Inequality of Public Health and Effects of Health Care Accessibility on Patient Referral System in Ondo State

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Abstract

The study examines the inequality of public health and effects of health care accessibility on patient referral system in Ondo state. Explorative research design was used, relying on secondary data, acquired from the Ondo State Bureau of Statistics. The data contains information for the years 2009-2011 on health matters in Ondo state. Data were analyzed using descriptive indexes statistics(i.e ratio, percentage, frequency and locational quotient)to determine the effects of public health inequality on patient-referral model. The study revealed that a healthcare facility served on average 5,045 people in 2011. Also, there was significant increase in reported cases of diseases especially for Malaria which increase by 24.7% between 2009 and 2010.The study revealed that majority (12) of the local governments had a locational quotient below 1.0 of general medical practitioners. Conclusively, there was inequality of public health care accessibility, thus having a negative effect on patient referral system. Therefore, there sholud be effective allocation of general practitioners and health facilities across the local governments especially in the medically underserved areas through effective urban planning intervention.

Keywords: Spatial Inequalities, locational quotient, Medically undeserved areas, Public health

1. Introduction

Documented in previous literature is the evidence of the impact of accessibility of healthcare facilities on utilization of health care services ([1, 2, 3]. Many of these works were rooted in the Central Place theory, which was developed by Walter Christaller (1933). Fundamentally, the central place theory uses the concept of threshold and range to explain size, number and distribution of services within a geographical setting. Threshold refers to the minimum population that is require to justify the siting of a facility or to make a facility viable, while range is the maximum distance residents will be willing to travel to use the facility. Initially, the concept was adopted in explaining siting of facilities in space, but overtime has been extended and adopted in explaining spatial distribution of health facilities and health care service delivery [3] .

In Nigeria, officially the threshold requires for the siting of a facility is 20,000 people or the area officially being declared as urban status of as it is the case with all local government areas in the country. This has negatively influence the provision of health facilities in the country at large and in Ondo state in particular. Consequently, one comprehensive health facility (general hospital) is available in each local government and one tertiary health care facility serving the whole state. However, strict adherence to the principles of Central Place theory as determinants for health care

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facility provision will further worsen spatial inequality to public health and inaccessibility of health care services in the country generally and in Ondo State in particular. This argument was further supported by Hart's position [4], who postulated that there is an inverse relationship between availabilty of good/service, in this case health facility and health services and the need of the population, which can be captured by patients'demand for health care services. This postulation has been referred to as the inverse care law. This law further suggests that poor neigborhoods, with less than the threshold will become medically underserved. Health planners and medical geographers are more concerned with spatial inequality in public health.

Studies have identified non-spatial factors such as income, culture and social class as key contributors to spatial inequality on health care delivery [5, 6]. On the other hand, distance, type of service available and the distance between similar services are spatial factors that largely influence accessibility. Similarly, in Nigeria, local topography can affect locational efficiency of health care facilities and services. For instance, it has become increasingly difficult to locate health care facilities in the riverine areas of southern and the desert regions in the north eastern Nigeria.

Broadly, the WHO population/distance criterion of 250metres is often used as the minimum distance benchmark to determine accessibility to healthcare facilities. However, in developing countries like Nigeria, where there have been challenges with available health personnels, inadequacy of health infrastructure and poor healthcare financing, this criteria are generally difficult to meet. Further, it is important to note that the spatial interaction between healthcare supply (health care service providers) and health care demand (patients) do not depends on accessibilty criteria alone but also on needs amongst other factors. Therefore, healthcare services in Nigeria and globally, adopted a multi-level health care model using patient referral procedure [7, 8]. This model is an hierarchical healthcare system that coordinate healthcare services between different levels of healthcare providers. This model has also been referred to as "gakekeeping model" [9].

Thus, patients are first attended to at the primary health care (PHC) level, which exists at the community level. At the primary healthcare level, the facility are referred to as level-1facility and the health personnel at this level are often referred to as general practitioner. Thus, base on severity of cases and available health resources patients are then referred and transferred to specialist hospital or regional hospital often refer to as level-2 facility [10]. Consequently, primary health care and/or general practitioners are often seen as gatekeepers for patients segmentation at the community level. The model ensures that the PHC is the closest health care services available to patients. Then as healthcare needs increases or health condition worsen, patients are referred to specialist or higher healthcare services. However, for the model to be efficient, there is need to understand the prevailing health needs within a territory and sufficient availability of general practioners at the level 1-facility across all commununities.

Morever, in the developed societies, there is sufficient availability of PHC facilities and general medical practitioners, whereas, in developing countries like Nigeria, there is grossly insufficient availability of general practitioners. Thus, in developing countries a one-way non-gatekeeping model is often adopted [11, 12]. Simlarly, in the developed countries, a suppy-demand ratio has been adopted to serve medically undeserved areas (MUAs) and health professionals shortage areas (HPSAs) [8]. However, the MUAs and HPSAs have been heavily criticized for its oversimplification of utilization of health care services, its statistical bias and the likelihood for health-needs of individuals to be extended beyond immediate residential neigborhoods [13, 14]. Thus, there is a need to understand the spatial interaction between healthcare supply and demand for effective determination of health care accessibility.

Several studies have examined spatial distribution of health care facilities in Nigeria. Sanni [15] examined distributional pattern of healthcare facilities in Osun state using locational quotient. The study revealed that there is variation in healthcare facilities across local governments in Osun state. In North Central Nigeria, a study examined spatial pattern of health facilities in Nararawa State [16]. The study revealed continuous growth in healthcare facilities and health personnel in the state between 2000 and 2009. However, majority of this increase are concentrated in urban centres. Similarly, in Benue state, Ujoh and

Kwaghsende [17] analyzed spatial distribution of healthcare facilities. The study found that there is approximately evenly distribution of health care facilities across senatorial zones in the state but significant variation across local governments. The implications of all these studies is that marginalized populations are largely underserved owing to spatial inequality in heathcare services. In a similar vein, the attention giving to patients will largely fall, base on the wide gap between ratio of healthcare personnel to patients. A study in south-south Nigeria [18] on locational efficiency of healthcare facilities revealed high concentration of health facilities in wards in Iko- Ekpene local government, with majority of wards medically underserved.

Elsewhere, there have been attempts to address the perceived spatial inequality in healthcare delivery. Study in China assessed income-related inequality in access to health care service in China using data from 2004-2009 [19]. Furthermore, Goddard and Smith [20] developed a theoretical framework for examining access and equity to healthcare services. Moreover, extant literature affirms that healthcare services cannot be evenly distributed due to multiplicity factors, which are broadly spatial and nonspatial in nature. Furthermore, existing studies on spatial inequalities on health care in Nigeria have considered the role of GIS in locational efficiency of healthcare facilities [18], spatial distribution and spatial pattern in healthcare faciliities distribution [15, 16, 21]. Some of these studies have recommended the need for more healthcare facilities and personnel [16] and the need to use geospatial statistics for locational efficiency of health care facility [18]. Yet, there is no research to examine the impacts of spatial inequality of health facilities on disease burden and the patient-referral system. Inequality of public health will largely hinder the effectiveness of patient referral model. Therefore, this research provides insight into the existing disease burden in relation to available healthcare services. This study focused on Ondo state in addressing these gaps in literature.

2. Materials and methods

2.1. Study locale

Ondo State is one of the six states within southwestern region of Nigeria. The state has eighteen local government areas. The state has a population of 3,460,877, with a total land mass of 14798.8 km^2 [22]. Thus, the state has a population density of 234km^2. At present, there are about 1, 814 localities within the state, with only 23 of these localities having the official population threshold above 20,000.

The state capital is in Akure south, which also has the highest population, with a population figure of 360268 and a mean of 1133 people per sq/km. There are ten local governments with population density less than the state average. Of the eighteen local governments in the state, only eight local governments are densely populated.

2.2. Methods

This study focus on secondary data acquired from the Ondo State Bureau of Statistics. The data acquisition was funded and supported through efforts of the United Nations Development Progamme (UNDP) and the World Bank through the Nigeria Statistical Development Project (NSDP). The data contains information for the years 2009-2011. Recent studies such as Langford and Higgs [23] advocated for gravity model as effective statistical method for measuring accessibilty, while several authors have developed the two-step floating catchment area (2SFCA) method [24, 25]. These methods require geospatial data. Also, other methods sch as Nearest Neigbor Analysis (NNA), variants of the gravity models (i.e (2SFCA), Thei Index, spatial autocorrelation through Global Moran's I. However, all these methods requires geospatial data.

Nevertheless, this study is limted to statistical data and consequently descriptive indexes were used in analyzing the data gathered. Data were analyzed using descriptive indexes statistics(i.e ratio, percentage, frequency and localtional quotient) to analyze the relationship between public health inequality and patient-referral model. Locational quotient of general practitioners was computed. By Locational quotient (L.Q), it refers to the proportion of a facility/personnel available within an area (i.e local government) to the proportion of the area's population to the state population. The formula is given as thus: L.Q= No of facilities in a LGA/No of facility in the LG/Population of the state. The locational quotient asumes that there is a mean representation of the facility concerned across space (LGAs). Expectedly, there ought to be a value of 1.0

in each LGAs to reflect mean distribution of facility/ practitioner. Locational quotients with value less than 1.0 shows areas that are medically underserved, while locational quotients with value greater than 1.0 are LGAs that are medically well served. The higher the locational quotient value is greater than one, the better tand the contrary holds true.

3. Results and Discussion

3.1. Availability of Health care facilities in Ondo State

Availability of health care facilities is a determinant of development which consequently influence patronage. Thus, the study assessed availability of health care facilities in Ondo state. Summarized in Table 1 is the number of health care facilities in Ondo state between 2009-2011. The Table revealed that there is no significant increase in available healthcare facilities within the period considered. It was revealed that there were more private hospitals than the comprehensive health care facilities (General hospitals and medical health centers). Consequently, residents will have to pay more to access health care services within the state. Of note, comprehensive health care facilities and private hospitals are level-1 facility, Often, they perform secondary health care services. Moreover, specialists' health centers are level-2 facility and they are relatively scarce in the state (Table 1). Although, health care provision was the sole responsibility of the government at the three levels (Federal, State and local). Conversely, inadequate provision from the government predisposes the private sector to meet the gaps in health care provision. So, the study revealed the ratio of health

Table 1. Health care facilities in Ondo state (2009-2011).

Year	Population	General hospitals	Maternal health center	Tuberculosis hospital	Opthametric hospital	Medical health centers	Dental clinic	Neuro psychiatric hospital	Private hospital	Total	Ratio
2009	3,771,872	18	417	18	4	22	4	1	252	736	1:5,125
2010	3,683,490	17	457	18	4	22	4	1	252	775	1:4,753
2011	3,914,838	18	457	18	4	22	4	1	252	776	1:5,045

Source: Ondo State Bureau of Statistics (2013) and Authors' Analysis (2021).

Distribution of general practitioners across health facilities and LGA

As shown in Table 1, there is significant variation in medical personnel (doctors) available in each facility across the LGA. At maternity hospital across the state, it was found that there is relatively no general practitioner except in Akure South, which happens to be the capital. The lack of general practitioners at the maternity hospital might be due to the fact that most patients are pregnant women and nursing mothers and are often attended to by nurses and the midwives.

At the general hospital, the study revealed that there is scarcity of general practitioners across the local governments. However, two local governments have relative larger share of general practitioners within the period considered. First, Akure South accounted for about two-fifths (39.4%) in 2009, 2010 and about one-fifth (20%) in 2011, then, Ondo west, which accounted for (16.3%) in 2009 and 2010 and (14.2%) in 2011. On availability of general physicians at the maternal health centers, there was observed sharp increase in 2011 as compared to the previous two years. Unexpectedly, Ile-Oluji LGA takes the largest share. However, considering that in the same year (2011), there was a general election that cut across both the Federal and at the State level, there were lot of developmental projects and quick response in addressing social inequality. This accentuated the provision of social amenities by those who were seeking re-election or grabbing control at the center. Thus, an observed increase in general practitioners in the underserved areas likes

Ile-Oluji/Oke Igbo (13.8%), Ilaje (9%), with sharp decrease in major urban local governments.

Reported Cases of selected Diseases between 2009-2011

Reported cases of Diseases in 2009

Table 5 shows the reported cases of diseases in 2009. The study revealed that Malaria accounted for 98.4% of reported cases of disease, while pneumonia which came second accounted for 1.2% of reported diseases. Nigeria is in the tropics, with humid temperature has been noted for high cases of Malaria causing death in untold proportion. According to the World Health Malaria report, 94% of all Malaria cases happen in Africa. It also established that 229 million cases of Malaria in 2019, accounted for about 23% deaths in Nigeria. Children under five are the most vulnerable group to Malaria, as they accounted for 67% of all Malaria deaths globally.

Table 2. Distribution of Doctors across health facility and LGA

LGA	General hospitals			Maternity hospital			Maternal health centers		
Year	2009	2010	2011	2009	2010	2011	2009	2010	2011
Akoko North East	12	12	93	-	-	-	1	1	71
Akoko North West	1	1	13	-	-	-	2	1	83
Akoko South East	3	3	18	-	-	-	2	1	36
Akoko South West	4	4	74	-	-	-	1	1	74
Akure North	2	2	29	-	-	-	1	1	82
Akure South	63	63	172	-	14	14	1	1	78
Ese Odo	2	2	25	-	-	-	1	1	28
Idanre	5	5	40	-	-	-	1	1	119
Ifedore	3	3	21	-	-	-	1	2	82
Ilaje	3	3	33	-	-	-	2	1	126
Ile-Oluji/Oke-igbo	3	3	28	-	-	-	1	1	194
Irele	2	2	0	-	-	-	1	1	66
Odigbo	8	8	41	-	-	-	1	1	131
Okitipupa	12	12	76	-	-	-	1	1	91
Ondo East	2	2	17	-	-	-	1	1	79
Ondo west	26	26	122	-	-	-	1	1	52
Ose	4	4	33	-	-	-	2	1	0
Owo	5	5	23	-	-	-	1	1	11
Total	**160**	**160**	**858**	**-**	**14**	**14**	**22**	**19**	**1,403**

Source: Ondo State Bureau of Statistics (2013) and Authors' Analysis (2021)

Reported cases of Selected diseases in 2010

Table 6 shows the distribution of reported disease in 2010. Expectedly, there was 24.7% increase in reported Malaria cases between 2009 and 2010 and also about 7.5% increase pneumonia reported cases between the time-frame. On the other hand, there were no cases for Tuberculosis for 2010 as compared to 2009 but a significant decrease in the cases of Onchocerciasis between the two periods.

Reported cases of diseases in 2011

Table 7 summarizes reported cases of selected diseases in 2011. The study reveals a significant fall in reported cases especially for Malaria, which fell by almost half (49.1%). In a similar vein, across the local governments, Akure south takes the largest (21.2%) burden with about of the total Malaria cases, while Ondo West accounted for 15.4% of the cases reported for Malaria. However, Malaria still accounted for the largest distribution of cases as it

Table 3. Reported cases of selected Diseases by LGA, 2009

LGA	Measles	Malaria	Pneumonia	Tuberculosis	Onchocerciasis	Grand total
Akoko North East	13	11,996	387	74	10	12,,480
Akoko North West	4	3,608	64	13	1	3,690
Akoko South East	8	4,172	140	3	1	4,324
Akoko South West	4	9,433	6	3	2	9,448
Akure North	3	7,525	33	9	3	7,573
Akure South	15	38,800	111	61	-	38,987
Ese Odo	-	2,603	-	37	-	2,640
Idanre	2	2,284	67	8	9	2,370
Ifedore	15	9,346	18	5	1	9,385
Ilaje	6	4,365	52	-	-	4,423
Ile-Oluji/ Oke-igbo	14	1,801	30	-	-	1,845
Irele	-	1,257	278	-	-	1,535
Odigbo	-	13,166	112	67	-	13,345
Okitipupa	4	5,146	67	34	3	5,254
Ondo East	-	1,165	370	2	-	1,537
Ondo west	16	38,800	79	95	-	38,990
Ose	2	4,082	109	1	1	4,195
Owo	-	3,702	-	110	1	3,813
Total	**106**	**163,251**	**1,923**	**552**	**32**	**165,834**

Reported Cases of selected Diseases between 2009-2011

Reported cases of Diseases in 2009

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Table 4. Reported cases of Selected Diseases 2010

LGA	Measles	Malaria	Pneumo-nia	Tuberculo-sis	Onchocercia-sis	Grand total
Akoko North East	8	14,754	249	-	-	15,011
Akoko North West	5	7,211	55	-	-	7,271
Akoko South East	5	5,697	10	-	1	5,713
Akoko South West	2	16,225	10	-	-	16,237
Akure North	10	8,617	83	-	-	8,710
Akure South	15	43,292	30	-	-	43,337
Ese Odo	-	1,386	238	-	-	1,624
Idanre	-	7,430	187	-	-	7,617
Ifedore	-	3,575	12	-	-	3,587
Ilaje	-	4,709	63	-	-	4,772
Ile-oluji/ Oke-igbo	3	2,803	21	-	-	2,827
Irele	1	3,093	242	-	-	3,336
Odigbo	1	15,490	16	-	-	15,507
Okitipu-pa	8	8,193	45	-	3	8,249
Ondo East	-	1,236	304	-	-	1,570
Ondo west	1	34,544	211	-	-	34,759
Ose	4	3,614	86	-	-	3,701
Owo	11	21,814	206	-	-	22,031
Total	**74**	**203,713**	**2,068**	**-**	**4**	**205,859**

Reported cases of Selected diseases in 2010

Table 4 shows the distribution of reported disease in 2010. Expectedly, there was 24.7% increase in reported Malaria cases between 2009 and 2010 and also about 7.5% increase pneumonia reported cases between the time-frame. On the other hand, there were no cases for Tuberculosis for 2010 as compared to 2009 but a significant decrease in the cases of Onchocerciasis between the two periods.

Reported cases of diseases in 2011

Table 5 summarizes reported cases of selected diseases in 2011. The study reveals a significant fall in reported cases especially for Malaria, which fell by almost half (49.1%). In a similar vein, across the local governments, Akure south takes the largest (21.2%) burden with about of the total Malaria cases, while Ondo West accounted for 15.4% of the cases reported for Malaria. However, Malaria still accounted for the largest distribution of cases as it accounted for 99.2% of the total cases reported.

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Akure South	15	43,292	30	-	-	43,337
Ese Odo	-	1,386	238	-	-	1,624
Idanre	-	7,430	187	-	-	7,617
Ifedore	-	3,575	12	-	-	3,587
Ilaje	-	4,709	63	-	-	4,772
Ile-oluji/ Oke-igbo	3	2,803	21	-	-	2,827
Irele	1	3,093	242	-	-	3,336
Odigbo	1	15,490	16	-	-	15,507
Okitipu-pa	8	8,193	45	-	3	8,249
Ondo East	-	1,236	304	-	-	1,570
Ondo west	1	34,544	211	-	-	34,759
Ose	4	3,614	86	-	-	3,701
Owo	11	21,814	206	-	-	22,031
Total	**74**	**203,713**	**2,068**	**-**	**4**	**205,859**

Source: Ondo State Bureau of Statistics (2013) and Authors' Analysis (2021)

Locational Quotient of General Practitioners and Implication for Patient-referral Model

Table 6 shows the locational quotient of general practitioners and locational quotient for Malaria disease burden across the LGAs and its implication on patient-referral model. On locational quotient of Malaria burden, only seven local governments have locational burden of Malaria above 1.0, while, eleven local governments have greater burden of Malaria disease. Malaria is expected to be treated at the level 1-facility and by general practitioner. However, with the high burden of the disease in the state and across the LGAS and inefficacy of public health, Malaria has become a great burden in the state and across LGAs.

From the study, it was revealed that only six local governments have a locational quotient above 1.0 of general practitioners. Yet, among these six local governments which have a locational quotient of above 1, only Akure South (state capital), is relatively well serve. Similarly, the study shows that twelve local governments are largely medically underserved. The implication of these findings is that the patient referral model cannot be expected to work when level-1 facilities are not evenly distributed across space (LGAs).

Health Policy Implications

The findings from this study emphasizes the patient referral model would be largely ineffective due to the spatial inequality in public health in the state. Broadly speaking, the patient referral model will only work well in Akure South the capital and relatively in Ondo West, while other LGAs will be largely medically underserved. Furthermore, the

Table 6. Locational quotient of General Practitioners and Malaria Burden in Ondo State

LGA	Projected Population 2011	Locational quotient of Malaria burden	Locational quotient of general practitioners
Akoko North East	206,578	1.8	3.1
Akoko North West	244,800	3.3	0.2
Akoko South East	95,712	37.8	0.9
Akoko South West	263, 578	0.4	1.1
Akure North	150,904	2.6	0.9
Akure South	41,340	26.3	19.0
Ese Odo	182,884	0.3	0.06
Idanre	149,710	0.8	1.2
Ifedore	203,467	0.4	0.5
Ilaje	334,318	0.4	0.5
Ileoluji/Oke-igbo	198,608	0.2	0.6
Irele	165,778	0.4	-
Odigbo	268,470	0.7	0.7
Okitipupa	270,400	0.5	1.3
Ondo East	87,840	1.2	0.9
Ondo west	333,731	1.8	1.9
Ose	166,037	0.0	0.9
Owo	256,400	0.4	0.4

Source: Ondo State Bureau of Statistics (2013) and Authors' Analysis (2021).

study revealed scarcity of level-1facility (primary health care and/or general hospital) and level 2-facility and general practitioner across the local governments. Thus, there is an urgent need to address the spatial inequality in public health with a view to full optimization of the patient-referral model. At present, a higher referral rate will further worsen the public health situation in the state. Similarly, the study reveals a high prevalence of Malaria disease in the state.

RECOMMENDATIONS AND CONCLUSION

This paper analyzed spatial inequalities of public health, disease burden and its effects on patient referral model in Ondo state. The study revealed that there are spatial inequalities in healthcare facilities and health personnel in the state. This is similar to the general trends observed across the country. Consequently, spatial inequality in public health will negatively affect the efficiency of the patient-referral model. The study recommends effective allocation of general practitioners and health facilities across the local governments especially the medically underserved areas through effective urban management strategy.

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