

Spatial Disparities in Residential Housing Health-An Application of Models to Akure, South-West Nigeria

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Abstract: The study examines the disparities existing in the health status of residents in the core, transition and peripheral residential areas of Akure using some environmental and utility parameters. The study adopts a random systematic sampling technique to select about 700 residential households who answered questions in a questionnaire posted to head of households. The tool of analysis was Double-Log Multiple linear Regression Model that has an inherent advantage of higher explanatory powers of R^2 and the possibility of interpreting results as elasticity estimates. The critical findings of the study show that the environmental and utility factors significantly influencing variations in health status of the citizens are: poor management of domestic wastewater, inadequate water supply, absence of toilet facilities or bad location of it and old age of buildings. Policies that address implications of the research findings are highlighted with appropriate recommendations.

Key words: Urban health, application of models

INTRODUCTION

There has been an increasing concern for the environment in many developing countries in the last half-century. This is attributable to the increasing realization that the environment produces some dangers to human health and life. This no doubt, emanates from the failures of basic environmental resources that ordinarily should guarantee healthy urban existence as well as the basic infrastructural facilities in Third World cities. Here in Nigeria and as in many other developing countries, communicable diseases still rank as important contributors to ill health. About one-third of the disease burden in Nigeria is associated with environmental factors McGranahan *et al.*^[1] This manifests in high prevalence of environmentally related deaths, disabilities and morbidities. The prevalence of communicable diseases in poor countries persists owing to the geoclimatic environment, which is more conducive to many vector-borne diseases and macro parasite related diseases. There are also notable contributing factors arising from the fact that both individuals and governments have taken far too few of actions aimed at diseases control transmission as in the Developed Economies. Thus, a need for empirical investigations adopting a multi-disciplinary approach to the dynamics of environment and health relationships on urban dwellers in Third World cities has arisen.

Urbanization, like agricultural change on the landscape, can be either beneficial or harmful to people's

health (McGranahan *et al.*^[1]). Much depends on how the fallouts of urbanization are managed. There is a wide range of urban-related environmental problems that can adversely affect people's health. These emanate from the demographic characteristics as well as the urban and physical growth components. When these problems are addressed efficiently, urbanization should lead to health gains. This is the thrust of environmental health-the scope of which includes housing, the residential environment and aspects of metropolitan planning and development Abbot^[2]. In its entirety, it dwells on the suitability of environmental conditions for the protection and promotion of human health, hence its relevance to Town and Country planning.

Among the harmful effects of urbanization in the Third World are health problems, emanating from the fallouts of inadequate urban infrastructures, poor city management and planning. There are other feasible consequences such as traffic accidents, inadequacies of the urban transportation system and consequent loss of productive time to commuting. Others include health problems emanating from long exposure to vehicular pollutants. This study looks at the spatial differences existing in the health status of residents of the core, transition and peripheral residential areas of Akure Nigeria. Key environmental parameters of housing condition were used to specify the differences highlighted.

Environmental health issues in Nigerian cities-a review of literature:

Communicable diseases are still very important contributors to out-patient afflictions in Nigerian hospitals for which environmental factors are major actors in the transmission cycle. Statistics across the globe show this same trend as literature attest to the fact that, communicable diseases are the most common cause of death world over Murray and Lopez^[3]. Research literature further reports that out of the global 51 million deaths in 1993, 16.4 million arose from infectious and parasitic diseases. For many residents in Third World cities, urban existence or living produces a hard experience of poverty, hunger, diseases and fatigue right from infancy. Murray and Lopez^[4] affirm that 5.3% of global deaths are attributable to poor water supply, sanitation and hygiene, all of which stress the incidence of urban poverty in particular. Altogether, these three factors account for 6.8% global diseases burden or 10% of Third World disease burden Murray and Lopez^[3]. The factors also reflect very strongly, the inequalities in access to safe, adequate water supply and sanitation as well as defective environmental management.

Researches emphasize the importance of environmental factors in urban health^[5,4]. They agree that infectious and parasitic diseases are 'environmental' because they are transmitted through air, water, soil, food, faecal wastes or through insects and animal vectors in the environment. On the strength of the above, the health of the individual is a reflection of his access to adequate environmental amenities that define decent urban existence.

Inequalities in health are rooted in unequal access to basic prerequisites for good living in cities. It is therefore very logical that the 1978 Alma Atta Conference endorsed the notion that links health to the living conditions of a given population. The Conference also endorsed the roles of community participation in health^[6-8].

Efforts aimed at correcting the inadequacies in the urban environmental management systems in Nigeria are contained in the Third National Development Plan^[9]. This document affirmed *inter alia* that

'... an efficient system of sewerage, drainages and refuse disposal is one of the most important factors affecting human health and the environmental quality of settlements. ... in many urban areas, outmoded methods are still being employed in the disposing of human wastes, streets are still littered with garbage ... the situation described has been with us for many years and indeed tended to worsen with increasing population and urban growth ...'^[9]

In view of the complexity and magnitude of health and environmental issues in many cities in Nigeria and the developing world, improvements in urban health and that of the individuals will require changes in physical and the socio-economic conditions of cities. It will also require an integrated approach that takes into account the link between socio-economic and environmental factors affecting health.

This study investigates the environmental and socio-economic factors affecting the health status of residents across residential neighbourhoods using data sourced from Akure in South Western Nigeria.

Akure, the study area is a typical city reflecting the Third World urbanization processes. Owing to a recent political cum administrative restructuring in Nigeria in the late 1970s, it began a metamorphosis from its hitherto quiet and low-lying provincial status to a bustling city of regional significance having become the state capital of the old Ondo State, Nigeria on February 3, 1976.

Akure is located on (lat. 7°15'N and long. 5°14'E). It stands at a height of about 137 meters above sea level. From these location attributes, the city enjoys high humidity,-a critical attribute in the management of the domestic waste generated in the city, which is largely organic. The town has a projected population of 484, 984^[10]. It has many residential districts that grew rapidly over time.

Its emergence as a state capital influenced the dynamics of the urbanization process, pattern and problems in Akure. Particularly the character of urban growth and population redistribution within the city has been affected. There are physical and structural peculiarities manifesting in the emergence of peripheral public and private residential estates with pronounced environmental problems. This contrasted sharply to the pre -1976 situation of very few private quarters and small public housing in the Government Reserved Area (GRAs) with neat environments. There are marked changes in the building density and socio-economic housing characteristics, residential composition and urban heterogeneity arising from the government staff quarters, public housing estates and large informal private housing sector. The urban land use characteristics are also dynamic and access to urban basic facilities across these residential districts is not uniform, given rise to inequalities in urban health of the inhabitants.

MATERIALS AND METHODS

Akure, the study area has residential quarters, categorized for the purpose of this study, into 'natural areas'. These are wards based on neighbourhood,

structural and morphological attributes, as well as the evolutionary trend across the cityscape. The general distinguishing attributes include the age of the buildings, location attributes and their socio-economic characteristics). Details of the classification are as follow:

The Core: Made up of dominantly old structures predating European colonization. The zone consists of about 27 traditional quarters and wards Fasakin^[11]. Through random sampling, 14 of these quarters (51.85%) were selected for the questionnaire administration. The quarters selected include Odo Ikoyi, Obanla, Igan, Odo Ijoka, Imuagun, Ijomu, Orita Igun, Idi Aagba, Owode, Eru Oba, Isolo, Araromi, Odopetu and Erekefa quarters.

The Transition areas: This is an extensive postcolonial development, spreading to all directions from the city core. It is a zone characterized by a strong mix of land uses-economic, administrative and residential. From the 10 broad areas in this zone, six quarters were chosen for the questionnaire exercise. These include Oke Aro Titun, Fanibi Quarters, Oke Ijebu, Okuta Elerinla, Awule Road axis and Upper Araromi/Oluwatosimile areas.

The public housing districts: These are housing districts developed by public initiative and noted for their strict compliance with development control ethics. Of the four notable estates in the metropolis, the study sampled three estates namely; Ijapo Estate, Alagbaka/Ala Housing Estates and the Federal Housing Estate.

The study employed the random systematic sampling technique to select respondents in the study areas for the survey. It achieves 10% coverage in each sampled district using a 1:10 sampling frame with replacement. However, the starting point alone was randomly chosen. In each chosen house, the study interviewed only adults who have been resident in the zone for not less than six months and preferably the household head.

For the analysis, the study made use of ten significant predictor variables to build three socio-economic models predicting the urban health disparities across the city residential districts. The dependent variable in the model is Housing Assessment. The study chooses the predictor variables after diligent correlation analysis was carried out to detect both colinearity and multi-colinearity among variables. Eight truly independent variables detected are presented below on Table 1.

This study uses the double-log models as against the linear models because of

- High explanatory powers of the R²
- The possibility of presenting regression coefficients directly as elasticity estimates and
- Of reduction in homoscedasticity-errors are distributed over the estimate parameters uniformly.

Table 1: Model variables

Variables	Codes
Dependent variable	ASSHOHE
Assessment of housing health	
Roofing materials	R-MAT
Type of kitchen	T-KIT
Mode of refuse disposal	R-DISP
Type of toilet	T-TOIL
Age of building	A-BUILD
Type of domestic water supply	DOM-WAT
Wall materials	W-MAT
Management of household wastewaters	H-WWAT

Source: Authors' Fieldwork, 2004

The general form of the equation used is presented as:

$$y = a + b_1x_1 + b_2x_2 \dots b_nx_n + e \quad (1)$$

The double log format is presented as:

$$\ln y = a + b_1 \ln x_1 + b_2 \ln x_2 \dots b_n \ln x_n + e \quad (2)$$

Where $b_1 - b_n = 1 \dots 8$ are the parameters to be estimated
 $X_1 - X_n =$ the independent (predictors) variables above
 $y =$ the dependent variable-housing assessment.

RESULTS AND DISCUSSION

According to Table 2, four parameters are significant in the assessment of housing health in the core of Akure Township. These factors are: (i) Household wastewater management (H-WWAT); (ii) Type of kitchen in use (T-KIT); (iii) Mode of Refuse Disposal (R-DISP) and Age of Building (A-BUILD). Out of the four factors, three (H-WWAT, T-KIT and A-BUILD) are significant at 0.5 alpha level ($p \leq 0.05$), while the mode of Refuse disposal (R-DISP) is significant at 0.01 alpha level ($p \leq 0.01$).

H-WWAT, T-KIT and A-BUILD have co-efficient estimates of 0.127, 0.166 and 0.095, respectively. Correctly interpreted, these mean that 100% improvement in the management of household wastewater, the type of kitchen used and a significant reduction in the age of building (a sort of improvement), will induce 12.7, 16.6 and 9% improvements in the health of buildings in the core. However, the most significant factor affecting housing health in this area remains the mode of refuse disposal with an estimate of 0.154. This infers that a 100% qualitative improvement in the way refuse is disposed, such as a shift from open dumping to sanitary landfills or 'agency evacuation' will improve housing health by 15.4%.

Taking the discussion from the rear, one sore point of the housing environment in the core areas of key cities in Nigeria, is the indiscriminate and disgusting littering of

Table 2: Pooled regression model of health conditions of residential houses for the core, transition and periphery areas of akure, Nigeria

Independent variables	Core residential area			Transitional zone			Periphery f- values		
	Reg. Co-efficient	t-values	Level of significance	Co-efficient	t- values	Level of significant	Co-efficient	t- values	Level of significance
1. Ln (H-WWAT)	0.127	2.382	0.018*	0.184	4.181	0.000	0.233	2.043	0.047*
2. Ln (R-MAT)	0.029	1.101	0.2717	0.014	0.566	0.572	-0.077	1.655	0.105
3. Ln (W.MAT)	0.009	-0.570	0.610	-0.006	0.166	0/868	-0.016	-0.210	0.835
4. Ln (DO-WAT)	0.036	0.672	0.502	0.254	3.223	0.001***	0.287	0.956	0.344
5. Ln (T-KIT)	0.166	2.098	0.037*	0.025	0.201	0.834	-0.669	-1.664	0.103
6. Ln (T-TOIL)	0.099	-1.317	0.189	0.116	1.078	0.283	1.552	3.042	0.004**
7. Ln (R-DISP)	0.154	2.967	0.003**	0.005	0.104	0.917	0.083	-0.565	0.575
8. Ln (A-BUILD)	0.095	2.269	0.0241*	0.706	9.090	0.000***	-.093	-0.457	0.650
Constant		0.044			-0.086		-1.120		
R ²		0.844			0.902		0.711		
N		350			240			90	

NOTE: Source: Fieldwork Analysis, 2004 *p≤0.05. i.e t- stat is significant at 0.05 alpha level (One-tailed test), **p≤0.01 i.e. t- stat is significant at 0.01 alpha level (One-tailed test), ***p≤0.05. i.e t- stat is significant at 0.001 alpha level (One-tailed test)

the surroundings of residential houses with refuse especially nylon materials. These materials are got from packaging materials for food items such as bread, ‘pure water’ in half-litre nylon containers and domestic food items such as pounded yam (Iyan), amala etc. Nylon materials are very common in refuse dumps in Nigeria. The dumps are usually sandwiched between buildings especially wherever incidental vacant plots exist. It is obvious that, no significant improvement can be made in urban health generally, without dealing with the issue of solid waste management in Akure or any city in Nigeria for that matter. This scenario also goes for the management of household water. In the core, sundry waste water from domestic and commercial sources are allowed to flow into the streets without drainage channels causing nauseating odour and creating mud-pools and pot-hoes on roads.

There is a correlation of some sort between the types of kitchen and age of building in the core. Because of the old nature of the building (mostly 40 years and above), it is either they do not possess any structured kitchen in-house, or a structured one far-flung from the main building. The implication of this situation is that foods are prepared in the open where a horde of flies, domestic animals and filth are present. Little wonder, diarrhoea and other forms of gastro-enteritic disorders are common in the core districts.

Turning to the transition area, three factors-(H-WWAT, DOM-WAT and A-BUILD) are very significant at 0.001 levels. With co-efficient estimates of 0.184, 0.254 and 0.706 respectively, a 100% improvement in the management of wastewater, domestic water supply and age of buildings will bring about 18.4, 25.4 and 70%. 6.6% increase in the quality of health of residents in these areas. While the findings on the management of wastewater and domestic water supply conform to apriori (deductive) expectations, that on age of buildings appear counter -intuitive. One should expect that, the newer

housing stock in the transition zone relative to the core should reduce the health hazards of the people in the zone. One thing that may have been responsible is the high number of apartment rooms and households that occupy a typical apartment in this area. It is common to find between 10 and 20 rooms each occupied by families of not less than 6-10 members. Ipso facto, it is apparent that the health of people in such buildings will be in jeopardy.

Like the core, the situation in the transition zone is almost the same in respect of domestic water supply and wastewater management. Residents of the area resort to hand dug shallow wells as the main source of domestic water while wastewater is allowed to drift about the streets in either blocked drainage channels or without channels. The palpable danger to health of people in these circumstances is better left to imagination.

Finally, only two factors influence notably the health of people and housing in the periphery. These factors are: management of household wastewater (H-WWAT) and type of toilet (T-TOIL). T-TOIL with an estimate of 1.552 is significant at 0.01 alpha level while H-WWAT is significant at 0.05 alpha level co-efficient estimate of 0.233. These mean that a 100% improvement in the toilet facilities found in the houses of people here will lead to a 155.2% improvement in the health of the people. This obviously does not conform to deductive expectations; since the houses are very recent, one should expect buildings in this area to possess modern toilet facilities. Consequently, the health stratum of residents should not be in jeopardy. However, there is a paradox in the housing mix of a typical Nigerian city especially the fast growing cities like Akure. This is the existence of substandard ‘modern buildings’ built in private layouts most of which do not have approved building plans from the relevant supervising authorities. These houses are built by civil servants who are desirous to free themselves from the shackles of greedy property owners. Such houses are

mostly 'core houses' with minimal facilities that are developed at owners' convenience over a long period. From this logic; it is also apparent that domestic wastewater management will be primitive and substandard. In essence, the only difference between the building in the periphery and those at the core is that the buildings in the periphery occupy wider spaces in standard plots, but they remain grotesque in facility management.

CONCLUSION

This study has investigated factors affecting the health of residents in the three residential densities (zones) in Akure, Nigeria employing some environmental parameters. Result of the analysis carried out on these parameters show that; the management of household domestic wastewater constitutes the most significant factor affecting the health of the citizens across the three residential zones without any exception. This is closely followed by the Age of buildings that significantly influence citizens' health in the core and the periphery,- the latter, a paradoxical outcome. Domestic water supply constitutes a serious problem to people living the transition zone, while the absence of adequate toilet facilities accounts for poor health in the core area only. In all, it appears that each of the component. Health model calibrated for the residential districts shows a robustly goodness-of-fit with R^2 estimates of 0.844, 0.902 and 0.711 for the core transition and the periphery, respectively. Thus, the model parameters employed have been quite efficient in predicting significant variations or rather improvement in the health status of the residents in the city. These findings have serious implication for social and health policies for the city of Akure.

It is very clear that the municipal Authority responsible for sanitation in Akure, must either fashion out a set of new rules or apply move rigorously existing sanitation byelaws to deal with sanitation problems in the city. The health management machinery of the old Western Region-(health superintendents/inspectors and personnel) which were common sights of city sanitation in the 1960's and 1970's need be resuscitated and empowered immediately to arrest the situation. Moreover, the core of Akure is due for facility upgrading and this can be done now that Akure has been chosen as one of the millennium city earmarked for upgrading by the United Nations Development Programme (UNDP).

While little or nothing can be done to alter the age of buildings, government can acquire buildings that are too old and dilapidated for redevelopment purposes. Those that are still fit for human dwelling can be upgraded

through home improvement assistance to their owners. In 1984, the Federal Government mandated Landlords with buildings without facilities to upgrade them. Then many of the old buildings in the area were plastered to strengthen them. That step can be repeated once again to beneficial effects.

Lastly, the issue of inadequate and suboptimal domestic water supply is a sore point in almost all the cities in Nigeria, where more than 70% of residents are deprived of such facility. Government has onerous responsibility to rehabilitate existing water works at Owena Dam. This supplies public optimal water to the people. Existing pipelines that are damaged through private and public construction activities should be rehabilitated. Toilet facilities inside buildings should not be compromised while existing dumps where kids and even some adults do ease themselves should be cleared with public toilets replacing them. Conclusively the authors are of the opinion that these measures will go a long way to reduce the health hazards to the people in Akure, if they are faithfully implemented. Health, people say, is wealth.

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