Health Infrastructure Inequality-A Case Study of Lagos State, Nigeria

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Abstract: Infrastructure plays a significant role in socio-economic development. Health infrastructure has direct impact on the health status of both agricultural and non-agricultural labour in the rural economy. For agricultural labour, improved health status tends to increase the disposable labour days thus leading to increased agricultural productivity, production and income. The distribution of health infrastructure between rural/agricultural and urban Local Government Areas (LGAs) should therefore be devoid of inequality in order not to enhance the disparity in the development of the rural and urban areas. The study assessed the distribution of health infrastructure in Lagos State, Nigeria using the dissimilarity index and gini coefficient, among others. The results show that inequality exists in the distribution of health infrastructure and that the rural/agricultural Local Government Areas are disadvantaged. The inequality is much higher in the distribution of private sector investments in health infrastructure compared to public sector investments. This implies that the policy of increased role for the private sector in the provision of socio-economic services by government may put the rural/agricultural LGAs at a disadvantage, if applied unrestrained to the health sector.

Key words: Socio-economic, LGAs, inequality, infrastructure, unrestrained

INTRODUCTION

Infrastructural facilities play a major role in socio-economic development. They impact positively on the development of rural/agricultural communities[1,2]. The provision of health infrastructure has direct impact on the health status of both agricultural and non-agricultural labour in the rural economy. Such infrastructural facilities include hospitals, sanitation and potable water facilities. For agricultural labour, improved health status tends to increase the disposable labour days thus leading to increased agricultural productivity, production and income.

The effects of increased income and improved health status should lead to increased life expectancy. Life expectancy is one of the key elements considered in the measurement of development level. Thus, in terms of index of development, provision of health infrastructure contributes in a more direct manner to development.

Nigeria operates a referral health service system. This is based on three-tier levels of health infrastructure comprising the Primary Health Centres (PHC), the secondary health facilities and the specialist hospitals, which are the tertiary facilities. PHCs are expected to be available at accessible distances to members of each community. Health issues that could not be handled at this level are referred to the General Hospitals; the secondary health facilities. Cases that require specialist attentions are referred from the General Hospitals to the tertiary health facilities[3]. Government aims to provide access to basic health facilities to all citizens. Access is defined in terms of distance to communities and costs of health services. It is therefore expected that health infrastructure will be available in adequate numbers given the distribution of populations and communities across Local Government Areas (LGAs). LGAs with high populations and/or more communities are hence expected to have proportionately more health facilities.

This study therefore attempts to appraise the distribution of public and private health infrastructure in Lagos State. Populations of LGAs as well as number of communities in the LGAs were used as the basis of the appraisal.

MATERIALS AND METHODS

Types and sources of data: Only secondary data were used for this study. The secondary data on public and duly registered private health facilities were obtained from the records of the Health Management Board, Lagos State

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while the distribution of communities across the LGAs of Lagos State was obtained from a survey conducted by the Centre for Rural Development (CERUD), an agency of the Lagos State Ministry of Rural Development. The population figures for the LGAs are projected figures and were extracted from the publication of the Centre for Rural Development.

The data collected on health infrastructure are the names and addresses of all public and duly registered private health facilities in the State. Given the addresses, the facilities were categorized into different LGAs, thus establishing the number of health facilities in the various LGAs. For the purpose of establishing how rural/agricultural communities have fared in terms of health infrastructure, attempt was made to identify the LGAs that could be classified as rural/agricultural. Based on the rural-urban classification study carried out by CERUD[4], the most rural LGAs are Amuwo-Odofin (71% rural), Badagry (65% rural), Epe (93% rural), Ibeju-Lekki (92% rural) and Ikorodu 71% rural). However, in terms of agricultural activities, Amuwo-Odofin has relatively insignificant agricultural production. Thus, for the sake of this study, rural/agricultural LGAs are taken to be Badagry, Epe, Ibeju-Lekki and Ikorodu.

Data analysis and analytical tools: The Lorenz curve is a common tool used in the assessment of distribution of income. It measures the proportion of a population that accounts for specific proportion of the income. Aside from income, the Lorenz curve has also been the basis of the evaluation of the distribution of other attributes of a population. The Gini coefficient (G) and the Index of Dissimilarity (ID) are two statistics that are based on the Lorenz curve. They are both linked to the concept of comparing the Lorenz curve with the line of perfect equality. Gini coefficient measures the degree of concentration (inequality) of a variable in a distribution of its elements. It compares the Lorenz curve of a ranked empirical distribution with the line of perfect equality The Gini coefficient ranges between 0, where there is no concentration (perfect equality) and 1 where there is total concentration (perfect inequality).

The extent of inequality in the distribution of the health infrastructure was explored with the Gini Coefficient and the Index of Dissimilarity. The elements considered are the populations of and the number of communities in the LGAs. The Gini index is calculated as:

$$G = 1 - \sum_{i=0}^{N} \sigma Y_{i-1} + \sigma Y_i)(\sigma X_{i-1} - \sigma X_i)$$

Where
σX is cumulative proportions of the number of communities or populations of the LGAs;

σY is the number of health infrastructure in the LGAs and N is the number of LGAs[5-7]. The index of dissimilarity is calculated as:

$$ID = 0.5 \sum_{i=1}^{N} |X_i - Y_i|$$

Where,

X is the cumulated proportion of the number of communities or populations of the LGAs,

Y is the cumulated proportion of the number of health infrastructure in the LGAs; and. N is the number of LGAs.

In addition to the evaluation of the extent of inequality in the distribution of health infrastructure, the distribution of the facilities was presented by Local Government Areas (LGAs). Also included in the distribution are the landmass, populations of and the number of communities in the various LGAs. The distribution was thereafter analyzed to indicate the number of communities, population and landmass per facility. The number of communities per facility provides an indication of how many communities share a health facility on the average and whether members of some communities have to go outside their communities to obtain medical attention.

RESULTS AND DISCUSSION

Distributions of populations, communities and landmass: The distributions populations, number of communities and landmass by LGAs are presented in Table 1. The table shows that the rural/agricultural LGAs (Badagry, Epe, Ibeju-Lekki and Ikorodu) accounted for relatively lower percentages of the population, higher percentages of number of communities and hence low population per community. In fact, they jointly accounted for 11.64%, 44.55% and 70.74% of the population, number of communities and landmass; respectively These LGAs have relatively large geographical areas, low population densities and communities that are more spread out than the other LGAs. The average population per community for these LGAs are 1,199, 1,530, 235 and 994 for Badagry, Epe, Ibeju-Lekki and Ikorodu, respectively. The implication of these figures is that, if population is the basis of distributing health infrastructure, these LGAs will have relatively fewer numbers of facilities. However, if it is assumed that each community should at least have a health facility, the rural/agricultural LGAs should have relatively more health facilities. The extent to which the distribution of health infrastructure is equitable given these two considerations is explored with concentration indices in the following section.

Concentration indices for health facilities: The gini and dissimilarity indices for health infrastructure in Lagos State are presented in Table 2. The indices are presented

Table 1: Distribution of population, communities and land mass by LGAs

S/No.	LGA	Population		Communities		Land mass		Population density
		No.	Percent of total	No.	Percent of total	Square kilometre	Percent of total	
1	Agege	608.925	7.83	60	3.79	20.00	0.70	30.446
2	Ajeromi/Ifelodun	757.097	9.74	60	3.79	16.00	0.56	47.319
3	Alimosho	584.601	7.52	127	8.03	140.80	4.92	4.152
4	Amuwo-Odofin	287.720	3.70	69	4.36	156.00	5.45	1.844
5	Apapa	78.142	1.01	32	2.02	28.50	1.00	2.742
6	Eti-Osa	206.045	2.65	71	4.49	157.00	5.48	1.312
7	Ifako-Ijaiye	274.743	3.53	56	3.54	46.00	1.61	5.973
8	Ikeja	275.936	3.55	41	2.59	52.92	1.85	5.214
9	Kosofe	512.056	6.59	65	4.11	77.40	2.70	6.616
10	Lagos Island	225.211	2.90	49	3.10	13.20	0.46	17.061
11	Lagos MainIand	381.997	4.91	62	3.92	22.62	0.79	16.888
12	Mushin	732.340	9.42	67	4.24	17.05	0.60	42.952
13	Oshodi/Isolo	610.231	7.85	22	1.39	44.98	1.57	13.567
14	Shomolu	534.247	6.87	42	2.65	15.10	0.53	35.381
15	Surulere	800.400	10.29	54	3.41	30.05	1.05	26.636
16	Badagry	161.813	2.08	135	8.53	366.00	12.79	442
17	Epe	137.659	1.77	90	5.69	644.00	22.50	214
18	Ibeju- Lekki	33.832	0.44	144	9.10	646.00	22.57	52
19	Ikorodu	250.553	3.22	252	15.93	203.00	7.09	1.234
20	Ojo	321.453	4.13	84	5.31	166.00	5.80	1.936
	Total	7.775.001	100.00	1582	100.00	2.862.62	100.00	2.716

Table 2: Concentration indices for health facilities in lagos state

Facilities	Communities		Population	
	Dissimilarity index	Gini coefficient	Dissimilarity index	Gini coefficient
Primary health centres	0.29685	0.24801	0.23600	0.12107
Public secondary health facilities	0.21390	0.10018	0.35548	0.32567
Private hospitals	0.45986	0.56330	0.24796	0.23163
Public secondary health facilities and private hospitals combined	0.38892	0.43024	0.23843	0.14015

with respect to the populations of and the number of communities in the respective LGAs. They were calculated for public and private health facilities separately and for both facilities combined.

From the indices it could be inferred that:

- There is some inequality in the distribution of public and private health infrastructure across the LGAs in Lagos State.
- The inequality in public secondary and private hospitals combined is more pronounced if the number of communities is the basis of assessing the distribution of the health infrastructure.
- Using the number of communities as the basis, the public secondary health facilities are better distributed than the PHCs while on the basis of population the PHCs are better distributed.
- The inequality in the distribution of private health infrastructure is much higher than that of public health infrastructure when the basis of assessment is the number of communities but lower if the basis is the population.

These results follow a priori expectations. Local Government health authorities take particular cognizance of population in locating the facilities, hence, the less pronounced the inequality in the PHCs when population is used as the basis of the evaluation. Also for the purposes of effective demand, private investors in health infrastructure consider population in locating their investments hence the lower level of inequality in private health facilities when population is the basis of the evaluation.

The higher level of inequality in the distribution of private health infrastructure compared with public health infrastructure also follows a priori expectations. The private sector will concentrate its investments in health infrastructure in LGAs where the maximization of profit is more assured. These are LGAs with relatively higher population and household incomes. These are invariably the urbanized LGAs. Government must therefore continually strive to mitigate any inequality created by private sector through its investment in health infrastructure. The moderating effect of public sector on the inequality created by private sector investments in health is demonstrated by the indices for public and private sectors combined compared to those of the private sector alone. For example, the gini coefficients for secondary health facilities based on the number of communities are 0.10018, 0.56330 and 0.43024 for public,

Table 3: Distribution of secondary health facilities (Public and private) in lagos state by LGAs

		Public					Private				
S/No.	Local government	No.	Percent of total	No. of communities per facility	Population per facility	Land area per facility (kmsq)	No.	Percent of total	No. of communities per facility	Population per facility	Land area per facility (kmsq)
1	Agege	7	2.73	8.57	86.989	2.86	39	4.12	1.54	15.613	0.51
2	Ajeromi/Ifelodun	9	3.52	6.67	84.122	1.78	75	7.92	0.80	10.095	0.21
3	Alimosho	17	6.64	7.47	34.388	8.28	40	4.22	3.18	14.615	3.52
4	Amuwo Odofin	6	2.34	11.50	47.953	26.00	29	3.06	2.38	9.921	5.38
5	Apapa	6	2.34	5.33	13.024	4.75	39	4.12	0.82	2.004	0.73
6	Eti-Osa	11	4.30	6.45	18.731	14.27	42	4.44	1.69	4.906	3.74
7	Ifako Ijaiye	5	1.95	11.20	54.949	9.20	14	1.48	4.00	19.625	3.29
8	Ikeja	9	3.52	4.56	30.660	5.88	107	11.30	0.38	2.579	0.49
9	Kosofe	7	2.73	9.29	73.151	11.06	53	5.60	1.23	9.661	1.46
10	Lagos Island	23	8.98	2.13	9.792	0.57	103	10.88	0.48	2.187	0.13
11	Lagos Mainland	10	3.91	6.20	38.200	2.26	8	0.84	7.75	47.750	2.83
12	Mushin	18	7.03	3.72	40.686	0.95	121	12.78	0.55	6.052	0.14
13	Oshodi/Isolo	12	4.69	1.83	50.853	3.75	82	8.66	0.27	7.442	0.55
14	Somolu	10	3.91	4.20	53.425	1.51	61	6.44	0.69	8.758	0.25
15	Surulere	11	4.30	4.91	72.764	2.73	50	5.28	1.08	16.008	0.60
16	Badagry	15	5.86	9.00	10.788	24.40	18	1.90	7.50	8.990	20.33
17	Epe	30	11.72	3.00	4.589	21.47	5	0.53	18.00	27.532	128.80
18	Ibeju/Lekki	16	6.25	9.00	2.115	40.38	1	0.11	144.00	33.832	646.00
19	Ikorodu	26	10.16	9.69	9.637	7.81	22	2.32	11.45	11.389	9.23
20	Ojo	8	3.13	10.50	40.182	20.75	38	4.01	2.21	8.459	4.37
	Total	256	100.00	6.18	30.371	11.18	947	100.00	1.67	8.210	3.02

private and public and private sector combined, respectively. The gini coefficient for private health infrastructure is five times as high as that of public secondary health facilities. The 0.43024 obtained for the public and private sector facilities combined demonstrates the moderating effects public sector investment on the concentration of private sector investments in health. A further analysis of the distribution of health facilities presented in Table 3 highlights the effects of the concentration of health facilities.

Distribution of health facilities: Table 3 shows that the rural/agricultural LGAs accounted for lower percentages of the total number of private health facilities and relatively higher percentages of the public health facilities. Similarly, the number of communities per private health facility is higher for the rural/agricultural LGAs compared to the urban ones. However, the number of public health facilities per community appears to be fairly distributed; that is, not unduly skewed against the rural/agricultural LGAs.

The distribution of the population per public sector health facilities is skewed in favour of the rural/agricultural LGAs while the land area per public health facility is skewed against them. The implications of these are that the people in the urban LGAs will only need to cover relatively shorter distances to reach a public health facility but each of such facility will attend to relatively more patients. The contrary is the case for the rural/agricultural LGAs. The people in these LGAs will have to cover relatively longer distances to reach a public health facility, however there will be relatively

fewer patients seeking medical attention in these hospitals compared to those in the urban LGAs.

In spite of the relatively higher populations in the urban LGAs, only 10 out of the 15 urban LGAs recorded higher than average population per private health facility, the average being 8,210 persons per private health facility. On the contrary, all the five rural/agricultural LGAs recorded higher than average population per private health facility. Similarly, all the five rural/agricultural LGAs recorded higher than average land area per private health facility, the average being 3.02 square kilometer per private health facility. Whereas only four out of the fifteen Urban LGAs recorded figures that are higher than the average.

The information contained in Table 3 clearly indicates the basis for the inequality in the distribution of health facilities as indicated by the concentration indices in Table 2. While the distribution of public sector health facilities between rural/agricultural and urban LGAs is fair on the basis of number of communities, it is skewed in favour of the rural/agricultural LGAs on the basis of population. However, on the basis of both the number of communities and population, the distribution of private health facilities is skewed against the rural/agricultural LGAs.

CONCLUSION

There is inequality in the distribution of health infrastructure in Lagos State, Nigeria. The inequality is more pronounced in the distribution of private health infrastructure compared to those of the public sector. The

public health facilities seem to be skewed in favour of the rural/agricultural LGAs if the basis of assessment is population. This is probably due to the state government policy, which more or less provide for distribution of secondary health facilities on LGA basis irrespective of population. The difference in population is however compensated for by the size of the hospitals, with those in the urban areas having higher number of doctors, nurses, beds, etc.

Given that the land areas of the rural/agricultural LGAs, residents of the rural communities in which an hospital is not sited will have to travel relatively longer distances to obtain medical services. The effect of this is more severe than it would otherwise have been given the poor transportation facilities that are predominant in the rural/agricultural LGAs.

Given that the distribution of private health facilities shows more inequality and the fact that private entrepreneurs will most likely build hospital where there is effective demand for medical services, the rural/agricultural LGAs will be disadvantaged because of lower incomes and hence, relatively lower effective demand for health service. There is hence a need for government to monitor the distribution of health infrastructure and plan new ones in such a way that inequality in the distribution of the infrastructure will be reduced. Deliberate effort must be made to compensate for lower private sector investment in health infrastructure in the rural/agricultural areas. This is very important because governments in Nigeria are working towards slimmer public sector and increasing dependence on the private sector for the provision of socio-economic services.

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