

Research Article

Hospital Service in Ethiopia and Its Spatial Distribution around the Ethiopia

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Abstract

This paper focused on the analysis of spatial distribution of hospitals in Ethiopia. Hence analyzing the spatial Distribution of existing hospital facilities is a significant aspect in healthcare and farther decision making concerning the distribution and equity among the number of population and geographical accessibility. Accordingly Based on point data obtained from google earth survey the spatial distribution of hospitals through regions of Ethiopia is mapped and disparity of distribution is measured by using Location quotient, a ratio of population per hospital and ratio of hospitals per area coverage where used.

The types of hospital distributed in the region and health policy were discussed in the paper. Even though there are hospitals within the regions, the analysis shows that there is the unequal spatial distribution of hospitals in Ethiopian regions. The ratio of population per hospital depicts the number of population per hospitals is very high even than the national average. Generally, the analysis shows that there is a scarcity of distribution of hospitals within a state in addition to unequal spatial distribution.

Keywords: Hospital service; Health care division; Health; Global Health

Introduction

The African continent is facing a health crisis occasioned by very low funding of health services and deterioration of health service infrastructure [1]. Weak infrastructure and limited distribution systems in low- income countries complicate access to health services, especially in rural areas. Government health outlets may be relatively few and widely dispersed and private-sector sources often favor wealthier urban areas, resulting in uneven service availability within a country. In the absence of a solid health infrastructure, strengthening primary health care and innovative community- based health service delivery systems help provide more equitable access to health services [2].

Healthcare is defined as a program of services that makes available all facilities of health and allied services necessary to promote and maintain the health of mind and body [3]. Hospital is one of the health care facilities to attain such objectives. Thus, it is very important to analysis the nature of spatial distribution and the assessment of hospital needed for a given population. It is crucial to conduct such revision which will help the people as well as decision makers to determine the condition of spatial distribution of hospitals in the country which will in turn enhance the accuracy of future planning.

Methodology

The data for the analysis has been collected from secondary sources. Accordingly, the number of hospitals with the respective region was taken from the Ethiopian Federal Democratic Republic ministry of health and Oromia regional health office. Other data is computed from web-based articles journals and books. The point data were obtained from google earth which was input for mapping spatial distributing by using GIS. The data obtained from different sources organized and presented by using tables and graphs. Then the data were analyzed by using qualitative and

quantitative approaches like Location quotient and ratio.

History of health care in Ethiopia

Numerous countries have created local environments to provide residents access to healthcare [4]. Hospital services are strongly consumption- and service-oriented, and they require improved spatial distribution research to maintain socially fair resource allocation, to eliminate spatial polarization, and to reduce spatial differentiation resources in response to the initiatives of the World Health Organization Distribution of existing healthcare centers is an important aspect in healthcare and decision making [3].

As stated by WHO [5], Modern medicine was introduced to Ethiopia in the 16th century during the regime of Emperor Libne Dingel (1508-1540), and was enthusiastically promoted during the reigns of Emperor Menelik II (1889-1913) and Emperor Haile Selassie (1930-1974). Emperor Menelik invited travelers, missionaries and members of diplomatic missions to introduce medicines and provide medical services, mostly in Addis Ababa, and various programs and interventions ensued.

According to Ministry Health [6] the first modern government-run hospital was built by Emperor Menelik II in 1906 in Addis Ababa with only 30 beds and was named Menelik II hospital, more hospitals were in existence at the time of the founding of the Ethiopian Ministry of Health in 1948. Since then many hospitals built at different areas of the country. The modern Ethiopian health system has a relatively short history. Moreover, it has been in constant change reflecting progress in the socioeconomic and political changes that took place during the last century particularly in the last two decades, in response to new health reform programs and policies launched locally to coincide with worldwide initiatives on health sector reforms [7].

With more than 90 million inhabitants, Ethiopia is the second most populous country in Africa, after Nigeria. Numbers of males and females are approximately equal. The rate of population increase

is estimated at 2.6% per year. In recent years the life expectancy has been increasing, and is now 64 years at birth. The population of the country is mostly agrarian and rural, with a low per capita income. Pneumonia is the leading cause of mortality in Ethiopia. Another major health issue in the country is maternal and child health [5].

According to FMOH [8] cited in Bogale article [1] after 1991 the Ethiopian government undertook a robust reform in deferent sectors. One of the reforms was health sector reform. After thorough study and assessment of the health situation, the FMOH of Ethiopia developed a health care financing strategy in 1998 that was endorsed by the Council of Ministers and became a very important policy document for introduction of health financing reforms. The government recognized that health cannot be financed only by government and underscored the importance of promoting cost sharing in provision of health services.

Regional distribution of population and hospitals

Expectedly the number of hospitals varies from region to region in response, partly, to differences in population sizes [7,9]. Despite

its spatial coverage, the highest number of hospitals is located in Oromia regional state. But this figure does not indicate the adequacy hospitals since the region is large in terms of area and a high proportion of the national population (Table 1). The second and third population regions, Amhara and SNN, have the largest distribution of hospitals next to Oromia regional state. This figure simply shows us the spatial distribution of hospitals over the region but not hospitals its adequacy of accessibility to the total ratio of the population (Figure 1).

As stated by Shivamallu [3], "Inequality in health services distribution has become a concern of challenge among different countries. Equality in distribution of health services and equal accessibility to such services has become a major principle in most health systems"

Spatial distribution of hospitals in Ethiopia

Distribution of hospitals is an important aspect of healthcare and decision making. Based on point data obtained from google earth the spatial distribution of hospitals in Ethiopia mapped and the data obtained from the ministry of health was measures by

Table 1: Regional distribution of population and hospitals.

S. No	Region	N.Ho	Population 1994 (c)	Population 2007 C	Population 2011	Population 2015 P	Population 2017P	Population 2019p
1	Addis Ababa	21	2,112,737	2,739,551	3,041,002	3,273,000	3,355,024	3,464,965
2	Afar	6	1,106,383	1,390,273	1,602,995	1,723,000	1,757,622	1,816,540.
3	Amara	84	13,834,297	17,221,976	18,866,002	20,401,000	20,711,665	21,322,562
4	Benishangul	6	460,459	784,345	982,004	1,005,000	1,083,200	1,136,906
5	DireDawa	2	251,864	341,834	387,000	440,000	439,685	456,174
6	Gambela	4	181,862	307,096	385,997	409,000	427,819	448,664
7	Hareri	5	131,139	183,415	210,000	232,000	234,137	242,917
8	Oromia	108	18,732,525	26,993,933	31,294,992	33,692,000	34,472,795	35,798,538
9	SNN	72	10,377,028	14,929,548	17,359,008	18,276,000	18,882,245	19,593,825
10	somali	10	3,152,704	4,445,219	5,148,989	5,453,000	5,605,339	5,811,263
11	Tigray	13	3,136,267	4,316,988	4,929,999	5,056,000	5,262,711	5,438,886
	Total		53,477,265	73,654,178	84,207,988	89,960,000	92,232,243	95,531,245

Sources: for number of hospitals ministry of health and for population data [9]

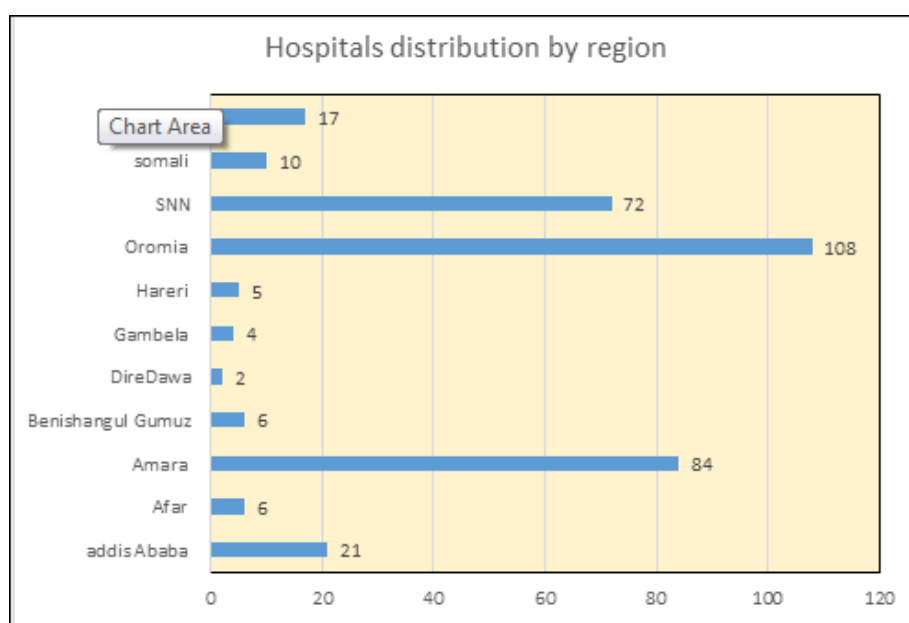


Figure 1: Distribution of hospitals by region (Source: computed from Table 1).

applying Location quotient and Lorenz curve. As shown on the map hospital health care services is spatially unequally distributed in Ethiopia. Accordingly, most of the hospitals in the country located around the center and to the north and south of the capital city in Addis Ababa (Figure 2).

As it indicated on the map the spatial distribution of hospitals in Ethiopia is mostly concentrated around the high population areas radiating to south and north of Addis Ababa. But there is spatially less distribution of hospitals to the east and north east of the country. This is may be due to less population areas in relation to the nature of the local climate condition. Generally, most of the distribution of the hospitals in Ethiopia is located on the high land areas where there is high population than sparse population of low lands.

Location quotient

Location quotient provides the spatial concentration pattern of amenities in a particular area. The location quotient is a method for comparing percentage share of a particular facility with its percentage share of population. This method is applied in order to show the variation in the concentration of hospitals among regions the country.

Health centers in a particular block the following formula has been used (Table 2).

$$L.Q. = (HV/PV) / (HD/PD)$$

Whereas L.Q =location quotient

HR= number of hospitals in the region

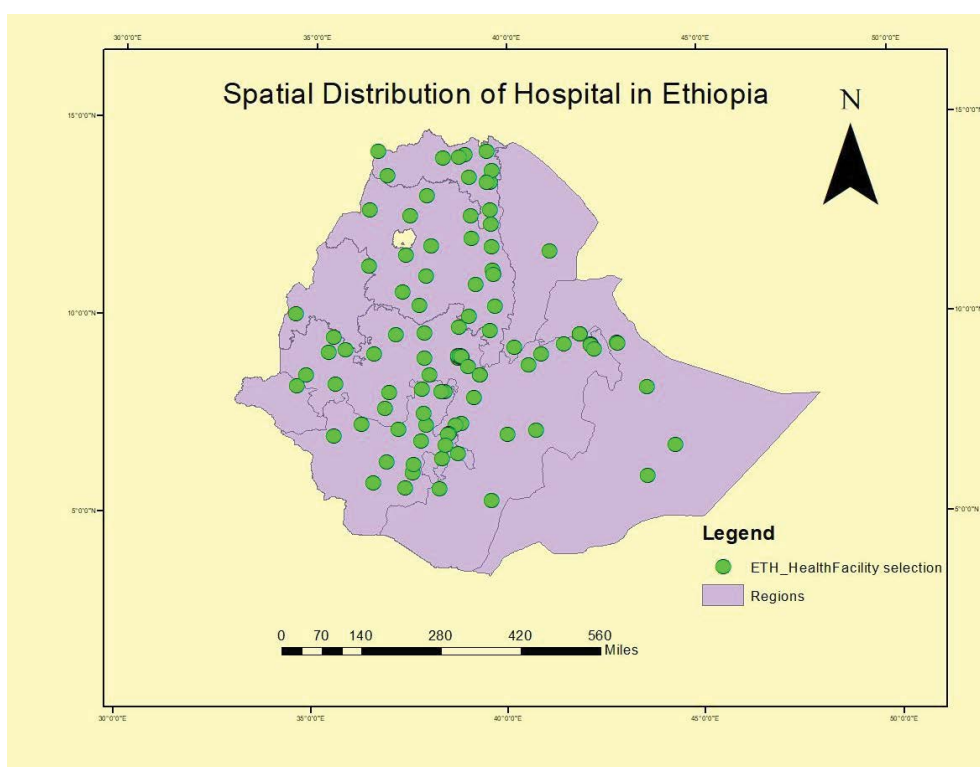


Figure 2: Spatial distribution of hospitals in Ethiopia (Source: Computed by author).

Table 2: Measures of hospital distribution by location quotient and ratios.

	Region	Number of hospitals	Area (km squ.)	Population 2019p	Location Quotient (L.Q)	Hosp per population	The ratio of hospital to Area (km squ.)
1	Addis Ababa	21	526.99	3,464,965	1.7	1:164998	1: 25sq.km
2	Afar	6	72,052.78	1,816,540	0.1	1:302757	1:12008 sq.km
3	Amhara	84	154,708.96	21,322,562	1.1	1:253840	1: 1842 sq.km
4	Benishangul Gumuz	6	50,698.68	1,136,906	1.5	1:189484	1: 8449 sq.km
5	DireDawa	2	1,558.61	456,174	1.3	1:228087	1:779 sq.km
6	Gambela	4	29,782.82	448,664	2.6	1:112166	1:7445 sq.km
7	Hareri	5	333.94	242,917	5.9	1:48583	1:67 sq.km
8	Oromia	108	284,537.84	35,798,538	0.9	1:331468	1:2634 sq.km
9	SNN	72	105,476	19,593,825	1.2	1:272136	1: 1464 sq.km
10	Somali	10	279,252	5,811,263	0.5	1:581126	1:27,925 sq.km
11	Tigray	13	53,638	5,438,886	0.9	1:319934	1: 3155 sq.km
	Total	335	1032566.62	95,531,245	1	1; 285168	1: 30 82 sq.km

PR= Population of the concerned region

HS= Number of hospitals in the state

PS= Population of the state

If the value of the quotient for a particular facility in all region equals to 1, it indicates that the hospitals are equally distributed. If the value of the quotient for a particular region is greater than 1, it means that the concentration exceeds the national average. A value lesser than 1 indicates a deficiency in the service, while a value equal to 1 or close to 1 indicates self-sufficiency [3].

As indicated by the table averagely one hospital in Ethiopia service more than 285,168 populations which exceeds the aggregate national standard in which one primary hospital per 100,000 populations. Even though there is a scarcity of health services there is an equal distribution of hospitals over the administrative region of Ethiopia. hence the location quotient in table 2 shows that Hospital distribution varies in the regional level in Ethiopia.

The degree of location quotient of hospital distribution is higher in the Harari region (5.9), which designates more number of hospital distribution are available to its population. Next the highest concentration of hospitals was found in Gambela, Addis Ababa and Benishangule regional states. Amahara Dire dawa and SNN have average national hospital distribution. Oromia and Tigry regional states have sufficient distribution but less than the

national average. While in Afar and Somale the value is less than 1, which reveals that the facilities are a deficit to the population. The location quotient of the hospital indicates that higher the value more hospital distribution is available to the population and vice versa (Figure 3).

Ratio of are square km per hospital

As it indicated in the figure in terms of areal coverage, in Somali regional state one hospital can cover 27,925 square km and the smallest areal coverage is in Addis Ababa administrative region which is 1:25square km. This is to mean that, hospital distribution is accessible within a short distance in Addis Ababa, Harari, Dire Dawa, SNN, and Amhara regional state in relation to Somali, Afar, Benishangule Gumuz and Gambela regional states which is less accessible in the average distance. Therefore, the accessibility of hospitals is very low in low lands of Ethiopia due to highly sparse population distribution.

Ratio of population per hospital

Every social institution has its outer limit to deliver proper services to the local population. In Ethiopian context a primary hospital can serve up to maximum of 100, 000 and minimum of 60,000 populations per hospitals. But as it indicated in figure 4 almost all regions have high population per hospital than the aggregate population per hospital services of a state (Figure 4).

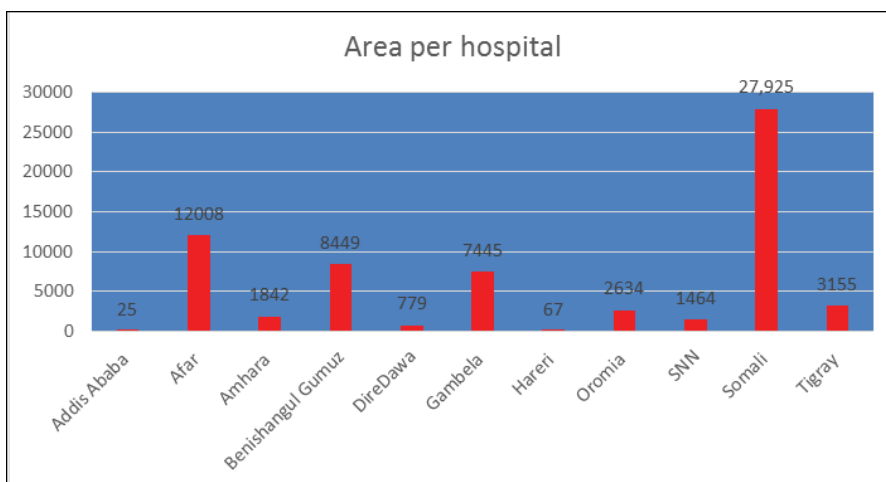


Figure 3: Area coverage per hospital.

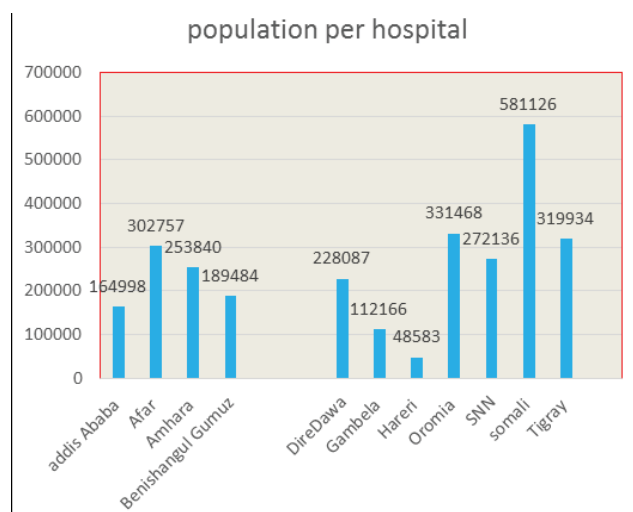


Figure 4: Population per hospital.

As indicated by the graph the ratio of population to the hospital is higher for Somali regional state which was one hospital give services for 581126 (1: 581126). Similar to a location quotient the graph indicates that there is scarcity of hospital distribution to the number of population in the Somali region of Ethiopia. In relation to the number of population Harari regional state has more accessible of hospital services than other regions in the state. Generally Somali (581126), Oromia (331468) and Tigray (319934) regional states have less than the average distribution of hospitals in the country which results in high population per hospitals than other regions in the state. Amahara (253840), Dire Dawa (228087) and SNN (272136) regions have nearly equal average national population distribution per hospitals. Others, Harari, Gambela Benishangule and Addis Ababa have less than national population distribution per hospital.

Types of hospitals distributed in the region

As stated by WHO [5] a primary hospital provides emergency surgical services, and is a referral center for the HCs and a practical training center for nurses and other paramedical health professionals.11 A general hospital serves as a referral center for primary hospitals and as a training center for health officers, nurses and emergency surgeons. Similarly, a specialized hospital is a referral center for general hospitals. A primary hospital provides inpatient and ambulatory services to an average population of 100 000. General hospital is a medical facility that provides health care to both in patients and out patients and treats many types of diseases with medical professionals. In Ethiopia a general hospital is supposed to serve 50,000 people and provide all types of clinical service including surgery [10,11] (Table 3).

As indicated in the table 3 the spatial distribution of hospitals mostly dominated by primary level, which depict the hospital

distribution in Ethiopia is a new phenomenon. Because primary level hospitals are low in capacity and mostly newly built in rural and rural towns of Ethiopia. Accordingly, the highest proportion of hospitals is primary (220), General (102) specialized and referral hospitals were (31). Most of the referral and specialized hospitals are primarily located around the center mostly Addis Ababa and some regional administrative towns. Primary hospitals as indicated above mostly rural hospitals, which has less capacity of services than general hospitals. Geographically, relatively general hospitals are located in the large and medium cities of the country (Figure 5).

Health policy in Ethiopia

To implement the policy, the Health Sector Development Program (HSDP) was developed in 1997/98, and a healthcare and financing strategy in 1998 [12]. According to Adugna [7] the current health policy has been in existence since 1993. It "... emphasizes the importance of achieving access to a basic package of quality primary health care services by all segments of the population, using the decentralized state of governance. The health policy stipulates that the health services should include preventive, primitive, and curative components. The right to health for every Ethiopian has been guaranteed by the 1995 Constitution of the Federal Democratic Republic of Ethiopia (FDRE), which stipulates the obligation of the state to issue policy and allocate ever increasing resources to provide public health services to all Ethiopians [13].

The National Health Policy is an overarching policy document that gives strong emphasis to the fulfillment of the needs of the less privileged rural population that constitutes about 83% of the total population in Ethiopia. The Health Policy outlines: Democratization and decentralization of the health system; Development of the preventive and promote components of

Table 3: Type of hospitals.

Tertiary Level	Specialized Hospital 3.5 -5 million people	
Secondary Level	General Hospital 1-1.5 million people	
Primary Level	Rural	Urban
	Primary Hospital 60000-10,0000 people	Health Centre 40, 000 people
	Health Centre 15000-25000 people	
	Health post 3000- 5000 People	

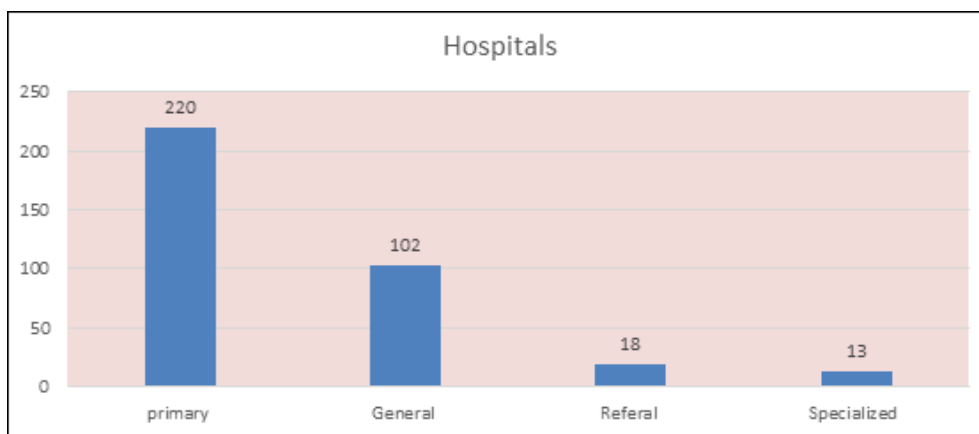


Figure 5: Distribution of hospitals by type.

the health service; Ensuring accessibility of health care by all population, promoting inter-sectoral collaboration, involvement of the NGOs and the private sector; and Promoting and enhancing national self-reliance in health development by mobilizing and efficiently utilizing internal and external resources [14].

During the past fifteen years, the Ministry of Health (MoH) has developed a first national health policy, followed by four consecutive Health Sector Development Plans (HSDPs). The recently implemented Business Process Reengineering (BPR) of the health sector has introduced a three-tier health care delivery system: Primary level one covering about 60,000-100,000 people; level two is a General Hospital covering 1-1.5 million people; and level three is a Comprehensive Specialized Hospital for about 3.5-5 million people [15].

The ongoing hospital reform is reorganizing hospital services into emergency services and non-emergency care delivery and further streamlining outpatient and inpatient services. Each of these service categories are being staffed by case teams with a well-rounded skill-mix, including medical doctors, nurses, pharmacy personnel, laboratory personnel, runners and other support staff [15]. The aim is to ensure that patients obtain the comprehensive quality health services they require, in line with the principle of 'one-stop-shopping'.

Health status and strategies in Ethiopia

Despite major strides to improve the health of the population in the last one and half decades, Ethiopia's population still face a high rate of morbidity and mortality and the health status remains relatively poor [6]. The ministry has also developed 20 years of visioning Ethiopia towards the path of universal health coverage (2015-2035). This document directs the pace of transitioning to low-middle income country by 2025 and to middle-middle income country by 2035. The current Health Sector Transformation Plan (HSTP), extrapolated from the GPT II, covers a five-year period from July 2016 to June 2020 and is well aligned with SDGs3 and health related SDGs and targets that also influence the performance of health determinants [13].

Conclusion

The study reveals that the hospitals are not equally distributed among the regional states of the country. The analysis of location quotient shows that there is more excess of hospitals than the national average, mostly in Harari, Gambela, Benishangule and Addis Ababa in proportion to the population size. While in Amhara and SNN the hospital distribution is nearly proportion to the demand of the population meaning national average. In Afar Somali, Oromia and Tigray the hospitals are deficit compared to the population size of the national average.

Similarly, the analysis of the ratio of population per hospitals shows that there is high proportion of population size per hospital in Somali, Oromia and Tigray in comparison to the regions of the state. This shows that despite the distance hospitals deliver services more than their capacity which can have an impact on the quality of service delivered. While relatively Harari and Addis Ababa has better accessible of hospitals per number of population. In terms of areal coverage in Somali, Afar, Benishangule gumuz and Gambela regional states area per hospital is relatively high with the average national coverage. This is to mean that population

travel long distance to access hospital services within these regions.

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