Investigating the Accessibility of the Primary Health Care Facilities to the Threshold Users in Enugu Urban areas using the Demographic Standards

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Abstract
This study applied demographic standards to investigate the capabilities of primary healthcare facilities (PHCFs) to cover the largest area of the study area and the service area that can be accessed. This study was conducted to find out the sufficient number of primary healthcare centers required to provide healthcare services to the entire community. Data was obtained by applying geographic information system (GIS) techniques to analyze primary care facilities using the demographic standards for primary care facilities. The study area needs 41 additional centers to cover the shortfall in service provision per the demographic and geographic standards. A significant deficiency in the number of primary care centers found in the study area compared to the large population at the geographical and demographic standards level.

1. Introduction

Access to healthcare services is one of the necessities of a modern human community. According to the World Health Organization (WHO, 2019) "health is complete physical, mental and social well-being, not merely the absence of diseases or infirmity". Humans' socioeconomic and productive lives are reliant on good health, and its absence leads to poor human health, socioeconomic hardships for families, and even death (Omonona et al., 2015). Child development, family well-being, and wealth creation are subject to the health status of adults (Asenso et al., 2011). Man's health is perceived as most vital because all economic activities are performed by a man (Olugbamila and Adeyinka, 2017). The various processes in accessing health care include health care quality, location, various health care needs, ease of paying for treatment, and willingness to seek treatment (Peter et al., 2008).

The ease of accessing a location by a user is termed geographical accessibility (McGrail and Humphrey, 2014). Wang et al. (2016) state that accessibility links places of demand and supply; available transportation means; and other travel hinderances in getting there. Several methods are used to measure spatial accessibility: provider-to-population ratio, kernel density, network analysis, cost distance analysis, gravity model, and Euclidean distance (Ouma et al., 2021). The spatial separation-based model is another method that is dependent on infrastructures such as healthcare facilities, as an input and it is applicable in areas where information on transportation

routes is unavailable (Parvin et al., 2021). The cumulative opportunity method applies the desired minimum travel time (isochrones) and takes into cognizance the land use pattern and inherent landscape limitations (Geurs et al., 2004).

Healthcare is the prevention, early or late diagnosis, and treatment of all types of diseases, including physical and mental health challenges, leading to the overall wellness of the human body (Oyibocha et al., 2014). To improve the human body, there is a need for hospital equipment, drugs, vaccines, available clean water, electricity supply, proper records, hospital ambulances, and all medical personnel to make it attainable (Ubochi et al., 2019). A patient's first level of healthcare is primary health care, and it is the initial element of the care continuum across communities (WHO, 2020). This health care is the least expensive outpatient consultation, where the patients have not been hospitalized. Severe and complicated health care challenges require a secondary level of care. Here, specialized health care facilities, known as second-tier hospitals/clinics, having healthcare specialists. The next level of health is tertiary healthcare, which provides referral functions for more complex cases from secondary healthcare facilities. Tertiary healthcare serves as the third tier of the healthcare system. In the public sector, these healthcare services are meant to be delivered across three tiers. In Nigeria, these three tiers of health care (primary, secondary, and tertiary) fall under the responsibility of the three tiers of government (Federal, State, and Local government) in the country.

Due to a deficiency in the distribution and planning of hospitals across the country, public and private health facilities have been given due attention to reducing the gap in Nigeria's hospital infrastructure (Agaja, 2012). With global recognition of Nigeria as one of the great nations in Africa, its healthcare status is poor (Welcome, 2011). Although there are global and national reforms and policies to address the dilemma in the healthcare system, Nigeria's local and state government areas are yet to achieve much in their implementation (National Health Policy, 2016). Owoola (2002) in Adeyinka and Olugbamila, (2016) affirm that the country has a high population to facilities ratio due to negligence in the distribution of healthcare facilities.

Barriers to seeking healthcare services include high hospital bills, and lack of health insurance and services, amongst others. Several factors like aging, and availability of healthcare services affect the utilization of health facilities where they are located (Bernstein et al., 2003). One of the fundamental human rights is access to good health services/care. Even more evident is the strain on health care provision during the coronavirus pandemic on the populace's health needs (Cohut, 2020). The government directive putting a ban on mass gatherings, several hospitals and centers restricted services to only severe cases deemed emergencies, and other needs of patients were denied. Hence, it has become more difficult than usual to access care for non-emergency cases (Adeboyejo, 2020).

Health care policies in Nigeria have been only partially implemented with the country's health system, which is a mixture of unorthodox and orthodox medicine, optimising resources, leading to failure in achieving the millennium development goals for health care. Accessibility and utilization of healthcare facilities across any region are very important. The distribution of healthcare facilities across regions is therefore very vital since it determines the level of health of the population in general. The clustering of such facilities can create the problem of accessibility, and to overcome this, even the distribution of such important amenities should be encouraged. Fadahunsi et al. (2017) note that the location of healthcare facilities does not always correspond to the needs of population in most states in Nigeria, and this has resulted in poor health care delivery. Disparities in the distribution and accessibility of healthcare facilities have resulted in

variations in health outcomes between regions. The third Sustainable Development Goal (SDG) is to ensure healthy lives and promote well-being for all ages (WHO, 2022). It is imperative that inequality in healthcare needs, especially the ease of accessing such facilities, be addressed in a bid to achieve the third Sustainable Development Goal.

Health facilities in Nigeria have evolved through a series of historical development including a succession of policies and plans which had been introduced by various administrations. However, the health facilities are inadequate in meeting the needs and demands of the public. Man through technology has continued to expand his land holding capacity and to improve his wellbeing.(Kucharska, 2017). This is because he believes that economic survival or self-sufficiency is synonymous with high standard of living. Also, various religious bodies and private agencies established hospitals, dispensaries and maternities in different parts of the country without considering the convenience of residents at patronizing them. Primary Healthcare (PHC) service delivery in Nigeria has been faced with a lot of problems some of which are inadequate manpower, obsolete equipment and unavailable drugs etc. Depending on which perspective of observation, some have applauded the efforts of the government in providing grassroots healthcare services whereas in some quarters such services are not adequately provided. This is evidenced in the number of ailing hospitals across the country. Besides, most of the government-owned hospitals are not optimally located which implies that community-based accessibility to these medical facilities has been compromised.

Conversely, many peripheral public healthcare facilities are not being patronized due to poor accessibility, poor service provision, and rivalry by healthcare providers, amongst others. In a variety of ways, there are positive and negative consequences to utilizing available facilities such as affordability, service cost, service delivery, cultural ethnicity, travel cost, distance, state of the road, infrastructure, and service providers (staffing). The presence and quality of staff and staff attitude to patients, lack of drugs and perceived high hospital bills, place of residence, and maternal education are challenges hindering health care utilization in hospitals/centers across demographics (Adeyemo, 2005).

Enugu state does not have existing literature on PHCF and thus existing distribution does not seem to have considered the basic physical and socio-economic features of the state that should inform location decisions. The sitting of these PHCF seems to be arbitrary in nature; as space standards that should constitute the fundamental location parameters were apparently not considered (Obateru, 2003). Moreover, there have been the geographic mal-distribution of regional, urban health care facilities in Nigeria has occurred the existing facilities are haphazardly distributed in Enugu metropolis (Buzai, and Marcos, 2012). The distribution of primary healthcare services in Enugu has been characterized by significant disparity. Such disparity is shown in the ways some of these medical facilities seem to be concentrated in one region at the expense of others. This often resulted in spatial inequality that characterizes Nigeria's socio-political landscape. Also, this inequality places pressure on the facilities which are already inadequate. There is need to ascertain how this spatial inequality can be reduced to favour patients patronizing these healthcare facilities. The study seek to investigate the accessibility of the primary health care facilities to the threshold users in Enugu urban using the demographic standard. The study serves as a foundation for healthcare planning and resource allocation, aiming to enhance healthcare accessibility and ultimately improve the overall health outcomes for the population in the region

2. Methods and Procedures

Data were collected primarily from secondary sources and geo-referencing method (GIS). Data on the population census figure of Enugu urban residents were sourced from the National Population figure of 2006 which was projected to 2024 using the Malthus population projection models of 3.6% urban population growth rate. Information on the number of existing primary health care facilities according to Local Government Areas up to 2024 were sourced from the statistical year book of Enugu State, 2024 edition, published by Enugu State Planning Commission.

Data were also gathered through Ground – Truthing Observations (GTOs) . They include the geo-location of the PHCF in Enugu urban using Global Positioning System (GPS), ARC GIS version 9.2 and Goggle Earth. All these were used to collect the coordinates of the Primary Health Care Centers using Global Position System (Germin 76 model GPS), Hand-held type and post field-work. The scanned map was be first geo - referenced, then, on screen digitized and computer image processing applied, using vector graphic techniques afforded by ArcView GIS 3.2a release. The list of healthcare centers and their addresses in the Enugu urban areas and Geo–Eye Image of Enugu urban as shown in table 2 were also sourced from google earth. The administrative map of Enugu urban served as the base map. GPS Device was used to collect coordinate points of the health centers in the three local governments. The administrative map of Enugu ubran was scanned and geo-referenced to WGS UTM ZONE 31. Healthcare facilities was digitized as point features and converted to Database format and these spatial data was organized in different layers. To depict the service supply environment, an inventory of all Primary health care facilities in the study area was conducted and presented in Table 1. This inventory was conducted by compiling an exhaustive list of facilities that were documented by the Enugu State Ministry Health and Health Service Management Board in their official records.

Table 1: Primary Health Centers in Enugu urban with Their Co Ordinates

S/N	Health Facility	Location	Neighborhood	Coordinates
1	Abakpa Health Center	Enugu East	Abakpa Nike	6° 28' 47.40" N, 7° 31' 00.11" E
2	GRA EAST HEALTH CENTER	Enugu North	GRA	6°27'39.58"N, 7°29'53.49" E
3	GRA WEST HEALTH CENTER	Enugu North	GRA	6°27'22.76" N, 7°29'18.23" E
4	INDEPENDENCE LAYOUT	Enugu North	Independence Layout	6°25'47.65" N, 7°31'06.82" E
5	INLAND TOWN	Enugu North	Ogbete	6°26'31.40" N, 7°29'52.86" E
6	NEW HAVEN HEALTH CENTER	Enugu North	New Haven	6°27'20.13" N, 7°31'30.13" E
7	NEW HAVEN WEST HEALTH CENTER	Enugu North	New haven	6°27'28.88" N, 7°30'51.67" E
8	COAL CAMP HEALTH CENTER	Enugu North	Ogbete	6°25'59.84" N, 7°28'55.05" E
9	OGUI NIKE HEALTH CENTER	Enugu North	Ogui	6°25'59.84" N, 7°30'05.12" E
10	UMUNEVO HEALTH CENTER	Enugu North	Asata	6°26'25.92" N, 7°30'11.63" E

11	AFIA NINE HEALTH CENTER	Enugu North	Asata	6°26'15.59" N, 7°30'17.09" E
12	UGBOEZEJI HEALTH CENTER	Enugu East	Abakpa Nike	6°29'32.66" N, 7°31'20.01" E
13	AMORJI NIKE HEALTH CENTER	Enugu East	Abakpa Nike	6°31'10.45" N, 7°31'31.00" E
14	FEDERAL HOUSING	Enugu East	Trans Ekulu	6°28'38.49" N, 7°30'15.52" E
15	HARMONY HEALTH CENTER	Enugu East	Abakpa Nike	6°24'50.26" N, 7°29'41.35" E
16	ACHARA 2 HOSPITAL	Enugu South	Achara L/O	6°25'26.37" N, 7°29'56.68" E
17	ALULU HEALTH CENTER	Enugu East	Abakpa Nike	6°30'10.51" N, 7°30'49.72" E
18	UGWOGO NIKE	Enugu East	Abakpa Nike	6°37'36.45" N, 7°33'28.70" E
19	ACHARA 1 HOSPITAL	Enugu South	Achara L/O	6°26'34.37" N, 7°29'51.56" E
20	UGBO OWA	Enugu East	Trans Ekulu	6°28'47.16" N, 7°29'09.22" E
21	ASATA HEALTH CENTER	Enugu North	Asata	6°26'44.18" N, 7°30'01.45" E
22	AKWUKE HEALTH CENTER	Enugu South	Awkunanaw	6°26'22.68" N, 7°30'09.05" E
23	ONUORIE HOSPITAL	Enugu North	Iva Valley	6°25'10.42"N, 7°31'04.57" E
24	OBIAGU HEALTH CENTER	Enugu South	Obiagu	6°25'10.46" N, 7°31'03.33" E
25	UWANI CENTRAL	Enugu South	Uwani	6°25'01.11" N, 7°30'54.65" E
26	NEW GARIKI	Enugu South	Awkunawnaw	6°23'24.32" N, 7°30'03.92" E
27	SATA HOSPITAL	Enugu North	Ogbete	6°26'43.60"N, 7°30'01.40" E
28	EVANGEL HOSPITAL	Enugu South	Maryland	6°19'51.18"N, 7°31'41.91" E
29	UWANI HEALTH CENTER	Enugu South	Uwani	6°25'48.06" N, 7°29'30.22" E
30	Eke OBINAGU HOSPITAL	Enugu East	Emene	6°17'23.92" N, 7°24'00.48" E
31	AMECHI HEALTH CENTER	Enugu South	Uwani	6°25'02.87" N, 7°29'53.51" E
32	UGWUAJI	Enugu South	Achara L/O	6°24'29.29" N, 7°33'07.41" E

Source: Enugu State Ministry of Health Handbook, 2024 & GIS

3. Results

The location of the PHCF center is determined by using both the geo-referencing analysis and the population distribution in the region, following the demographic standard set by the Nigeria Ministry of Health which was adopted by the Enugu State Ministry of health, which specifies serving a population of 20,000 people per PHCF. After applying the demographic standards, the study yielded the following findings as presented in Table 2.

Table 2. Number of people who received services and who do not receive services through PHCFs according to the demographic standard in Enugu urban (Ratio 20,000:1)

S/N	LOCATION	2024 POPULATION	No of PHCF	Served population	Unserved population	PHCF needed	Remark
ENUGU NORTH							
1	IVA VALLEY	21,662	1	20,000	1,662	1	BELOW
2	OGUI LAYOUT	100,468	1	20,000	80,468	4	BELOW
3	INDEP/ LAYOUT	24,452	1	20,000	4,452	1	BELOW
4	ASATA	53,181	3	60,000	-		GOOD
5	NEW HAVEN	45,680	2	40,000	5,680	1	BELOW
6	OGBETE	63,331	3	60,000	3,331	1	BELOW
7	G.R.A	47,754	2	40,000	7,754	1	BELOW
	SUB TOTAL		13	260,000	103,347	9	
ENUGU SOUTH							
1	AWKUNANAW	32,748	2	40,000	-		GOOD
2	UWANI	77,660	3	60,000	17,660	1	BELOW
3	ACHARA LAYOUT	122,422	3	60,000	62,422	3	BELOW
4	MARYLAND	11,368	1	20,000	-		GOOD
5	OBIAGU	13,368	1	20,000	-		GOOD
	SUB TOTAL		10	200,000	80,082	4	

ENUGU EAST							
1	ABAKPA	220,781	6	120,000	100, 781	5	BELOW
2	EMENE	108,495	1	20,000	88,495	4-5	BELOW
3	TRANS EKULU	27,935	2	40,000	-		GOOD
	SUB TOTAL		**9**	**180,000**	**189,276**	**9**	
TOTAL		**957,937**	**32**	**640,000**	**372,705**	**22**	

Source: Secondary sources, 2024

The projected total population of the Enugu urban neighbourhoods selected as at 2024 is 957,937 people. Out of 32 PHCFs, 640,000 individuals are receiving services in accordance with the prescribed criteria. The population without access to services amounts to approximately 317,937 people as presented in table 5.35. According to the demographic standard, a larger percentage of the population should have access to PHC services. The shortage in health centers represents approximately 22 PHC facilities. Statistical data as seen in Table 2 indicates that the highest number of individuals lacking services in PHCs is found in the Abakpa Nike (Enugu East LG council area) region, with a shortage of 100,781 people and followed by Emene (88,495) – all are in Enugu East Local government area.

4. Discussion

This study appreciated the accessibility of these PHCFs in the study area by identifing the provider-to-population ratios. This measure is useful for gross supply comparisons between geopolitical units and service areas and is used by policy analysts to set the minimum local supply standards and to identify under-served areas. The population density (in persons per square kilometre) was divided by the density of health care centres per square kilometer. This step was achieved by using the ArcGIS model builder, which was based on the arithmetic overlay function. The output showed that with the exception of only four neighbourhoods – Obiagu, Mary land, Trnas Ekulu and Asata, all the other neighbourhoods in the Enugu metropolis areas are not well served by health care facilities. This scenario reflects the imbalance of health care facility provisions in the entire area of the study area. Thus, the existing model that was used by health care planners to providing health care facilities in Enugu urban failed to achieve its ultimate goal. Therefore, virtually all parts of Enugu need additional health care facilities. The spatial pattern of the Enugu population indicated an increased density in the city centres and a decreased density in the southern and western areas of Emene and Akwunananw areas of Enugu-Town. This increasing population density in the city centres suggests that the demand for health care services in these areas is high relative to other parts of the city. This model will be useful if local health authorities plan to increase the supply of health care facilities. The study showed that the non-serviced areas in the

study areas are larger than the areas served. Therefore, we need new health services centers in the underserved areas.

Overall, this study provides valuable insights into the distribution of PHCF services based on demographic standards in the study area. The findings can serve as a foundation for healthcare planning and resource allocation, aiming to enhance healthcare accessibility and ultimately improve the overall health outcomes for the population in the region. However, further research and collaboration between various stakeholders, including government agencies, healthcare providers, and community representatives, will be necessary to address the challenges highlighted by the study and ensure equitable

access to healthcare services for all residents. The variations in PHFC coverage across different sub-districts signify the importance of localized and targeted healthcare planning and resource allocation. It is evident that certain areas are more underserved than others, requiring specific attention and efforts to improve healthcare accessibility in those regions.

The study's findings can serve as a foundation for evidence-based decision-making in healthcare planning and policy development. By identifying the areas with the greatest need for additional healthcare resources, policymakers can prioritize their interventions to achieve more equitable healthcare distribution and improve the health outcomes of the

population in the study area. The implementation of a service scope based on a 2.5 km radius from schools is a commendable step towards improving healthcare accessibility and promoting the well-being of the school community. It also encourages early intervention and preventive healthcare practices, which can contribute to better health outcomes among the school community.

However, it is crucial to continue evaluating and refining the service area to ensure that healthcare services effectively reach all populations, particularly those residing near markets. By addressing the challenges and disparities identified in the evaluation process, healthcare providers and policymakers can work together to build a more inclusive and accessible healthcare system, ultimately contributing to the improvement of community health and well-being. The study highlights the importance of adhering to demographic standards to ensure that a larger percentage of the population has access to PHC services. There is a shortage of 22 PHCFs, based on the demographic standard of 20,000 people per PHC. This shortage of health centers directly affects the number of individuals who lack access to healthcare services in the region.

The study's results have significant implications for healthcare planning and resource allocation in Enugu urban. Policymakers and healthcare authorities need to take into account the demographic standards and the actual healthcare needs of the population when planning the distribution and establishment of PHCFs. The study identifies significant gaps in healthcare access for a substantial portion of the population. Addressing these disparities requires careful planning, resource allocation, and the establishment of new PHC centers, particularly in regions with the greatest need. By addressing the shortages and expanding healthcare infrastructure, policymakers can work towards achieving a more equitable healthcare system that caters to the healthcare needs of all individuals in the neighbourhood.

5. Conclusion

In conclusion, there is a significant deficiency in the number of PHCFs in the study area compared to the large population, at the demographic standards level. The region is in urgent need of filling these gaps by establishing new PHC centers to meet the population's needs and provide high-quality PHCF services in line with international standards. This will also help alleviate the burden on central hospitals in the region.

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