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Spatial Variability of Poverty and Primary Health Facilities in Rural Areas of Ayedaade Local Government, Osun State, Nigeria

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Abstract: *This paper examined the distribution pattern of health centres to determine the poverty level due to spatial variability of accessibility to health care facilities in rural areas of Ayedaade Local Government, Osun State, Nigeria. Three hundred sixty-eight household heads from 4,539 households in 25 selected villages were sampled based on Slovin's principle. Buffer and average nearest neighbourhood analyses were performed in ArcGIS 10.4 software to determine the distance covered to the nearest health centre and the spatial location pattern of health centres. $1.90 per day international poverty line, 5 Likert Scale, ANOVA, and correlation were used. The inverse relationship at r = - 0.447 revealed that the more the poverty, the less the poor's capability to cater to their health service. It calls for some forms of intervention by the government to reduce health services cost for rural dwellers.*

Keywords: Spatial Variability, Primary Health Care, Health Expense, Poverty, Rural Areas

1. Introduction

Primary health centres serve as forerunners in fighting diseases, both communicable and non-communicable diseases in the community (Alma–Ata, 1978; World Health Organization, 2018). The high rate of mortality in the world might be due to inadequate access to primary health care in many parts of the world (Fashui 2012; Ajala, Lekan, and Adeyinka, 2005; Gary, 2005). Spatial accessibility to health centres, which is how health centres can be reached from different locations without impediment, can be measured in terms of availability and nearness (distance, time, and cost). Spatial average distance between health centres and residences of the populace should be of paramount consideration (Wei and Fashui, 2003; Joseph and Philip, 1984; Fashui, 2012). Primary health centres are the lowest health centres in the hierarchy of health services that provide health care to communities at a trekkable distance. The level of accessing health centres decreases with an increase in distance from patients' residence. There was a high level of accessibility to health centres within the fifteen-minute walk distance in Rural Victoria, Australia, while walking time beyond the fifteen minutes was deemed poor accessibility (Matthew & John, 2009). National Population Commission, 2000 based on its Nigeria Demographic and Health Survey 1999 revealed that 60.6% travelled not longer than 4 kilometres to access the health centre; while 72.9% accessed the health facilities (health centre, clinic or hospital) within the radius of 4 kilometres.

Different initiatives have set the benchmark for health expenses to ensure that minimum standards of health care are attained. It was quite unfair that many low-income countries failed to meet the benchmark on health expenses. Considering the annual total health expense: Bangladesh incurred 37 dollars per person, Myanmar spent 15 dollars per person; Zimbabwe spent 60 dollars per person per annum which was below the minimum standard of 271 dollars per person annually (WHO, 2017; and Save the Children Fund, 2017). Likewise, on primary health, Sierra Leone spent 41.30 dollars in 2013, and Nepal spent 10 dollars per person in 2015, which was not up to Chatham House benchmark of 86 dollars per person on primary health service. Out of money allocated to the health sector, at least 57% should be for primary health service in order to achieve the third Sustainable Development Goal, but 33% of the health budget was spent on primary health care, especially in low and middle-income countries. High out-of-pocket health care expenses could aggravate the level of poverty (The Save the Children Fund 2017, World Bank, 2016).

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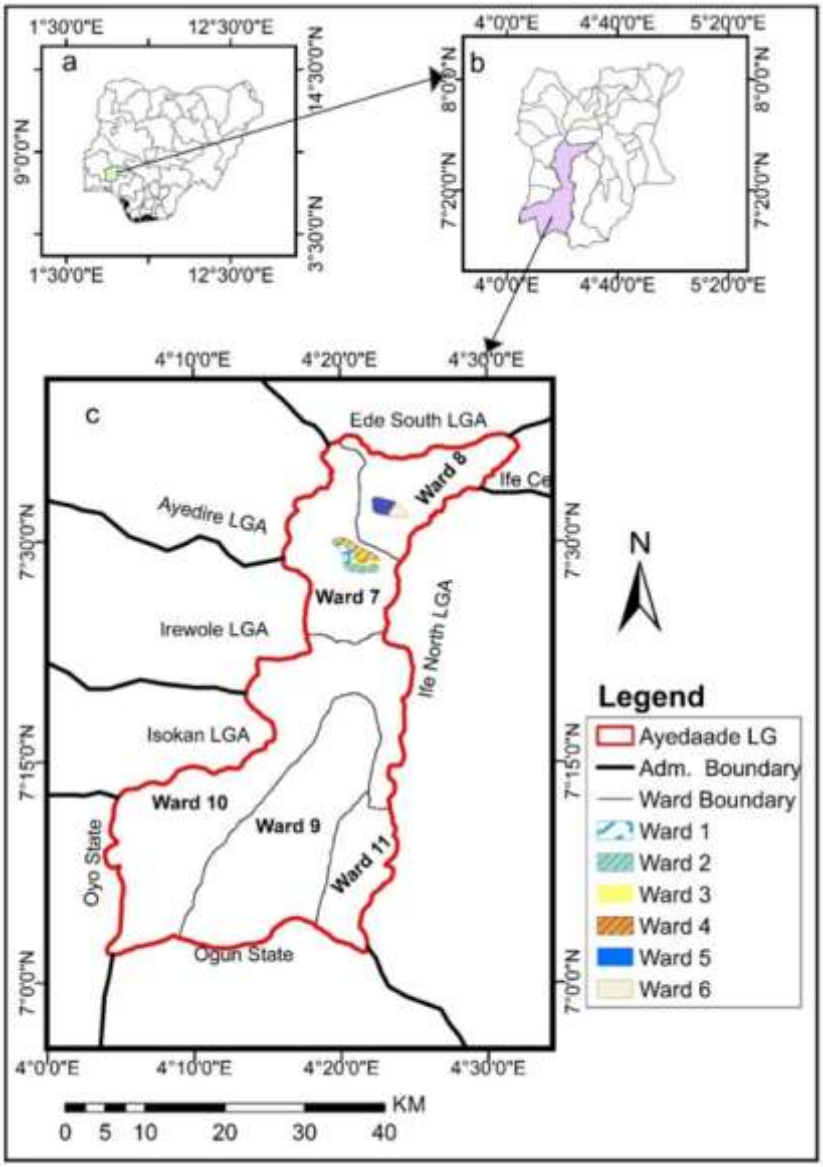
With a high level of poverty in many parts of the World (Ogunlela, 2008; WHO, 2017; Olabamiji, 2018), the individual was still responsible for a large proportion of health expenditure as it was not commensurate with Chatham House benchmark of 15 to 20% of total health expenditure as an out-of-pocket health expense. The average out of pocket in low and middle-income countries was 59%, while the government was only responsible for 17%, the donor was responsible for 17%, and the remaining 7% from other sources. Bangladesh was one of the countries with the highest out of pocket expense (67%) on health (Save the Children Fund, 2017). Available data on primary health centres (13,703 public primary health centres, and 6, 575 private primary health centres) in Nigeria revealed spatial inequality and thus poor accessibility across country's region as only 48.4% in North – East, 55.3% in North – West, 61.1% in North – Central, 37. 1% in South – East, 73.1% in South – West, and 45.9% in the South-South had access to health service. Only 55.1% of Nigerian, 47.8% of rural dwellers, and 16.1% of rural poor were accessible to health service (Nigerian National Bureau of Statistics, 2011).

Scholars have suggested a preferred reasonable catchment area of primary health centres and the willingness of dwellers to receive medical care from that primary health centre. Ivo, Steve, Lawrence and Blaise (1998) found that the number of patients decreased by 50% at a distance of 3.5km to the primary health centres in Papua New Guinea. Olayinka (2016) observed that the average travel distance to the nearest primary health centre with mental service was 15.3km. Olawole (2010), Ivo et al. (1998), and Olayinka (1998) found that rural dwellers tend to prefer the nearby primary health centre. Klemeck, Leonard, and Masatu (2009) posed that patients tend to neglect nearby primary health centre and receive treatment in secondary and tertiary health centres to their high service quality. Exorbitant out-of-pocket health expenses and long-distance to health centre have been identified as major predicaments to optimum utilization of primary health care (Olawole, 2010; Calyn, Ermias, Mideksa, Peter, 2016). Different studies have shown that people preferred different levels of health care regarding quality, distance, and expenses involved; it is imperative to assess how health care quality, distance, and expenses contribute to poverty level and inequality in the accessibility to primary health care delivery. Therefore, this paper examined spatial variability, accessibility to primary health centres, and its cost implication on poverty level among the people in a rural area of Ayedaade Local Government, Osun State, Nigeria.

1.1 The Study Area

Ayedaade Local Government is geographically located between Latitude 7^0 2′and 7^0 39′ North of the Equator, and Longitude $4^0$3′ and $4^0$32′ East of Prime meridian. It has eleven political wards, two urban settlements, and one hundred and seventy-two villages (Figure I). As of 2006 National Census, the study area population was 149,569 (National Population Commission, 2006). Using 2.6 per cent growth rate as approved for the area, it was estimated to be 184,730 population in 2017. There are fifty-three public secondary health centres, four hundred and sixty-seven public primary health centres, and two public tertiary health centres in Osun State. There are thirty-two health centre (two secondary health centres, eighteen public health centres, and ten registered private health centres) in Ayedaade Local Government Area of Osun State (National Bureau Statistics, 2011).

Figure I: *Map of the Study Area: (a) Nigeria, (b) Osun State, and (c) Ayedaade Local Government*



Source: Re-digitized 2001 Ayedaade LGA Political Map

2. Methodology

Primary data were collected through questionnaires and the Global Navigation Satellite System (GNSS). Secondary data used were census data and the study area map. Both simple random and systematic sampling techniques were used in this study. Twenty-five villages were randomly selected from 172 villages based on an equal proportion from 5 rural wards of 11 political wards in the study area. Slovin's procedure was adopted in selecting 368 household heads out of 4, 539 total target household heads in the selected villages. From preliminary fieldwork, a total of 2, 735 houses were listed across 25 villages. The houses were selected using a systematic procedure (in each village, the first house was selected based on balloting, and subsequent houses were selected at regular interval got by dividing the sample size with the number of houses). In each selected house, the questionnaire was administered to the household head. Likert Scale ranging from 5=very good; 4=good; 3=Fair; 2=Bad; to 1=very bad, were used to ascertain the condition of public primary health centres in the study area. GNSS was used to take the coordinates of villages and primary health centres. Descriptive statistical techniques such as a table, graph, and inferential statistics such as ANOVA and correlation were applied with the application of SSPS version 23. The distance to available primary health centres was ascertained by applying ArcGIS 10.4 (buffer and average

nearest neighbourhood) based on a relative distance of 1 to 4 kilometre, which was adopted from National Population Commission 2000 based on its Nigeria Demographic and Health Survey, 1999. The $1.90 per day International Poverty Line was used to ascertain the poverty level, and the condition of health centres was assessed based on five -Likert Scale. ANOVA was used to establish the variation in the condition of health facilities, and correlation was used to ascertain the relationship between the poverty level and out-of-pocket health expense.

3. Results and Findings

Table 1 depicted the demographic attributes of the respondents. The sampled population composed of 86% of male and 14% female. The large per cent of male was due to the fact that household heads were sampled. There was heterogeneity in the age range of the respondents as 5% of the respondents were less than 30 years old; 29% were in the age group of 30 years but younger than 45 years; while 31% ranged from 45 years to 60 years. The household heads older than 60 years represented the highest per cent (35%) among the sampled. With 65% population below 60 years indicates a large proportion of the population in active age still reside in the rural areas, and their means of livelihood remains primary occupation. Table 1 revealed that the mean household size was seven in the study area. This finding is closely similar to Amao, Ayantoye, and Oladejo (2013), who found out that the household size was averagely six in their study of poverty and income inequality among houses in Osun State, Nigeria.

Table 1: *Sex, Age, and Household Components of the Respondent*

	FREQUENCY	PERCENTAGE
Sex:		
Male	317	86
Female	51	14
Total	368	100
Age (X):		
X < 30 Years	17	5
30 Years ≤ X ≤ 45 Years	108	29
45 Years < X ≤ 60 Years	113	31
X > 60 Years	130	35
Total	368	100
Household Size:		
Mean household size	7	
Mean number of wife	1	
Mean number of children	5	

Source: Authors' Fieldwork

3.1 Accessibility to Health Facilities

Figure 2 showed that the distribution of primary health centres was clustered in the study area at p-value of 0.030 and Z-value of – 2.176 with the observed mean distance of 3,133 metres based on EUCLIDEAN method under the average nearest neighbourhood. This showed that primary health centres were not far from one another in rural areas (Figure 2 and Table 2). Mokgalaka, 2014 in Johannesburg that the primary health facilities were located in such a way that 93% of the population could access them within the radius of 5 Km. Nigeria Demographic and Health Survey 1999 (National Population Commission, 2000) showed that 32% of Nigerians covered the distance of more than 10 kilometres, and 60.6% covered not more than 4 kilometres before accessing the health centres. Wei and Fashui (2003) found out that the spatial pattern of primary health centres was concentrated in Chicago.

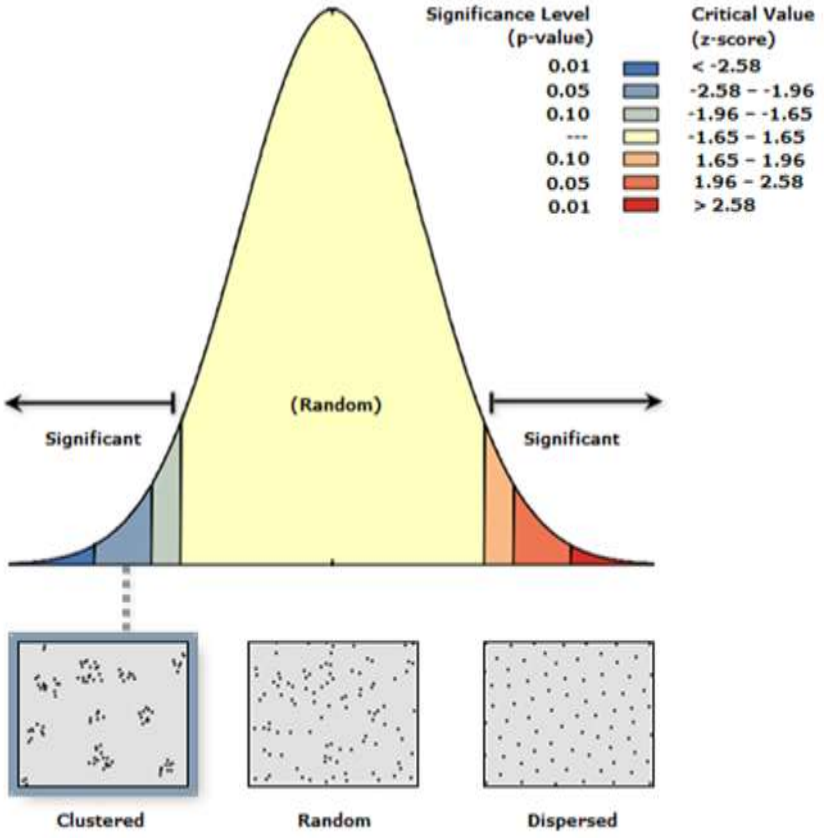


Figure 2: *Spatial Pattern of Public Primary Health Centres*

Table 2: *Average Nearest Neighbour Analysis of Public Primary Health Centres*

Average Nearest Neighbor Summary	
Observed Mean Distance:	3133.2711 Meters
Expected Mean Distance:	4201.6541 Meters
Nearest Neighbor Ratio:	0.745723
z-score:	-2.175467
p-value:	0.029595

Source: Authors' Fieldwork

Table 3 showed that eighteen thousand, three hundred and forty-six rural dwellers (80.8%) of fifteen villages travelled at the radius of one kilometre to the nearest public health centres in terms of estimated travel distance to primary health centres. Two thousand, two hundred and seventeen rural dwellers (9.8%) of four villages travelled more than one kilometre but less than two kilometres to primary health centres. One thousand eight hundred and fifty-three patients (8.2%) of five villages covered more than two kilometres but less than three kilometres estimated distance before accessing primary health centre. While two hundred and eighty-one inhabitants (1.2%) of one village travelled more than three kilometres but less than four kilometres before reaching the nearest primary health centre; none of the villages were up to five kilometres to the nearest public health centre based on the result of buffering. This revealed a very high level of accessibility to public primary health centres in terms of estimated distance in the area as primary health centres were located very close to rural settlements.

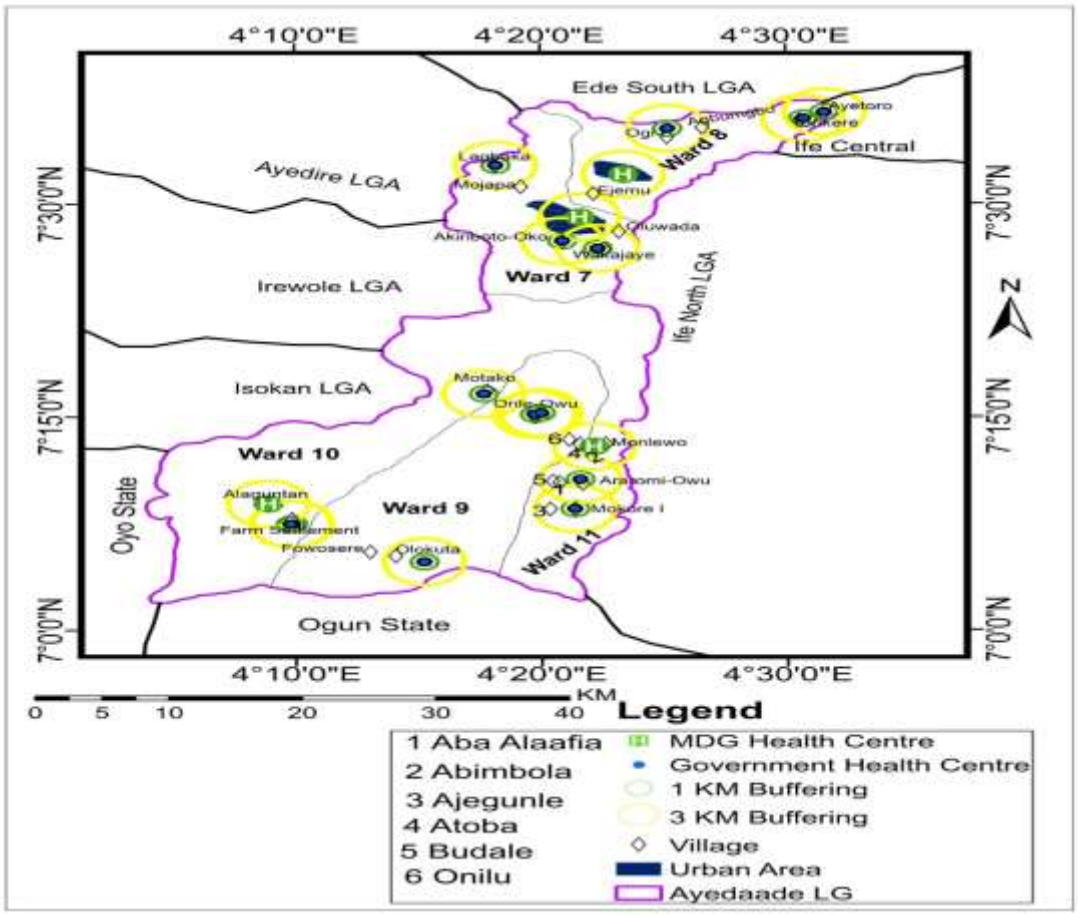
***Table 3**: Distance to Public Health Centres*

Distance to Public Health Centres	Relative Level of Accessibility	Scale	2017 Estimated Population		Settlement	
			F	%	F	%
0 to 1 KM	Very High	4	18, 346	80.8%	15	60%
1.1 to 2 KM	High	3	2, 217	9.8%	4	16%
2.1 to 3KM	Low	2	1, 853	8.2%	5	20%
3.1 to 4 KM	Very Low	1	281	1.2%	1	4%

Source: Authors' Fieldwork

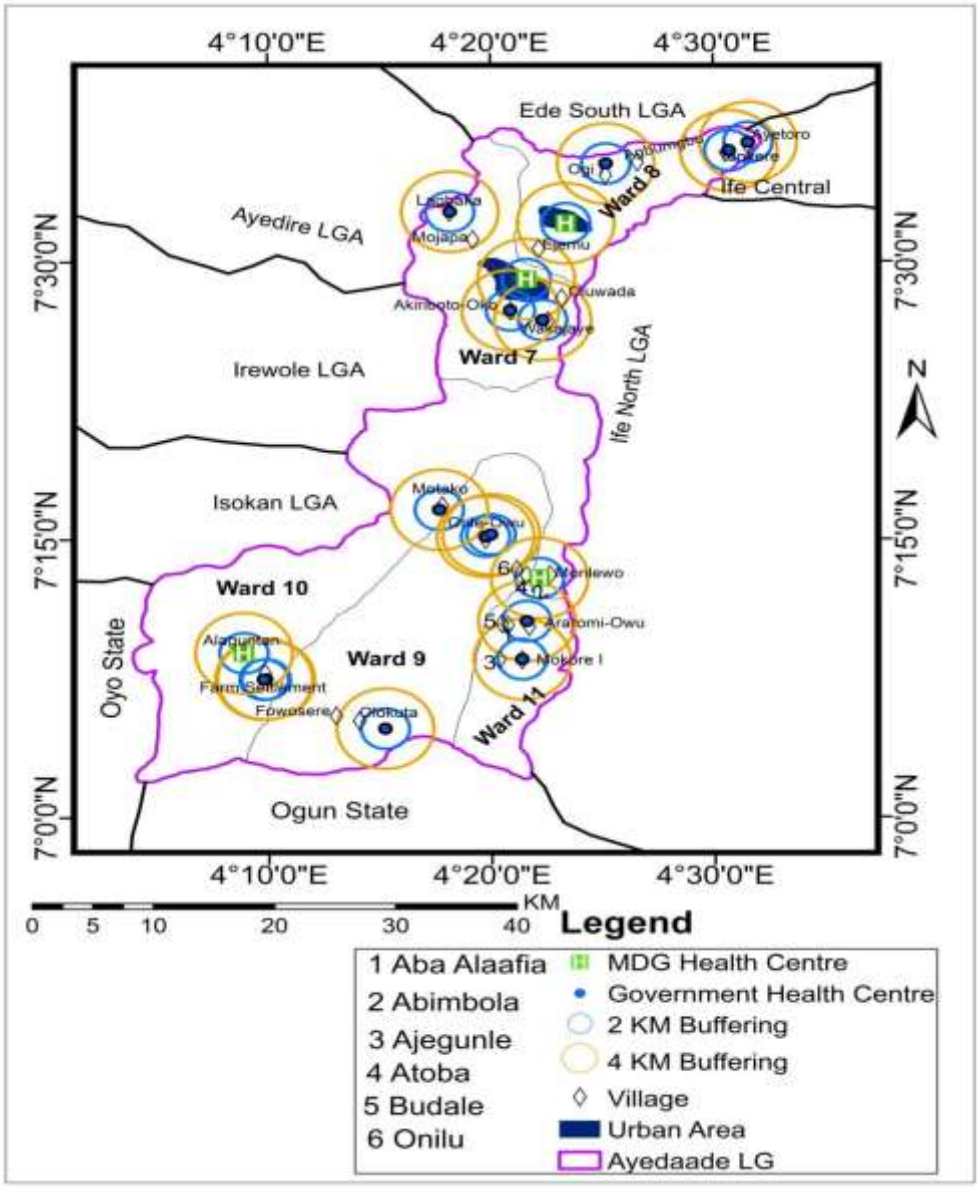
In order to be specific in term of nomenclature of the villages, Figure III revealed that fifteen villages (Farm Settlement, Alaguntan, Mokore, Araromi- Owu, Abimbola, Molewo, Atoba, Orile-Owu, Motako, Akiriboto-Oko, Wakajaye, Lagbaka, Ogi, Tonkere, and Ayetoro) were less than one kilometer away from primary health centres. Another four villages (Onilu, Aba Alaafia, Ajegunle, Budale,) were more than one kilometre but less than two kilometres away from primary health centres. Figure IV showed that five villages (Agbumgbu, Ejemu, Mojapa, Oluwada, and Olokuta) were more than two kilometres but less than three kilometres away to public primary health centres. Only one village called Fowosere was more than three kilometres and less than four kilometres to the nearest primary health centres. This was also observed in research works of Ivo et al., 1998 that the rate of patient attendance reduced with an increased distance. Though some findings have revealed that people travelled over 5 km to access health centres (Olayinka, 2016), this was not always applicable in all areas. None of the rural dwellers travelled beyond four kilometres in this study (Figure III and Figure IV).

***Figure III:** 1 KM and 3 KM Buffers around Primary Health Centres*



Source: Authors' Fieldwork

Figure IV: *2KM and 4 KM Buffer around Primary Health Centres*



Source: Authors' Fieldwork

It was essential to expatiate on the condition of public primary health centres in rural areas based on 5-Likert Scale in order to illuminate the extent to which rural dwellers were treated. Table 5 presented that the condition of public primary health centres in twelve villages were very bad with indices of 1.0 expect Mojapa with 1.5, which was due to its nearness to Lagbaka II. The condition was bad (2.0) in Akiriboto-Oko. This pointed that the situations of health facilities were pathetic in thirteen villages. The condition of public primary health centres was fair in seven villages (Wakajaye, Ayetoro, Tonkere, Orile-Owu, Alaguntan, Farm Settlement, and Araromi-Owu); good in five villages (Lagbaka II, Ogi I, Motako, Abimbola, and Mokore I) which has made the average condition in the whole study area to be fair (2.8); and none of the primary health centres in the sampled villages was in very good condition. ANOVA showed that there was no significant variation in the condition of public primary health centres at p-value of 0.404 in the area (see Table 4). The attention must be given to the improvement in the condition of public primary health centres since more than half of the sampled villages were in a dilemma of bad public health centres. This also indicated that there had not been serious improvement in the distribution of the public health facilities ten years after the initial study of Aguda and Ajala 2007 on development

inequalities that public infrastructures which showed primary health centres as less developed in Ayedaade Local government, Osun State, Nigeria.

Table 4: *Variation in Condition of Public Health Service*

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	7.250	4	1.813	1.056	0.404
Within Groups	34.336	20	1.717		
Total	41.586	24			

Source: Authors' Fieldwork

3.2 Out-of-Pocket Health Expenses and Poverty Level in the Study Area

Appropriate expense on health has been advocated and recommended by different organizations. WHO, 2017 recommended that every country should spend at least $271 on a citizen per annum on all kinds of health care, while Chatham House 2014 recommended $86 per person on primary health care per annum. Chatham House also recommended that, if condition warrants, out of pocket health expense should not exceed twenty per cent of the aforementioned health fee. Based on these recommendations, a reasonable daily out of pocket health expense per person is Seventeen Naira on primary health care; and Fifty-Four Naira on all health cares. Table 5 presented that none of the villages in the study area enjoyed free health care. It revealed that at One Dollar equates Three Hundred and Sixty-three Naira; the mean daily expense per person was above One-Hundred Naira in four villages, namely: Ejemu, Araromi-Owu, Ajegunle, and Mokore I. The most exorbitant fee on health care was spent by people in Ejemu with One Hundred and Ninety-Five Naira. Mojapa, Agbumgbu, Ogi I, Ayetoro, Tonkere, Olokuta, Atoba were the villages where out of pocket health expense was below One Hundred Naira. In the remaining thirteen villages, an individual spent below Fifty Naira on health cares per day. Only in Akiriboto-Oko and Abimbola that out-of-pocket health expense was Two Naira and Four Naira respectively per day. The result revealed that only four out of twenty-five villages had their residents spend less than or equals to recommended seventeen Naira out of pocket expense on primary health care. The average Sixty-Six Naira out of pocket health expense in the whole study area showed that rural dweller spent beyond recommended daily personal health expense. But the low out of pocket expense in Akiriboto-Oko resulted from the adoption of local herds instead of depending on drugs due to the high level of poverty, while it was due to free health service rendered by MDGs primary health centre in Abimbola. It could be obvious that the people in some of the villages spent more on health care due to the lack of primary health centres in their villages and primary health centres without free drugs for patients. Table 6 connote that the poor could not pay the out-of-pocket health care fee as there was an inverse relationship between the capability to pay out-of-pocket health care fee and poverty level at r = - 0.447. This indicates that there should be free primary health care for everyone as it has been enshrined in the third SDGs in order to make life healthier and better for everyone.

Table 5*: Villages, Estimated Population, Households, Poverty Level, Mean Out-of-Pocket on Health, and Condition of Primary Health Centres*

VILLAGES	2017 ESTIMATED POPULATION	NUMBER OF HOUSEHOLDS IN EACH VILLAGE	POVERTY LEVEL IN PERCENTAGE	MEAN OUT-OF-POCKET EXPENSE ON HEALTH	CONDITION OF PRIMARY HEALTH CENTRES
Mojapa	238	48	25	89	1.5
Oluwada	745	149	42	37	1.0
Wakajaye	3,261	652	59	41	2.9
Akiriboto-Oko	121	24	100	2	2.0
Lagbaka II	329	66	60	49	4.2
Agbumgbu	365	73	67	72	1.2
Ogi I	509	102	38	63	3.6

Ayetoro	1210	242	50	57	3.3
Tonkere	2,943	589	50	84	3.4
Ejemu	160	32	33	195	1.0
Olokuta and others	345	69	50	76	1.0
Fowosere and others	281	56	60	11	1.0
Atoba	366	73	83	75	1.0
Onilu and others	312	62	40	31	1.0
Orile-Owu (Obalufon)	3,152	630	49	40	3.3
Alaguntan	250	50	25	18	2.5
Motako	452	90	42	33	4.0
Monlewu and others	259	52	50	59	1.0
Abimbola	368	74	83	4	4.0
Farm Settlement	1,372	274	23	42	3.3
Budale	641	128	70	25	1.0
Araromi-Owu	3,058	612	36	108	3.2
Aba Alaafia	130	26	50	17	1.1
Ajegunle	1,134	227	28	139	1.1
Mokore I	696	139	36	123	3.6
Total	22,697	4539	47	66	2.8

Source: Authors' Fieldwork

Table 6: *Relationship between Poverty Level and Out-of Pocket Health Expense*

Correlations

		Poverty	Health Expense
Poverty	Pearson Correlation	1	- 0.447*
	Sig. (2-tailed)		0.025
	N	25	25

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Authors' Fieldwork

4. Conclusion

This study inferred the condition of primary health centres in Ayedaade Local Government was still poor in more than half of the villages in the area with no significant spatial variability in the condition of primary health centres. The spatial distribution pattern of government primary health centres was clustered as they were not far from one another with an average distance of less than four kilometres. In comparison, Mokgalaka, 2014 observed in Johannesburg (South Africa) that the primary health facilities were located in such a way that 93% of the population could access them within the radius of 5 Km, and Wei and Fashui 2003 described pattern of primary health centres as being concentric in Chicago. Nigeria Demographic and Health Survey 1999 (National Population Commission, 2000) showed that 32% of Nigerians covered the distance of more 10 kilometres, and 60.6% covered not more than 4 kilometres before accessing the health centres. Thus, this study concluded that there was a distance lag effect on the patronage with increasing distance from residence to primary health centres in the study area. This was also observed in Ivo Muller et al., (1998) in Papua New Guinea. Though studies, for instance, Olayinka 2016, have shown that people travelled more than five kilometres to the nearest primary health centres. This is not always applicable as this study confirmed that primary health centres are located within 4- kilometre radius of accessibility in terms of physical location. However, the availability of personnel and ancillary health facilities, including drugs, to provide services are still grossly inadequate. This was also reflected in out-of-pocket health expenses of rural dwellers that were beyond international standard. There was also a significant inverse relationship between poverty and out-of-pocket health expenses in rural areas. This calls for some forms of intervention by the government to reduce health services cost for rural dwellers as this will alleviate people from poverty. Thus, this

paper advocates for an increase in health personnel and supply of necessary facilities and drugs at an affordable cost to improve accessibility to health care services by rural dwellers, thereby improving their well-being.

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