

Weighted Mean Distance – An Index to Measure Suitability of Geographical Location of PHCs

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ABSTRACT: The establishment of Primary Health Centres in India started as early as in 1952, and over the last six decades it has undergone several changes to meet the increasing demand for health care services. Until the eighth Five Year Plan, the emphasis was on the expansion of the health care establishment. However, during the eighth and subsequent plans the emphasis was mainly on consolidation of existing health infrastructure rather than on expansion. The trust has been on qualitative improvement in the health services through strengthening of physical facilities like provision of essential equipment, and consumables, construction of buildings and staff quarters, of medical and paramedical staff and in-service training of staff.

The location of the primary health center with respect to the various villages in its functional area is an important aspect. Its suitability in this context depends upon the transport infrastructure in the region. In this paper a study is conducted of all the primary health centers of Dhule taluka of Dhule district of Maharashtra state of India. The weighted mean distance is proposed as an index. The parameter “weighted mean distance indices” are compared with the “composite indices” for the different primary health centers, which are based on different technical and social dimensions. This parameter may be used for redistribution of villages among the primary health centers or introduction of new primary health centers to support the increasing population in villages.

KEY WORDS: Composite Index, Facility Management, Functional Audit, Primary Health Center, Weighted Mean Distance

I. INTRODUCTION

Primary Health Centers (PHCs) are the corner stone of rural health services. A typical PHC covers a population of 20,000 in hilly, tribal, or difficult areas and 30,000 populations in plain areas with 4-6 indoor/observation beds [ix]. It acts as a referral unit for 6 sub-centers and refer out cases to CHC (30 bedded hospital) and higher order public hospitals located at sub-district and district level. The performance of PHCs can be assessed against the set norms and standards laid down at national, state and sometime specifically at local levels. In order to provide optimal level of quality health care, a set of standards are being recommended for PHCs to be called Indian Public Health Standards (IPHS) for PHCs [x]. The launching of National Rural Health Mission (NRHM) has provided this opportunity. The setting standards are a dynamic process. Currently the IPHS for PHCs' has been prepared keeping in view the resources available with respect to functional requirement for PHCs with minimum standards such as building manpower, instruments, and equipments, drugs and other facilities etc [vi]. The overall objective of IPHS for PHC is to provide health care that is quality oriented and sensitive to the needs of the community. It has been defined as an essential health care which should be based on practical, scientifically sound and socially acceptable methods and technology. It should be made universally accessible to the individuals and the family in the community through their full participation. It is to be made available at a cost

which the community can afford to maintain at every stage of its development in a spirit of self-reliance and self-determination. PHC is the first level of contact of the individuals, the family and the community with the national health system bringing health care as close as possible to where the people live and work. It constitutes the first element of the process of continuing health care, and this should get full support from the rest of the health system [v].

The health care system in India, at present, has a three-tier structure. The first tier, is the primary tier, has been developed to provide health care services to the vast majority of rural people. The primary tier comprises three types of health care institutions: Sub Centre (SC), Primary Health Centre (PHC) and Community Health Centre (CHC). The rural health care infrastructure has been developed to provide primary health care services through a network of integrated health and welfare system. India is a signatory to the Alma Ata Declaration of 1978 and was committed to attaining the goal of "Health for All by the Year 2000 A.D" through the universal provision of primary health care services [vii]. Normally, the location of the PHC is based on the availability of the other necessary infrastructure in and around the village selected for it, but in many of the cases it is observed as a political decision. In fact, it should be selected on the basis of the availability and condition of transport infrastructure and the populations of the attached habitat.

II. DESCRIPTION OF RESEARCH AREA

The Dhule taluka of Dhule district of Maharashtra state, India is considered for study. Dhule is located at 20.9°N 74.78°E and lies in the Khandesh region, which forms the northwest corner of Deccan Plateau. The district is bounded by Gujarat State on west and by Madhya Pradesh on north along with Nandurbar, on east and south by Jalgoan and Nasik respectively. The Dhule taluka is one of the four talukas of Dhule district. There are 10 PHCs in Dhule taluka. The location of the different PHCs and their jurisdiction is shown in Figure 1. The demographic description of these PHCs is given in Table 1.[ii]

Figure – 1 : Map showing the jurisdiction of All PHCs in Dhule Taluka [ii]

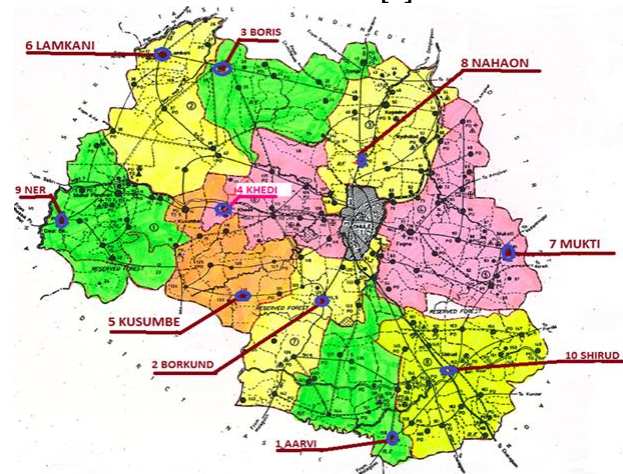


Table – 1 : Demographic Description of PHCs [ii]

Sr	PHC	Number of Villages under PHC	Population of All Villages
1	Aarvi	14	38211
2	Boris	11	32301
3	Borkund	13	26706
4	Kheda	12	34229
5	Kusumba	13	27300
6	Lamkani	13	26009
7	Mukti	22	63122
8	Nagaon	11	29950
9	Ner	11	28007
10	Shirud	12	30821
	Total	132	336656

III. METHODOLOGY

Each primary center covers number of villages around it. The population and the distance of each village from the PHC center exhibit the suitability of location of that PHC center with respect to the overall population of villages. The weighted mean distance is calculated as index for it. The higher the weighted mean distance indicates the unsuitability of location. The distance in tar road is given

as weight 1.00 in calculation and the WBM/Kachha road is given weight 2.00, as the vehicle speed is assumed half in WBM/Kachha road as compared to bitumen road. The sample calculation showing the calculation of weighted mean distance for PHC – 1 is shown in Table – 2.

Table – 2 : Sample Calculation of Weighted Mean Distance for PHC-1

Sr.No.	Name of Village	Population	Kachha Road "Km"	Pakka Road "Km"	Population x Distance "Km"
1	Arvi	6277	0	0.5	3138.5
2	Ajnale	871	3	10	13936
3	Awadhana	4039	0	10	40390
4	Bendrepada	1521	1	5	10647
5	Chaugaoan	3919	3	5	43109
6	Dhadre	2197	0	5	10985
7	Dhadri	1073	0	5.5	5901.5
8	Hendrun	3428	2	5	30852
9	Kulthe	1159	2	5	10431
10	Moghan	3813	1	5	26691
11	Purmepada	2379	4	3	26169
12	Ranmala	1987	7	7	41727
13	Sadgaon	3412	3	12	61416
14	Tikhi	2136	5	9	40584
	SUM	38211			365977.00
Weighted Mean Distance (Kms)					9.58

Similarly the weighted mean distance is calculated for every PHC. The calculations are shown in Table 3.

Table – 3 : Weighted Mean Distance – All PHCs

Sr. No.	PHC	Number of Villages	Total Population	Weighted Mean Distance (Km)
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1	ARVI	14	38211	9.58
2	BORIS	11	32301	10.39
3	BORKUND	13	26706	8.99
4	KHEDA	12	34229	10.31
5	KUSUMBE	13	27300	10.34
6	LAMKANI	13	26009	12.51
7	MUKATI	22	63122	16.83
8	NAGAON	11	29950	7.79
9	NER	11	28007	15.27
10	SHIRUD	12	30821	11.85
	SUM	132	336656	

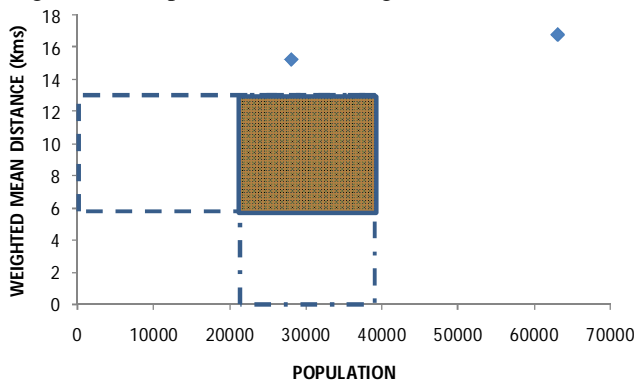
IV. RESULTS

It is evident from the Table 3, that all the 10 primary health centers of Dhule taluka are serving a total population of 3,36,656 souls (as per 2011 census), which is living in 132 villages which includes the Wadi and Tanda. The weighted mean distance is minimum (7.79 Kms) for PHC – 8 i.e. Nagaon and maximum (16.83 Kms) for PHC – 7 i.e. Mukati. The population under the PHC-7 is highest i.e. 63122, which is around 18% of the total population under all PHCs. This may be one of the reasons behind it. The weighted mean distance of PHC-9 is also quite high i.e. 15.27, whereas its population coverage (28007) is less than that of PHC – 7 (29950). It is evident from the figure 4.14 that for eight PHCs the weighted mean distance varies from 7.79 – 12.51, whereas for two PHCs i.e. PHC-9 (Ner) and PHC-7(Mukati), it is more than 15 Kms. Hence, the relocation of the villages under the near by PHC with better/shorter transport routes should be done. This may be suggestion for PHC-9 (Ner), PHC-6 (Lamkani) and PHC-10 (Shirud). However for PHC-7 (Mukati), the only feasible solution is the division of jurisdiction in two PHCs or

introduction of new PHC. The plot of population versus weighted mean distance is shown in Figure - 2.

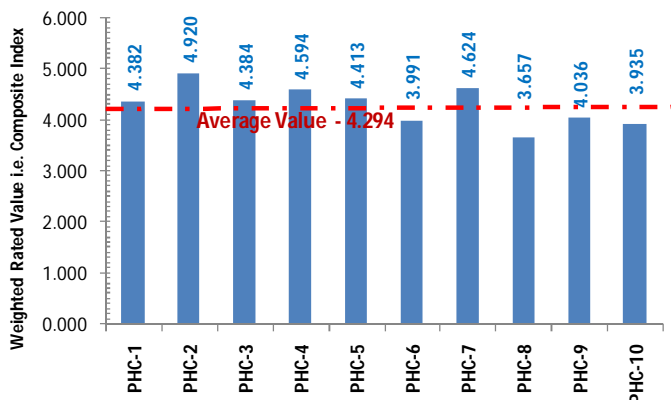
It is clear from the plot that there is no correlation between the population coverage and weighted mean distance.

Figure – 2 : Population versus Weighted Mean Distance



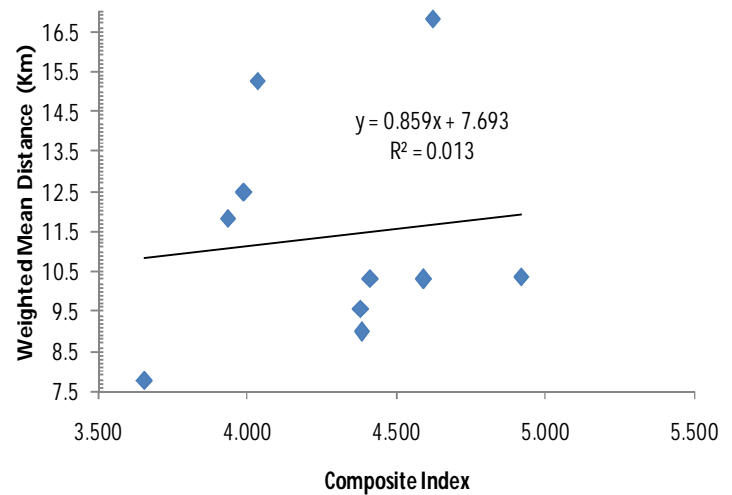
The composite indices of the all ten primary health centers are calculated and is shown in Figure – 3, which is the weighted average of the rated value of eight dimensions i.e. area, facilities, water supply, sanitation, campus environment, man-power, building condition (PHC) and building condition of quarter, i.e. area, facilities, water supply, sanitation, campus environment, man-power, building condition (PHC) and building condition of quarter, on which the functional audit is done [viii].

Figure – 3 : Composite Index of All Primary Health Centers [viii]



The weighted mean distance versus the composite index plot as shown in Figure - 4 does not show any correlation.

Figure – 4 : Correlation among the Weighted Mean Distance & Composite Index



V. CONCLUSIONS

- i. The relocation of the villages in the jurisdiction of PHC-9 (Ner), PHC-6 (Lamkani) and PHC-10 (Shirud) is suggested for reducing the travelling distances. Some of the villages at farthest points may be relocated to the nearest center.
- ii. The PHC-7 (Mukati), which have 22 villages and 63122 souls in its jurisdiction needs immediate attention of authorities for introducing another PHC by dividing its jurisdiction.
- iii. It is clear from the analysis that there is no correlation between the population coverage and weighted mean distance.
- iv. The weighted mean distance versus the composite index plot does not show any correlation.

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