THE INTERNATIONAL JOURNAL OF HUMANITIES & SOCIAL STUDIES

Geospatial Mapping of Common Waterborne Diseases: An Example from Kwara State, Nigeria

Dr. Akanbi, Oluwatoyin Adewuyi
Senior Lecturer, Department of Geography and Environmental Department
University of Abuja, Nigeria

Abstract
Spatial pattern of diseases is of importance to geographers; it assists in determining the origin of diseases and by extension aid our understanding of their consequences for the social system. One of the methods of determining such spatial pattern is GIS, which combine maps with words, numbers or images to produce maps. Generally, GIS is of importance, because it is a means of obtaining and analysing data from isolated areas still lack road signs. It can also be used to analyze, determine the location of features and relationships to other features; additionally, GIS is also useful to answer where the most and/or least of some feature exists. It is equally useful in determining the density of features in a given space and what is happening nearby some features or phenomenon. Most importantly, GIS assists how a specific area has changed over time (and in what way). The study area is Kwara State, Nigeria and in focus are common waterborne diseases. The data obtained on waterborne diseases were juxtaposed on satellite map of the study area obtained through GIS ArcGIS software. A final map was generated which identified potential areas of common waterborne diseases areas. The study therefore recommends that, application of GIS into spatial analysis of the existing health delivery system.

Keywords: *Spatial pattern, mapping, GIS, maps, images*

1. Introduction

GIS is a major instrument in decision making; it relies on hardware, data, software and users. Studies have shown that GIS is available for many purposes-mapping, proximity analyses, locational analysis associated with mapping and management of natural resources (*Dempsey, 1999, Great Lakes Coastal Planning, 2007, Nofal, 2012*). Thus, GIS analysis helps in quick understanding of environmental health data and by extension assists in explaining the relationship between disease patterns and social, institutional, technological and natural environment (grindgis.com, nd; Akanbi, 2019).
Generally, Uluocha (2007) submitted that, a typical Geographic Information System (GIS) software contain tools in the form of algorithms (programs, rules or commands) for performing certain task such as data input, storage, retrieval, analysis, query, output and updating. In Nigeria, Jacob and Olajide (2011) listed dearth of qualified staff and data limitations are some of the problems associated with GIS application in Nigeria.

GIS started as a discipline in the department of geography, University of Ibadan, Ibadan, Nigeria the1996/97 academic session (Yusuf, 1997). S'aad and Kuta (2015) identified the cost of hardware and software as other impediments to GIS utilization in Nigeria. Cost of inputs of GIS are very expensive, thus its accessibility is very difficult and a major impediment to full realization of GIS fitness. Similarly, misinterpretation of results as a result of lack of training is also a major challenge in GIS utilization.

Despite these limitations, studies have shown that, prospect of GIS is getting higher in Nigeria (Osei et al, 2006; Ajewole and Oladipo, 2010; Njar, 2015, Muslim and Ifeanyi, 2017).

Local Government Areas	Federal Hospitals	State Hospitals	Private Hospitals
Asa		32	9
Ilorin-West		33	21
Ilorin –East	1	42	19
Ilorin –South		50	17
Moro		33	20
Baruten		36	9
Kaiama		30	10
Edu		34	8
Patigi		24	9
Ekiti		22	8
Oke-Ero		21	7
Irepodun		34	15
Ifelodun		57	18
Oyun		47	14
Offa		19	8
Isin		34	8
Total	1	548	200

Table 1: Distribution of Hospitals by Local Government Areas, Kwara State, Nigeria
Source: Field Survey, 2018

The Independent National Electoral Commission has used GIS to redistribute electoral wards with the introduction of electoral voting system, through which all eligible voters, eliminates duplication and thereby minimizes discrepancies in the electoral process. This is also useful in agricultural sector to analyze soil data and to determine (Okon, 2015). In telecommunication sector, Okon (2015) opined that, GIS can be a great asset in planning and decision-making tool for telecom industries. Indeed, the success or failure of telecommunication evolves in viable GIS. In the same vein GIS is also being utilized as the Central Bank of Nigeria (CBN), introduced GIS for mapping of areas to drive its financial inclusion strategy.

2. The Study Area

Kwara State is the gateway state between northern and southern Nigeria, occupying a land area of 32,500 square kilometres. It is located between latitude $8^{0}00^{1}$ and $9^{0}10^{1}$ north and longitude $2^{0}45^{1}$ and $6^{0}40^{1}$ east. Also, it is bounded in the north and east by River Niger, while it shares boundary in the south with Oyo, Osun and Ekiti States. Similarly, Kwara State share boundary with Kogi State and Benin Republic in the east and west respectively (Oyebanji, 2000). Kwara State has a population of 2,365,353 million people; this made up of 1,193,783 Males and 1,171,570 Females (Federal Government of Nigeria Official Gazette, 2007). It has both highland and lowland with an elongated shape that cover about 32,500sqkm with interspersed hills and valleys in part of Baruten, Kalama and Moro Local Government Areas. The state is also drained by many rivers, chief among which is River Niger. Others include rivers Asa, Moro, Moshe, Ero, Oyun, and Osin, all of which have been harnessed for water supplies to towns and villages. Many of these rivers have also been utilized for agricultural purposes. There are two main climate seasons, dry and wet seasons in Kwara State; with annual rainfall ranging from 1000mm -1500mm and maximum average temperature ranges between 30^{0}C-35^{0}C (Oyebanji, 2000). The vegetation is made up of rain forest and wooded savannah; the rain forest has trees like Iroko, Opepe and other trees are used in the construction industry. The wooded savannah is however confined to the central and northern parts of the state. Notable trees around these areas are locust bean, akee-apple and Shea butter. The soil type is lateritic in nature with reddish or brownish due to the presence of iron.

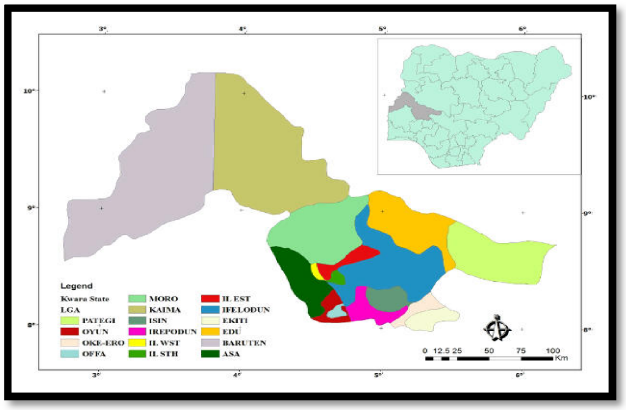

Figure 1: Map of Kwara State by Local Government Areas
Source: Adopted from Akanbi, 2015

3. Methodology

This involved three stages and the first stage included collection of data on Waterborne Diseases (WBDs) for the study from health department of each headquarters that makes up the study area. The second stage included determination of coordinates of administrative headquarters of each headquarters of the local government with the aid of ArcGIS software. Health departments of each area councils were selected because data relating to the health of each area council were domiciled in them. The last stage involved drawing a geospatial map using the available data with the aid of ArcGIS.

Local Government Areas	Common Diseases	Number Quantity	Coordinate GPS Lat. (E)	Coordinate GPS Long. (N)
Asa	Cholera	200	4°21'28.84"E	8°25'53.688"N
Ilorin-West	Hepatitis B	240	4°33'7.831"E	8°26'46.113"N
Ilorin –East	„	400	4°50'53.791"E	8°38'7.628"N
Ilorin –South	Cholera	260	4°43'19.447"E	8°24'8.84"N
Moro	Typhoid	200	4°34'52.679"E	8°48'54.194"N
Baruten	Hepatitis B	300	3°34'0.454"E	9°13'4.6"N
Kaiama	Diahorea	210	4°20'1.467"E	9°25'36.014"N
Edu	Tryphanomiasis	150	5°9'14.701"E	8°52'6.417"N
Patigi	Onchoceriasis	119	5°49'26.218"E	8°29'23.385"N
Ekiti	Typhoid	128	5°15'39.146"E	8°1'43.283"N
Oke-Ero	„	130	5°16'49.045"E	8°11'37.425"N
Irepodun	„	215	4°58'45.61"E	8°6'57.829"N
Ifelodun	„	218	5°9'49.651"E	8°31'43.184"N
Oyun	„	114	4°35'10.154"E	8°4'38.031"N
Offa	„	158	4°41'52.074"E	8°7'32.778"N
Isin	„	148	5°0'47.933"E	8°15'7.122"N
Total		3,190		

Table 2: Distribution of Water Borne Diseases by Local Government Areas, Kwara State, Nigeria
Source: Author's Field Survey, 2018

4. Findings and Discussion

A survey of the study area shows the level of prevalence of some water borne diseases in Kwara State for the year under review. The prevalence ranges between 114 cases of typhoid in Isin Local Government Area and 400 cases of hepatitis b in Ilorin-West Local Government Area of the state. These data were juxtaposed on each headquarters in relation to their data with the aid of ArcGIS (Table 2). The outcome of this process is geospatial map (Figure 2).

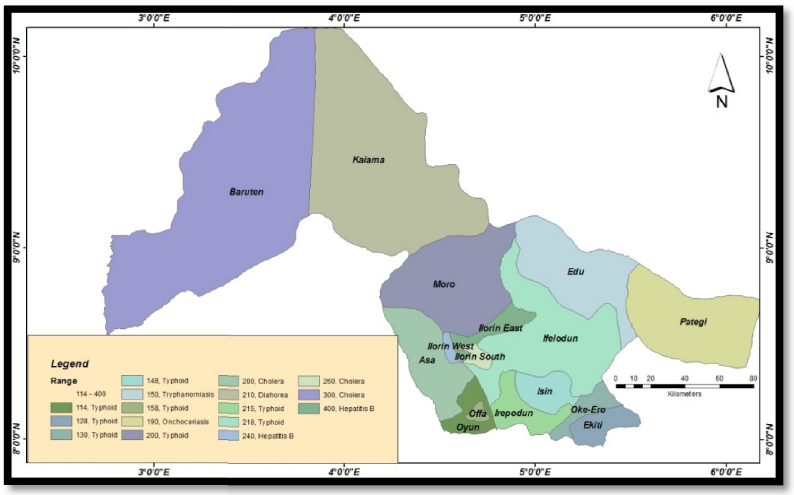

Figure 2: Geospatial Map of Major WBDs in Kwara State, Nigeria

5. Recommendations

The study concludes that, GIS has become an important tool in spatial analysis of geographical phenomena. It is most useful as an alternative to explain the complex spatial prevalence of diseases, thus a means of curtailing epidemic situation with the associated challenges.

As a result of the foregoing, the study recommends the application of GIS to address a number of health issues ranging from assessing diseases' prevalence to public hospitals to other geographical related questions, not only of the study area, but human society.

6. References

i. Ajewole, P.O. and Oladipo I.O. (2010) Prospects of precision agriculture in Nigeria. Retrievedhttps://www.researchgate.net/publication/267270319_Prospects_of_precision_agriculture_in_Nigeria
ii. Akanbi, O.A (2015) Spatio –Temporal Analysis of Prevalence of Waterborne Diseases in Kwara State. An Unpublished Ph. D, Ahmadu Bello University. Zaria- Nigeria.
iii. Akanbi, O.A. (2019) Geospatial Analysis of Public Secondary Health Facilities in Abuja, Municipal Area Council, Abuja, Nigeria. *Ethiopian Journal of Environmental studies and Management,* 12(1):56-63
iv. Dempsey, C. (1999) Mapping and Geographic Information Systems (GIS): What is GIS? Retrieved from https://researchguides.library.wisc.edu/GIS.
v. Federal Republic of Nigeria (2007) Official Gazette, Lagos-Nigeria., 24(94).
vi. Great Lakes Coastal Planning (2007) Introduction to Geographic Information Systems (GIS)Retrieved from
vii. https://www.aqua.wisc.edu/CRP/introduction to Geographic Information Systems
viii. Jacob, D.E. and Olajide, O. (2011) Relevance and Challenges of GIS in the Management of Protected Forest in Nigeria. *Nigerian Journal of Agriculture, Food and Environment. 7(2):*63-66
ix. Jimoh, U.U. and Wahab, B. (2015) Locational Distribution of Health Care Facilities in the Rural
x. Area of Ondo State. *British Journal of Education, Society & Behavioural Science 11(1)*: 1-8.
xi. Muslim, O and Ifeanyi, M.N (2017) The use of Geospatial Technology for Managing Elections in Nigeria: Issues and Challenges. *International Journal of Innovation and Research in Educational Sciences 4 (4),* ISSN (Online): 2349–5219
xii. Njar, G.N. (2015) The Challenges, Services and Real -Time Capabilities of Mobile and Web GIS for Emergency Management in Nigeria. FIG Working Week 2015. From the Wisdom of Ages to the Challenges of the Modern World Sofia, Bulgaria, 17– 21May 2015
xiii. Nofal, J (2012) Basic Uses of GIS .Retrieved from https://www.gislounge.com/basic-uses-of-gis/
xiv. Okon, I.I. (2015) Uses, Applications and Prospects of GIS in Nigeria. A Paper presented at UNICAL GIS Day, On 26-Nov-15 2015.
xv. Osei, A, Edmund, C, M and Twumasi, Y.A. (2006) Use of GIS and Remote Sensing Technology as A Decision Support in Land Administration: The Case of Lagos, Nigeria. Retrieved from https://www.fig.net/resources/proceedings/fig_proceedings/.../ts06_01_osei _etal.pdf
xvi. Oyebanji, J.O. (2000), Kwara State. In: Mamman, A.B.; Oyebanji, J.O. and S.W. Peters (eds).*A people United, A Future Assured*, Gabumo, Calabar, Nigeria 293 – 294.
xvii. S'aad, I and Kuta, A.A. (2015) Challenges in using Geographic Information Systems (GIS) to
xviii. Understand and Control Crime in Nigeria. *Journal of Humanities and Social Science, 20 (3): 43*-48.
xix. Uluocha, N. O. (1999) Issues in the Development of GIS Databases for Urban Mapping in
xx. Nigeria. In: P. Rizzi (Ed.) Proceedings of the 6th International
xxi. Conference in Computers in Urban Planning and Urban
xxii. Management, Franco Angeli, Milano, Italy
xxiii. Yusuf, R. (1997) GIS Higher Education Development in Nigeria: The Example of the GIS Programme, The University of Ibadan, Nigeria.http://www.ncgia.ucsb.edu/cnf/gishe97