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Spatial Analysis of Modern Health Care Resources in Rural Districts of Ibadan, Nigeria

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Abstract:

This paper analyses the spatial distribution of health care resources (e.g. health facilities and health personnel) in rural districts of Ibadan. The paper reveals that in terms of number, the spatial distribution of health care facilities and personnel varied markedly in the study area. Furthermore, it was also confirmed that population is not an important factor accounting for the distribution of health care facilities. However, the spatial inequalities in the distribution of health personnel makes the health personnel to be found in larger numbers in some health institutions than in others.

1. Introduction

Health care resources continue to be a central theme in the literature on medical geography. This is because health and health care are central to community well-being as well as to personal welfare. This is not only because they have a strong influence on people's earning capacity and productivity; but they are also regarded as a multi-sectoral responsibility inseparably linked to a nation's socio-economic development (Meadesetal., 1988, Phillip, 1990, WHO,1996, Okafor 2008, Awe, 2014). Traditionally, medical geographers have been concerned with analyzing the spatial patterns of health related phenomena and in investigating their ecological relationships with environmental and other factors. Over the years, research has included the application of geographical methods of analysis in studying the distribution of health care service facilities and the access- opportunity of potential consumers of those facilities (Bailey and Phillips, 1990; El- kahtani, 1991, Mishra and Mishra, 1996).

In doctor-patient interactions, accessibility and utilization have been regarded as important concepts that place patient and practitioner in the best possible position in relation to each other (Joseph and Philips, 1984; Joseph, 1986; Phillips, 1990). Accessibility here is defined as the relative degree of ease with which a location may be reached from other locations (Morril, 1970; Penchansky and Thomas 1981; Okafor, 1990; Rosenberg and Hanlon, 1996; Rogers et al., 1999; Gullifordetal., 2002). Rogers et al., (1999) see it 'as providing the right service at the right time in the place'. However, studies have affirmed that equitable distribution of healthcare resources can be understood only when accessibility and utilisation measures are considered (Perry and Gesler,2000; Goddard and Smith, 2001; Kwan et al., 2003). It is pertinent to point out that the concept of accessibility cannot be equated with the use of services; rather utilisation is the evidence that access has been achieved.

In the Third world countries, available studies have shown that the need for medical care has been found to be very high as they are characterized by high degrees of poverty, unchecked exposure to communicable diseases and low life expectancy compared to affluent societies where medical services are more available (King, 1966, Phillip, 1990; Oppong and Hodgson, 1994). Many of these studies have shown the existence of regional inequalities in the availability and distribution of health facilities and personnel among the nations of the world. This was found to be highly skewed in favour of urban centres to the neglect of the rural areas where majority of the population resides (Okafor, 1982; Ramanchandran and Shastri, 1983; Awe, 2014). In spite of the gross neglect of the rural areas in the availability and distribution of health care resources, there is a general lack of empirical research into the provision and distribution of health care resources and how they vary within and between rural areas. Based on these one can determine how health care resources can be provided and located to take care of the health needs of the general population especially in the setting. It is through optimal utilisation of such health care services that the goal of achieving socially and economically productive lives could be attained. This paper therefore focusses on the types and sizes of modern health care resources within the rural districts of Ibadan. The major concern pertains to spatial pattern of health facilities and spatial distribution of health personnel as well as the measurement of inequality between health facilities distribution and population size.

2. The Study Area

The rural districts of Ibadan comprise of three selected spatially contiguous rural Local Government Areas (LGAs) of the six rural LGAs in Ibadan region. These three rural LGAs are:Ido, Akinyele and Lagelu (see Fig. 1). Ibadan, the capital of Oyo State, Nigeria, is located approximately on Latitude 7^o 20¹and longitude 3^o 50¹ (Udo, 1982). However, this rural districts of Ibadan occupy an area of approximately 2,659.97km² with a total population of 606,617 (1991 census). It shares common boundaries with Afijio LGA to the

north, Osun State to the east, Ibarapa LGA to the west and Ogun state to the South. The remote rural settlements outside the suburban areas of Ibadan were digitized in Arcview GIS software. The software was then used to determine the centroid of Ibadan metropolis using polyon-centriod script in Arcview extension for 2km buffering each from Ibadan metropolis' centroid to suburban boundary areas of between 10-12km radius. Areas outside this 12km buffering constitute the remote rural areas used for the study.

The settlement pattern here is dispersed and a greater percentage of the population live in villages of about 2,100 (National Primary Health Care Development Agency [NPHCDA], 1997). Agriculture is the main occupation of the people. The area is characterized by inadequate provision of basic infrastructural facilities (such as safe portable water supply, electricity and so on) that are essential to the maintenance and promotion of good health. Even the few areas where medical

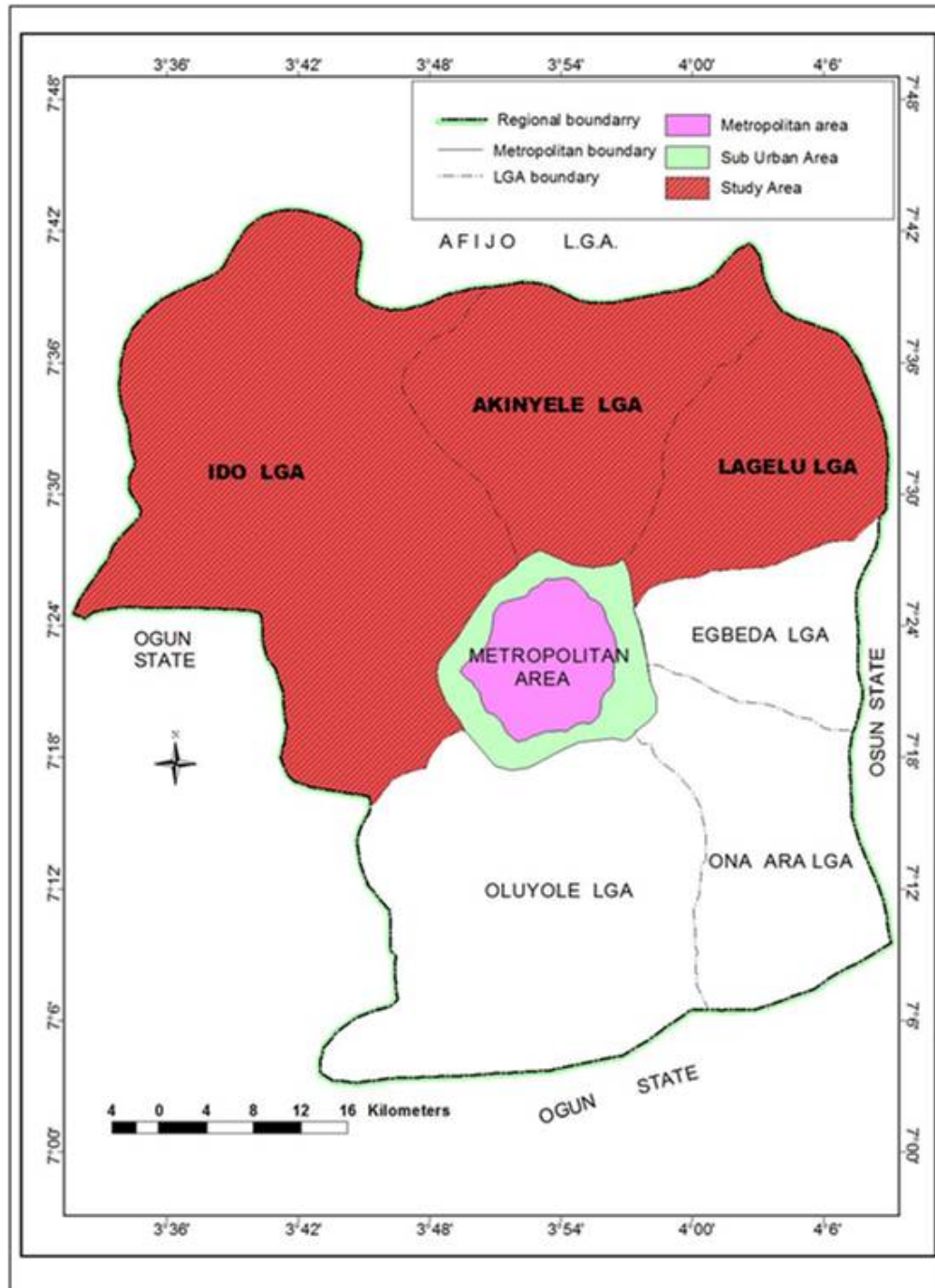


Figure 1: The Study Area

facilities exist, such facilities are often short-staffed, poorly maintained and often inadequately supplied with drugs. Specifically, occupational hazards, neglect with respect to the provision of socio-economic improvements, inadequate environmental protection and the consequences of widespread abject poverty, illiteracy and ignorance which are prevalent in the rural areas all contribute negatively to the poor health conditions of the rural dwellers in this area (Iyun, 1982; Awe, 2014).

3. Conceptual/Theoretical Framework

The Central Place Theory (CPT) as postulated by Walter Christaller (1966) provides the basic concept for this paper giving that it provides explanation on types and sizes of facilities in a given region. Basically this theory explains the spatial organization of central places and their hinterland particularly in terms of their relative location and size. In formulating the theory, Christaller (1966) demonstrated how, under specified conditions a nested hierarchy of central places would result and these would be distributed in hexagonal pattern of service areas. The hierarchical concept of order and range of goods and services derives from the theory is about the size, number and distribution of towns seen as central places. Central places are towns that serve as centres for regional communities by providing them with central goods like automobiles, and central services like health care services.

Central places vary in importance, and two broad categories are recognized, namely: higher order central places and lower order central places. Lower order central places provide lower order goods and services for every small catchment area, while the higher order central places supply goods and services of high order, as well as those supplied at lower-order centres. They provide goods and services for extensive catchments areas or complementary regions. Generally, the trade areas of smaller centres lie within those of large centres.

In a like manner, the hierarchical structure of the provision of health facilities has implications for the utilisation of the facilities. These implications are mediated through the referral system. Secondary health care facilities are referral facilities for primary health care facilities. In the same vein, tertiary facilities are referral facilities for secondary facilities. In terms of utilisation, this referral system implies that, strictly speaking, the public have direct access to primary health care facilities while access to secondary facilities is by referral from the primary level. Access to the tertiary level is by referral from the secondary level (Pacione, 1984). In terms of the spatial arrangement of facilities, the referral system requires a nesting of facilities and their catchment areas. This means, for example, that within the catchment area of a secondary health care facility we will have several primary facilities serving as feeders for the secondary one. Similarly, within the catchment area of a tertiary facility we have a number of secondary facilities, with the latter serving as feeders for the former. Thus, within the catchment area of a tertiary facility we expect to have a number of secondary facilities and several primary facilities. This arrangement ensures that the different levels of health care form a regional network, with each level linked to the successive level as demonstrated in Figure2.

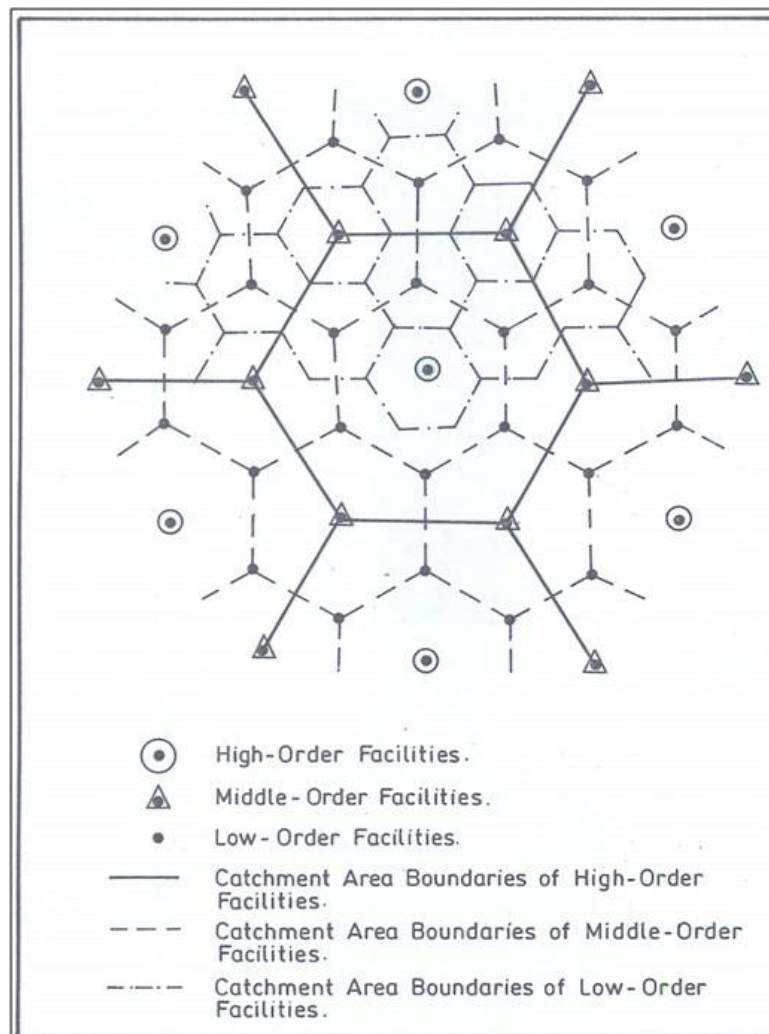


Figure 2: The Nesting of Health Facilities and Catchment Areas
[Source: Onorkerhoraye, 1997]

4. Data Collection Procedure

Both primary and secondary data were required in this study. The collection of data from the primary source involved community (reconnaissance) survey and the administration of health facility questionnaire to various categories of health care providers. The community survey involved the identification of health care facilities in the study area. In this study, a health care facility is defined as any health care unit owned either by public and private authorities as well as voluntary organizations which provides health care services. These health facilities were stratified into Higher-Order Facility- General Hospital and Lower-Order Facilities-Primary Health Centres, Maternity Centres and Health Clinics.

This was closely followed by the identification and location of all settlements in the rural districts with any type of health care facility as defined above. Visits were then made to each of the health care facilities where informal questions and interviews were held with patients to elicit information on the health care situation in their community. This phase was subsequently followed by the administration of health facility questionnaire to 10 selected major health care facilities (both public and private) that kept up-to-date record on utilisation for in-depth investigation among the three selected spatially contiguous rural Local Government Areas. The questionnaire sought information on facility –based factors that influence the use of health facilities. Such health facility – based factors include name of the facility, location, ownership and personnel (e.g. number of doctors, nurses, midwives, dentists, laboratory technicians, community health workers (CHWs), community health extension workers (CHEWs), and other paramedical staff). Also, included are equipment and supplies such as beds, medical equipment, drugs and types of health care services available.

The health care facilities were visited one after the other. In each case, the questionnaire was left with the head of the health care facility to complete. In some cases, several visits were made to health care facilities before the completed questionnaire could be retrieved. All the health care providers satisfactorily completed the questionnaire by the end of the fieldwork.

Data from records of Government and non-government agencies served as secondary sources of data used to compliment those from the primary sources. Basically, the data on total number of health care facilities and their locations were obtained from the list of health care facilities from each of the three rural Local Government Areas Information Unit and Health Department. Data on estimated (projected) population sizes of the settlements were obtained from the records of the last 1991 National Population Enumeration Areas (EA), from the National Population Commission (NPC). These sources of secondary data (publications) were the most recent and comprehensive editions at the time of the fieldwork.

5. Analyses and Discussion

5.1. Spatial Pattern of Health Care Resources (e.g. Health facilities and Personnel)

The spatial distribution of modern health care facilities and personnel are analysed. While histograms are used to show the spatial distribution of health personnel, Lorenz curve is used to show the inequalities in the distribution of health care facilities investigated. The choice of these types of maps became necessary given the advantage of visual clarity over and above other types of maps.

5.1.1. Spatial Distribution (By Number) of Modern Health Facilities

The spatial distribution of health facilities in Figure 3 and Tables 1 and 2 indicates that the number of health care facilities varied markedly amongst the spatially contiguous rural LGAs according to types, sizes and ownership. For instance, Tables 1 and 2 show that the total number of health facilities varies from only 3 (30.0 percent) each in Akinyele LGA serving a total population of 27,063 and Lagelu LGA serving a total population of 18,695 to 4 (40.0 percent) in Ido LGA serving a total population of 22,157.

In terms of type of health facilities, the only hospital is Moniya General Hospital. It is in Akinyele LGA and is owned by the State Government. From the point of view of accessibility, the concentration of hospital in Akinyele LGA means that the facility will easily be patronized by the inhabitants of the area; while on the other hand, the inhabitants of Ido and Lagelu LGAs who have no single hospital or have a few cottage hospitals will have to travel longer distances before they can utilise the health facility. Given the effect of distance on the demand for central goods and services, the utilisation of hospital facilities by the disadvantaged populations in Ido and Lagelu LGAs will no doubt be adversely affected. Health care centres are however available in all the LGAs. The numbers range from 1 each in Akinyele and Lagelu LGAs to 2 in Ido LGA. All these health centres are owned by the local governments of each of the three LGAs (See Tables 1 and 2).

S/N	Local Govt.	Name of Health Facility	Location	Ownership
1.	Akinyele	General Hospital	Moniya	State Govt.
2.	“	Primary Health Centre	Akinyele	Local Govt.
3.	“	WellCare Maternity Centre	Moniya	Private Individual
4.	Ido	Primary Health Centre	Ido	Local Govt.
5.	“	Primary Health Centre	Omi-Adio	Local Govt.
6.	“	Primary Health Clinic	Koguo	Local Govt.
7.	“	Muslim Maternity Home	Omi-Adio	Community
8.	Lagelu	Primary Health Centre	Ogburo	Local Govt.
9.	“	Primary Health Clinic	Sagbe	Local Govt.
10.	“	Idera Maternity Home	Lalupon	Private Individual

Table 1: Health Care Facilities

Source: Author's Analysis

S/N	LGA	2002 projected population	Type 1		Type 2		Type 3		Type 4		Total %	
			No.	%	No.	%	No.	%	No.	%	No.	%
1.	Akinyele	27,063	1	33.3	1	33.3	1	33.3	-	-	3	30.0
2.	Ido	22,157	-	-	2	50.0	1	25.0	1	25.0	4	40.0
3.	Lagelu	18,695	-	-	1	33.3	1	33.3	1	33.3	3	30.0
	Total	67,915	1	10.0	4	40.0	3	30.0	2	20.0	10	100.0

Table 2: Spatial Distribution of Health Facility Type

Note:

Type 1: General hospital

Type 2: Health Care Centres

Type 3: Maternity and Child Welfare Centres

Type 4: Health Clinics

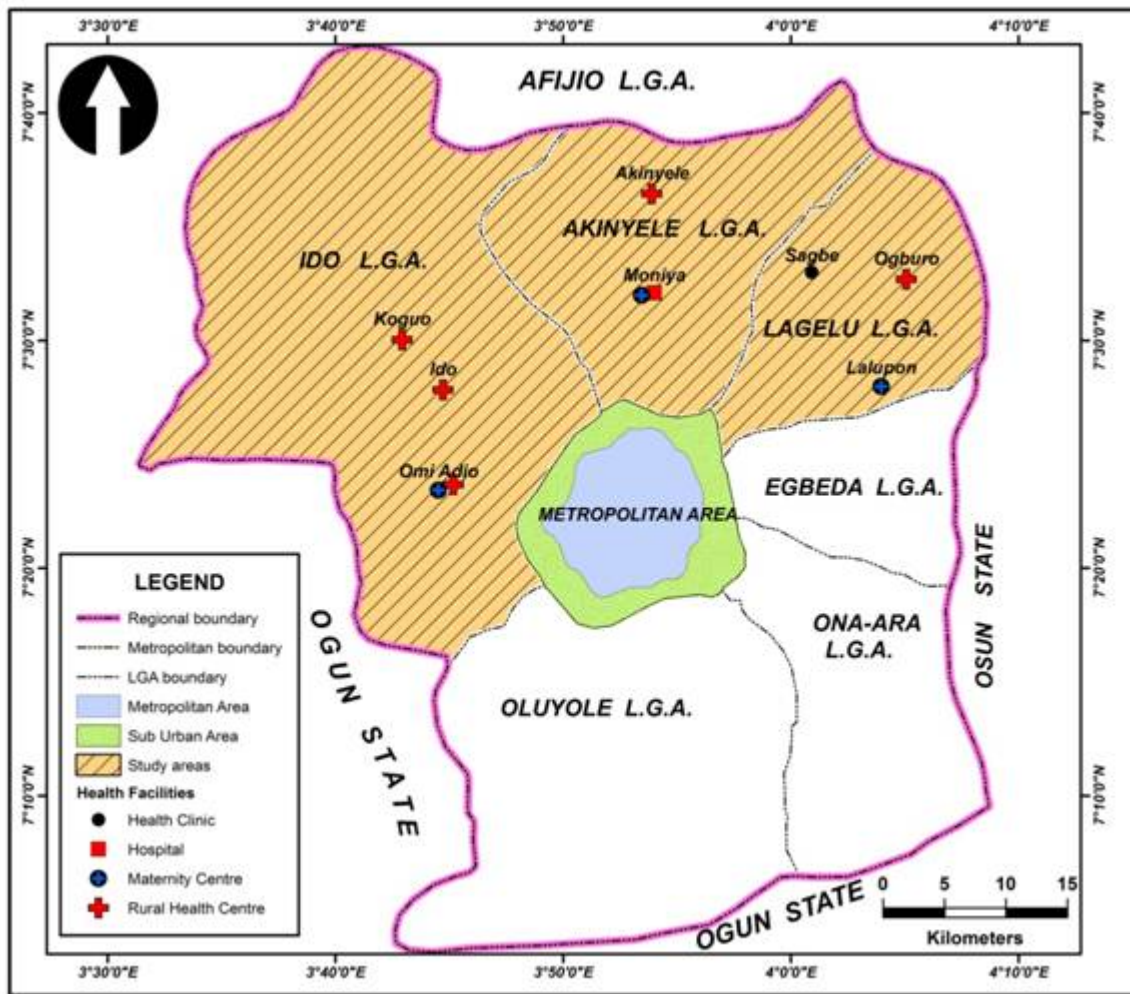


Figure 3: Spatial Distribution of Health Facilities in the Rural Districts of Ibadan
Source: Author's Analysis

Out of the three maternity and child welfare health facilities in the study area, two (WellCare and Idera maternity centres) are owned by private individuals while Muslim maternity home is owned by the Muslim community in Ido LGA. In addition, the two standard health clinics are owned by Local Governments of Ido and Lagelu LGAs.

The factors that may likely be responsible for the uneven distribution of health care facilities (in terms of number and types of facilities) in each of the LGAs may be attributed to the federal and state government's health care implementation policies on primary health care at grassroots level using some of the rural LGAs as models. For instance, the high concentration of primary health centres at Akinyele LGA compared to other LGAs may be attributed to its status as one of the model rural LGAs in Oyo State for the implementation of primary health care delivery at the grassroot level. Also, the location of the General Hospital in Akinyele LGA at

Moniya may be attributed to the large population of the settlement which may have met the threshold conditions for its establishment compared to other settlements in the rural LGAs of the study area.

5.1.2. Spatial Distribution (By Number) of Health Personnel

This section of the paper focuses on the provision and distribution of health care personnel. This is based on the premise that the availability of modern health personnel will influence utilisation behaviour of patients from different residential neighbourhood in the rural districts. The numbers of doctors, nurses, midwives, laboratory technicians, trained community health workers, community health extension workers and other paramedical staff were matched with the population of the settlements to be able to determine their current ratio.

Tables 3 - 6 show the number of health personnel as well as population per health personnel in the area of study.

S/N	LGA	No. of Health Facilities	No of Beds		Doctors	Laboratory Technicians (Lab/T)		Nurses		Midwives (MW)		Community Health Workers (CHW)		CHEW	Health Assistant (HA)			
			1986	2001(%)		1986	2001(%)	1986	2001(%)	1986	2001(%)	1986	2001(%)		1986	2001(%)	1986	2001(%)
1.	Akinyele	3	10	32(49.2)	-	3(60.0)	1	3(60.0)	3	13(50.0)	1	9(45.0)	-	2(15.4)	-	2(12.5)	2	14(40.0)
2.	Ido	4	11	19(29.2)	-	1(20.0)	1	1(20.0)	4	10(38.5)	2	8(40.0)	2	6(46.2)	6	10(62.5)	9	12(34.3)
3.	Lagelu	3	6	14(21.6)	-	1(20.0)	1	1(20.0)	2	3(11.5)	2	3(15.0)	-	5(38.4)	3	4(25.0)	4	9(25.7)
	LGA Total	10	27	65(100.0)	-	5(100.0)	3	5(100.0)	9	26(100.0)	5	20(100.0)	2	13(100.0)	9	16(100.0)	15	35(100.0)

Table 3: Health Personnel amongst the Rural LGAs, 2002

Source: Author's Analysis

S/N	LGA	Name of Health Facility	Location	No of Beds		Doctors		Laboratory Technicians (Lab/T)		Nurses		Midwives		Community Health Workers (CHW)		CHEW		Health Assistant (HA)	
				1986	2001	1986	2001	1986	2001	1986	2001	1986	2001	1986	2001	1986	2001	1986	2001
1.	Akinyele	General Hospital	Moniya	-	20	-	2	-	2	-	8	-	6	-	-	-	-	-	9
2.	"	Primary Health Centre	Akinyele	4	5	-	-	-	-	-	1	-	1	-	2	-	2	-	2
3.	"	Well care Maternity Center	Moniya	6	7	-	-	-	-	3	4	1	2	-	-	-	-	2	3
		LGA Level		-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-
		LGA Total		10	32	-	3	1	3	3	13	1	9	-	2	-	2	2	14
4.	Ido	Primary Health Centre	Ido	4	6	-	-	-	-	2	3	2	3	-	2	3	5	3	4
5.	"	Primary Health Centre	Omi-Adio	5	6	-	-	-	-	2	3	-	3	1	2	2	3	2	3
6.	"	Primary Health Clinic	Koguo	2	2	-	-	-	-	-	-	-	-	1	2	1	2	2	3
7.	"	Muslim Mat. Home	Omi-Adio	-	5	-	-	-	-	-	4	-	2	-	-	-	-	2	2
		LGA Level		-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-
		LGA Total		11	19	-	1	1	1	4	10	2	8	2	6	6	10	9	12
8.	Lagelu	Primary Health Centre	Ogburo	3	5	-	-	-	-	1	2	1	-	-	2	3	2	2	3
9.	"	Primary Health Clinic	Sagbe	-	4	-	-	-	-	-	-	-	1	-	3	-	2	-	3
10.	"	Idera Maternity Home	Lalupon	3	5	-	-	-	-	1	1	1	2	-	-	-	-	2	3
		LGA Level		-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-
		LGA Total		6	14	1	1	1	1	2	3	2	3	-	5	3	4	4	9

Table 4: Health Care Personnel in the Rural Districts of Ibadan

Source: Author's Analysis

Tables 3 and 4 show that there is an uneven distribution of health manpower between the three rural LGAs. As at the year 2002, the number of beds ranged from 14 (21.6 percent) and 19 (29.2 percent) in Lagelu and Ido LGAs to 32 (49.2 percent) in Akinyele LGA. Also, the number of doctors varied from only 1 (50.0 percent) each in Ido and Lagelu LGAs, to 3 (60.0 percent) in Akinyele LGA. The number of laboratory technicians (Lab/T) ranged from 1 (20.0 percent) each in Ido and Lagelu LGAs to 3 (60.0 percent) in Akinyele LGA. The number of nurses varied from 3 (11.5 percent) in Lagelu LGA., 10 (38.5 percent) in Ido LGA to 13 (50.0 percent)

in Akinyele LGA. The number of mid-wives ranged from 3 (15.0 percent) in Lagelu LGA, 8 (40.0 percent) in Ido LGA to 9 (45.0 percent) in Akinyele LGA. Community Health Worker (CHW) varied from only 2 (15.4 percent) in Akinyele LGA, 5 (38.4 percent) in Lagelu LGA to 6 (46.2 percent) in Ido LGA. The number of Community Health Extension Workers (CHEW) varied from 2 (12.5 percent) in Akinyele LGA, 4 (25.0 percent) in Lagelu LGA to 10 (62.5 per cent) in Ido LGA. Lastly, the number of Health Assistant ranged from 9 (25.9 percent) in Lagelu LGA, 12 (34.3 percent) in Ido LGA to 14 (40.8 per cent) in Akinyele LGA.

Tables 5 and 6 and Figure 4 show that the health personnel/population ratios vary among the rural LGAs. As at year 2002, the ratio of bed to persons ranged from 1:846 in Akinyele LGA, 1:1,166 in Ido LGA to 1:1,335 in Lagelu LGA. The ratios of doctor to persons also varied from 1:9,021 in Akinyele LGA, 1:18,695 in Lagelu LGA to 1:22,157 in Ido LGA. The population per laboratory technician (Lab/T) ranged from 1: 9,021, 1:18,695, in both Akinyele and Lagelu LGAs to 1: 22,157 in Ido LGA. Population per nurse varied from 1:2,082 in Akinyele LGA, 1: 2,216 in Ido LGA to 1: 6,232 in Lagelu LGA. Population per mid-wife varied from 1:2,770; and 1: 3,007 in Ido and Akinyele LGAs to 1: 6,232 in Lagelu LGA. Population per Community Health Worker (CHW) ranged from 1: 3,693; 1:3,739 in Ido and Lagelu LGAs to 1: 13,532 in Akinyele LGA. Population per CHEW varied from 1: 2,216; 1: 4,674 in Ido and Lagelu LGAs to 1:13,532 in Akinyele LGA while that of Health Assistant ranged from 1: 1,846; 1: 1,933 in Ido and Akinyele LGAs to 1:2,077 in Lagelu LGA.

S/N	LGA	No. of Health Facilities (HF)	2002 projected population of patients' origins	Beds		Doctor		Laboratory Technicians (Lab/T)		Nurses		Midwives (MW)		Community Health Workers (CHW)		Community Health Extension Workers (CHEW)		Health Assistants (HA)	
				No	Pop. Per Bed	No	Pop. Per Doc	No	Pop. Per Lab/T	No	Pop. Per Nurse	No	Pop. Per (MW)	No	Pop. Per CHW	No	Pop. Per CHEW	No	Pop. Per (HA)
1	Akinyele	3	27,063	32	846	3	9,021	3	9,021	13	2,082	9	3007	2	13,532	2	13,532	14	1,933
2	Ido	4	22,157	19	1,166	1	22,157	1	22,157	10	2,216	8	2770	6	3,693	10	2,216	12	1,846
3	Lagelu	3	18,695	14	1,335	1	18,695	1	18,695	3	6,232	3	6,232	5	3,739	4	4,674	9	2,077
	Total	10	67,915	65	1,045	5	13,583	5	13,583	26	2,612	20	3,396	13	5,224	16	4,245	35	1,940

Table 5: Health Personnel/Population Ratio amongst the Rural LGAs, 2002.

Source: Author's Analysis

S/N	LGA	Name of Health facility	2002 projected population of patients' origins	No of Beds		Doctors		Laboratory Technicians (Lab/T)		Nurses		Midwives (MW)		Community Health Workers (CHW)		CHEW		Health Assistant (HA)	
				No.	Pop. per bed	No.	Pop. per Doc.	No.	Pop. per Lab/T	No.	Pop. per Nurse	No.	Pop. per MW	No.	Pop. per CHW	No.	POP. PER CHEW	No.	Pop. per HA
1.	Akinyele	Moniya General Hosp.	24,448	20	1,272	2	12,224	2	12,224	8	3,181	6	4,241	-	-	-	-	9	2,828
2.	"	Akinyele Pry. Health Centre	2,864	5	573	-	-	-	-	1	2,864	1	2,864	2	1,432	2	1,432	2	1,432
3.	"	WellCare Mat. Centre (Moniya)	18,348	7	2,621	-	-	-	-	4	4,587	2	9,174	-	-	-	-	3	6,116
		LGA Level	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
		LGA Total	27,063	32	846	3	9,021	3	9,021	13	2,082	9	3,007	2	13,532	2	13,532	14	1,933
4.	Ido	Ido Pry. Health Centre	2,649	6	442	-	-	-	-	3	883	3	883	2	1,325	5	530	4	662
5	"	Omi-Adio Pry. Health Centre	18,313	6	3,052	-	-	-	-	3	6,104	3	6,104	2	9,157	3	6,104	3	6,104
6	"	Koguo Pry. Health Clinic	1,110	2	555	-	-	-	-	-	-	-	2	555	2	555	3	370	
7	"	Muslim Mat. Home (Omi-Adio)	17,959	5	3,592	-	-	-	-	4	4,490	2	8,980	-	-	-	-	2	8,980
		LGA Level	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
		LGA Total	22,157	19	1,166	1	22,157	1	22,157	10	2,216	8	2,770	6	3,693	10	2,216	12	1,846
8.	Lagelu	Ogburo Pry. Health Centre	1,669	5	334	-	-	-	-	2	835	-	2	835	2	835	3	556	
9	"	Sagbe Pry. Health Clinic	1,342	4	336	-	-	-	-	-	-	1	1,342	3	447	2	671	3	447
10	"	Idera Mat. Home (Lalupon)	15,787	5	3,157	-	-	-	-	1	15,787	2	7,894	-	-	-	-	3	5,262
		LGA Level	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
		LGA Total	18,695	14	1,335	1	18,695	1	18,695	3	6,232	3	6,232	5	3,739	4	4,674	9	2,077

Table 6: Health Personnel/Population Ratio in the Rural Districts of Ibadan, 2002

Source: Author's Analysis

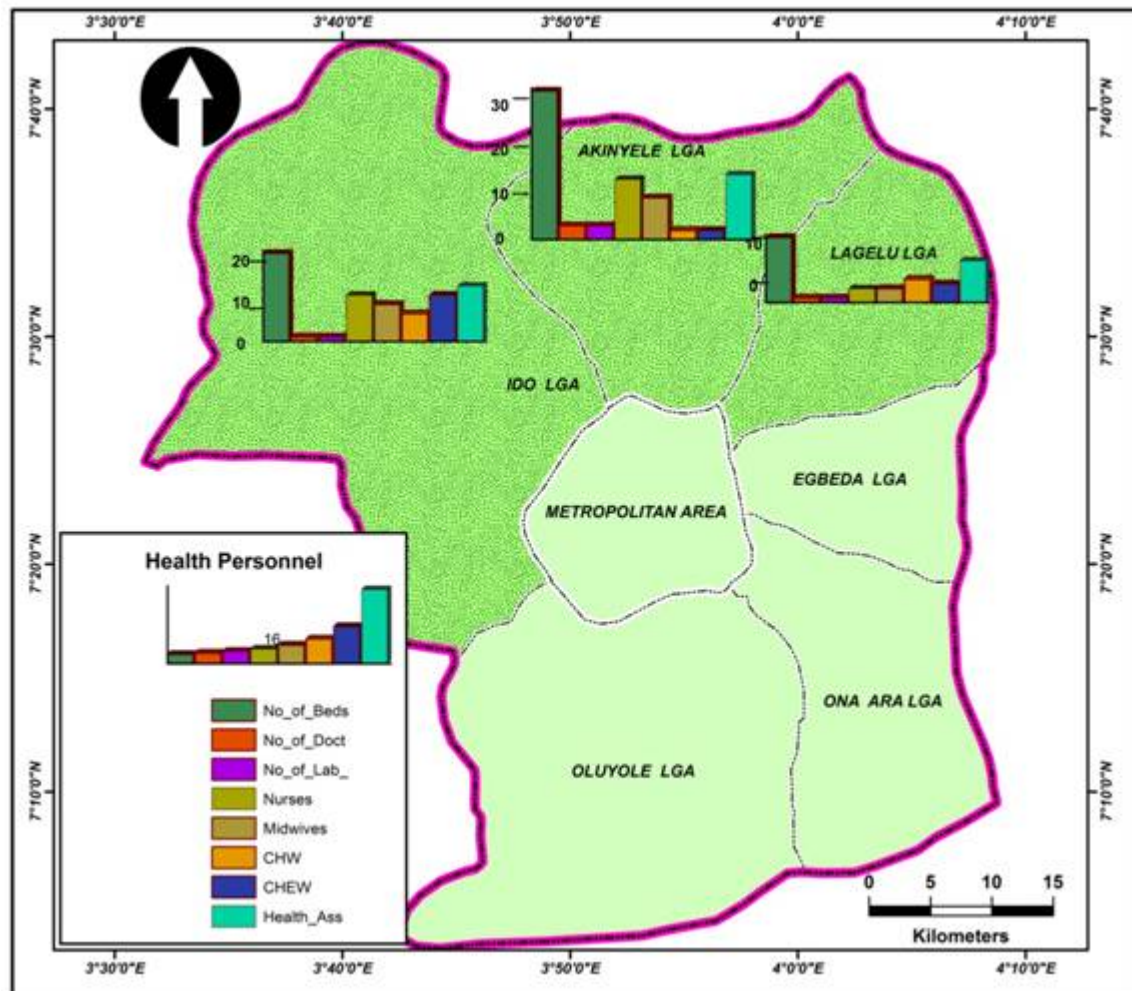


Figure 4: Spatial Distribution of Health Personnel in the Rural Districts of Ibadan, 2002

Given the foregoing analyses, the adequacy of existing modern health personnel in the study area can be determined vis-a-vis Nigeria's national standard and World Health Organization (WHO) recommended standard. Comparing the doctor/population ratios in the study area with the WHO's recommended standard of 1:10,000 for a developing country (Olaniyan, 1995), Tables 5 and 6 show that the number of doctors is inadequate in Ido and Lagelu LGAs as their ratios are above the recommended WHO standards, compared to Akinyele LGA whose ratio is below WHO recommended standard. Also, compared to Nigeria's recommended standard of population per mid-wife (1: 2,125) in 1998 (Onorkerhoraye, 1999), the number of mid-wives was found to be inadequate in virtually all the three rural LGAs as their ratios are above Nigeria's recommended standard.

In terms of population per nurse ratio, the Nigeria's recommended standard is 1:500 (FRN, 1987:12-15). This shows that the number of nurses was inadequate for all the three LGAs as their ratios are above the Nigeria's recommended standard. A possible reason for the unequal distribution of health manpower in the study area can be attributed to the practice of some health personnel manipulating postings. They avoid health institutions in remote rural settlements and prefer health institutions with fairly adequate facilities, which are situated along good and motorable roads. Health personnel are found therefore in larger numbers in some health institutions than in others.

5.1.3. Inequality between Health Facilities Distribution and Population Size

In order to confirm the inequality in the distribution of health facilities, gini coefficients were computed. Gini coefficient is one of the best known measures of inequality. It compares the percentage frequency of some attributes with the distribution of the 'distributional criterion' (Smith, 1977; 1979; Okafor, 1987). The coefficient is a single measure of the extent to which a condition or activity is concentrated areally by comparison with some other distribution (Smith, 1975). This other distribution is usually the distributional criterion, which in our case is the index of need for health care, namely, population size, or more specifically, the percentage distribution of population in the rural LGAs. The Gini coefficient is defined as follows:

$$G = \frac{1}{2} \sum_{i=1}^n /x_i - y_i/$$

where x_i is the proportion of the health facilities located within LGA_{*i*}, and y_i is the proportion of the total population (i.e. the index of need) in each LGA_{*i*}.

One graphical device for the representation of inequality is the Lorenz curve. It is related to the Gini coefficient and, in drawing the graph, the cumulative percentages of the distributed phenomenon (health facilities) are plotted against the cumulative percentages of the distributional criterion (population size). A 45-degree diagonal curve is the line of perfect equality and, if the Lorenz curve coincides with the diagonal, then there is perfect equality in the distribution of facilities. The greater the departure of the Lorenz curves from the diagonal, the greater the inequality. On the other hand, the Gini coefficient (G) ranges from 0 to 100 (or from 0 to 1.0). A coefficient value of zero indicates perfect equality, while 100 indicates maximum inequality. The larger the value of the coefficient, the greater the inequality.

In spite of their technical and conceptual limitations (Smith, 1977), the Gini coefficient and the Lorenz curve are useful tools for the evaluation of the spatial distributions on the basis of equality. The Gini coefficients were calculated for the health care facilities in Tables 2 and 5, and the results are set out in Tables 7, 8 and 9. The results confirm that there are inequalities in the distribution of the health care facilities in the study area. The level of inequalities is relatively high for Community Health Workers (24.47), doctors/laboratory technicians (20.16) while the distribution of health centres, maternity centres and health clinics reveal lower level of inequalities: 17.39, 6.52 and 19.93 respectively.

LGA	2002 Projected Pop.		Hospital		Health Centres		Maternity Centres		Health Clinics		Beds	
	%	Cum%	%	Cum%	%	Cum%	%	Cum%	%	Cum%	%	Cum%
Akinyele	39.85	39.85	100.00	100.00	25.00	25.00	33.33	33.33	-	-	49.23	49.23
Ido	32.62	72.47	-	-	50.00	75.00	33.33	66.66	50.00	50.00	29.23	78.46
Lagelu	27.53	100.0	-	100.00	25.00	100.00	33.33	99.99	50.00	100.00	21.54	100.0
Total	100.00		100.00		100.00		99.99!		100.00		100.00	

	Doctors		Lab/ Tech		Nurses		Midwives		CHW		CHEW		Health Assistants	
	%	Cum%	%	Cum%	%	Cum%	%	Cum%	%	Cum%	%	Cum%	%	Cum%
Akinyele	60.00	60.00	60.00	60.00	50.00	50.00	45.00	45.00	15.39	15.39	12.50	12.5	40.00	40.00
Ido	20.00	80.00	20.00	80.00	38.46	88.46	40.00	85.00	46.15	61.54	62.50	75.00	34.29	74.29
Lagelu	20.00	100.00	20.00	100.00	11.54	100.00	15.00	100.00	38.46	100.00	25.00	100.00	25.71	
Total	100.00		100.00		100.00		100.00		100.00		100.00		100.00	

Table 7: The Percentage Distribution of Health Care Facilities and Population, and Data for the Lorenz Curves

Source: Author's Analysis(Computed from Tables 4 and 7! Rounding error)

Health Facilities	Gini coefficient (G)
General Hospital	30.08
Health Centres	17.39
Maternity Centres	6.52
Health Clinics	19.93
Beds	9.39
Doctors	20.16
Laboratory Technicians (Lab/T)	20.16
Nurses	16.00
Midwives (MW)	12.54
Community Health Workers (CHW)	24.47
Community Health Extension Workers (CHEW)	16.21
Health Assistants (HA)	1.90
Source: Author's Analysis	

Table 8: Gini coefficients (G) for health care facilities

Moreover, the (G) values for beds, nurses, midwives, community health extension workers (CHEW) and health assistants (HA) are as follows: 9.39, 16.00, 12.54, 16.21 and 1.90 (See Table 8). The lower-order institutions in the rural districts, namely health centres, maternity centres and health clinics are more numerous and this might be responsible for the relatively low levels of inequality in their distribution.

The Lorenz curves in Figure 5 do not coincide with the line of perfect equality, thus confirming the existence of inequalities in the distribution of the health care facilities investigated. The areas of inequality refer to the areas between the line of perfect equality and each of the curves marked a point **B** on the graph. This point corresponds to 50 percent on the vertical axis, i.e. axis measuring the proportion of facilities. When projected on to the horizontal axis, the points show the proportion of the population accounting for 50 percent i.e. half of the health facilities. In essence only about 45 percent of the population controls 50 percent Midwives while 41 percent, 40 percent and 32 percent of the population control 50 percent of meds, nurses, doctors and laboratory technologists respectively. These proportions represent the privileged or advantaged population usually referred to as minimal majority (Alker, 1970:191), while the others represent the underprivileged or disadvantaged population.

In addition to the graphical illustration of the inequality in the distribution of the facilities in the rural areas, the ratios of advantage were computed for health facilities (see Table 9). This is to enable us to easily identify the most advantaged rural LGAs, as well as the most disadvantaged ones. In terms of health centres: Ido LGA; Maternity centres: Ido and Lagelu LGAs; Health Clinics: Ido and Lagelu LGAs; Beds: Akinyele LGA; Doctors/Lab/T: Akinyele LGA; Nurses: Akinyele and Ido LGAs; Midwives: Akinyele and Ido LGAs; CHW: Ido and Lagelu LGAs; CHEW: Ido LGA; have their ratios above 1.0. Ratios below unity are indicative of disadvantage while those above unity are the advantaged LGAs (Smith, 1979; Okafor, 1987).

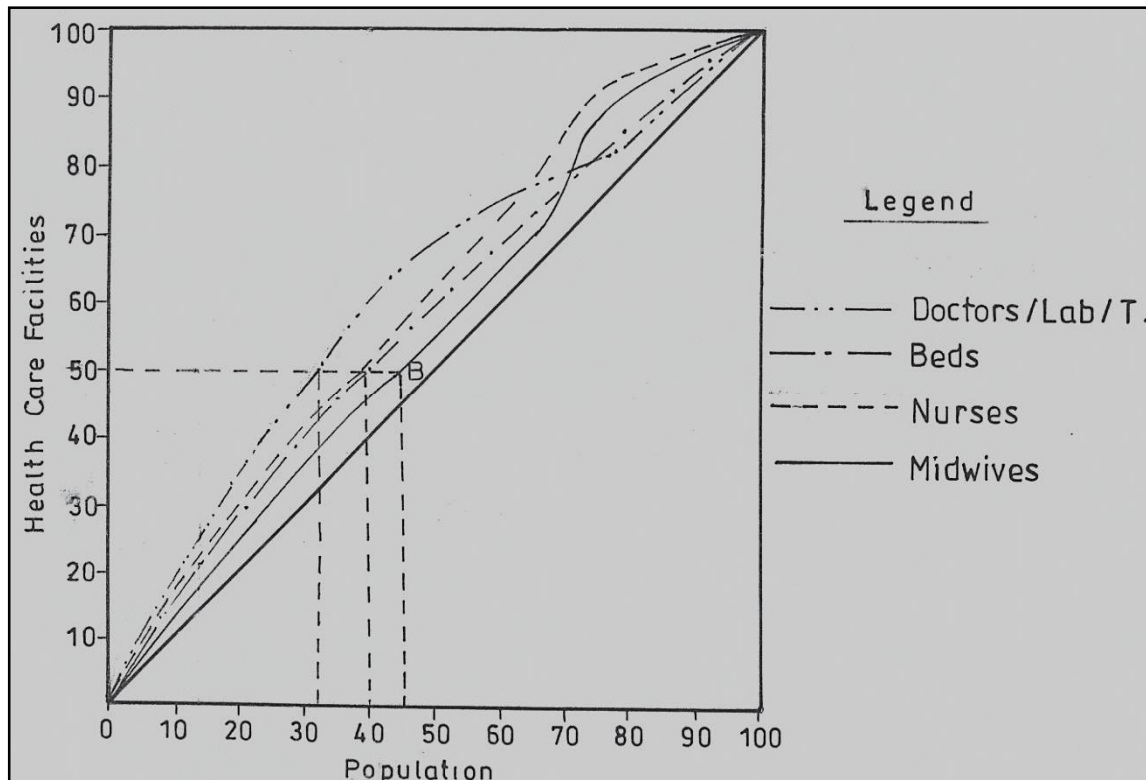


Figure 5: Lorenz Curves for Health Care Facilities

LGA	Hospital	Health centres	Mat. Centres	Health clinics	Beds	Doctors	Lab./Tech	Nurses	Midwives	CHW	CHEW	HA
Akinyele	2.51	0.63	0.84	-	1.24	1.51	1.51	1.25	1.13	0.39	0.31	1.00
Ido	-	1.53	1.02	1.53	0.90	0.61	0.61	1.18	1.23	1.41	1.92	1.05
Lagelu	-	0.91	1.21	1.81	0.78	0.73	0.73	0.42	0.55	1.40	0.91	0.93

Table 9: Ratios of Advantage (x_i/y_i) for Health Care Facilities

Note: Ratios of Advantage = x_i/y_i

Source: Source: Author's Analysis(Computed from Table 7)

		Population Size	No. of Facility
Population Size	Pearson correlation	-	-0.099
	Sig (2-tailed)		0.937
	N	3	3
Number of Health facility	Pearson correlation	-0.099	-
	Sig (2-tailed)	0.937	
	N	3	

Table 10: Correlation between the Distribution of Health Facilities and Population Size of the Rural Districts

Source: Author's Analysis(Computed from Table 2)

As further proof of the disparity between population and health care facilities, a correlation analysis was carried out. The results of the analysis confirm that the correlation between the variables 'number of health facilities' and 'population size' is -0.099 (see Table 10). This shows that there is a negative relationship between the distribution of health facilities and the population size of the rural LGAs. However, the correlation coefficient is low (-0.1) and not significant ($P>0.05$). This means that places with small population do not necessarily have more facilities. This suggests that other factors are more important than population size in the distribution of health care facilities in the study area.

6. Summary

This paper has shown that there are spatial inequalities in the provision and distribution of health care resources (e.g. health facilities and health personnel) in the study area. It has also confirmed that population is not an important factor in accounting for the distribution of health care facilities. This suggests that other factors are more important than population size in the distribution of the health facilities. A possible reason for the spatial inequalities in the distribution of health manpower is that some health personnel manipulate their postings and thereby avoid health institutions in remote rural settlements. Health personnel are therefore found in larger numbers in some health institutions than in others. The existence of this uneven distribution of health care resources suggests that government should involve the identification of problem areas (e.g. neighbourhoods or regions). Such problem areas should become the focus of government policy aimed at redressing spatial variations in health care provision. In view of this, it will require the government designing a location policy that ensures that specific areas of need such as Akinyele LGA which is deficient in health clinic as well as Ido and Lagelu LGAs which are deficient in hospital facility receive priority attention.

In the same vein, in order to meet future challenges in the provision of health care personnel in rural areas, there is also need to train and retrain more community health workers to carry out the basic functions carried out by nurses, midwives and health educators in view of the reluctance of professionally trained health personnel to work in the remote villages in the area. This will not only enable people to have easy access to appropriate and high quality health care services, but also safeguard the health of the rural dwellers whose contributions to the national economy cannot be overemphasized.

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