10
	3.	≥ 10
Primary Healthcare Centre	1.	≤ 10
	2.	11-20
	3.	21 & above
Community Health Centre	1.	0-20
	2.	21-40
	3.	41 & above

For the purpose of a better comparison, data are grouped into five categories such as very high, high, medium, low and very low with the help of standard deviation and mean method. Data extracted from the DLHS-4 (2012) are then represented in the Choropleth map using Arc Gis Software.

4. Literature review

The studies related to the accessibility component of the healthcare facilities have been grouped broadly under two categories for the convenience of the study. The spatial part comprises of the studies dealing with methodology, distance as a factor posing a hindrance to accessibility in regions where road facility is poor.

4.1 Studies related to spatial accessibility

Mao & Nekorchuk (2013) conducted a study to illustrate the method of multiple-mode 2SFCAM (Two-Step Floating Catchment Area Method) in Florida, USA. It used the 2SFCAM and incorporated multiple transportation modes to account for a more accurate measurement of accessibility. This was then compared with the traditional single-mode 2SFCA and concluded that single-mode overestimates accessibility in urban areas where there exist different types of transportation modes. At the same time, it underestimates the accessibility in rural areas where the road networks are homogenous. This study overcame the earlier assumption of a uniform mode of transportation and provided a more realistic representation of accessibility through various transport networks.

Hare & Barcus (2007) conducted a study of geographical accessibility in terms of Kentucky's cardiovascular diseases and hospital services. The study found that people living

in far off areas tend to travel for access to healthcare facilities while people living 45 minutes from healthcare facilities are socially and economically marginalized. It also pointed to the fact that areas of low accessibility are more likely to be hospitalized.

Spatial accessibility and efficiency of healthcare services have been carried out by Kumar (2004) in the Rohtak and Bhiwani districts of Haryana between 1981 and 1996 using Location allocation model and logistic regression. The study found that there was not much change in the accessibility in 1981 and 1996 although geographic access to PHC'S has improved from 1981-1996. While locational efficiency has not improved due to factors such as political interventions favouring selective regions at the cost of others. Contrary to the demand of healthcare institutes tends to be based in more accessible areas and not inaccessible ones.

Saikia & Das (2014) studied the accessibility of public healthcare facilities within the Northeastern states and found that states like Arunachal Pradesh (47.1 per cent), Manipur (51 per cent) and Mizoram (69.4 per cent) had accessibility below the national average of 71.4 per cent in sub-centres. The same case was repeated in the accessibility of PHC too with all the states except for Tripura (78.9 per cent) having accessibility below the national average of 71.2 per cent. However, the accessibility of CHC with referral transport facilities is above the national average except for Arunachal Pradesh.

4.2 Studies related to the non-spatial part

Accessibility as a non-spatial concept in healthcare has been studied in India mostly from the angle of equity, existing social inequality in the form of caste, class, region and gender biases. For convenience, the studies dealing with the non-spatial part of accessibility of healthcare facilities have been organized based on socio-economic factors such as the inaccessibility across different social groups, inaccessibility due to economic factors and the vulnerable groups such as women and elderly. The studies are as follows:

Mackinney et al., (2014) analyzed the literature on healthcare access and recommended that the framework for access should include four dimensions of access which are place, people, provider and payment as the basis for healthcare policy. As all the dimensions are interconnected inevitably affecting the outcome, it is desirable for policymakers to deliberate upon the four dimensions while making policy decisions.

India is known for its' diversity of people and their caste, class, religion etc. To study accessibility without studying the literature dealing with inequalities in access to healthcare

and across social groups, the study will be incomplete. Here, the study of Baru et al., (2010) can be taken up, who studied the inequities in access to healthcare across different sections of society and found that factors such as lack of funds, quality healthcare services, unregulated commercialization and rising costs, lack of quality in public and private sector etc affected the inequities in access to healthcare. In fact, it was found that the Government of India spending approximately 19-20 per cent of health expenditure one of the lowest in the world.

Accessibility to healthcare facilities can also be hindered by economic factors such as lack of funds and high cost of treatment as found by the previous study. The same result has been found by Kesterton et al., (2010) while conducting a study on accessibility to institutional delivery in rural India. The study found that accessibility in terms of healthcare services was affected by financial constraints and not by the unavailability of health workers. It found that the rate of institutional delivery increased from 10-15 per cent of households with the poorest wealth, education and access to 67 per cent of households with the highest income.

Often poverty affects access to the most basic building blocks of health which includes access to healthcare facilities, adequate housing, proper nutrition and being able to be a part of society (Black & Laughlin, as cited by Bartley et al., 2006). Apart from inaccessibility, the poor are also exposed to the unhygienic environment comprised of crowded and damp housing, lack of sanitation. As such they are unable to maintain a hygienic environment and are prone to infectious diseases making their situation worse (Smith, as cited by Bartley et al., 2006).

Rajagopal (2010) in a study found that access to healthcare was determined by one's social status which also reflects one's economic status. The people with higher income opted for private hospital treatment due to ill-equipped and crowded government hospitals. While the poor who cannot afford to have better treatment are not able to access private hospital treatment. However, they wanted to have access to the private healthcare system owing to its efficiency. Also, the poor lack social capital which may enable them to have greater information regarding certain health behaviours and healthcare services (Folland, Goodman & Stano, 2013).

5. Study Area

The northeastern region is located between 20°N - 29°30'N latitude and 89°46'E - 97°30' E longitude. The region is comprised of the states like Arunachal Pradesh, Assam, Nagaland, Meghalaya, Mizoram, Manipur and Tripura, Sikkim. Topographically, the region is very

harsh and inaccessible and surrounded by hills on three sides. This region is isolated from the rest of India if not for a 40 km corridor along 'the Bhutan and Nepal Himalayan foothills' (Taher and Ahmed, 2012).

The Road network is very poor in the region and the total railway length of just 2592 km (NTDPC, 2012) is concentrated only in Assam and has a total road length of just 3,76,819 km. The region has a population of 4.56 crores with a population density of 174 persons per sq. km (Northeastern Council Secretariat, 2015). The region is known for its diverse ethnic groups and cultural practices).

The region comprises 81 districts out of which the majority are hill districts. In the present study, due to the unavailability of accessibility data of Assam, only the accessibility of the SC, PHC, and CHC of the remaining seven states are calculated and mapped accordingly which is altogether 59 districts. Meanwhile, the newly created districts of Manipur are not taken into account as the accessibility data only deals with the old districts of Manipur which is only nine in total.

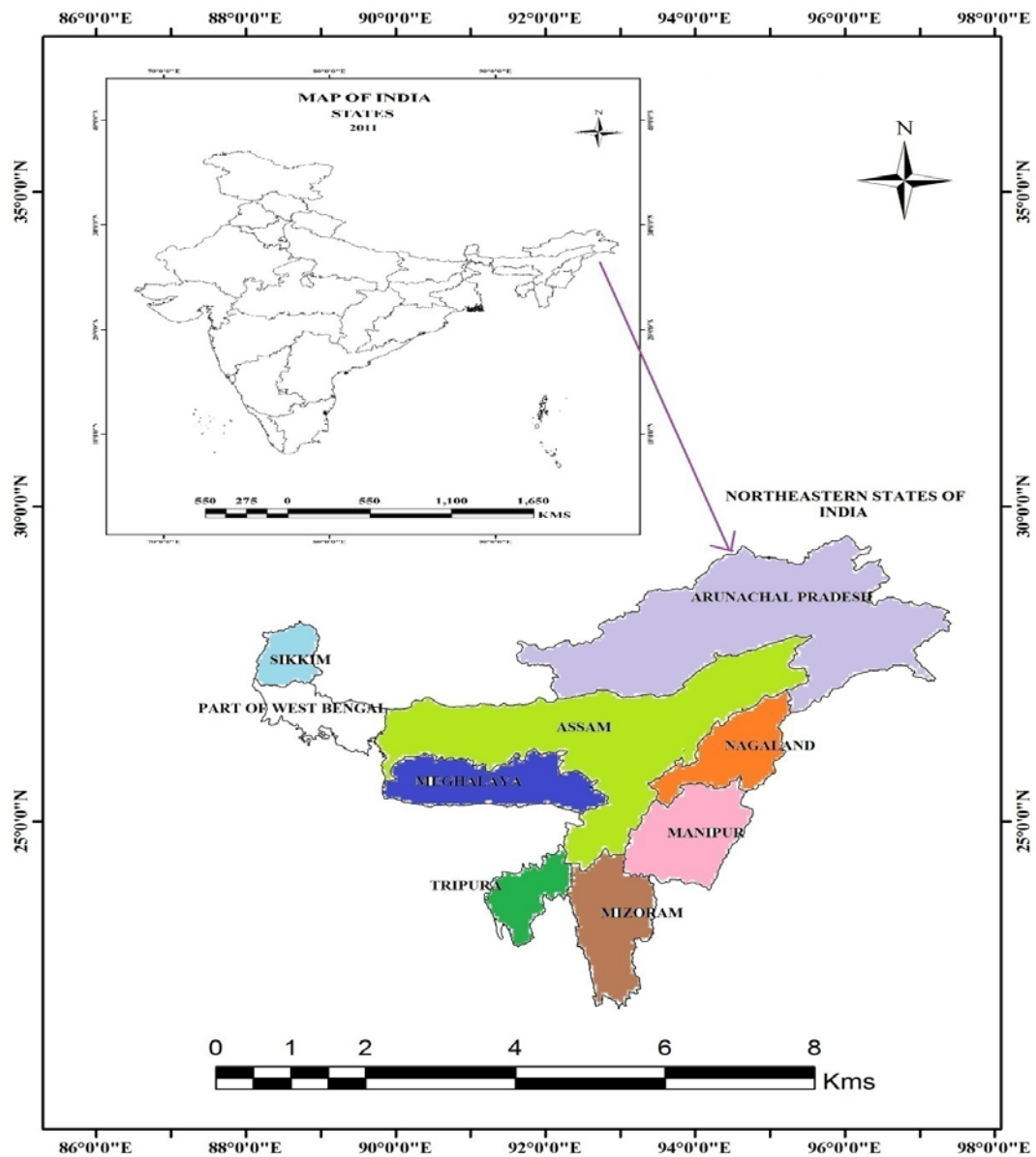


Fig No. 1: Location map of Northeastern states of India.

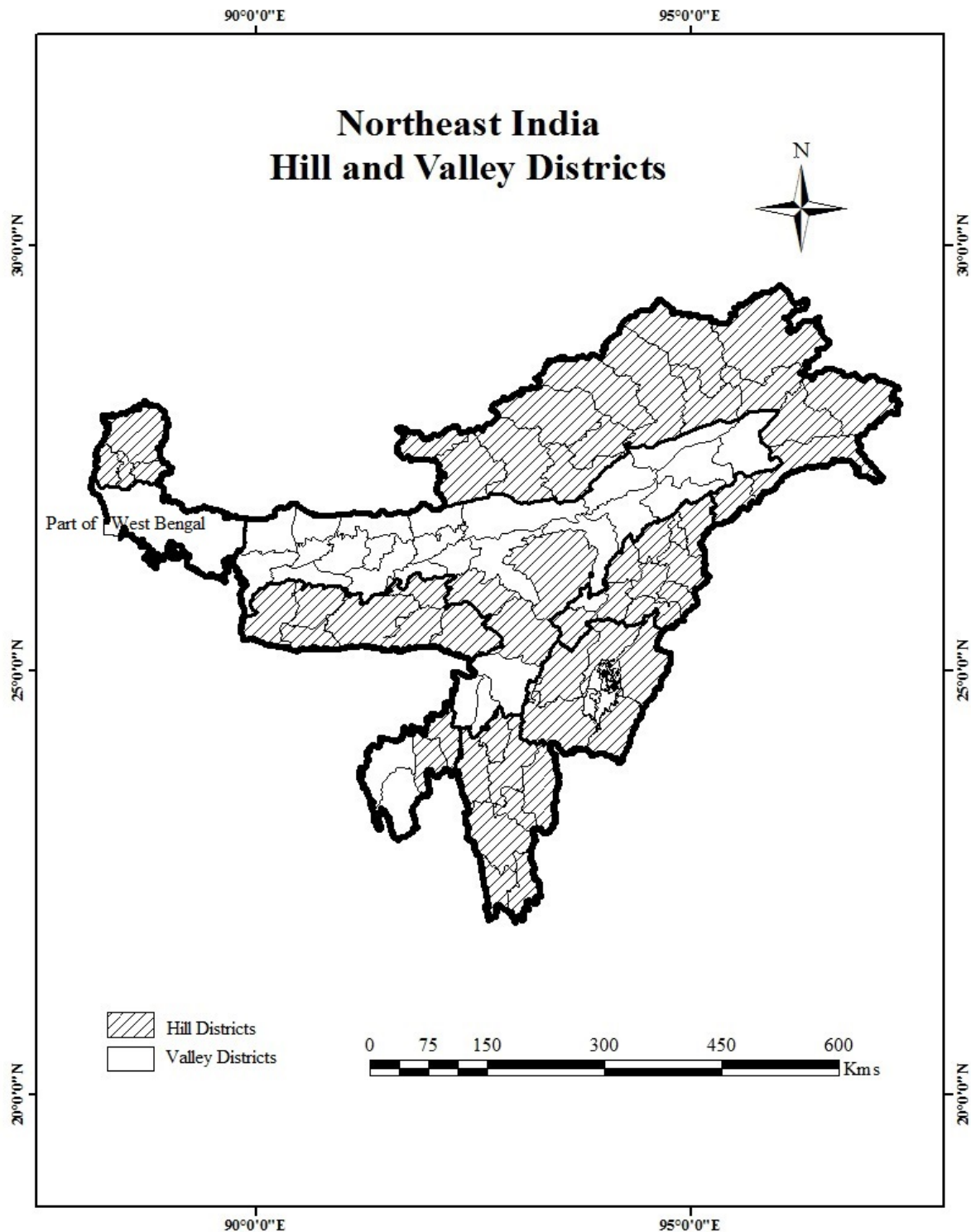


Fig. no. 2: Hill and Valley Districts of Northeastern States of India.

6. Patterns of Accessibility of Healthcare Facilities

Accessibility has been studied from the dimensions of distance, income inequality, social groups etc. Physical accessibility of healthcare is a problem in rural areas especially in the

rugged topography of the Northeast making the construction of connectivity and maintenance very costly due to physio-climatic conditions. A study found that in India "only 37 per cent of people were able to access IPD facilities within a 5km distance, and only 68 per cent were able to access the OPD in rural areas. This is strikingly different from urban areas where 73 per cent and 92 per cent of people have access to IPD and OPD respectively" (IMS Institute for Health Informatics, 2013). Also, the travel distance to healthcare facilities is more in rural areas than urban areas which were 63 per cent and 27 per cent respectively. This increase travel distance in rural areas directly impacts the productive capacity of the people in rural areas.

6.1 Sub-centres

The average of all districts with villages that had Sub-centres within 3 km is 39.74 per cent with 31 districts having more than the average percentage. The districts have been grouped into four categories with 13 districts in the high category, 28 in the medium category, 7 in the low category and 11 in the very low category which is highlighted in Fig. No. 3 Bishnupur (83.33 per cent) and Aizawl (83.33 per cent) were grouped in the very high category of accessibility of sub-centres within 3 Kms from the villages. Bishnupur lies in the plain area of Manipur valley and hence be more conducive to the construction of Sub-centres in the area. While Aizawl being the capital city of Mizoram might have the amenities needed to support the facilities of Sub-centres. The rest of the districts in the high category include Thoubal (81.82 per cent), South Tripura (75 per cent), Imphal East (73.33 per cent) etc. which were grouped in the high category. Thoubal and Imphal East districts are falling in the valley region of Manipur and hence may help in ensuring high accessibility. At the same time, hill districts like East Khasi Hills (72.73 per cent) and East Garo Hills (69.23 per cent) of Meghalaya, Zunheboto (66.67 per cent), and Papum Pare (63.64 per cent) were also grouped under the high category which shows that accessibility is determined not only by spatial factors but also non-spatial factors.

Districts lying in the medium category includes the North district of Sikkim, Churachandpur of Manipur and Serchhip of Mizoram with the highest accessibility. Lohit (28.57 per cent),

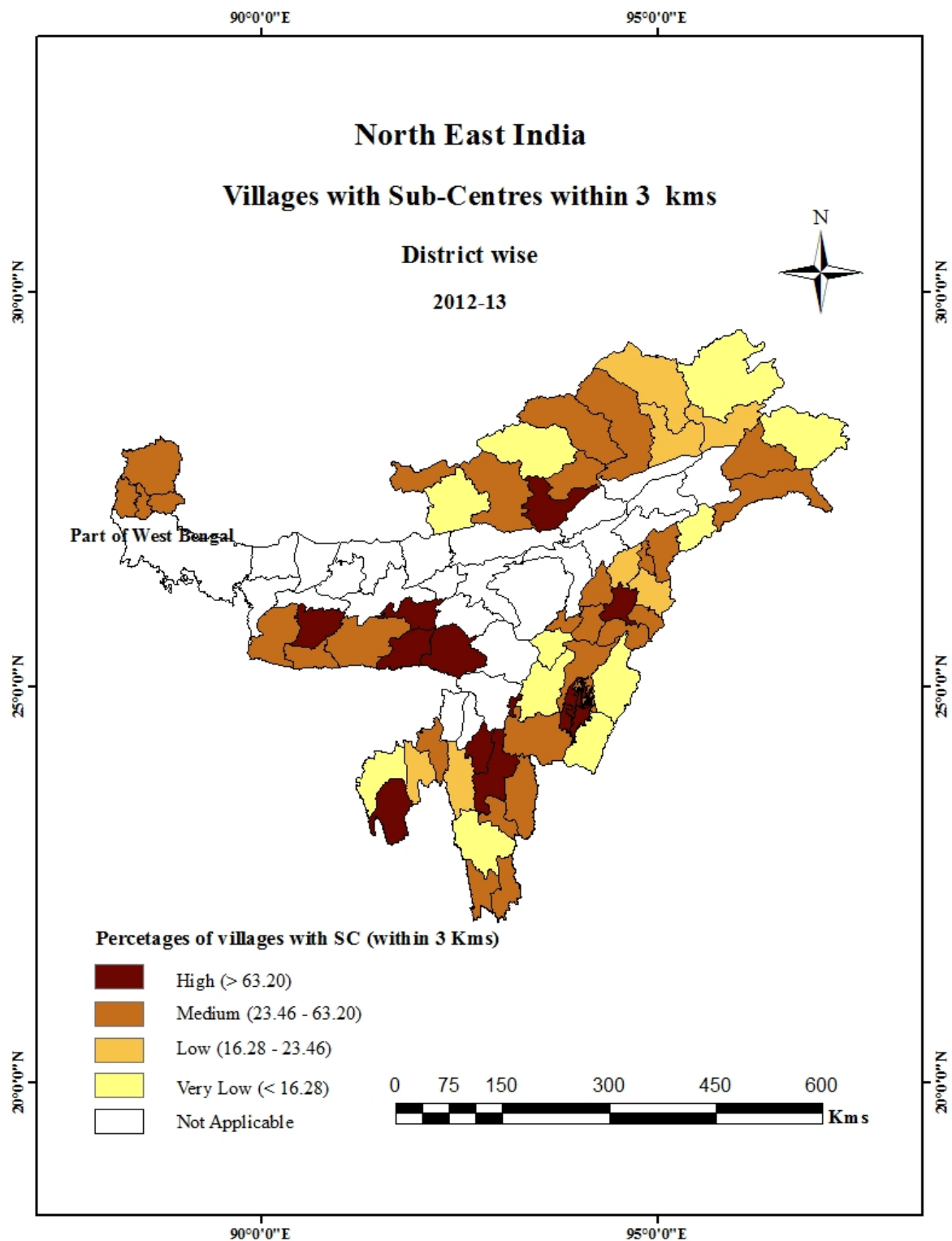


Fig. No.3: Villages with SC's within 3 Kms across districts in Northeast India, 2012-13.

East Kameng (28.57 per cent), Mon (33.33 per cent) etc. have the lowest accessibility in the medium category. All the districts mentioned above are hilly except for the Churachandpur district of Manipur which lies in the valley region once again showing the importance of non-spatial factors in ensuring accessibility which may be due to socio-economic as well as political factors like unwillingness to ensure access to healthcare on part of the concerned authority.

Districts like Mamit (18.18 per cent) of Mizoram, Lower Dibang Valley (20 per cent) of Arunachal Pradesh and Mokokchung (23.08 per cent) of Nagaland occupied the low category. While districts like Chandel (15.38 per cent), Lunglei (8.33 per cent) and Anjaw (5 per cent) etc occupied the very low category. All these districts are hilly. Hence proving that spatial factors influence accessibility to a certain extend.

The least accessible districts are demarcated based on the accessibility of 4 - 10 km and 10 and above km. In the 4-10 km category, West Tripura (100 per cent) and Dhalai (80 per cent) have the highest percentage. West Tripura did not have any villages with sub-centres within 3 Kms which made it the least accessible within 3 Kms. Dhalai also was categorized in the same category with 80 per cent of villages lying within a distance of 4-10 Kms but very low villages' percentages of villages that were accessible within 3 Kms from the villages. Kolasib district had high accessibility of sub-centres with most villages lying within 3 km and least percentage of villages within the 4-10 km category. In the least accessible category of villages with SC above 10 Kms Tamenglong (77.78 per cent) had the highest percentage indicating that it is the least accessible which is explained by its rough terrain and topography along with poor connectivity within the district. Dibang Valley also had the least accessibility with 66.67 per cent of villages that had accessibility beyond 10 km and no villages with accessibility within 3 Km.

In fact, most of the districts in the region as a whole were had sub-centres located beyond 3 Km from villages. Since Sub-centre acts as the first contact point between the patients and healthcare services, location matters a lot, especially to the women. This will ensure easy accessibility to sub-centres. Easy accessibility is important as many a time patients prefer to remain without visiting healthcare centres due to distance factors as well as the activities they have to do at home.

6.2 Primary Health Centres

There were 11 districts in the very high category where villages were located within 10 Km from PHC as shown in Fig. no. 4. Among these districts, Imphal West (100 per cent), Imphal East (88.89 per cent), Bishnupur (88.24 per cent), Thoubal (87.50 per cent) were top in the list along with Dhalai (85.19 per cent), Papum Pare (80.00 per cent) etc.

Meanwhile, districts with villages within 10 km from PHC in the range of 71.43-50.00 percentages were included in the high category. Some of the districts in this group were East Khasi Hills (71.43 per cent), South Tripura (69.57 per cent), Dimapur (61.64 per cent) etc. which is shown in Map 3.7. South Tripura and Dimapur belong to the valley region and hence have high accessibility.

Those districts with 20-47 per cent of villages having PHC within 10 km from the villages were grouped in the medium category. In this category, the highest accessibility was found in West Kameng (47.06 per cent), Wokha (46.67 per cent), Lower Dibang Valley (45.45 per cent) etc. The least accessible areas were the Kolasib (26.67 per cent), Mamit (29.17 per cent), Saiha (31.58 per cent) etc. of Mizoram.

Aizawl, Serchhip and Lawngtlai of Mizoram, Upper Siang of Arunachal Pradesh, Kiphire of Nagaland occupied the low category. Zunheboto occupied the lowest category with no PHC within 10 km of villages. The district belongs to the hilly region of the state and hence has low accessibility of PHC from villages.

Accessibility has been studied taking into account the percentages of villages lying above 10 km i.e., in the 10-20 km category and 20 and above km category. West Garo Hills (60.61 per cent) and Kurung Kumey (44.44 per cent) had better accessibility had better accessibility as it had most villages within 10-20 km category. Lawngtlai (8 per cent) and Tirap (9.09 per cent) had the least percentages of villages in the the 10-20 Kms category as 68 per cent and 54.55 per cent of PHC were located outside the 20 Kms parameter.

Lohit (zero per cent), West Siang (4.35 per cent), East (10.53 per cent) etc. had the least villages with PHC in the 20 and above 20 km. This showed that the villages in these districts had good

accessibility within the 20 Kms parameter. The least accessible districts were those of Upper Siang which had 80 per cent of villages above 10 km in PHC while Anjaw had 71.43 per cent above 20 km from PHC.

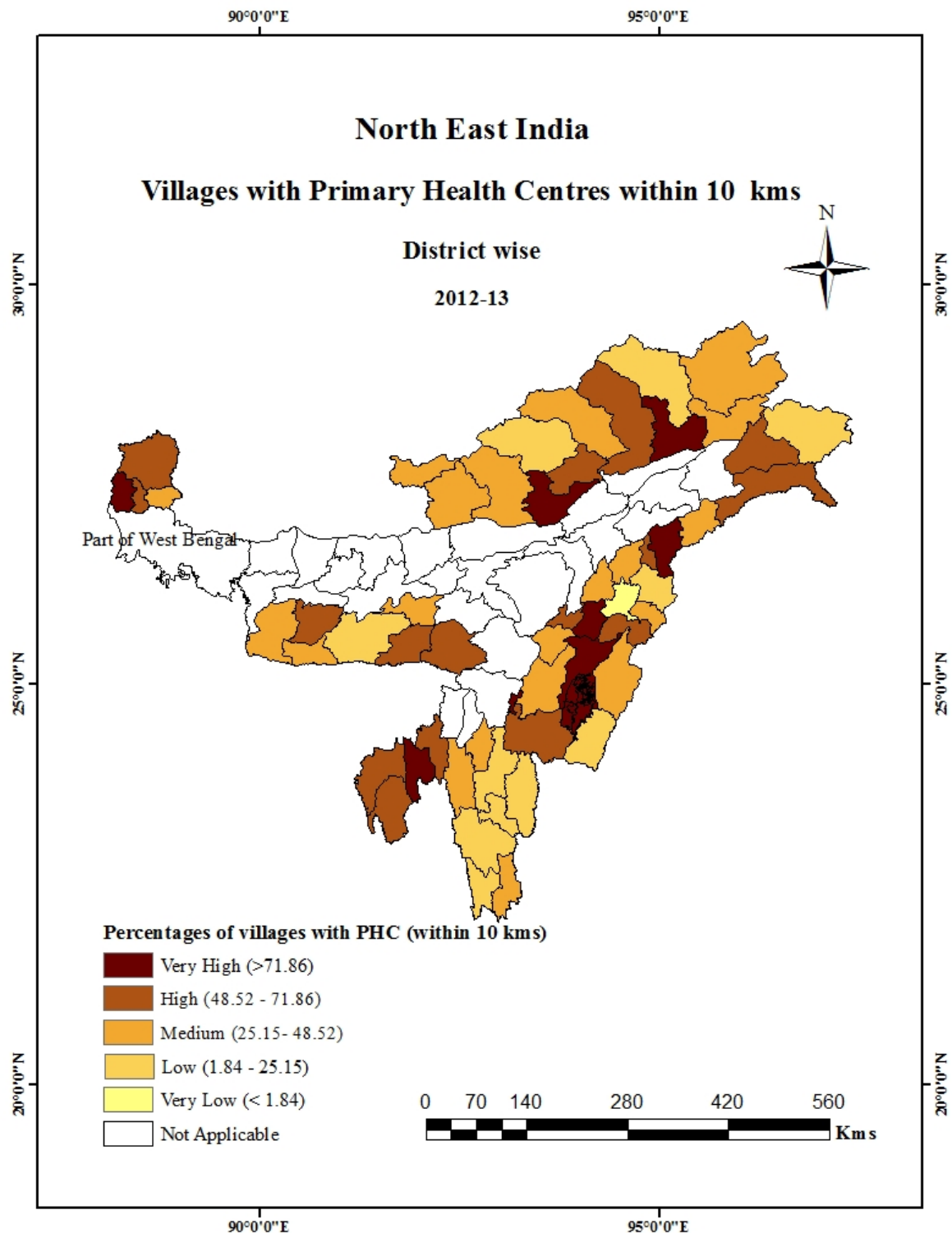


Fig. No. 4: Villages with PHC within 10 Kms across districts in Northeast India, 2012-13.

6.3 Community Health Centres

A deeper analysis at the district level revealed that Imphal West and Imphal East had very high accessibility of CHC with 100 per cent of villages within 20 Kms of CHC which was

found in the case of PHC too (Refer Fig. No. 5). These two districts along with Bishnupur occupied the very high category of accessibility. This may be because both the districts are situated in plain areas and hence highly accessible.

Districts like Kohima (88.89 per cent), East Siang (72.73 per cent), Longleng (75 per cent) etc. occupied the high category. Kohima being the capital city of Nagaland might have better access to healthcare facilities.

Maximum districts occupied the medium category all of which belong to the hill regions except for Dimapur of Nagaland which is shown in Map 3.8. The districts include Dibang Valley

(66.67 per cent), East Khasi Hills (62.50 per cent), Ri Bhoi (53.13 per cent), Aizawl (50 per cent) etc.

The least accessibility to CHC was found in the districts of Dhalai (25.71 per cent), Serchhip (25 per cent), Ukhrul (33.33 per cent), Upper Subansiri (46.15 per cent) etc. All of these districts were located in the hilly regions and hence construction of CHC within 20 Kms of villages may not be possible. Lastly, the very low category was occupied by South Garo Hills (21.74 per cent), Tirap (21.43 per cent), Peren (9.09 per cent) etc.

In the 21-40 km category, Kolasib (63.64 per cent) and Tirap districts (53.57 per cent) had the highest percentage indicating the average accessibility of the villages in the regions. These districts had a few villages with accessibility within 20 Kms. While the lowest category is occupied by Bishnupur (4.55 per cent), Kiphire (5.26 per cent), Lower Subansiri (6.90 per cent) etc. but have very high percentages of villages with CHC within 20 Km. Meanwhile, villages with the least accessibility include Peren (63.64 per cent), Saiha (60 per cent) and Lawngtlai (60 per cent) which showed that these villages had very least accessibility to CHC. The villages with very low percentages in the above 40 Kms category included Changlang (3.33 per cent), Tuensang (8.33 per cent), East (9.52 per cent) etc. which had very high accessibility of villages within 20 Km.

In conclusion, the valley district of Bishnupur had the best accessibility and the hilly district of Mamit the least. In terms of PHC and CHC, the valley districts like Imphal East and Imphal West

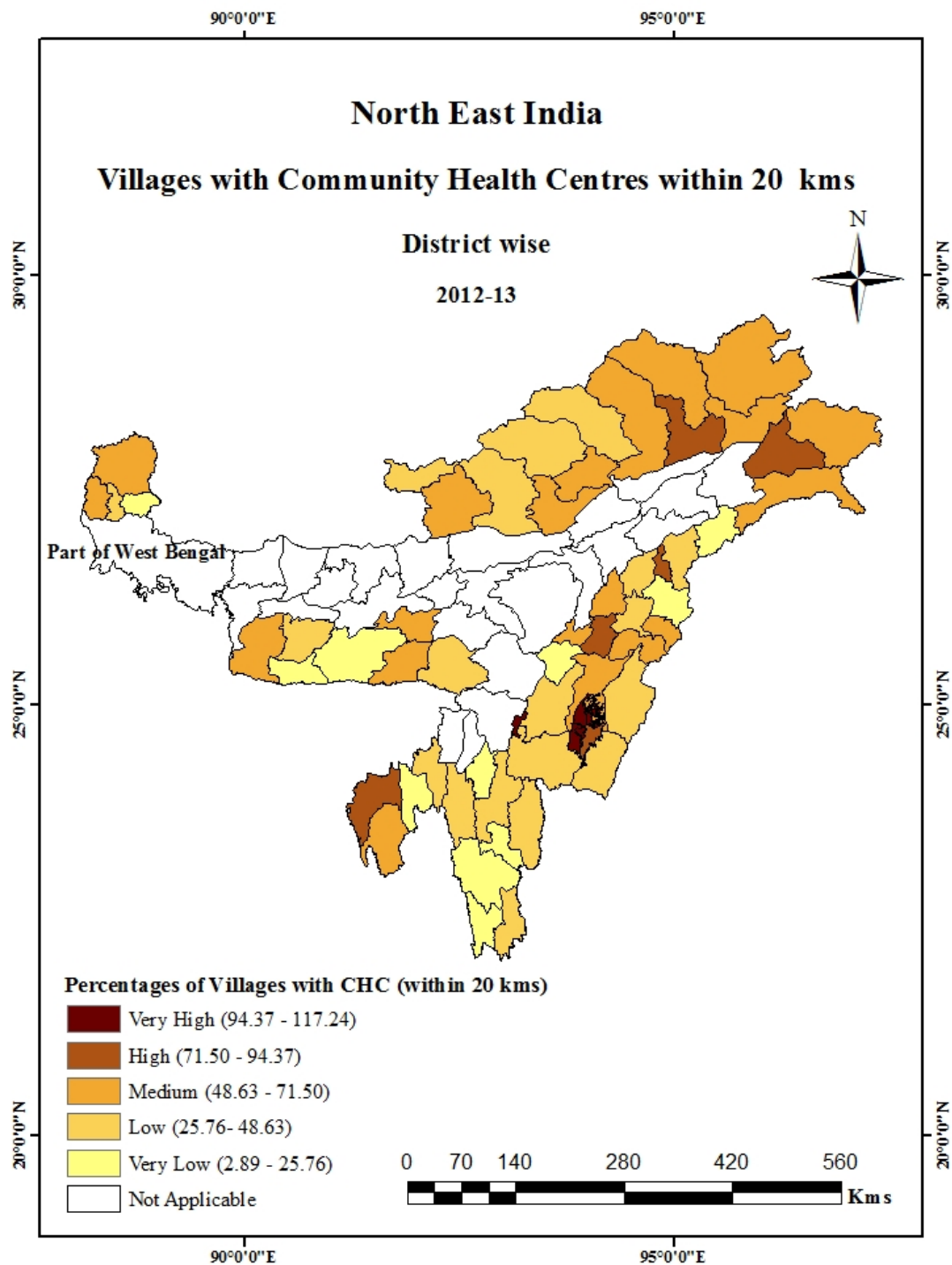


Fig. No. 5: Villages with CHC within 20 Kms across districts in Northeast India, 2012-13.

had the best accessibility in CHC. The hill district of East Khasi Hills had the best accessibility in PHC.

7. Patterns of accessibility of Human resources

The accessibility of human resources has been analysed taking the availability of Lady Doctor in villages that are either staying or visiting the villages of the total availability. The variable 'lady doctors who are either visiting or are staying in the villages' are taken for calculating the accessibility of human resources to the population of the villages. The logical explanation behind this is that the availability of doctors on paper does not reflect the true accessibility of the doctors to villagers. They will only be accessible by the villagers if they are actually available in the villages. The availability of lady doctors is taken as a proxy for the availability of other doctors due to the limitation of data. Also, the DLHS (2007) norm prescribed the mandatory availability of lady doctors in the PHC and as PHC more or less caters to the village population. Also, village aggregate data for the whole district is taken as a proxy for the entire district. This is well justified as most of the PHC's covered in the survey are mostly rural and represent the rural population of the state.

Here, accessibility has been shown using the density of doctor per 10000 populations; this ratio which is a well-known method used either for showing the availability of healthcare facilities or accessibility. The density of doctors per 10000 populations has been adopted from WHO (2006) which compared the density of health workers per 10000 population in the whole world. Although there is no exact density norm as stated by WHO, the density of 2 doctors per 1000 population has been taken as a good indicator of availability. So, this ratio has been adopted for analysing the accessibility of human resources in the North Eastern Region of India.

District wise accessibility of human resources reveals that West Kameng (22 doctors per 10000 population), South (19 per 10000 population) and Aizawl (16 per 10000) districts were categorized under the very high category of accessibility of human resources (Refer Fig. no. 6). The districts of Lower Subansiri (13 doctors per 10000 population), Jaintia Hills (12 doctors per 10000 population), Wokha (11 per 10000 population) etc. were categorized in the high category. These districts had high accessibility of healthcare facilities as well as high availability of human resources.

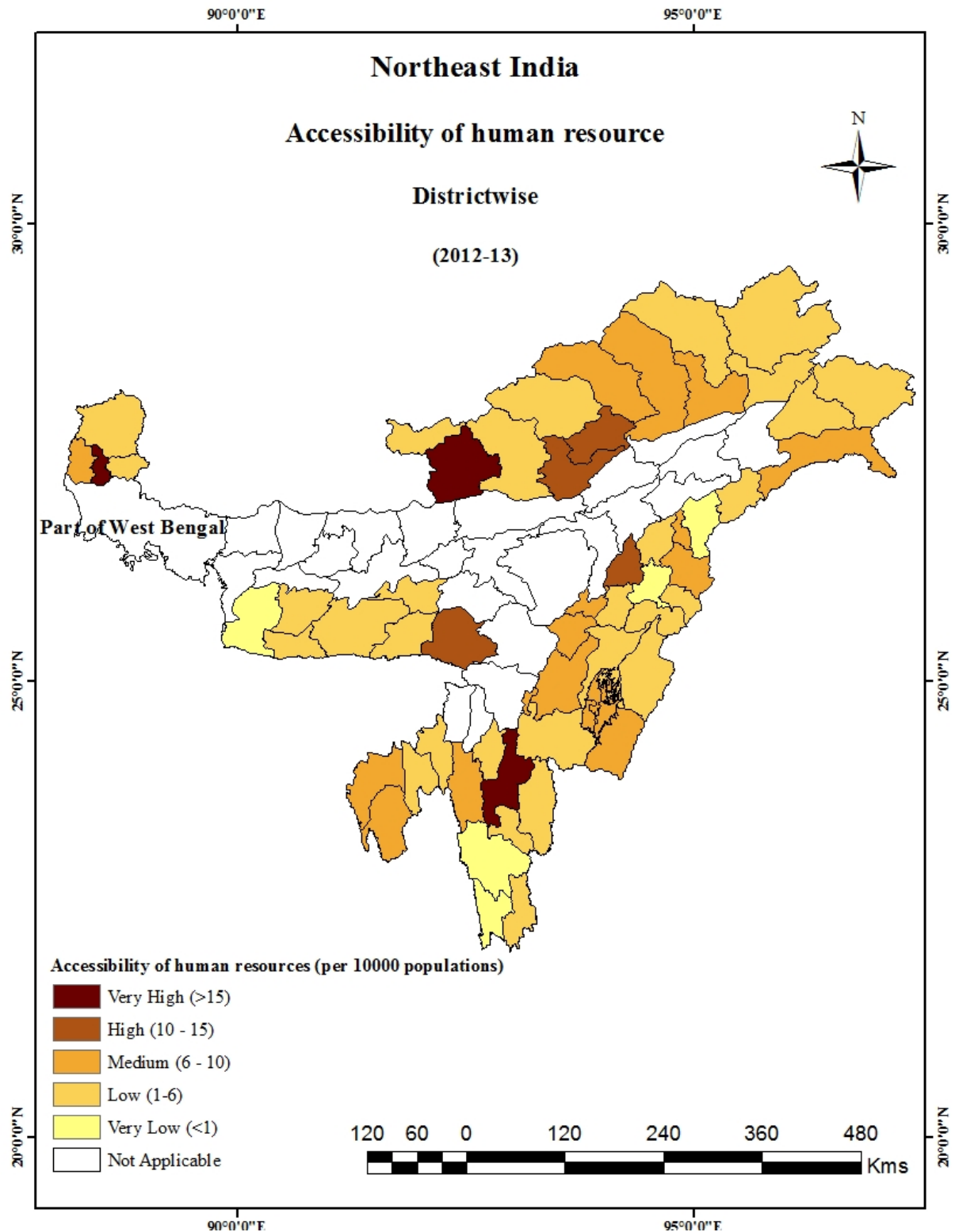


Fig. No. 6: Accessibility of human resources across districts in Northeast India.

The districts of Longleng (10 doctors per 10,000 population), Changlang (8 doctors per 10000 population), South Tripura (9 doctors per 10000 population) etc. which had a density of at least five doctors per 10,000 populations occupied the medium category. These districts

also had very high accessibility of CHC and moderate accessibility of PHC and SC. Changlang had moderate accessibility of SCs, PHCs and CHCs. But South Tripura had high accessibility of SCs, PHCs and CHCs.

Districts like the Mokokchung (6 doctor per 10000 population), Kolasib (4 doctor per 10,000 population), Phek (4 doctor per 10,000 population), Dibang Valley (3 doctor per 10,000 population), Ukhul (2 doctor per 10,000 population), Senapati (2 doctor per 10,000 population) etc. were categorized under the low category. The reason behind this inaccessibility to doctor may be due to low accessibility to SC, PHC and CHC as well as low availability of human resources except for Phek which has moderate availability of human resources but is low on the accessibility of human resources. The densities of doctors accessible per 10000 populations in these districts are ranging from four to five.

The districts with the least accessibility to doctors included the districts of West Garo Hills of Meghalaya, Lunglei of Mizoram and Mon of Nagaland which has zero doctors per 10,000 populations. This may be due to inaccessibility to health centres for example Lunglei had low accessibility of physical infrastructure (8.33 per cent villages were accessible to SC within 3kms).

From the above analysis, it is clear that the hilly district has comparatively better accessibility to human resources. So, it is the economic development that determines the accessibility and not the topography in developed regions.

8. Conclusion

The study found that spatial factors do play an important role in higher accessibility of the healthcare facilities in the districts. For instance, it was found that the Thoubal district of Manipur which happens to be lying in the valley region and hence more accessible topography had the highest accessibility of Sub-centres with 81.82 per cent of the villages within the districts having SC within 3 km. This means that for any minor ailments, people have greater access to healthcare as compared to Tamenglong district of Manipur which had 77 per cent of the villages with SC above 10 km meaning very low accessibility for acute illness and well as basic access to healthcare. However, non-spatial factors also influence access to healthcare as it was found that several hill districts were having a high number of villages with SC within 3 Kms.

In terms of PHC, the most accessible district was Imphal West with 100 per cent of villages with PHC within 10 Kms. Imphal West is the capital hub of Manipur with accessible roads

and plain topography. While the least accessible districts were Upper Siang of Arunachal Pradesh with 80 per cent of the villages having PHC above the 10 km range while the Anjaw district of Mizoram has 70 per cent of the PHC above 20 Kms. So accessibility to healthcare is very limited in these districts.

At the CHC level, the valley districts of Manipur like Imphal East and Imphal West had 100 per cent villages within 20kms which shows that spatial factors do play a critical role in ensuring accessibility of healthcare within the districts. While hill districts like Peren (63.64 per cent) of Arunachal Pradesh, Lawngtlai (60 per cent) and Saiha (60 per cent) of Mizoram had the least accessibility of CHC. From the analysis, it is clear that spatial factors do play a critical role in ensuring the accessibility of healthcare facilities within the districts.

In terms of non-spatial factors, accessibility of human resources, it is found that hill districts like West Kameng (22 doctors per 10000 population) had the highest accessibility of human resources. Hill districts like South of Sikkim (19 doctors per 10000 population) and Aizawl (16 doctors per 10000 population) also had very high accessibility of human resources as compared to the valley districts. Also, at the same time, hill districts like West Garo Hills, Lunglai and Mon had zero doctors per 10000 population which show that the human resources are not accessible at all. From the above analysis, it is clear that both spatial and non-spatial factors play important role in ensuring accessibility of healthcare facilities as well as human resources. However, they are not the only factors determining access to healthcare. Further research needs to be conducted to study the interplay of various factors affecting access to healthcare. However, it cannot be denied that the present study helps in identifying the districts lacking access to healthcare both from a spatial and non-spatial perspective. This can be used as a tool for framing target-oriented policy for increasing access in a particular hill and valley districts and will go a long way in establishing the focus areas for policy programmes as well and help in increasing accessibility to healthcare.

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References

- [1] A.C. MacKinnay, A.F. Coburn, J.P. Lundblad, T.D. McBride, K. J. Mueller and S. D. Watson.
“Access to rural health care – A literature review and new synthesis”, Rural Policy Research Institute, 2014, 3-18.
- [2] A.J. Kesterton, J. Cleland, A. Slogett and C. Ronsmans, “Institutional delivery in rural India: Relative importance of accessibility and economic status”, BMC Pregnancy and Childbirth, 2010, 1-9.
- [3] B. Dhak, “Use of maternal health care in rural India: Relative importance of socio-economic status and accessibility”, Health & Population Perspectives, 34(1), 2011, 11-18.
- [4] Census Info India, Arunachal Pradesh Profile, 2011. http://censusindia.gov.in/2011census/censusinfodashboard/stock/profiles/en/IND012_Arunachalpercent20Pradesh.pdf
- [5] Central Bureau of Health Intelligence, National Health Profile, New Delhi: Ministry of Health and Family Welfare, 2015.
- [6] Directorate General of Health Services, Indian Public Health Standards (IPHS) for Sub-Centres, New Delhi: Directorate General of Health Services, 2007.
- [7] Directorate General of Health Services, Indian public health standards (IPHS) for community health centres, New Delhi: Directorate General of Health Services, 2012.
- [8] Directorate General of Health Services. Indian Public Health Standards (IPHS) For Primary Health Centres, New Delhi: Directorate General of Health Services, 2007.
- [9] International Institute for Population Sciences (IIPS) and Macro International, National Family, 2007.
- [10] D. Saikia and K.D. Das. “Access to public health-care in the rural Northeast India”, The NEHU Journal, 7(2), 2014, 77-100.
- [11] D. Subhojit, N. Devaki, J.K. Lakshmi, S. Kabir and K.S. Reddy, “Health of the elderly in India: Challenges of access and affordability, ageing in Asia findings from new and emerging data initiatives.” The National Academies Press, 2012, 371-386.
- [12] International Institute for Population Sciences (IIPS). District Level Household and Facility Survey (DLHS-4), 2012-13: Household questionnaire, 2014.
- [13] IMS Institute for Healthcare Informatics. “Understanding Healthcare Access in India. What is the current state?”, 2013, 11-17.
- [14] L. Mao and D. Nekorchuk. “Measuring spatial accessibility to healthcare for populations with multiple transportation modes”, Health & Place, 24, 2013, 115-122.

- [15] M. Bartley, J. Ferrie and S. Montgomery, Health and Labour market disadvantage: Unemployment, non-employment & job security, Social Determinants of Health (Second edition), Oxford University Press, 2006.
- [16] M.F. Guarliardo. “Spatial accessibility of primary care: Concepts, methods and challenges,” *Int JHealth Geogr* 3(3), 2004. 1-10.
- [17] M. Taher and P. Ahmed, Geography of North-East India, Guwahati: Mani Manik, 2012.
- [18] N. Kumar, “Changing geographic access to and locational efficiency of health services in two Indian districts between 1981 & 1986”, *Social Science and Medicine*, 58(10), 2004, 2045-2067.
- [19] National Transport Development Policy Committee (NTDPC), Report of the working group on improvement and development of transport infrastructure in the North East for the national transport development policy committee. Planning Commission, Government of India, 2012.
- [20] North Eastern Council Secretariat, Basic Statistics of North Eastern Region, 2015. Directorate of Printing & Stationary, Government of Meghalaya, 2015, pp.1-176.
- [21] N. Rajagopal, “Transformational process of health care choice of poor in Kerala”, *Journal of Health Management*, 12(2), 2010, 123-135.
- [22] R. Baru, A. Acharya, S. Acharya, A.K.S. Kumar and K. Nagaraj, “Inequities in access to health services in India: Caste, class and region,” *Economic and Political Weekly*, Special Article, XLV (38), 2010, 47-58.
- [23] S. Folland, A.C. Goodman and M. Stano , *The economics of Health and Health care* (7th ed.), New Jersey: Pearson, 2013.
- [24] S. Salsberg and G.J. Forte. “Trends in the physician workforce, 1980-2000”, *Health Affairs*, 21(5), 2002, 163-173.
- [25] T. I. Shah, S. Bell and K. Wilson. “Spatial accessibility to health care services: Identifying under-serviced neighbourhoods in Canadian urban Areas”, *Plos One*, 2016, p.4.
- [26] T.S. Hare and H.R. Barcus, “Geographical accessibility and Kentucky’s heart-related hospital services.” 27(3-4), 2007, 181-205.
- [27] WHO, Basic Documents, World Health Organization, 2006. http://www.who.int/governance/eb/who_constitution_en.pdf

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