GEO-EYE

ORIGINAL ARTICLE

Geospatial Assessing of Healthcare Services in Tribal areas of Nasik District using G.I.S.

Dnyaneshwar S Suryawanshi [1*]

1 *Professor & Head, Department of Geography, VWS Dr. M. Y. Vaidhya Arts, Prof P. D. Dalal Commerce & Dr. D. S. Shah Science, College, Dhule, Maharashtra, India.*

OPEN ACCESS

Received: 21-02-2026
Accepted: 22-02-2026
Published: 12-06-2026

Citation: Dnyaneshwar. Geospatial Assessing of Healthcare Services in Tribal areas of Nasik District using G.I.S.. 2026; 15(1):18-22.
https://doi.org/10.53989/bu.ge.v15.i1.26.5

* **Corresponding author.**
dsskbcnmu@gmail.com

Funding: None

Competing Interests: None

Published By Bangalore University, Bengaluru, Karnataka

ISSN
Print: 2347-4246
Electronic: xxxx-xxxx

Abstract

The hinterland of population depends on health service facilities. The area and people they can be used to gauge how effective they are? The primary goal of this article is to categorize PHCs into various service levels, as per average area served by per composite weightage on altitudinal belt-wise distribution of PHCs. Field survey, questionnaires; inspections of five rural hospitals and 38 PHCs are used for together data. GIS-based diagrams have been created for spatial evaluation and composite weightage are used to determine the average service area. The findings indicate that, primarily at higher elevations with poor accessibility, 34.88% of PHCs serve less than 3 square kilometers, 51.16% serve between 3 and 6 square kilometers and 13.95% cover more than 6 square kilometers. Five categories ranging from better served to very badly serviced, have identified through the classification of PHCs. PHCs are distributed unevenly, but significantly overall with the maximum concentration found in the 600–700 m altitudinal belt. The study has attention to regional differences in access to healthcare and offers suggestions for fair resource distribution of health planning in tribal areas.

Keywords: Health services, Composite Weightage, GIS, Tribal Area, PHCs

1 Introduction

Rural service centers play an essential role. A service center's primary function is to provide service to the surrounding region. A service center may also serve as a collecting and distribution point. A central place theoretically enjoys a central location, as its name indicates in a given area of a region and provides variety of functions or services not only to its own population but also to that of its own immediate contiguous surrounding area [8]. Christlar Walter designated the functions of services performed for the surrounding countryside as central functions and the places wherein such services are performed as central places .The centrality of a service is importance in the provision of goods and services to the surrounding hinterland. Population is indicated by the number of services it provides and by the proportion of these services supported solely by the tributary population [2]. Agro-service centers, educational service centers, health service centers and other types of service centers

may be categorized based on the tasks they serve. A tribal health care center is a location that provides health services to the tribal hinterland around it [10]. In this research, tribal health service centers are defined as rural hospitals and primary health centers that offer health services to the surrounding countryside. The tribal communities that are served by these medical facilities are referred to as tribal health service centers [1].

Many geographers were inspired by the book to pursue study on the spatial aspects of health and sickness. ATA Learmonth, of Milton Keynes, UK, Rais Akhtar, of Srinagar, K. Choubey, of Sagar, Jayshree De, of Baroda, C. D. Deshpande, of Mumbai, Nilofar Izhar, of Aligarh, R.P. Misra, of Allahabad, Gopal krishnan, of Madurai, Jayanti Hazra of Kolkata, D.S. Suryawanshi from Maharashtra. The national health and medical organization of Kolkata (NATMO) have released some interesting maps on health and the distribution of health facilities. In Western countries, the subject is well-developed. Due to a lack of reference material, virtually little study has been done in poor countries. The sub discipline was founded by Jacques May, the pioneer of medical geography in the United States, who wrote on the ecology of diseases [9].

Study area:

The study area is located in the north-western and southwest region of the Nasik District. It extends from 19^0 44' 57" to 20^0 43' 55" north latitudes and 73^0 14' 05" to 73^0 06' 57" east longitudes. Study area covers an area of 4581.98 sq. km., which is 29.40 % of the geographical area of the district. It is surrounded by Deola and Chandwad tehsil in the east and the north-east, Gujarat state in the north, Palghar districts of Maharashtra State to the south-west, Igatpuri Tehsil to the south. It consists of 05 tehsils, namely Pet, Dindori, Surgana, Kalwan and Trembakeshwar. The population of the region is 976092. It includes 760 villages and 40 PHC [7].

Objectives:

1. To classify the PHCs on various service levels.
2. To examine on altitudinal belt-wise distribution of PHCs
3. To evaluate the average area served per composite weightage.
4. To assessing the area and composite weightage in relation to health service efficiency.

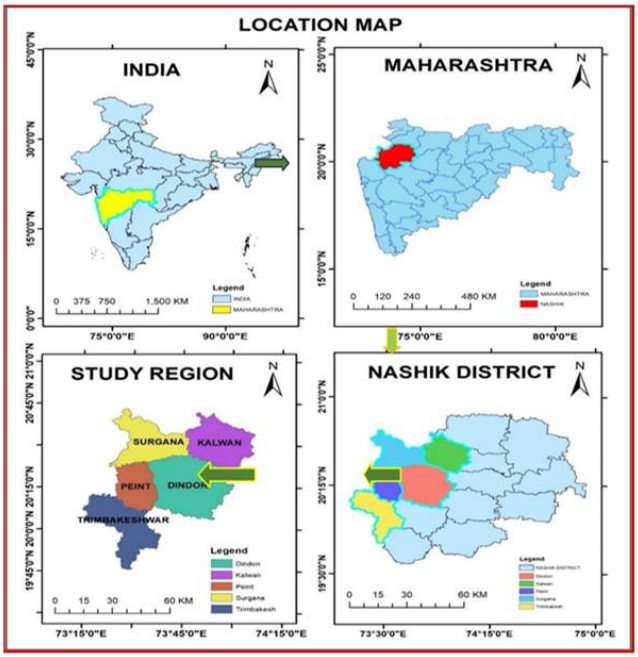

Fig. 1

2 Methodology

A thorough field investigation has been carried out in order to obtain this material. Information on household, village and primary health centers conditions have been compiled using three separate forms of questionnaires. A total of 38 PHCs, 5 RHs are assessed and data on the number of patients treated have been compiled. In the area PHCs are directly inspected and data on infectious patients with different diseases are obtained from primary health center and rural hospital. The average area serviced by each composite weightage can be used to investigate the scope of the health care. Here, an endeavor is made to establish a link between the hinterland and the health-care services offered in the service centers. It is a truth that, the more efficient health service facilities are the smaller than the area served by each composite weightage. The following formula is used to calculate the average area per composite weightage.

Area per Composite Weightage= TAa/ CWa

Whereas,

TAa: Total area served by primary health center.

CWa: Composite Weightage of a primary health center.

3 Result and Discussion

One helpful metric for assessing the extent of healthcare is the average area served by each composite weightage. It facilitates the connection between the services provided by health centers and the hinterland of population. Weak centers cover vast hinterlands, while efficient and well-equipped facilities typically service smaller areas. This metric emphasizes the accessibility, equity and spatial distribution of healthcare services. As a result, it offers insightful information for allocating health resources and regional planning [11]. The resultant values are given in [Table. 1].

Table 1: Tribal Tehsil of Nasik District: Altitudinal belt-wise proportion of primary health centers according to average area served by per composite weightage, 2024-25

Average Area served Per C.W.	300 to 400 M.		400 to 500 M.		500 to 600 M.		600 to 700 M.		Above 700 M.		Region	
	No. of PHC	%	No. of PHC	%	No. of PHC	%	No. of PHC	%	No. of PHC	%	No. of PHC	%
Less than 3	-	-	3	42.85	2	50	8	44.44	2	20	15	34.88
3 -6	2	50	4	57.14	2	50	8	44.55	6	60	22	51.16
Above 6	2	50	-	-	-	-	2	11.11	2	20	06	13.95
Total	**04**	**100**	**07**	**100**	**04**	**100**	**18**	**100**	**10**	**100**	**43**	**100**

Source: Computed by Researcher, 2024-25

[Table. 1] and [Fig. 2] indicate that, 15 of the total number of primary health service centers (34.88 percent) fell into the category of having a service area of less than 3 square kilometers. However, the 600–700-meter altitudinal belt has the highest concentration of health service centers (53.33 percent). Per composite weightage input from [Table. 1], there are 22 health care centers with an area of 3 to 6 sq. km. All of these service centers are more or less uniformly spread in the supplied three altitudinal belts. There are 06 health service centers that serve an area of more than 6 square kilometers per composite weightage. The majority of them can be found at higher elevations.

[Fig. 3] is created of scattered diagram, after additional examination of the health service centers using indicators such as average population per composite weightages and average area per composite weightage in the region. The average population area per composite weightage data on the 'Y' axis are shown against the average area per composite weightage values on the 'X' axis. The diagram depicts five unique types of health-care facilities. They are following:

Better served health service centers: There are six health service centers in this category. Kalwandi, Peint RH, Talegaon, Barhe, Surgana RH, and Kanashi are among the most important. They are less than 700 meters above sea level, with a moderate population per composite weightage and an average area of less than 2 square kilometers per composite weightage [6].

Well served health service centres: Five unique categories can be seen in [Fig. 2]; those health service centers in the first category give better services to their moderate population region. The remaining four may have a high concentration of health-care centers that provide excellent to bad service. The typical population served by per weightage centers is 700 to 1600 people, with an average size of 2 to 4 square kilometers. Well-served health service centers are those located in the western part of the country. Jogmodi, Ambe, Bhuwan, Kohar, Varkhede, Mohadi, Khedgon, Dindori RH, Bubali, Jaidar, and Dalwat primary health centers are among the 19 health service locations mentioned.

Moderately served health service centers: This category may include health service centers that are located to the right of the boundary line. This group is made up of 11 different health service centers. The typical population served by per weightage centers is 900 to 1500 people, with an average size of 4 to 6 square kilometers. Kumbhale, Umrale, Nigdol, Pandhane, Umbarthan, Mani, and Mankhed are some of them [12].

Poorly served health service centers: This category includes 5 service centers, each of which serves more than 1100 people and covers an area of 6 to 8 square kilometers. Nanashi, Kochargaon, Borgaon, Chinch Ohal and

Shirasgaon are some of these service hubs. There is a severe scarcity of various health-care amenities at these centers.

Very poorly served health services centers: Per composite weightage, health care centers like Ware have a high average population and an area of more than 8 square kilometers. As a result, they are included in health service locations that are underserved, such as those that are far away and poorly equipped.

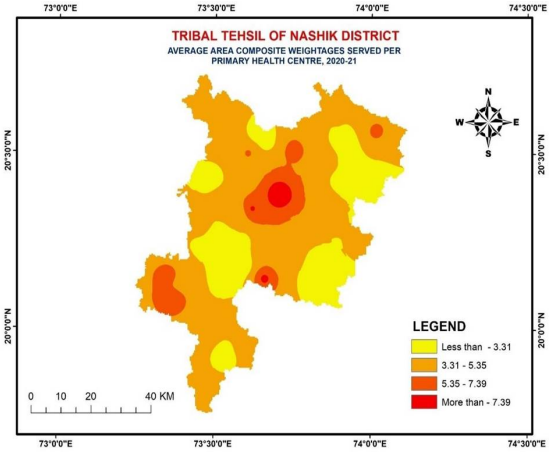

Fig. 2

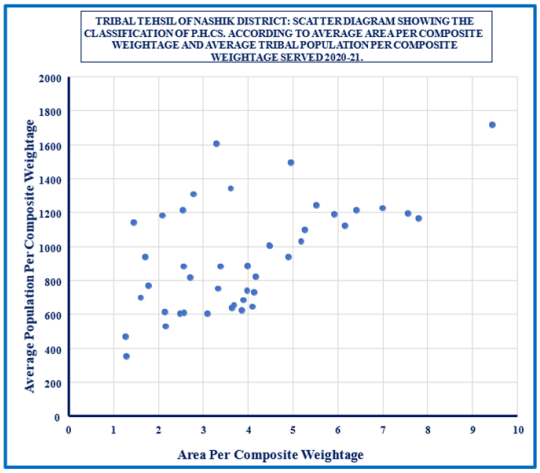

Fig. 3

4 Conclusions

In the tribal tehsils of Nasik district, primary health clinics are distributed unevenly but significantly across altitudinal belts; the 600–700 m belt has the highest number of health facilities (53.33%). According to composite weightage, 34.88% of PHCs serve an area of smaller than 3 square kilometers, suggesting that there are effectively run health facilities in some areas. The majority of PHCs (51.16%) are located in service areas between 3 and 6 square kilometers, indicating that most centers offer a moderately balanced level of health coverage. Only 13.95% of PHCs serve more than 6 square kilometers per composite weightage, and the majority of these are found at higher elevations with inadequate accessibility and health services. Better served, well served, moderately served, poorly served, and very poorly served are the five groups into which the dispersed diagram analysis divides PHCs, revealing a distinct hierarchy in health care efficiency throughout the area. Regional differences in access to health services are highlighted in the study [13]. While certain places, like Kalwandi, Peint RH, and Barhe, offer effective services, others, including Ware, Nanashi, and Kochargaon, experience acute shortages, necessitating immediate policy attention and resource allocation.

References

1. Borase, Suryawanshi DS, Kate AM (2014): GIS base mapping of Spatio-temporal distribution of healthcare services in Nasik district(M.S.)India. *IJHEPS*. 01(07) 2014, pp 52-57 www.ijheps.org
2. Christlar W. (1933): *The central places of Southern Germany*. Translated by C. W. Baskin, Prentice Hall.
3. Suryawanshi DS, Kate AM. Measuring the level of development of government healthcare facilities in tribal & non tribal region of Nasik district (M.S.) India. *International journal of educational research and technology*. 2015;6(4):30-34.10.15515/ijert.09764089.6.4.3034
4. Garud SB, Suryawanshi DS. (2008) Status of Tribal Health Service Centers in Dhadgaon Tahsil of Nandurbar District, Shillong *Hill Geographer*. Vol-XXIV, No.1-2, and Pp 8589
5. Garud SB, Suryawanshi DS. Planning of Health Administration in Tribal Area: Present & Future. Journal of Research & Development. 08(03), 2018. pp.10-19. http://jrdrvb.com/
6. Wetal JD, Awhad AA, Suryawanshi DS, Suryawanshi MV. Spatial analysis of area influence of primary health centres in the tribal Tahsils

of Nasik district. *IJARIIT*. 2022;8(3).10.21203/rs.3.rs-2155441/v1

7. Wetal JD, Suryawanshi DS, Patil BS. (2021): Health Care Services in Tribal Tahsils of Nasik district. International Journal of Creative Research Thoughts (IJCRT). 9(7), 2021. www.ijcrt.org
8. Rai PK, Nathawat MS. *Geoinformatics in Health Facility Analysis*. 2017;.10.1007/978-3-319-44624-0
9. Rao SK. (1998). Health Care Services in Tribal Areas of Andhra Pradesh: A Public Policy Perspective. *Economic and Political Weekly*, 33(9). 481-486. https://www.jstor.org/stable/4406472
10. Singh SB. (1977): Distribution of centrality and hierarchy of rural central places in Sultanpur district of U.P., India, The National Geographical Journal, Vol. 23, Part 3-4, Page- 185-194.
11. Suryawanshi DS. (2007): *Geography of Healthcare*, Raj Publication, Jaipur.
12. Suryawanshi DS, Chaudhari SR. (2007): A study of healthcare services in tribal area of Western Satpura Region. *Deccan Geographer*. Vol-45 Pp 99-106
13. Suryawanshi DS, Garud SB (2013): Impact of relief on inequalities of infrastructure facilities in Dhadgaon tahsil of Nandurbar dist, (Maharashtra) India. Indian Stream Research Journal. Vol-6 Pp10-15 www.isrj.jet