Geographical Analysis of the Patterns of Healthcare Facilities and HIV/ AIDS Response Sites in Benue State, Nigeria

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Abstract: This study analysed the spatial patterns and characteristics of healthcare facilities and HIV/AIDS response sites; and the relationship between the distribution of population and healthcare facilities/HIV/AIDS response sites in Benue State, the State with the highest record of HIV/AIDS in Nigeria. Primary and secondary data were used for the study. GPS receiver was used to obtain the geographic coordinates of healthcare facilities and HIV/AIDS response sites; and questionnaire to acquire attribute data of the sites. The secondary data used included the list of all healthcare facilities at community and LGA levels, maps, and the population of the state. The spatial analyses of the phenomena of interest were done based on the LGAs. All the 1243 healthcare facilities in the 23 LGAs of the state were captured in the study. Four key HIV/AIDS services (VCT, PMTCT, ART and HBC) were purposively selected for the study. The analogue map of Benue State was processed and used for various GIS analyses and cartographic enhancement for the purpose of report presentation. The study identified three categories of Healthcare Facilities (primary, secondary and tertiary) in the state. There existed spatial variation in the distribution of the various healthcare facilities in the state. The PHCs were observed to be more widely distributed in the state (93.4%) than the SHCs (6.3%) and THCs (0.2%) which were observed to be largely concentrated in the urban LGAs. Also, specialised HIV/AIDS services like PMTCT and ART were observed to be concentrated in the urban LGAs. The population/Facility ratio for PHCF, SHCF and THCF were 2,371:1; 34,413:1; and 1,376,539:1 respectively. There existed a direct relationship between both population and distribution of healthcare facilities ($r = 0.694$, $p > 0.5$); and population and the distribution of HIV/AIDS response sites ($r = 0.664$, $p > 0.5$) in the state. The study concluded that the problem of HIV/AIDS in Benue State is more engendered by the paucity of information about the availability of response sites than their inadequacy; and recommends that a robust database for healthcare facilities and HIV/AIDS response sites be developed at all levels in order to enhance information flow to policy formulators and by extension people who require healthcare and HIV/AIDS services.

Keywords: Benue state, healthcare facilities, HIV/AIDS response sites, Nigeria, population.

1. INTRODUCTION

The distribution questions have continued to be vital in both academic and policy formulation circles because it is recognised that despite the provision of additional facilities in different locations, the question of the population served by these facilities in still very crucial in the assessment of the efficiency and optimality of such facilities [1].

The location of healthcare facilities, within which the Human Immuno-deficiency Virus and the Acquired Immune Deficiency Syndrome (HIV/AIDS) response sites are mostly located, is an important aspect of healthcare provision. The challenge of HIV/AIDS has been an issue of global concern, especially in developing and resource constrained countries

of Africa, which today is the continent with the highest incidence of the disease [2].

In Nigeria, the first case of AIDS was identified in the mid-1980s and HIV incidence in the country reached a peak of 5.8% (among women attending antenatal) in 2001 [2]. Hence, Nigeria became the country with the third highest level of infection in the world, coming behind India and South Africa respectively. Spatio-temporal variations exist in the prevalence of the disease. As at 2001, estimates showed that the incidence of the disease in the North-Central geo-political zone of the country was 7.0%; 5.8% in the North-East and South-South respectively, 4.2% in the South-East, 2.7% in the North-West and 2.3% in the South-West. By 2006, the incidence had reduced to 6.1% in the North-Central, 4.3% in the North-East and 5.3% in the South-South zone. However, in the South-East, North-West and South-West, the prevalence of the disease had increased to 4.7%, 3.5% and 2.6% respectively [2]. Estimates showed that as at

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2006, there were about 3,000,000 adults living with HIV/AIDS in Nigeria, about 220,000 deaths from HIV/AIDS and about 930,000 children orphaned by AIDS in Nigeria. In addition, there were about 240,000 HIV positive children, about 9,000 of who contracted the virus from their mothers through the mother-to-child-transmission [3]. In 2010, there were estimated 3.14 million people living with AIDS, 2.1 million deaths from AIDS, 2.2 children orphaned by AIDS and about 1.5 million in need of antiretroviral therapy. Despite these staggering figures, however, recent records indicate a reversal in the prevalence of HIV/AIDS in Nigeria from 5.8% in 2001 to 4.1% in 2010 [4].

The care, treatment and legislation protecting HIV/AIDS patients have been a global issue, particularly, in Nigeria [5]. Although there is no cure currently available for HIV/AIDS [6, 7]; the availability of care and support for people living with HIV/AIDS (PLWHA) in developed countries have proven to be effective in reducing morbidity and mortality associated with HIV/AIDS [6-9].

In 2010 the National Action Committee on AIDS launched a comprehensive national strategic framework to cover the period between 2010 and 2015. This strategic plan requires an estimated 756 billion naira (around USD 5 billion) to implement. Some of the objectives included in the framework are to reach 80% of sexually active adults and 80% of most at-risk populations with HIV counselling and testing by 2015; ensure that 80% of eligible adults and 100% of eligible children are receiving ART by 2015; and to improve access to quality care and support services to at least 50% of people living with HIV by 2015 [10].

However, one of the contemporary challenges today in the treatment of HIV/AIDS is the logistics of enhancing access to care and treatment for PLWHA in developing countries where approximately 95% of world's population living with HIV/AIDS reside [11, 12].

In spite of the global and national fight against HIV/AIDS and the huge amount voted to combat the disease, literature reveals that a small percentage of people in need of HIV/AIDS services in the developing countries, Nigeria inclusive, have access to them [12-15]. This could be partly attributable to the paucity of information on locations where HIV/AIDS services are available. Most studies on HIV/AIDS in Nigeria are centred on prevention, public awareness strategies and some related issues such as assessing the impacts of these strategies. There have also been studies on the socio-economic burden and cost of various aspects of the disease [16, 17]. Other studies on care and treatment in Nigeria have centred on the evaluation of governments' policies. In addition, monitoring and evaluation programmes have been conducted, mostly by donor agencies, on HIV/AIDS services provision in both rural and urban parts of Nigeria.

Questions about the locational pattern, accessibility and utilisation of HIV/AIDS response sites have remained a daunting challenge both to policy makers and researchers alike in Nigeria largely because of paucity of data. The number of voluntary counselling and testing (VCT) centres and their patronage; the total number of centres caring for orphans and vulnerable children and the number of those cared for as well as the level of patronage of centres for

treatment of opportunistic infections have not been ascertained [15]. Hence, this study analyses the spatial patterns of HIV/AIDS response sites in Benue State, with a view to understanding the distributional inequality in the allocation of treatment centres.

The study hypothesizes that there exist a direct relationship between population and distribution healthcare facilities; and population and distribution of HIV/AIDS response sites in Benue State.

2. METHODOLOGY

2.1. The Study Area

Benue State, lies between Latitudes 6º 25' 54" and 8º 9' 34" North of the Equator and Longitudes 7º 29' 20" and 9º 56' 18" East of the Greenwich Meridian, covering a land area of about 30,800 km^2. It is situated within the Lower Benue Trough which separates the north-central highlands from the south-eastern scarplands and the Cross River Plains. The State is located in the North Central geo-political zone of Nigeria, and bordered by Nassarawa State in the north, Taraba State in the east, Enugu, Ebonyi and Cross River States in the south and Kogi State in the west (see Fig. **1**).

2.2. Data Sources and Acquisition

Primary and secondary data were used for the study. The primary data involved the use of Global Positioning System (GPS) receiver to obtain the geographic coordinates of the location of healthcare facilities and HIV/AIDS response sites. The questionnaire, among other issues, sought information about the characteristics of each facility, and type of HIV/AIDS services provided. The secondary data included the list and addresses of all the healthcare facilities (HCF) in the state obtained from the State's Ministry of Health. Also the population figures of the State and LGAs were derived from the records of the National Population Commission, Abuja.

2.3. Data Collection Procedure

The unit of spatial analyses of the patterns of HIV/AIDS treatment centres was conducted at the LGA level. All the 1243 healthcare facilities in the 23 LGAs of the State were captured in the study. Using the list of all registered health care facilities obtained from the State Ministry of Health, which contains the name and address of each facility, it was easy to navigate to where the facilities were located. For every facility mapped; a questionnaire was administered to the proprietor or the head of the facility.

Four HIV/AIDS services were purposively selected for the study, these were voluntary counselling and testing (VCT), prevention of mother to child transmission (PMTCT), administration of anti-retroviral therapy (ART), and home based care (HBC).

2.4. Data Preparation and Analysis

The analogue map of Benue State was scanned and exported to ArcGIS software, where it was georeferenced using the Universal Transverse Mercator, Zone 32N
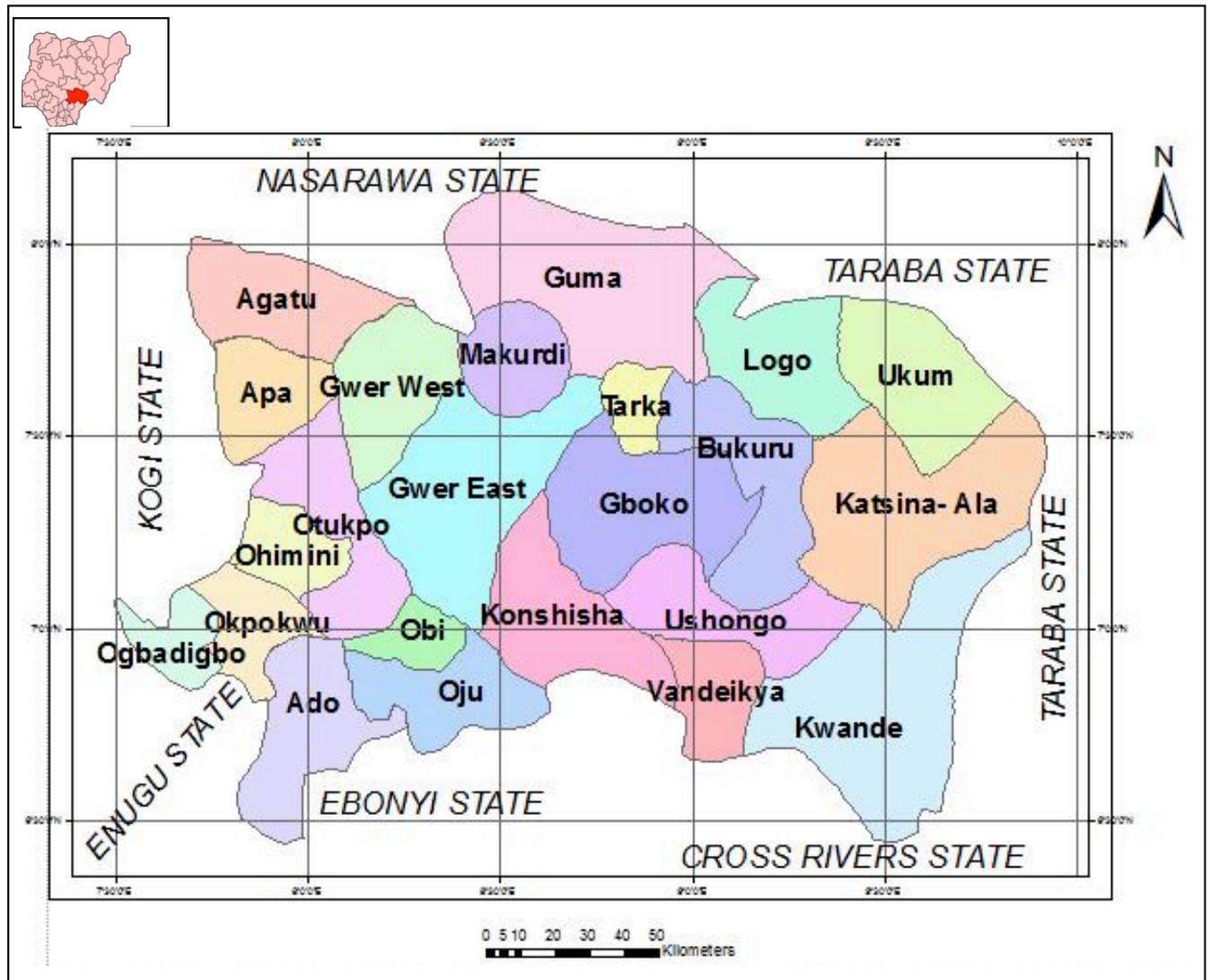
Fig. (1). Study Area – Benue State. [Source: Authors].

(Minna). Thereafter, relevant layers of the map were digitised and their various attribute tables created. The positional and attribute data of the HCFs and HIV/AIDS response sites hitherto structured in Microsoft Office Access were imported into ArcGIS and overlaid on the shape files already created. This was followed by the various GIS analysis and cartographic enhancement. These involved the use of various visual variables and appropriate visual perception. Dot maps, pie and bar charts and other relevant tools were used to represent phenomena of interest on maps. Correlation analysis was carried out to determine the nature of relationship between population and distribution of HCFs and HIV/AIDS response sites.

The spatial pattern of the HCFs and HIV/AIDS response sites and their characteristics in Benue State were analysed using both GIS tools and simple frequency count. The geographic coordinates of all the HCFs were located on the LGA map of the State to show a quick view of the spatial patterns. Then, query analyses were carried out to represent the various categories (Primary, secondary and tertiary) of HCF. Furthermore, the frequency distribution of the facilities

was performed and discussed. This was done in phases, first, the general patterns of HCFs, and then the various tiers. Thereafter, the spatial patterns of specific HIV/AIDS response sites (VCT, PMTCT, ART, and HBC) were analysed and represented cartographically.

3. RESULTS AND DISCUSSION

3.1. Spatial Distribution of Healthcare Facilities in Benue State

The location of the 1,243 HCFs in the state is shown in Fig. (**2**). The HCFs were made up of three different categories representing the three tiers of HCF in Nigeria – primary (93.4%), secondary (6.3%) and tertiary (0.2%), (see Table **1**). In all, Gboko LGA with 107 (8.6%) HCFs had the highest number in the State. This was followed by Ushongo LGA with 80 (6.4%) and Otukpo with 78 (6.3%). Makurdi, Konshisha and Ukum LGAs accounted for 73 (5.9%), 68 (5.5%) and 67 (5.4%) respectively. Ado LGA had 13 (1.0%) HCFs, the least in the State.
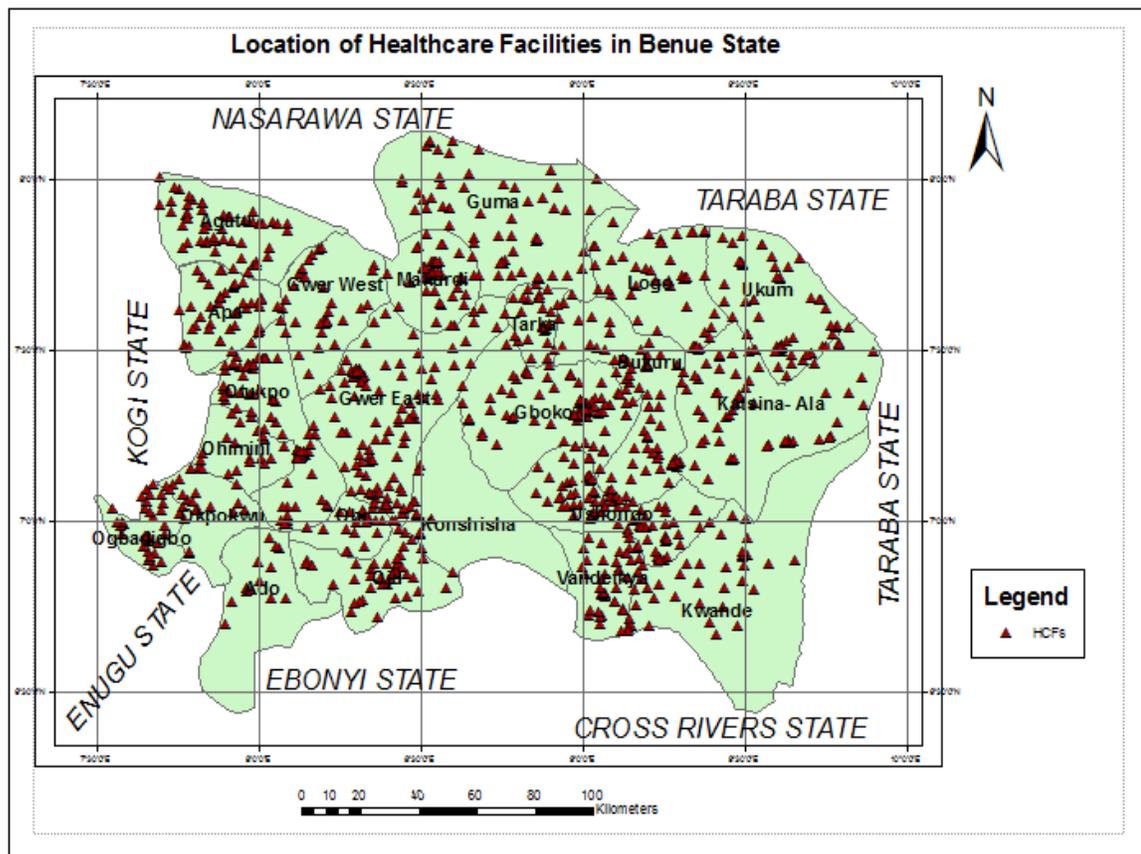
Fig. (2). Location of Healthcare Facilities in Benue State. [Source: Authors' analysis].

In order to depict the distribution of HCFs according to the various tiers, the number of the various categories of HCFs in each LGA were aggregated and used in showing the LGA scenario. Data showed that the Primary Healthcare Facilities (PHCFs) were more widely distributed across the various LGAs than both the Secondary Healthcare Facilities (SHCFs) and the Tertiary Healthcare Facilities (THCFs), which were concentrated in mostly urban LGAs such as Makurdi, Gboko and Otukpo.

Specifically, Makurdi LGA had 21 SHCFs which represented 26.3% of the 80 SHCFs in the State. This was followed by Gboko 16 (20%), and Otukpo11 (13.8%). No SHCF was recorded in Ado, Agatu, Guma, Konshish and Ohimini. There were only two THCFs in the State and the two were located at Makurdi, the State capital (see Fig. **3**).

3.2. Spatial Patterns of HIV/AIDS Response Sites

Four HIV/AIDS services were purposively selected for analysis. These are prevention of mother to child transmission (PMTCT), anti-retroviral therapy (ART), HIV voluntary counselling and testing (VCT) and home based care for HIV/AIDS sufferers (HBC). These services were mostly located within HCFs and there were occasions in which a given facility would provide more than one service simultaneously.

VCT was the most widely provided HIV/AIDS service. It was the only service provided in all the LGAs. On the other hand, provision of the relatively more specialised services like PMTCT and ART were concentrated in the urban LGAs.

For instance, 57% of all the PMTCT centres in the State were located at Makurdi and Gboko with Makurdi alone accounting for 47% of the total. In addition, the two urban LGAs accommodated 51% of all the ART centres in the State (see Table **2** and Figs. **4-8**).

3.3. Relationship between Population and Distribution of Facilities

The population/facility ratio in each LGA and the State in general is presented in Table **3**. This was done for every category of HCF and all HCFs put together. On the average, there were 2,215 persons to every HCF in the State. The highest population/facility ratio was recorded in Ado LGA (8,011:1). This was followed by Kwande (4,624:1), Makurdi (3,286:1), and Okpokuru (3,223:1) LGAs respectively. The LGAs with the least ratio were Apa (1,048:1), Ohimini (1,158:1), Agatu (1,176:1) and Logo (1,273:1). Incidentally, these were some of the LGAs with the least population in the State (see Fig. **9**). The pattern observed for the total number of HCFs is not radically different from what was obtained for the PHCFs. The urban LGAs, particularly Makurdi, did not present any unique advantage over the others in terms of the ratio for PHCFs (see Fig. **10**).

However, this is different in the case of SHCFs where the urban LGAs of Otukpo, Makurdi, and Gboko recorded the lowest population/facility ratio (8,139:1, 12,690:1, and 14,993:1) respectively. The ratio recorded by these LGA were far below the State average which was 34,413 persons

Table 1.   Distribution of HCFs according to Tier and LGA.

| LGA	HCF Tier						Total	
	Primary		Secondary		Tertiary			
	No	%	No	%	No	%	No	%
Ado	13	1.1	0	0.0	0	0.0	13	1.0
Agatu	46	3.9	0	0.0	0	0.0	46	3.7
Apa	49	4.2	1	1.3	0	0.0	50	4.0
Buruku	45	3.9	1	1.3	0	0.0	46	3.7
Gboko	91	7.8	16	20.0	0	0.0	107	8.6
Guma	69	5.9	0	0.0	0	0.0	69	5.6
Gwer East	55	4.7	2	2.5	0	0.0	57	4.6
Gwer West	41	3.5	1	1.3	0	0.0	42	3.4
Katsina-Ala	63	5.5	4	5.0	0	0.0	67	5.4
Konshish	68	5.9	0	0.0	0	0.0	68	5.5
Kwande	37	3.3	2	2.5	0	0.0	39	3.1
Logo	57	4.9	1	1.3	0	0.0	58	4.7
Makurdi	50	4.4	21	26.3	2	100	73	5.9
Obi	26	2.2	1	1.3	0	0.0	27	2.2
Ogadibo	60	5.2	1	1.3	0	0.0	61	4.9
Ohimini	29	2.5	0	0.0	0	0.0	29	2.3
OJU	46	3.9	4	5.0	0	0.0	50	4.0
Okpokwu	27	2.3	1	1.3	0	0.0	28	2.3
Otukpo	67	5.8	11	13.8	0	0.0	78	6.3
Tarka	28	2.4	1	1.3	0	0.0	29	2.3
Ukum	61	5.2	6	7.5	0	0.0	67	5.4
Ushongo	77	6.6	3	3.8	0	0.0	80	6.4
Vandeikya	56	4.8	3	3.8	0	0.0	59	4.7
Total	1,161	100.0	80	100.0	2	100	1,243	100
% of Total		93.4		6.4		0.2		100

Source: Fieldwork, 2007.

per facility (34,413:1). It has already been established that the two THCFs in the State were located in the State capital (Table **1**).

In order to ascertain the relationship between population and the distribution of HCFs and HIV/AIDS in the State, the Pearson's moment correlation coefficient was used. The correlation coefficient ($r = 0.694$, $r^2 = 0.482$, $p > 0.05$), implies a direct relationship between population and healthcare facilities. Although direct, but the relationship is rather weak as only 48% of HCFs is determined by population, leaving 52% to other factors. In a similar vein, the result of correlation analysis between population and HIV/AIDS response site is direct ($r = 0.664$, $r^2 = 0.441$, $p > 0.05$). This also implies a rather weak relationship, meaning that there are other important locational factors of HIV/AIDS response facilities in the state other than population.

4. CONCLUSION AND RECOMMENDATION

This study has shown that there exists a direct (though weak) relationship between population distribution and number of healthcare facilities on the one hand and the number of HIV/AIDS response sites on the other. The study concludes that the problems of HIV/AIDS in Benue State, Nigeria is not as a result of the inadequacy of HCFs and HIV/AIDS response services but rather, the paucity of information on their distribution. The study, therefore, recommends that a robust database for healthcare facilities should be developed at all administrative levels. This will provide a framework for effective management of all aspects of HCFs and HIV/AIDS services. In addition, it will enhance information flow to people who require healthcare services especially the specialised ones and aid in locational decision-making.
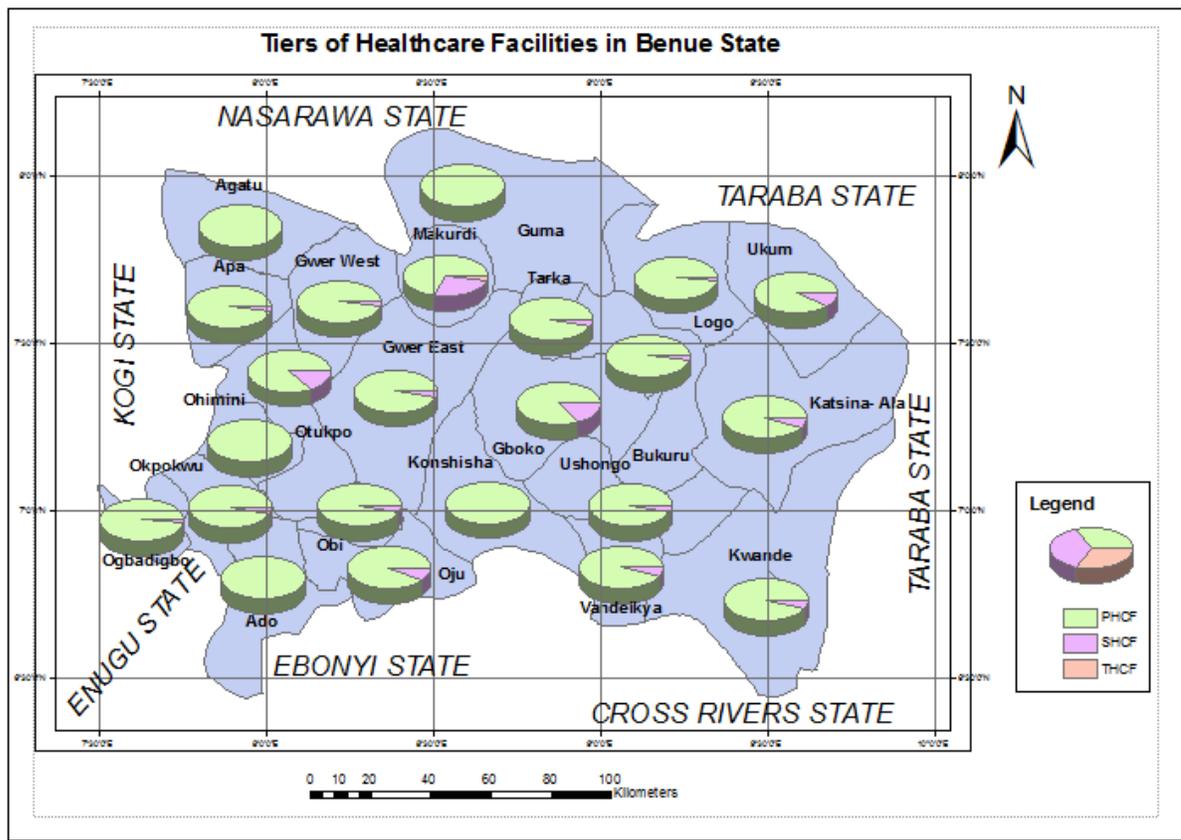
Fig. (3). Distribution of HCFs according to Tier and LGA. [Source: Authors' analysis].
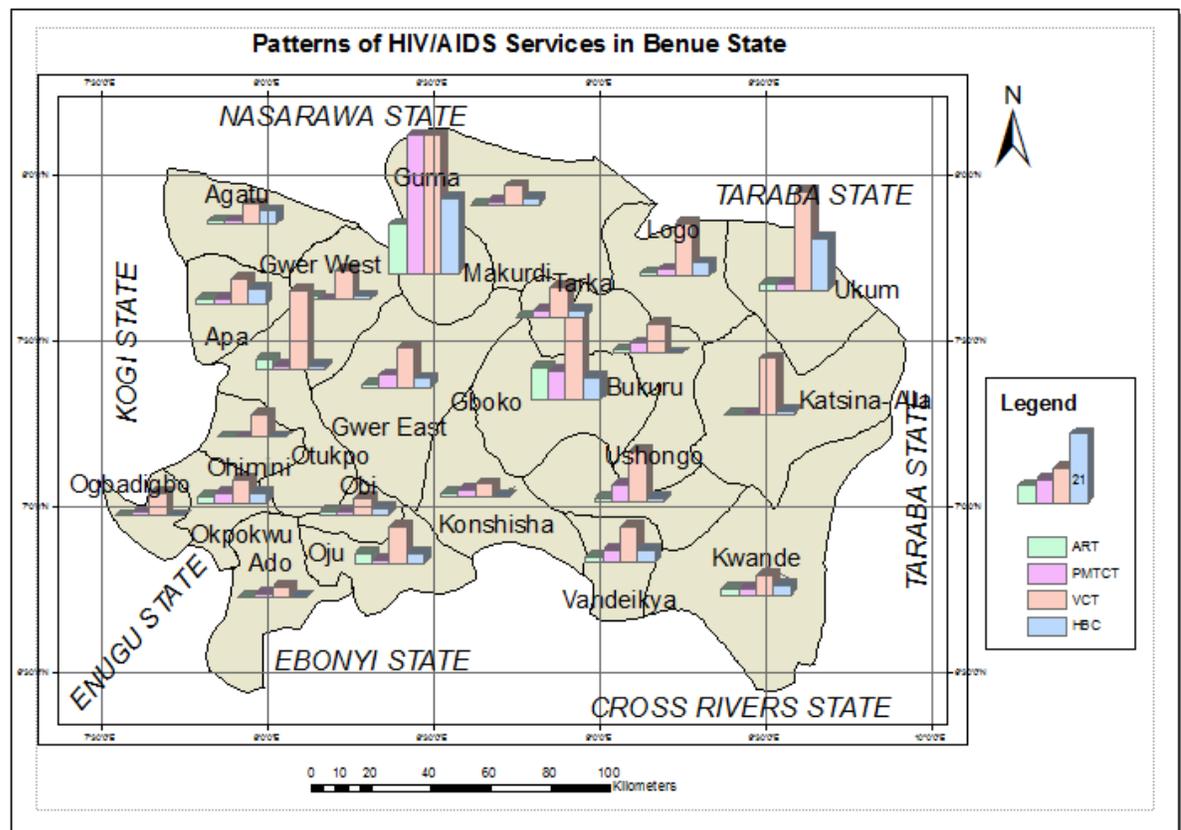
Fig. (4). Spatial Variations in HIV/AIDS Services Provision. [Source: Authors' analysis].
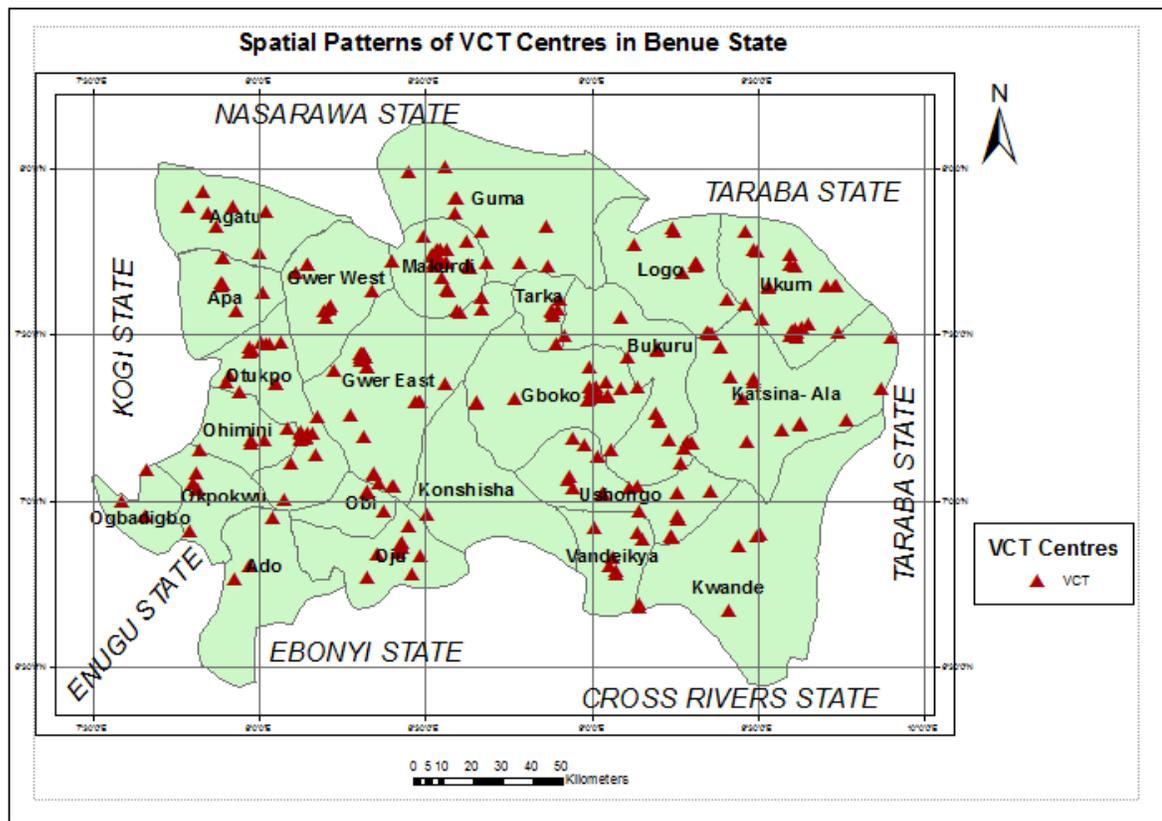
Fig. (5). Distribution of VCT Centres in Benue State. [Source: Authors' analysis].
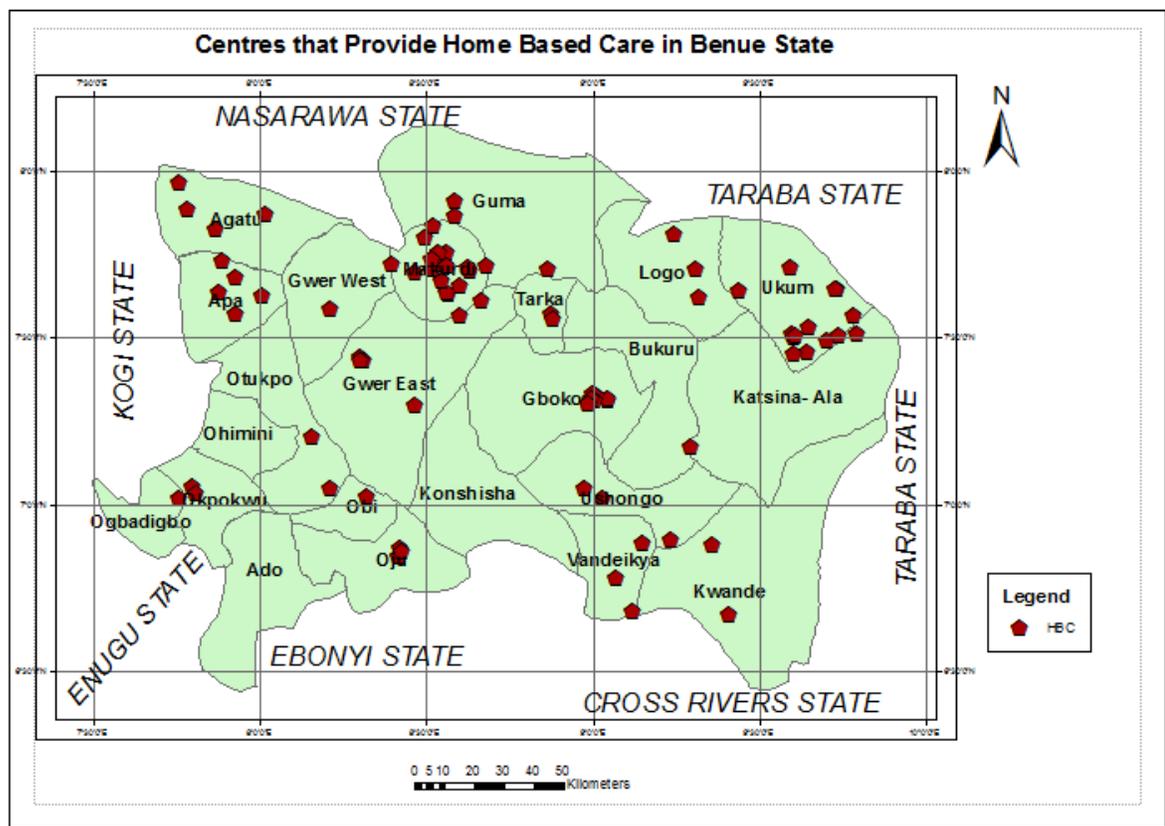

Fig. (6). Distribution of Centres that Provide HBC in Benue State. Source: [Authors' analysis].
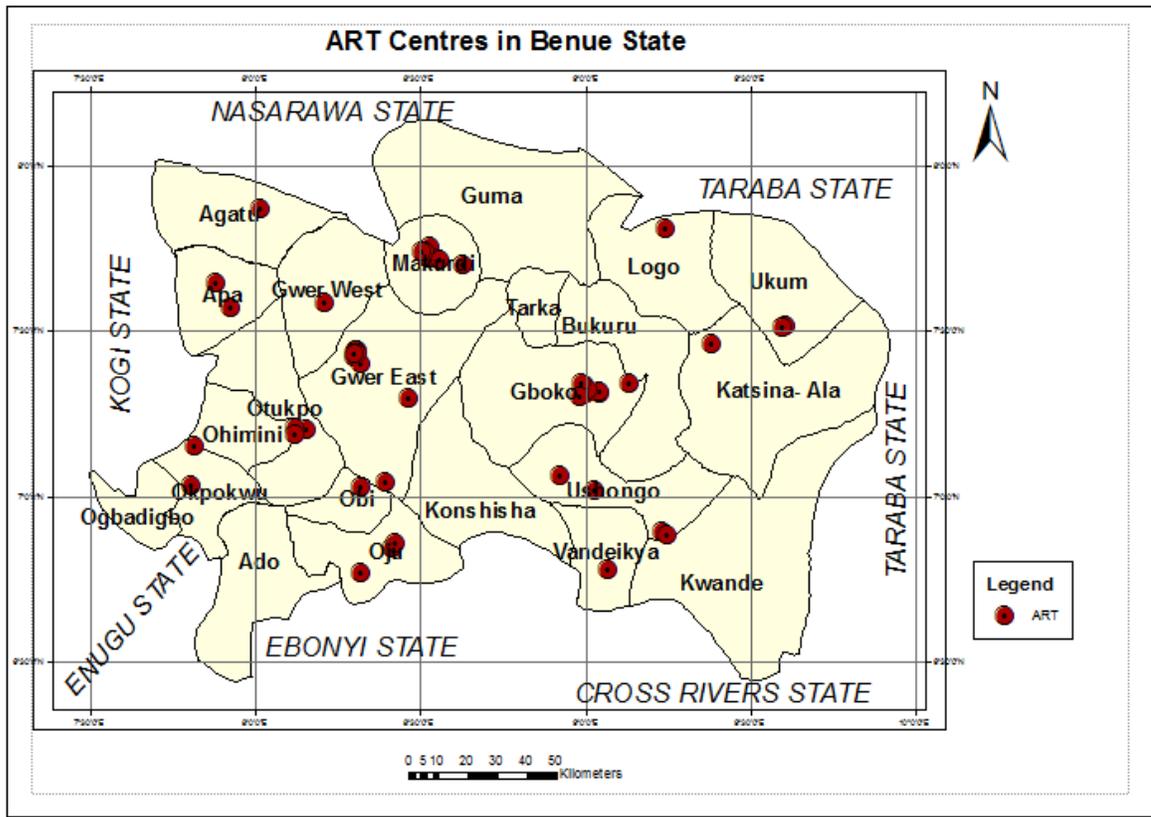
Fig. (7). Distribution of ART Centres in Benue State. [Source: Authors' analysis].
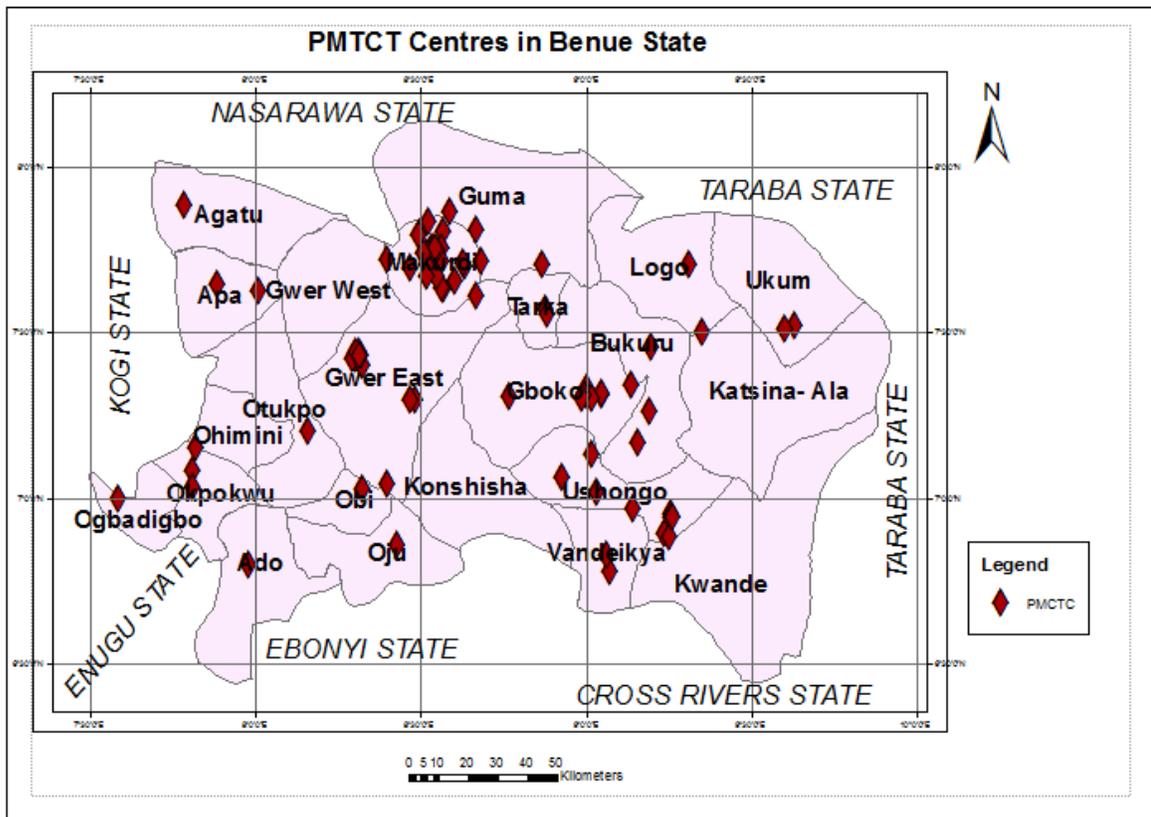

Fig. (8). Distribution of PMTCT Centres in Benue State. Source: [Authors' analysis].

Table 2.   Distribution of HIV/AIDS services in Benue state.

| LGA | HIV/AIDS Services | | | | | | | | Total | |
	VCT		PMTCT		ART		HBC			
	No	*%*	*No*	*%*	*No*	*%*	*No*	*%*	No	*%*
Ado	3	1.0	1	1.1	0	0	0	0	4	0.8
Agatu	6	2.1	1	1.1	1	2.0	4	4.7	12	2.3
Apa	8	2.8	2	2.3	2	4.1	5	5.9	17	3.3
Bukuru	9	3.1	3	3.4	1	2.0	0	0	13	2.5
Gboko	25	8.7	9	10.	10	20.4	7	8.2	51	10.0
Guma	6	2.1	1	1.1	0	0	2	2.4	9	1.8
Gwer East	12	4.2	4	4.5	1	2.0	3	3.5	20	3.9
Gwer West	9	3.1	0	0	1	2.0	1	1.2	11	2.1
Katsina-Ala	17	5.9	0	0	0	0	1	1.2	18	3.5
Konshisha	4	1.4	2	2.3	1	2.0	0	0	7	1.4
Kwande	6	2.1	2	2.3	2	4.1	3	3.5	13	2.5
Logo	16	5.5	2	2.3	1	2.0	4	4.7	23	4.5
Makurdi	42	14.5	42	47.2	15	30.6	23	27.1	122	23.8
Obi	5	1.7	1	1.1	1	2.0	2	2.4	9	1.8
Ogbadibo	7	2.4	1	1.1	0	0	0	0	8	1.6
Ohinimi	7	2.4	0	0	0	0	0	0	7	1.4
Oju	11	3.8	1	1.1	3	6.1	3	3.5	18	3.5
Okpokuru	7	2.4	3	3.4	2	4.1	3	3.5	15	2.9
Otukpo	24	8.3	1	1.1	3	6.1	1	1.2	29	5.7
Tarka	9	3.1	2	2.3	0	0	2	2.4	13	2.5
Ukum	30	10.4	2	2.3	2	4.1	16	18.8	50	9.8
Ushongo	15	5.2	5	5.6	1	2.0	1	1.2	22	4.3
Vandeikya	11	3.8	4	4.5	2	4.1	4	4.7	21	4.1
Total	*289*	*100*	*89*	*100*	*49*	*100*	*85*	*100*	**512**	**100**

Source: Field work, 2007.
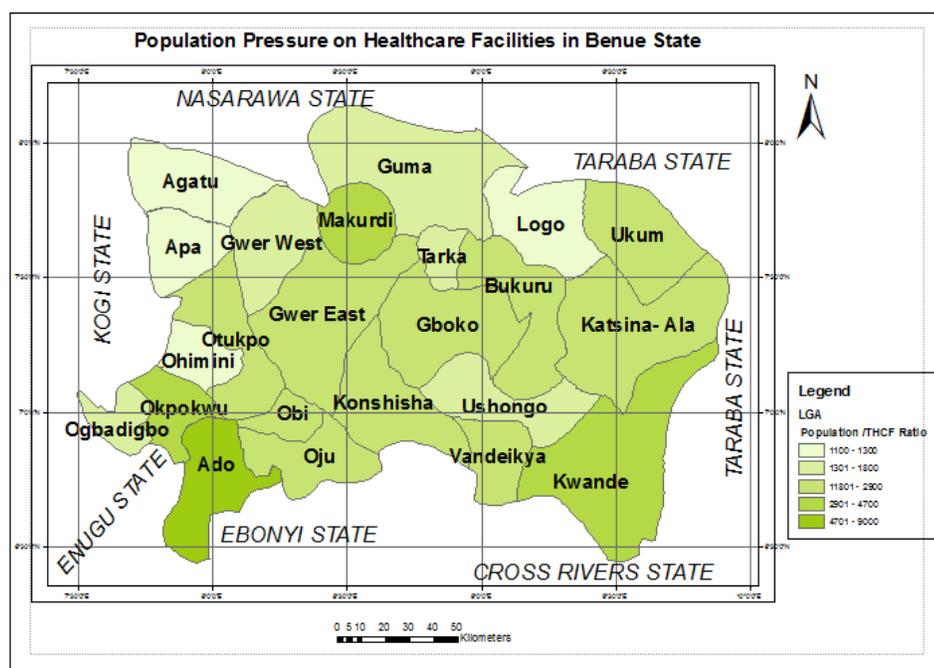
Fig. (9). Population/total healthcare facility ratio. [Source: Authors' analysis].

Table 3.   Population-healthcare facility ratio.

| LGA	HCF Tier						Total		Population
	Primary		Secondary		Tertiary				
	No	Pop/PHCF	No	Pop/SHCF	No	Pop/THCF	No	Pop/Total HCF	
Ado	13	8,011	0	-	0	-	13	8011	104,137
Agatu	46	1,176	0	-	0	-	46	1176	54,101
Apa	49	1,070	1	52,417	0	-	50	1048	52,417
Buruku	45	2,884	1	129,790	0	-	46	2822	129,790
Gboko	91	2,928	16	16,656	0	-	107	2491	266,490
Guma	69	1,686	0	-	0	-	69	1686	116,336
Gwer East	55	2,139	2	58,815	0	-	57	2064	117,630
Gwer West	41	1,819	1	74,586	0	-	42	1776	74,586
Katsina-Ala	63	2,560	4	40,320	0	-	67	2407	161,281
Konshish	68	2,141	0	-	0	-	68	2141	145,614
Kwande	37	4,874	2	90,164	0	-	39	4624	180,327
Logo	57	1,296	1	73,848	0	-	58	1273	73,848
Makurdi	50	4,798	21	11,423	2	133,245	73	3286	239,889
Obi	26	2,640	1	68,648	0	-	27	2543	68,648
Ogadibo	60	1,492	1	89,497	0	-	61	1467	89,497
Ohimini	29	1,158	0	-	0	-	29	1158	33,577
OJU	46	2,236	4	25,719	0	-	50	2058	102,877
Okpokwu	27	3,342	1	90,241	0	-	28	3223	90,241
Otukpo	67	2,368	11	14,426	0	-	78	2034	158,681
Tarka	28	1,521	1	42,591	0	-	29	1469	42,591
Ukum	61	2,713	6	27,582	0	-	67	2470	165,490
Ushongo	77	1,600	3	41,055	0	-	80	1540	123,166
Vandeikya	56	2,890	3	53,954	0	-	59	2743	161,863
Total	1,161	2,371	80	34,413	2	1,376,539	1,243	2,215	2,753,077

Source: Field work, 2007.
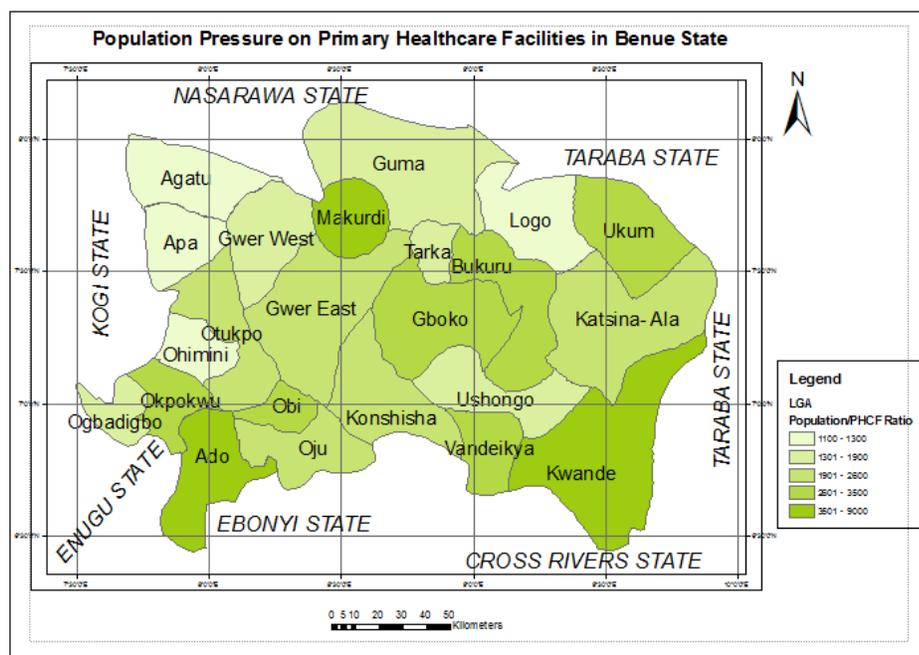
Fig. (10). Population-Primary Healthcare Facility Ratio. [Source: Authors' analysis].

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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