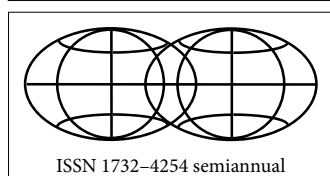# Richard Ingwe

Physical health facilities in Nigeria's sub-national regions : geodemographic and spatial analyses of health institutions in Nigeria's 36 states and Federal Capital Territory

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Physical health facilities in Nigeria's sub-national regions: geodemographic and spatial analyses of health institutions in Nigeria's 36 states and Federal Capital Territory

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Abstract. This paper reports results of geodemographic-spatial analyses of physical health-care facilities in Nigeria's 36 states and federal capital. Apart from facilitating understanding of the interaction between health facilities and population sizes and their characteristics in the states, the geodemographic-spatial analyses proved useful in ranking shares of health facilities in Nigeria's states/territory. The findings show distributions (per capita shares) of various health-care facilities in the following states: highest shares of public (primary and secondary) health facilities and fair share of tertiary facilities in Kogi; lowest per capita shares of public and private primary health care facilities in Ebonyi; highest per capita share of private health facilities in Nasarawa (primary), Anambra (secondary) and Oyo (tertiary); highest total private health facilities of all levels due to the large number of its private primary health facilities in Nasarawa. The results show how the policies of governments and private organizations providing health services responded to health needs of state populations and highlight areas requiring further research. The policy implications of the study include the need to apply geodemographic and spatial analyses as part of the criteria for determining policy for providing or allocating health facilities in the states/territory.

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Contents:

1. Introduction

The development literature features substantial debate on the impact of changes in population, health and nutrition on economic growth and *vice versa*. Irrespective of the fact that the free-market neoliberal capitalist policies formulated by international financial institutions (IFIs) including the International Monetary Fund (IMF), the World Bank and Bretton Woods Institutions (BWIs) have been observed to feature enormous apathy to investment in human capital development in the health and education among other sectors (Makanjuola, 2002; Altvater, 2009; Bayer 2009), World Bank economists: W.C. Baum and T.M. Stokes (1985: 213–4) acknowledged relationships between dynamics in population, health, nutrition, and economic development. The affliction of large populations running into millions of people, especially in developing countries, by poverty and poor life quality has been attributed to the development challenge posed by rapid and nearly uncontrolled population growth that swells the existing large population base.

Three reasons have been put forward to explain how economic and social development is hampered by rapid population growth. First, high rhythms of population growth increase demands for scarce goods and services required by people in the present and future, thereby posing difficulties for decision makers responsible for improving people's life quality. The task of increasing the stock of goods and services for the population includes providing more physical and human capital per person for the existing population and those being added to it. Human capital development includes per capita improvements on educational attainment, health status and production skills. Without improvements on the three aspects of a person's life, stagnation or decline in personal productivity and income occurs as a result of the compulsive way individual workers resort to the use of improper equipment and poor skills at the workplace.

Therefore, modern economic planning places high premium on increasing the number of highly skilled workers or at least maintaining the existing level of productivity without incurring a decline. Life quality improvement at sub-national levels (defined as increases in the stock of human resources or professionals and physical capital per person), is difficult to achieve under the context of rapid population growth. Ruefully, most developing countries have been experiencing rapid population growth to the extent that doubling or tripling of their populations have either reportedly occurred or are projected to occur within the near future, thereby impeding the achievement of increased human and physical capital and by extension of life quality improvement.

Second, several natural resource-dependent agrarian economies have recorded rapid population growth leading to increased pressure on the existing stock of natural resources. Low levels of scientific knowledge and technological know-how (and do-how) are responsible for the natural resource dependence and resort of the teeming population to agricultural employment, which in turn is frequently based on poor farming and production systems that result in low yields. Unlike the advanced capitalist economies which have achieved and used scientific and technological progress for application in industrial manufacturing and to create vibrant tertiary and quaternary economic sectors, developing countries remain entrapped in low-yielding primary agriculture. Consequently, exploding populations of natural resource-dependent developing countries suffer low or declining incomes and life quality. It is projected that the dominance of the labour force by agriculture employment to the tune of about 70 percent will persist in some developing countries (e.g. Kenya) until about 2025. Moreover, natural resource dependence of poor agriculture communities drives large populations into areas that pose risks of health, accidents, natural and human disasters. Wetlands, coastal areas, river banks, and deltas have been reported to attract large populations of poor people who seek to exploit

natural resources existing in areas that either hold large quantities of water or are water-saturated. Yet such wetlands are susceptible to annual floods which increase the risk of spreading lethal water-borne diseases.

Third, rapid population growth is considered as a challenge to the promotion of economic and social change management because of the way it makes the processes of adjustment harder and more difficult than under conditions of stable population. Developing countries have been reported to be experiencing rapid urbanisation without increased industrialisation, employment and opportunities for improved well-being that were associated with urbanisation of the advanced (Western capitalist) nations. The urbanisation of poverty in developing countries, resulting from rapid population growth, has been accompanied by large clusters of urban poor congregating in sectors of urban areas that lack basic services (safe water, improved sanitation, roads, modern electricity, acceptable housing, and so forth) (Ravallion, 2002; Ravallion, et al., 2007).

Poor health and malnutrition hamper economic and social development in several ways. Some of the several challenges posed to development by illness and malnutrition include: reduction of workers' productivity, retardation of learning and mental development in educational institutions and workplaces, diversion of resources from public and private entities and from other productive ventures towards health spending and reduction in efficient use of other resources such as land. Research-derived results of how these factors and three ways that rapid population growth hampers economic development have been documented (e.g. Baum, Tolbert, 1985: 213-4). In recognition of the significant role played by health and nutrition in improving human capital of populations, the eight Millennium Development Goals (MDGs) that were declared by member countries of the United Nations in 2000 devoted about three of these goals (G) to health (G4 – reduce child mortality; G5 – improve maternal health; and G6 – combat HIV/AIDS malaria and other diseases), while nutrition was captured under G1 (eradicate extreme poverty and hunger). These four goals are also related to the rest of the MDGs which mostly concentrate on human capital development including: G2 – achieve universal primary education; G3 – promote gender equality and empower women; while G7 – ensure environmental sustainability and G8 – develop a global partnership for development; all of which provide basic support for development (United Nations, 2007).

2. Health care improvement in the context of pluralist ethno-cultural diversity of populations in Nigeria

Granted that physical and human capital are required for development of nations, their provision to national populations is not ethno-culturally neutral because of the tendency of policy makers and agitators to divert the scarce resources to certain areas. Therefore, efforts are purposely made to spread or share health resources in a way that equality is achieved as a means of attaining social order, peace, harmony, and progress in the society. Like most of other development policies and programmes, health care programmes depend on the nature of 'structural power'. This was described by the anthropologist Eric Wolf as the power that organises and orchestrates the systemic interaction within and among societies, directing economic and political forces on the one hand and ideological forces that shape public ideas, values, and beliefs on the other (Haviland et al., 2005: 722, citing Wolf, 1999). Under globalisation, structural power is perceived as causing or guiding systemic interaction between global forces and directing dynamic economic and political institutions on the one hand and those that shape public ideas, values, and beliefs on the other. Two forms of these important interacting forces that have been acting globally have been identified as soft and hard. Hard power describes the use of economic and military force to wield and apply coercion on people at various levels. Soft power refers to the application of non-coercive and co-optation strategies that are as effective and as strong as the coercive approaches to pressure people by persuasion, attractive ideas, beliefs, values, and behaviour. This includes propaganda, ideological campaigns designed to re-shape the hearts and minds of people, subtle means such as 'foreign aid, international diplomacy, news media, sports, entertainment, exhibitions in art galleries, museums, academic programmes and so forth' (Haviland et al., 2005: 722; Nye, 2002). While J. Nye extended the concept of structural power to examine how it is used at the global level, its influence has been observed at the levels of nation state, sub national (regional) among others. The use of structural power in its hard and soft forms might be determined by specific national circumstances. For example, in ethno-culturally plural societies, structural power must seek ways of making the ethno-cultural groups that form the country to either accept or tolerate state policy generally and healthcare in particular.

While reports of ethnic resurgence by anthropologists emphasise 'revolt against dominant global culture from the USA including the Coca Colas, the MacDonalds, the Big Mac, the Jeans, etc.' (Haviland et al., 2005: 710-1), issues arising from dissatisfaction with unequal shares of nationally pooled and allocated resources by governments within single states that present a multiplicity of ethnic groups that are dominated by one or a few are described by terms such as marginalisation. In Nigeria, a multiplicity of ethno-linguistic groups have been reported to be engaged in contests for ever larger shares of state (federally) – controlled and shared resources. This has involved bitter quarrels and the waging of a bitter 30-month (1967-1970) civil war by the Igbos of south-eastern Nigeria as a means of pursuing secession from the Federal Republic of Nigeria (Ladipo, 1986; Oyovbaire, 2000).

3. The research problem

The significance of the health standard of the population in national socio-economic development is underscored by the way it has become one of the major criteria for indicating the level of development of nation states. The United Nations Development Programme (UNDP) has been publishing annual reports of the human development index (HDI) for nation states which, among other criteria, involves assessments of the health condition of the population. Ruefully, the HDI reports are usually restricted to national average of health and other development conditions. Therefore, the health (like other development sectors') conditions of sub-national regions (36 states and 774 Local Government Areas) in Nigeria have remained, by and large, unknown or poorly known. This ignorance of the health conditions of Nigeria's sub-national regions hampers the assessment of the extent to which these social, economic and political spaces perform in terms of providing health care to their various populations. In Nigeria, information derived from rigorous analyses of the performance of sub-national regions in providing health care is virtually non-existent. Without the required information on the health care facilities available to various populations, the production of knowledge and building of understanding of the interaction between this and other development situations for the past, present and future of Nigeria and its constituent sub-national regions have been compromised. Consequently, planning and management of development programmes within the health sector and other sectors that it affects positively have been seriously hampered. The practice of planning and management in these sectors has degenerated to the extent that they have been conducted haphazardly, using the derogatory and ineffective decision and policy-making system of incrementalism or 'muddling through' instead of applying other decision/policy-making approaches that are capable of improving health care as a social-capital-building means of raising life quality, productivity and general socio-economic development of the nation and sub-national regions.

In post-civil war Nigeria (coinciding with oil boom) from the 1970s onwards, the responsibility for improving life quality generally and health care in particular has become the overlapping function of all levels of government, including federal, state and local governments. While an attempt was made to allocate specific responsibilities for providing health care of specific categories to specific levels of government, or (involving assigning primary health care to local government, secondary health facilities to state governments and tertiary health facilities to the federal government), there has been an increasing tendency for considerable overlap in the provision of the various levels of healthcare by all three levels of government. For example, state governments and private investors have reportedly increasingly been involved in establishing tertiary health facilities and so forth. Moreover, the development (i.e. establishment) of private entities of various kinds that invest in health services has varied over Nigeria's national space as obtains in most nations due to several factors. The variation in the occurrence of these factors adds to the existing variation in social, economic and environmental conditions of Nigeria's sub-national regions in terms of population size, culture, incomes earned, spending habits and so forth. All these factors are bound to combine or interact to produce various degrees (or measures of availability and use) of health care facilities in each of Nigeria's 36 states and 774 Local Government Areas, but how this has occurred is poorly understood. Information on these conditions, including the extent to which governments at different levels, private entities, have established and managed health facilities of various categories, is virtually non-existent in Nigeria. Without information on the number of health care facilities of various types and those who established and managed them, it is difficult to determine the degree of sufficiency or otherwise of these services as a way of indicating disparity in health services in various areas in the country.

4. Objectives and organisation of the paper

The objective of this study is to show the degree of accessibility of various populations of Nigeria's 36 states and Federal Capital Territory (FCT) to various levels of physical health facilities within their jurisdictions. In the remainder of this paper, I frame the analysis on the incrementalism theory, present Nigeria's key health challenges, before applying methods of geo-demography, spatial and clustering for analysing per capita shares of various health facilities to Nigeria's sub-national regions. Then, I discuss the findings of the study and conclude the paper.

5. Incrementalist theory of decision making, planning and policy

The way Nigeria's health sector has offered services to its population has depended on the disposition of the nation's decision or policy makers. The disposition of policy makers has conformed to the type of decision making that has been recognised and described as incrementalist theory for assessing the availability of physical health facilities in the country. It has been recently reported that this policy making attitude has been applied by policy makers in Nigeria's universities in their response to climate change (Ingwe et al., 2010). Incrementalist theory has been classified as one of the procedural theories of regional planning concerned with the content of planning and the things manipulated within the environment (Omuta, Onokerhoraye, 1986: 121). Incrementalism is anchored on the belief that government decision making is usually undertaken in relatively small adjustments (contrasted to radical shifts) to existing development policy. It is concerned with defining, examining the necessity or otherwise of various ways of substantiating change by small, disjointed steps, various forms of centrism and defense of the adoption of middle paths to decision making – at which point diverges radicalism and conservatism on the one hand and revolution and maintenance of the *status quo* on the other. It has been suggested that the preference for incrementalism arises from the consideration of the history and culture of the nations where it has been applied while these and other factors could make radicalism and revolution more preferable.

The origin of this theory is credited to the works of Ch. Lindblom, published in 1953 (with R. Dahl, 1959) and thereafter. Lindblom and colleague's conception of incrementalism has been considered an extreme denunciation of the theory of synoptic rational approach to policy and decision making and planning, which emphasised comprehensiveness and rationality in addressing development problems and realities. To Lindblom, decision makers infrequently approach development situations with ideal goals in mind but only apply marginal changes to the existing problems that are raised to their attention and visibility. Therefore, policy reviews cover a limited number of the catalogue of problems or issues which are usually known to professionals in the fields of planning, including academic research. W. Grant is among those who agree with Lindblom's claim that incrementalism describes decision makers' response to development problems and attitude to budgeting in stable Western democracies. However, Grant rejects incrementalism as a suitable approach to development scenarios characterised by considerable shocks (such as wars and other crises) in the decision making process (Grant, 2003, in McLean, McMillan, 2003: 262). Geographers and regional development planners have highlighted Lindblom's conception of incrementalism as a more direct attack on development problems based on his conviction that the comprehensive rational approach to decision making is inoperable, idealistic, and impracticable, even though it can be described, but only theoretically. To Lindblom, incrementalism offered realistic, feasible, and immediate remedies to pressing development problems. He rationalised the significance of incrementalism by arguing that the urgent issues raised to the attention of decision makers' tables do not deserve to be delayed so as to await the creation of comprehensive rational plans. The concern of incrementalism is to model reality by creating simple ideas, which reduce the confounding complexity of real world problems, which only professional planners and scholars deal with for creating information and understanding for decision makers. Another rationalisation of incrementalism is that it facilitates linkages between the past, present and future problems, thereby assisting in understanding the history and knowledge of development issues. Radical adjustments to situations are seen as capable of breaking the evolutionary and historical trend of problems. Incrementalism has been defended as being cheaper and faster because it facilitates savings from resources (money, time, etc.) that could have been frittered away if the comprehensive approach were adopted. It is considered to be suitable for systems framework

which are perceived to be fragmentary and disjointed due to their constituent subsystems and elements. It has also been seen as suitable for decentralised political systems, but unsuitable for centralised totalitarian systems, where its disjointedness causes breakdown because of the need to clear all actions at the central power systems (Omuta, Onokerhoraye, 1986: 127‑130).

Other advantages of incrementalism include: its facilitation of stable management, greater predictability of its outcomes, its greater appreciation of realism and pragmatism, ease of its implementation, its prevention of popular protests against public decisions; its reduction of idealism and low requirement of intellectual capital from its implementers. It has been criticised for being biased towards certain ideologies and classes, retrogressive, myopic and expensive in the long term as a consequence of its involvement of prolonged avoidance of the comprehensive rational and radical decision making and planning approaches. Moreover, it involves prolonged application of far too many of the 'small' old solutions to the extent that the more dynamic problems make these solutions that were created long ago become misfits for the newer solutions, thereby complicating the new problems. The claim that incrementalism is cheaper is considered fallacious and dubious because of its involvement of postponement of radical solutions that differ from the old practice. By this characteristic, it allows problems the time they require to build up, and acquire devastative characteristics for affecting society. Some have argued that, like its peers in the theories of decision making, it is only one of the varieties of the one single decision making approach: rational comprehensive approach, and not necessarily separate from it. In this regard, incrementalism assumes some conspicuous characteristics depending on prevailing circumstances (Igwe, 2005: 197‑8). Y. Dror's criticism of incrementalism centres on its suitability only in situations of unusual social stability and impracticability under conditions of social dissatisfaction with policy when problems are dynamic (ever changing) and availability of resources is characterised by transiency, featuring shortages (Grant, 2003: 262). That is, the choice between incrementalism and other decision making approaches is determined by several factors, including ethics, class, ideology, and expediency of change required as conditioned by specific circumstances. While the level of socio-economic development determines the practicability of incrementalism, the fact that there remains scope for improvement in the most advanced societies makes the debate about the suitability of incrementalism

in the advanced Western democracies doubtful, and difficult, and makes a case for other approaches, including revolution and radicalism. Incrementalism, reformism, gradualism (in terms of the tentativeness of the latter two) cannot be easily distinguished from pragmatism and eclecticism because they smack of drawing their rationales from 'practicality' instead of utopianism and their reliance on immediate utility contrasted to general laws and guiding principles (Lindblom, Dahl, 1953; Lindblom, 1959; Grant, 2003; Igwe, 2005). The incrementalist theory is suitable for assessing the availability of physical health facilities in various states in the country for several reasons. Several reports of the acute shortage of health facilities in Nigeria show that decision making on sharing pooled resources by the Federal Government of Nigeria seems to have been unchanging in most sectors of the general economy and in the health sector in particular.

6. Some of Nigeria's key health challenges

With a population projected at 161 million in 2011 (BussinessDay, 2011: 21), Nigeria has been presented as the most populous country in Africa. Nigeria's 2006 population of over 140 million was nearly 20% of sub-Saharan Africa's (SSA) total population of 732.5 million in 2005 (Nigeria, 2007a, 2007b; WRI, et al., 2005: 177). The projection that Nigeria's population will rise to over 206.7 million (WRI, et al., 2005: 177) indicates the necessity of planning towards improving human life quality generally and meeting the increasing health needs in future. Huge quantities of Nigeria's large deposits of proven fossil fuel, including 4,635 million metric tones of oil equivalent (*mtoe*) and 4,497 mtoe of natural gas (WRI, et al., 2005: 201) among other energy resources (Adekeye, 2008: 18‑23), have been extracted for export to earn an average of US$ 20 billion annually since the 1970s (Adams, 1991). Ruefully, a disproportionately large part of these earnings get stolen by the elite (less than 1% of the population). For example, the nation lost US$ 1 billion in 1978 under the military dictatorship that was in power between 1976 and 1979. Between US$ 5 and 50 was reportedly stolen by the Sani Abacha dictatorship that reigned between 1993 and 1997 (Adams, 1991 citing Lombardi, 1986; Omojola, 2007: 20‑35; Ribadu, 2009). The consequence of this high level of corruption on the health sector is gross under-funding and mass poverty. About 70.2% and 90.8% of the nation's population lived on less than
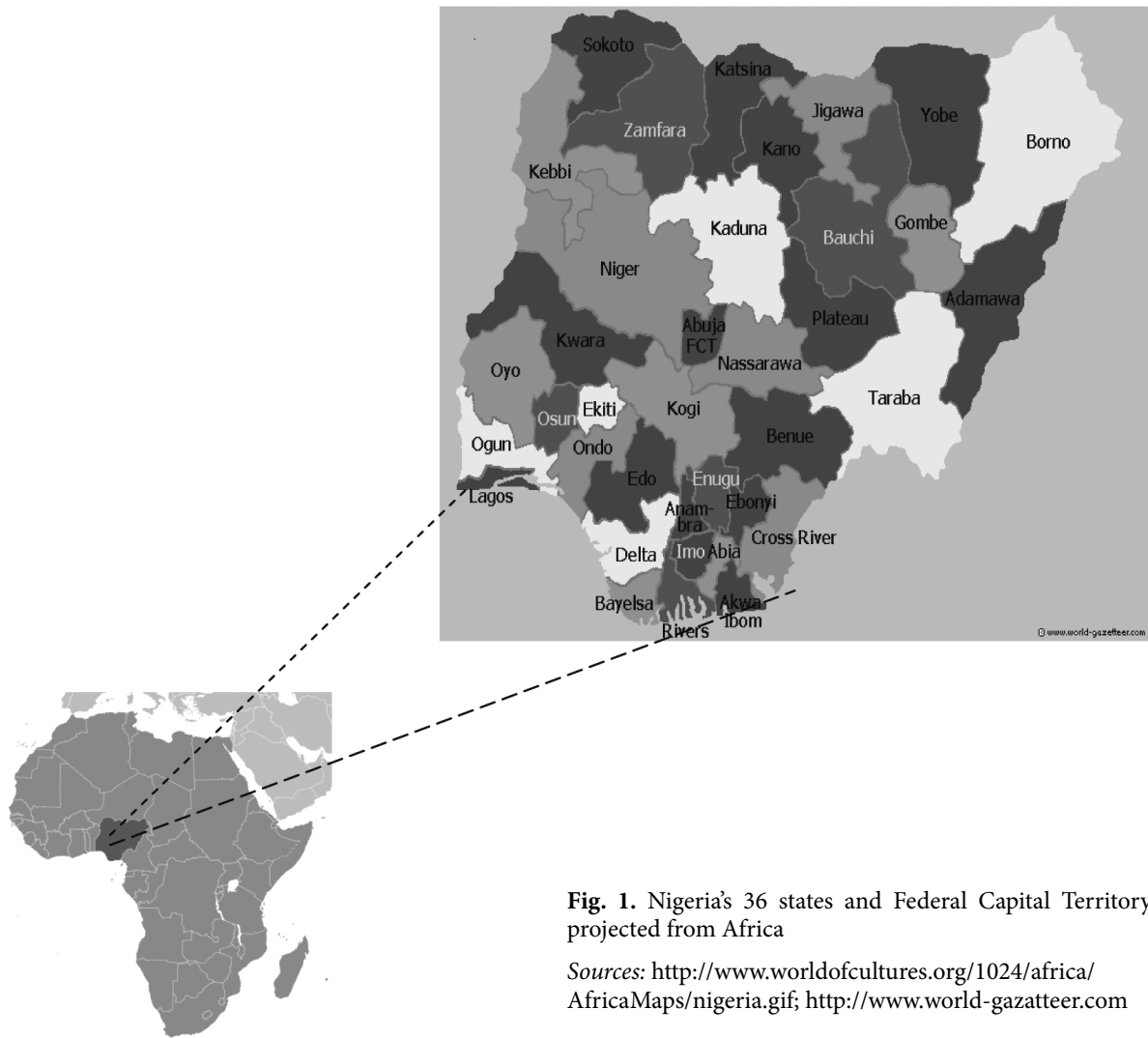
Fig. 1. Nigeria's 36 states and Federal Capital Territory projected from Africa

Sources: http://www.worldofcultures.org/1024/africa/ AfricaMaps/nigeria.gif; http://www.world-gazatteer.com

US$ 1/day and US$ 2/day respectively in 1997 (WRI, et al. 2005; Ingwe, 2009). Nigeria's ranking on the human development index (where the most developed country was represented as '1') was only 0.47. The nation's human poverty index (100 = highest rate of poverty) was only 35.1 in 2002. Although the nation's gross domestic product (GDP) was US$ 32,953 million in 2002 and was the second largest in SSA, its GDP per capita purchasing power parity (PPP) in 2002 was only US$ 919 (12th largest in SSA) (WRI, et al, 2005: 189–193).

Reports have shown that indicators of socio-economic development including human health conditions in Nigeria have been poor over several years (Ingwe et al., 2008). The following health-related conditions were reported: Life expectancy at birth rose from 48.1 years between 1980 and 1985 to 51.5 years between 2000 and 2005; only 27 physicians were available per 100,000 populations between 1995 and 2003; malnutrition in children under the age of 5

was high between 1995 and 2002, with underweight prevalence of 36 and stunting prevalence of 43. There was a high burden of various diseases in the Cross River State: the proportion of adults aged 15-49 years living with HIV/AIDS in 2003 was 5.4 percent representing a change of 6.5 percent since 2001; use of anti-retroviral therapy between 2002 and 2003 was 1.5% (State Planning Commission, 2005). The burden of diseases in Nigeria has been high. Nigeria's Federal Ministry of Health reports that deaths resulting from Malaria in recent years were: 4,773 (1996), 4,603 (1997), 6,197 (1998), 4,048 (1999), 5,465 (2000), 4,207 (2001), 3,616 (2002), 4,057 (2003), 2,364 (2004), (Nigeria, 2006: 95-6). Tuberculosis incidence rate per 100,000 populations in 2002 was 304. Only 1.2% of children under 5 years old were using treated bed nets between 1999 and 2004. Health care expenditure per capita was low with total spending of US$ 31 and government spending of US$ 7 in 2002 (WRI, et al, 2005: 181).

Table 1. Socio-economic conditions including poverty in Nigeria 2005

No.	A	B	C	D
1	Abia	2,833,999	22.27	28.01
2	Adamawa	3,168,101	71.73	68.91
3	Akwa Ibom	3,920,208	34.82	46.04
4	Anambra	4,182,032	20.11	30.36
5	Bauchi	4,676,465	86.29	76.51
6	Bayelsa	1,703,358	19.98	26.29
7	Benue	4,219,244	55.33	42.84
8	Borno	4,151,193	53.63	48.65
9	Cross River	2,888,966	41.61	51.64
10	Delta	4,098,391	45.35	62.28
11	Ebonyi	2,173,501	43.33	46.06
12	Edo	3,218,332	33.09	44.31
13	Ekiti	2,384,212	42.27	35.51
14	Enugu	3,257,298	31.12	33.89
15	Gombe	2,353,879	77.01	66.34
16	Imo	3,934,899	27.39	26.46
17	Jigawa	4,348,649	95.07	89.54
18	Kaduna	6,066,562	50.24	37.72
19	Kano	9,383,682	61.29	46.70
20	Katsina	5,792,578	71.06	60.42
21	Kebbi	3,238,628	89.65	86.20
22	Kogi	3,278,487	88.55	87.46
23	Kwarra	2,371,089	85.22	79.85
24	Lagos	9,013,534	63.58	64.05
25	Nasarawa	1,863,275	61.59	48.17
26	Niger	3,950,249	63.90	56.01
27	Ogun	3,728,098	31.73	29.84
28	Ondo	3,441,024	42.14	41.47
29	Osun	3,423,535	32.35	22.66
30	Oyo	5,591,589	24.08	19.28
31	Plateau	3,178,712	60.37	46.78
32	Rivers	5,185,400	29.09	43.12
33	Sokoto	3,696,999	76.81	70.54
34	Taraba	2,300,736	62.15	54.07
35	Yobe	2,321,591	83.25	74.12
36	Zamfara	3,259,846	80.93	73.38
37	FCT (Abuja)	1,405,201	43.32	46.98
	Nigeria, Federal Republic of	140,003,542	54.4	51.55

Explanation: A – state/territory; B – 2006 population; C – poverty incidence 2004; D – poverty incidence – measured using criterion of spending US$ 1 per day based on adjusted purchasing power parity (PPP)

Source: Author's computation from data obtained from various sources; Nigeria, 2005: 69

7. Material and research methods

The methods of geodemography, spatial and cluster analyses were used. These methods have recently been applied to analyse: Nigeria's Federal Government sharing of Internet resources to secondary schools in the nation's 36 states and federal capital territory (Ingwe, Otu, Agi, Eja and Ukwayi, 2008, 2008); intensity of agro-forestry practice in Nigeria's 36 states and federal capital territory (Ingwe, Ushie, Ojong, and Okeme, 2009); distribution of degree-awarding tertiary institutions in Nigeria (Ingwe, Ikeji and Ugwu, 2011); and urban environmental quality in Africa including slumisation, poverty, diseases burden, etc., (Ingwe, 2012). Geodemographic analysis (geodemographics) involves the application of: spatial analysis, spatial analytical tools and computerized cartography; rigorous modeling, representation and segmentation of variable social spaces by applying geographic information systems (GIS) for processing datasets endowed with spatial attributes. Geodemographics develop statistical techniques for processing datasets concentrating on demographic variables and distributions of human populations over (geographic) space and to highlight the latter's particular characteristics. The use of geodemographics has led to the achievement of immense benefits, improved analyses and performance (including profit made by marketers of goods and services in most parts of the world, especially the United States of America and elsewhere (Goss, 1995). GIS is profusely described in the literature (e.g. Demers, 2000). Demography defines the scientific study of human populations, including their size, composition, distribution, density, growth and the population's other social, economic, and political characteristics within a delimited territory or region (National Population Commission, 1990) adds value to information used for policy making. Although Ingwe et al. 2008 provides details on how the method draws from the basic concepts of Euclidean space elaborated by geospatial scientists (Harvey, 1969) and geodemography (Goss, 1995), for the purpose of clarifying its technical and philosophical bases we outline some of its features below. It involves the use of the sub-national regions or 36 states as the spatial units of analysis, while the populations of the 36 states and territory provide the raw data for computing per capita shares for the various spatial units.

The concept of Euclidean space (referring to space that is based on the Euclid and measured in metrical units) has been recognised by philosophers of science as providing a suitable form of measurement of physical distance on *terra firma*. The concept of space has offered geographic research both advanced as well as simple geometric 'language' that provides tremendous value (Harvey, 1969). Therefore, Euclidean space is presented as a multi- (that is, two or more) dimensional scheme for analysing geospatial problems. For example, the first two dimensions of a conceptual

framework designed to resolve a geographical problem comprise the distance between the two axes in space namely: 'x' and 'y'. The remaining two dimensions could be: 'z' denoting the magnitude of an event or feature (e.g. demography, i.e. population and its characteristics) and 't', describing the time over which the event occurred or the feature developed (Harvey, 1969). Owing to the relevance of the concept of space to geographic analysis and the increasing frequency of its application by geographers to analyse myriad of development problems, this spatial analysis has become synonymous with geography and studies that are considered to be geographic (i.e. spatial) in the literature. Therefore, the term spatial is commonly used to describe the application of geographic space, meaning the distribution of things (features, phenomena and so forth) on the Earth's surface (Demers, 2000).

In this study, geodemographic analysis involved computing per capita shares of various types of physical health facilities by manually dividing absolute numbers of each of the health facilities by populations of the 36 states and Federal Capital Territory, which form the spatial units of this analysis. The results indicate shares of physical health facilities for specific populations. To clearly represent the per capita shares of health facilities for the populations of the states/territory, I ranked the products of the above computation by state/territory). This involved visual determination of the ranks of each of the states/territory based on the magnitude of the index of the per capita shares of health facilities obtained from the computation.

Cluster analysis or profiling. To facilitate understanding of the results obtained, I used cluster analysis (cluster profiling) to create groups of states/territory, using their shares of health facilities. This involved comparing and creating groups of states based on their degree of similarity, affinity or their degree of clinging together in descending order of their ranks derived from their per capita shares of each of the various health facilities. This method has been used to create natural groups of objects (Green et al., 1992; Ogunniyi, 1992: 121; Howard, Sharpe, 1996: 107). This clustering was done separately for health facilities provided by governments and private organisations. This facilitated clear presentation of our results by classifying the results for each of the categories of types of health facilities into five quartiles, four of which comprised nine states/territory whose constituents were the ranks of the states/territory in terms of their per capita shares of the specific health facility type compared to their counterparts. The quartiles

and their ranks are as follows: first (1–9), second (10–18), third (19–27), fourth (28–36), and fifth (the last i.e. 37th state/territory). Since Nigeria comprises 36 states and the Federal Capital Territory, this state or territory takes the 37th position. When one or more states/territory occupies the same rank, this causes the quartile to possess more than nine members.

Data structure and modeling. Since health facilities of different types are provided by various stakeholders (governments, private and voluntary organisations), the concepts of data structure and modeling present handy tools for organising or building a database on the different types of health facilities provided in various parts of Nigeria. Database structure comprises the entire database, variables (including those on which data are collected and those derived), computations performed on the variables, units of measurement and the range of values that is reliable (Vesley et al., 2006: 2–11). The extent to which models could be successfully deployed to model (or represent) real life relationships as depicted by data and/or things they stand for or described is determined by the degree to which the actual real life phenomena could be simplified (i.e. modeled) in order to create a more effective way of managing the data, create and communicate information to various audiences, such as policy makers (Lipschutz, 1986: 1–2).

Data and sources. We used data on physical health care facilities of three types, including: primary health centres (PHCs), secondary health centres (SHCs) and tertiary health centres (THCs) provided by two major entities: governments and private organisations. Governments providing health care were unclassified and unspecified but of three levels: federal, state and local. Similarly, private entities providing health institutions were neither classified nor specifically named. The data was produced and reported by the Federal Ministry of Health and obtained from the National Bureau of Statistics. Data on the population of Nigeria by state (territory) was generated through census enumeration of housing and population in 2006 and reported by the National Population Commission (Nigeria, 2007).

8. Research results and discussion

8.1. Public health facilities

The findings will be presented as two major categories of health facilities: public and private. Each of the health categories covers three types or levels of health: primary, secondary and tertiary.

Table 2. Populations' access to public health facilities (primary, secondary, and tertiary) in Nigeria

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Abia	2,833,999	221	7.79817E-05	26	12	4.2343E-06	27	2	7.05717E-07	6	236	8.32746E-05	26
Adamawa	3,168,101	232	7.323E-05	27	14	4.41905E-06	24	1	3.15647E-07	21	247	7.80386E-05	27
Akwa Ibom	3,920,208	344	8.77504E-05	22	45	1.1479E-05	5	1	2.55089E-07	27	390	9.94845E-05	19
Anambra	4,182,032	167	3.99327E-05	35	35	8.36914E-06	9	2	4.78236E-07	14	204	4.87801E-05	35
Bauchi	4,676,465	648	0.000138566	8	17	3.63522E-06	28	1	2.13837E-07	33	666	0.000142415	10
Bayelsa	1,703,358	142	8.33647E-05	24	10	5.87076E-06	18	1	5.87076E-07	9	163	9.56933E-05	22
Benue	4,219,244	531	0.000125852	12	20	4.74019E-06	21	1	2.37009E-07	31	552	0.000130829	12
Borno	4,151,193	388	9.34671E-05	19	34	8.19042E-06	10	2	4.81789E-07	13	424	0.000102139	17
Cross River	2,888,966	408	0.000141227	7	21	7.26904E-06	13	2	6.92289E-07	7	429	0.000148496	9
Delta	4,098,391	259	6.31955E-05	30	25	6.09995E-06	16	1	2.43998E-07	30	285	6.95395E-05	31
Ebonyi	2,173,501	30	1.38026E-05	36	17	7.82148E-06	11	2	9.20174E-07	4	49	2.25443E-05	37
Edo	3,218,332	254	7.89229E-05	25	34	1.05645E-05	6	4	1.24288E-06	2	292	9.07302E-05	24
Ekiti	2,384,212	152	6.37527E-05	29	15	6.29139E-06	15	1	4.19426E-07	20	168	7.04635E-05	30
Enugu	3,257,298	176	5.40325E-05	32	10	3.07003E-06	32	2	6.14006E-07	8	189	5.80263E-05	33
Gombe	2,353,879	197	8.36916E-05	23	13	5.5228E-06	20	1	4.24831E-07	18	211	8.96393E-05	25
Imo	3,934,899	220	5.59099E-05	31	14	3.55791E-06	29	1	2.54136E-07	28	236	236/3934899	32
Jigawa	4,348,649	412	9.47421E-05	18	11	2.52952E-06	34	1	2.29956E-07	31	424	9.75015E-05	21
Kaduna	6,066,562	813	0.000134013	10	11	1.81322E-06	35	3	4.94514E-07	12	827	827/6066562	11
Kano	9,383,682	637	6.78838E-05	28	27	2.87734E-06	33	2	2.13136E-07	34	666	7.09743E-05	29
Katsina	5,792,578	719	0.000124124	13	1	1.72635E-07	36	1	1.72635E-07	37	721	0.00012447	13
Kebbi	3,238,628	529	0.000163341	5	14	4.32282E-06	25	2	3.08773E-07	23	544	0.000167972	5
Kogi	3,278,487	722	0.000220224	1	83	2.53166E-05	1	1	3.05019E-07	25	806	0.000245845	1
Kwarra	2,371,089	329	0.000138755	8	41	1.72916E-05	2	1	4.21747E-07	19	371	0.000156468	7
Lagos	9,013,534	386	4.28245E-05	34	30	3.32833E-06	29	4	4.43777E-07	15	420	4.65966E-05	36
Nasarawa	1,863,275	329	0.000176571	4	8	4.29352E-06	26	2	1.07338E-06	3	329	0.000176571	4
Niger	3,950,249	718	0.000181761	2	18	4.55667E-06	23	1	2.53149E-07	29	737	0.000186571	2
Ogun	3,728,098	397	0.000106489	15	52	1.39481E-05	4	3	8.047E-07	5	452	0.000121241	14
Ondo	3,441,024	331	9.61923E-05	17	24	6.97467E-06	14	1	2.90611E-07	26	356	356/3441024	16
Osun	3,423,535	457	0.000133488	11	53	1.54811E-05	3	2	5.84191E-07	10	522	0.000152474	8
Oyo	5,591,589	501	8.95989E-05	21	19	3.39796E-06	30	1	1.7884E-07	36	521	9.31757E-05	23
Plateau	3,178,712	471	0.000148173	6	29	9.12319E-06	7	1	3.14593E-07	22	521	0.000163903	6
Rivers	5,185,400	260	5.18764E-05	33	31	5.97832E-06	17	1	1.92849E-07	35	292	5.6312E-05	34
Sokoto	3,696,999	359	9.71058E-05	16	12	3.24588E-06	31	2	5.40979E-07	11	373	0.000100893	18
Taraba	2,300,736	413	0.000179508	3	2	8.69287E-07	8	1	4.34644E-07	16	416	0.00018081 2	3
Yobe	2,321,591	249	0.000107254	14	11	4.73813E-06	21	1	4.30739E-07	17	261	0.000112423	15
Zamfara	3,259,846	294	9.01883E-05	20	24	7.36231E-06	12	1	3.06763E-07	24	319	9.78574E-05	20
FCT (Abuja)	1,405,201	0	0	37	8	5.69314E-06	19	2	1.42328E-06	1	10	7.11642E-06	28
Nigeria	140,003,542	13703	9.78761E-05	NA	845	6.03556E-06	NA	58	4.14275E-07	NA	13951	9.96475E-05	NA

Explanation: A – state/territory; B – 2006 population; C – PHCs; D – per capita PHCs; E – rank by PHCs; F – SHCs; G – per capita SHCs; H – rank by SHCs; I – THCs; J – [per capita THCs; K – rank by THCs; L – total PHFs; M – per capita TPHCs; N – rank by TPHCs

Source: Author's computation using data from Federal Ministry of Health, 2004, in: NBS 2006 and Nigeria, 2007

Table 3. Private health centres (primary, secondary and tertiary) in Nigeria

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Abia	2,833,999	500	0.000176429	2	13	4.58716E-06	19	0	0	2	513	0.00018016	2
Adamawa	3,168,101	86	2.71456E-05	19	0	0	32	0	0	3	86	2.71456E-05	26
Akwa Ibom	3,920,208	1	2.55089E-07	31	148	3.77531E-05	6	0	0	4	145	3.69878E-05	23
Anambra	4,182,032	125	2.98898E-05	18	533	0.00012745	1	0	0	5	658	0.000157338	7
Bauchi	4,676,465	2	4.27673E-07	29	0	0	33	0	0	6	2	4.27673E-07	34
Bayelsa	1,703,358	0	0	32	6	3.52245E-06	8	0	0	7	6	3.52245E-06	31
Benue	4,219,244	583	0.000138176	4	35	8.29532E-06	16	0	0	8	618	0.000146472	8
Borno	4,151,193	13	3.13163E-06	18	17	4.09521E-06	21	0	0	9	30	7.22684E-06	31
Cross River	2,888,966	72	2.49224E-05	21	43	1.48842E-05	13	0	0	10	115	3.98066E-05	22
Delta	4,098,391	248	248/4098391	12	11	2.68398E-06	24	0	0	11	259	6.31955E-05	18
Ebonyi	2,173,501	6	2.76052E-06	26	44	2.02438E-05	11	0	0	12	50	2.30044E-05	27
Edo	3,218,332	63	1.95754E-05	22	315	9.78768E-05	2	0	0	13	378	0.000117452	11
Ekiti	2,384,212	93	3.90066E-05	15	18	7.54966E-06	17	0	0	14	111	4.65563E-05	20
Enugu	3,257,298	327	0.00010039	6	200	6.14006E-05	4	0	0	15	527	0.000161791	5
Gombe	2,353,879	34	1.44442E-05	23	2	8.49661E-07	34	0	0	16	36	1.52939E-05	28
Imo	3,934,899	368	368/3934899	7	302	7.67491E-05	3	0	0	17	670	0.000170271	4
Jigawa	4,348,649	0	0	33	0	0	35	0	0	18	0	0	36
Kaduna	6,066,562	331	5.45614E-05	14	2	3.29676E-07	31	0	0	19	333	5.48911E-05	20
Kano	9,383,682	0	0	34	15	1.59852E-06	26	0	0	20	15	1.59852E-06	33
Katsina	5,792,578	1	1.72635E-07	30	0	0	36	0	0	21	1	1.72635E-07	35
Kebbi	3,238,628	2	6.17545E-07	28	24	7.41055E-06	18	0	0	22	26	8.02809E-06	30
Kogi	3,278,487	10	3.05019E-06	25	88	2.68416E-05	9	0	0	23	98	2.98918E-05	25
Kwarra	2,371,089	173	7.29623E-05	9	22	9.27844E-06	15	0	0	24	195	8.22407E-05	15
Lagos	9,013,534	625	6.93402E-05	11	164	0.000181948	12	0	0	25	789	8.7535E-05	13
Nasarawa	1,863,275	354	0.000189988	1	19	1.01971E-05	14	0	0	26	373	0.000200185	1
Niger	3,950,249	104	2.63275E-05	20	17	4.30353E-06	20	0	0	27	121	3.0631E-05	24
Ogun	3,728,098	131	3.51386E-05	16	88	2.36045E-05	10	0	0	28	219	219/3728098	19
Ondo	3,441,024	118	3.42921E-05	17	160	4.64978E-05	5	0	0	29	278	8.06727E-05	16
Osun	3,423,535	202	5.90033E-05	13	129	3.76804E-05	7	0	0	30	331	9.66837E-05	12
Oyo	5,591,589	746	0.000133415	5	6	1.07304E-06	28	1	1.7884E-07	1	752	0.000134488	10
Plateau	3,178,712	438	0.000137792	4	11	3.46052E-06	22	0	0	31	447	0.000140623	9
Rivers	5,185,400	368	7.09685E-05	10	10	1.92849E-06	25	0	0	32	378	7.2897E-05	17
Sokoto	3,696,999	32	8.65567E-06	24	3	8.11469E-07	29	0	0	33	35	9.46714E-06	29
Taraba	2,300,736	194	8.43208E-05	8	1	4.34644E-07	30	0	0	34	195	8.47555E-05	14
Yobe	2,321,591	4	1.72296E-06	27	0	0	37	0	0	35	4	1.72296E-06	3
Zamfara	3,259,846	0	0	35	10	3.06763E-06	23	0	0	36	10	3.06763E-06	32
FCT (Abuja)	1,405,201	223	0.000158696	3	2	1.42328E-06	27	0	0	37	225	0.000160119	6
Nigeria	140,003,542	6577	4.69774E-05	NA	2458	1.75567E-05	NA	0	1.7142676433^{-09}	38	9025	6.44627E-05	NA

Explanation: A – State/territory; B – 2006 population; C – PHCs; D – per capita PHCs; E – rank by PHCs; F – SHCs; G – per capita SHCs; H – rank by SHCs; I – THCs; J – Per capita THCs; K – rank by THCs; L – total private HCs; M – Per capita TPHC; N – rank by TPHCs

Source: Author's computation using data from Federal Ministry of Health, 2004, in: NBS 2006 and Nigeria, 2007

Public primary health facilities (PHCs). As table 2 shows, the shares of the public PHCs are enumerated below. The first quartile comprised (in descending order of their respected ranks): Kogi (1), Niger (2), Taraba (3), Nasarawa (4), Kebbi (5), Plateau (6), Cross River (7), Bauchi (8), and Kwara (8). The second quartile included: Kaduna (10), Osun (11), Benue (12), Katsina (13), Yobe (14), Ogun (15), Sokoto (16), Ondo (17), and Jigawa (18). The third quartile comprised: Borno (19), Zamfara (20), Oyo (21), Akwa Ibom (22), Gombe (23), Bayelsa (24), Edo (25), Abia (26), and Adamawa (27). Those in the fourth quartile included: Kano (28), Ekiti (29), Delta (30), Imo (31), Enugu (32), Rivers (33) Lagos (34) Anambra (35), and Ebonyi (36). The fifth had the Federal Capital Territory (37) at the last position.

Public secondary health facilities (PSHFs). The availability of these facilities in the various states or territory was as follows. The first quartile comprised the following: Kogi (1), Kwara (2), Osun (3), Ogun (4), Akwa Ibom (5), Edo (6), Plateau (7), Taraba (8), and Anambra (9). Those in the second quartile were: Borno (10), Ebonyi (11), Zamfara (12), Cross River (13), Ondo (14), Ekiti (15), Delta (16), Rivers (17), and Bayelsa (18). The third quartile comprised: the FCT (19), Gombe (20), Benue (21), Yobe (21), Niger (23), Adamawa (24), Kebbi (25), and Nasarawa (26). The fourth quartile included: Abia (27), Bauchi (28), Imo (29), Lagos (29), Oyo (31), Sokoto (32), Enugu (33), Kano (34), Jigawa (35), and Kaduna (36). The fifth quartile had Katsina (37) as the last state.

Public tertiary health facilities (PTHFs). The performance of the 36 states and FCT in providing public tertiary health facilities is summarised below. Those in the first quartile included: FCT (1), Edo (2), Nasarawa (3), Ebonyi (4), Ogun (5), Abia (6), Cross River (7), Enugu (8), and Bayelsa (9). The second quartile comprised: Osun (10), Sokoto (11), Kaduna (12), Borno (13), Anambra (14), Lagos (15), Taraba (16), Yobe (17), and Gombe (18). Those in the third quartile included: Kwara (19), Ekiti (20), Adamawa (21), Plateau (22), Kebbi (23), Zamfara (24), Kogi (25), Ondo (26), and Akwa Ibom (27). The fourth quartile comprised: Imo (28), Niger (29), Delta (30), Delta (30), Benue (31), Jigawa (31), Bauchi (33), Kano (34), Rivers (35), and Oyo (36). The fifth quartile had Katsina state (37th).

8.2. Private health centres

The performance of private entities in terms of providing private health facilities in the various states and the Federal Capital Territory is described below.

Private primary health centres (PPHCs). Those in the first quartile included: Nasarawa (1), Abia (2), FCT, Abuja (3), Benue (4), Plateau (4), Oyo (6), Enugu (6), Imo (8), and Taraba (8). The second quartile included: Kwara (10), Rivers (11), Lagos (12), Delta (13), Osun (14), Kaduna (15), Ekiti (16), Ogun (17), and Ondo (18). The third quartile included: Anambra (19), Adamawa (20), Borno (21), Niger (22), Cross River (23), Edo (24), Gombe (25), Sokoto (26), Kogi (27), Ebonyi (28), and Yobe (29). The fourth quartile included: Kebbi (30), Bauchi (31), Katsina (32), Akwa Ibom (33), Bayelsa (34), Jigawa (35), Kano (36), and Zamfara (37).

Private secondary health facilities (PSHCs). The performance of the various states and territory in providing secondary health facilities is summarised below. Those in the first quartile include: Anambra (1), Edo (2), Imo (3), Enugu (4), Ondo (5), Akwa Ibom (6), Osun (7), Bayelsa (8), and Kogi (9). Those in the second quartile were: Kogi (10), Ebonyi (11), Ogun (11), Lagos (12), Cross River (13), Nasarawa (14), Kwara (15), Benue (16), Ekiti (17), and Kebbi (18). The third quartile comprised: Abia (19), Niger (20), Borno (21), Plateau (22), Zamfara (23), Delta (24), Rivers (25), Kano (26), and FCT (27). Those in the fourth quartile included: Oyo (28), Sokoto (29), Taraba (30), Kaduna (31), Adamawa (32), Bauchi (33), Gombe (34), Jigawa (35) and Katsina (36), The least performing state was Yobe (37th).

Private tertiary health facilities (PTHFs). A private tertiary health facility existed only in Oyo state in 2004. There was no private tertiary health facility in any other of the 35 states and the FCT. Therefore, Oyo state took the first position while the remainder 36 states took positions corresponding to their alphabetical orders from second up to 37th.

8.3. Discussion

There was a wide disparity in the provision of health facilities to various states and Federal Capital Territory by both public and private health developers. For example, Ebonyi state had the least number of public private health centres (30) compared to Kogi state (722): range of 692. There was wide variation between these states with the least and highest numbers of PHCs. It is not clear if the response of state governments (i.e. providers of these PHCs) was driven by rigorous assessment of demographic characteristics of the respective states and territory. Usually, governments determine the location of health facilities based on the existence of human settlements and need for healthcare. However, there was evidence that

demographic characteristics, especially size, was not seriously considered by governments in providing PHCs. If this was considered, it was definitely not in all the states/territory. This point could be illustrated with two examples of states which are the most populous in Nigeria. Kano and Lagos states presented rather low per capita shares of public PHCs: (6.79×10^{-05} and 4.27×10^{-05}) respectively.

The provision of secondary health facilities by governments also exhibited wide disparity. While the government (it is unclear if it was the federal or state governments or both) provided only one SHF in Katsina state, Kogi state Government provided as much as 83 (the highest number) nationwide. There was wide disparity in the per capita shares of SHFs in those states with the highest number to that with the lowest in the various types of health facilities. The provision of tertiary health centres by governments was relatively uniform in most of the states and FCT. Each state had at least one in 22 states, while the highest was four in Lagos and Edo states. That uniformity is attributable to a policy of providing the tertiary health facilities in close association with the establishment of schools/colleges of Medicine within universities funded and managed by governments either at the federal or state levels. States with higher numbers of tertiary health facilities were those which have established one or more state-funded universities with medical schools or colleges in addition to those provided by the Federal Government. Kano state's large population (9,383,682) in 2006 made it to have a low per capita share of tertiary health facilities of 2.3×10^{-07}) compared to the FCT's (1.42×10^{-06}), irrespective of their possession of two university teaching hospitals in each of them.

There was also a wide disparity in the availability of private health facilities within two of the three categories. While Katsina had only one, Benue had 583 (range: 562). Although privately provided PHCs filled some of the gaps left by the failure of governments in several states such as Lagos, and Benue among others, this was not the case in Ebonyi state. With only 30 public PHCs, those provided by private entities were only six. The disparity in the availability of private state health facilities (SHCs) was illustrated by only Taraba state (this was not found in a few states) compared to 533 in Anambra state (range: 532). Unlike its neighbours in southeastern Nigeria that had large numbers of private SHFs (533 in Anambra, 302 in Imo, 200 in Enugu), Ebonyi state had only 44. Apart from one private tertiary hospital in Oyo state, this category of health facility was not provided by private entities in any of the other 35 states and the FCT.

The per capita shares of all three types of private health facilities combined were naturally affected by one or all of the three categories. This can be illustrated by the total per capita private health centres which were highest in Nasarawa state because of the contribution of private PHCs in the state (354). Two states (Akwa Ibom and Katsina), which had only one each of the private PHCs, scored total private per capita shares of (3.70×10^{-05} and 1.73×10^{-07}) ranked 23rd and 36th respectively.

The total per capita shares for public health facilities (combination of PHCs, secondary and tertiary) were affected by one or more of the single categories. The possession of the highest total per capita shares of the public health facilities by Kogi state (2.46×10^{-04}) was influenced by its possession of the highest number and per capita shares of secondary health facilities (83 and 2.53×10^{-05}) respectively. Consequently, Kogi state's possession of only one tertiary health facility (likely resulting from the Kogi State funded university) made its per capita share and ranking low (3.05×10^{-07} and 250) respectively. However, these low scores did not take the shine off Kogi state's presentation of the highest number of public health facilities in 2004. The lowest total per capita share of health facilities by Ebonyi state was not surprising since it had the lowest numbers of public and private primary health centres. However, its possession of fairer shares of secondary and tertiary health facilities did not contribute much towards balancing the numerical deficit in the PHCs.

Limitations of the study. The data used in this study did not show the specific governments (whether state or federal) that provided the various health facilities described generally as 'public'. This prevented the analysis of the degree of contribution of each of the two levels of government in providing various health facilities at different locations. The data did not indicate specific location of health facilities (whether in urban or rural areas). Therefore, it was not possible to analyse disparity in availability of health goods by urban and rural areas. Another limitation is that this study covered only the availability (or provision) of physical health facilities. It is well known that health care is not complete with only physical health facilities without adding human capital (including the competences and skills of medical doctors, and paramedical professionals, such as nurses, laboratory technologists among others). The data also omits particular details (such as names, core businesses, etc.) of private entities providing the various health facilities. This prevented understanding of the contributions of the providers of health facilities.

The analysis used data from Nigeria's 2006 census of population and housing, which the official agency, National Population Commission, reported the population of Lagos city state to be 9,013,534. The Lagos state government used scientific evidence (such as record of births, VAT collections, etc.) to convincingly dispute and reject that report and estimated its acceptable population in 2006 to be at least 17.55 million (Kolapo, Faloseyi, 2007; Kolapo et al., 2007). This controversy deserves comment and poses implications for this study. Using the higher population of Lagos megacity translates to considerable alteration of most of the shares of physical health facilities reported thus far. The shares that result from the computation based on the larger population of Lagos must translate to show greater unmet need for various health facilities of various categories than the results presented above.

9. Conclusions

The use of geodemographic and spatial analyses in this study has effectively highlighted variations in per capita shares of various categories of health facilities, thereby indicating the performance of public and private entities in providing health facilities in Nigeria's 36 states and the Federal Capital Territory. The effectiveness of these analytical models derives from the way geodemography elucidates on the interaction between populations and its characteristics (size, etc.) and the number of health facilities. Instead of showing only the absolute numbers of health facilities as commonly done by most politicians, geodemography facilitates the representation of the outcomes of the interaction between these two factors: the population in need of health goods and the quantity of health goods. The relevance of this analysis is demonstrated by the way it exposes important aspects of provision of goods, including sufficiency or otherwise, for policy makers in governments and business or voluntary organisations which might be interested in developing the health sector. Therefore, the information produced in this study is useful for policy in the public and private sectors. Although the computation was done manually, the data and information produced can be input into electronic geographic information systems to implement further scientific analyses.

Further research is necessary for understanding health development in Nigeria. Such studies should strive towards clarifying the factors (sociological, economic, and environmental, among others) accounting for the availability of some peculiar health facilities in some states/territory. For example, there is need to answer some questions: Why was it that Ebonyi state possessed low numbers of PHCs but higher numbers of tertiary health facilities? Do patronage and/or preference for higher level health facilities by people (or public) play a role in the decision to provide the different levels of health facilities in Ebonyi state and other states with similar characteristics? There is need for further studies aimed at clarifying some patterns in the regional and other characteristics of the distribution of health facilities in the states and FCT. There is need to explore clues exposed by this study for creating hypotheses for other studies. There is need to answer the questions: is the provision of private health facilities in various states motivated or driven by deficiency in publicly provided health facilities? To what extent has the provision of health facilities by public and private entities been determined by demographic factors (e.g. population and health status or need)? Such research projects are also necessary at local government area scales using disaggregated data.

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