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SPATIAL DISTRIBUTION PATTERN OF LOWER BASIC SCHOOLS FOR THE IMPLEMENTATION OF LOWER BASIC EDUCATION IN RIVERS STATE, NIGERIA

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Abstract

This study examined the spatial distribution pattern of public lower basic schools for the implementation of lower basic education in Rivers State. One research question guided the study. The descriptive survey design was used. The population for the study was the 942 public lower basic schools in Rivers State. Stratified random sampling technique was used to draw the sample size of 289 schools. A handheld Global Positioning System receiver was the instrument used for the study. Nearest neighbour analysis was used to answer the research question. Findings revealed that the overall pattern of distribution of existing public lower basic schools in Rivers State is clustered. Specifically the distribution of schools in Degema and Akuku-Toru Local Government Areas is dispersed with Rn of 1.72 and 1.36 respectively. The pattern of distribution of Bonny, Opobo/Nkoro, Abua/Odual, Port Harcourt, Obio/Akpor and Ikwerre indicates a clustered pattern with Rn of 0.91, 0.83 0.84, 0.74, 0.72 and 0.24 respectively. The study therefore recommended among other things that the state governments should make policies that guide school mapping and ensure their strict compliance. Since school mapping is an integral aspect of micro-planning, every local government should be statutorily required to have a comprehensive school map of its area that should be updated at least every decade. The services of professional planners should be utilized by the Ministry of Education and should also ensure that modern mapping equipment are deployed for this very important exercise.

Key words: *GIS, basic education, spatial distribution, nearest neighbour analysis*

Introduction

A major objective of any nation is to improve the quality of life and wellbeing of its citizens. Education is generally regarded as a catalyst for achieving this objective. Formal education is said to be a structured means through which a nation develops its human resources by providing them with useful knowledge, skills, attitudes and values which will enable them to be productive and active agents in socio-economic and political development. It is globally recognized as a potent instrument for sustainable growth and development (Osah, 2021).

Quality education significantly improves the quality of lives of individuals, empowers them politically, socially and economically, thereby developing in them the capacity to be liberated from the chains of poverty, illiteracy, marginalization, social exclusion and ignorance (Obasi, 2018). Education is much more than what many people understand it to be. Ordinarily, it goes beyond mere certification, reading and writing, it is a process that instils good morals, a positive attitude towards life ethical behaviour and good human relations (Osah, 2021). This is essential to human development. Ipso facto, education is an essential aspect of human development because it provides an avenue to help people to grow economically and broaden their understanding of cultural and social practices in the community. Education is the key to development as it opens up a world of possibilities from advances in health care services, to innovative tools for use in agricultural sector.

Going forward, in order to reap these benefits fully, there is a need to unleash the potential off the human mind. The best way to achieve this is through education, and it should not be taken lightly (Osah, 2021). It is on this premise that the United Nations (UN) in 1948 under the Universal Declaration of Human Rights (UDHR) declared education 'a right of everyone'. This was the first effort to organize and protect the human rights of all people with regards to education (Moyn, 2014). After the 1948 Declaration, there were other major international and Pan-African education related conferences and initiatives that were held and launched to promote education as a right for all. In 1990, a world conference on Education for All (EFA) was held in Jomtien, Thailand (Power, 2014). The Jomtien Declaration particularly led many countries to redefine and update existing policies and programmes of basic education in their countries (Verspoor, 2008). This gave rise to the introduction of the Universal Basic Education Programme in Nigeria in 1999 (Osah, 2021). Education is an excellent equalizer that has the best chance of improving a person's standard of living as well as positively impacts the lives of those around them. Again, education provides people with the tools they need to avoid exploitation and abuse effectively (Chapman, Muijs, Reynolds, Sammons, & Teddlie, 2015). Currently, the World Bank has a campaign that aims at emphasizing equal learning opportunities for poverty reduction and better human development. Having the necessary literacy skills could greatly help in reducing the number of people living below the poverty line. That is why various governments across the globe are struggling to provide free basic education to their people (Girltalkhq, 2019).

The Universal Basic Education (UBE) Programme is a nine year uninterrupted educational programme that is free, compulsory and it comprises both the primary and junior secondary education (Obasi & Madu, 2018). It was designed to eradicate illiteracy, poverty and ignorance. The vision of the UBE programme as stated by the Federal Government of Nigeria (2004) in her UBE Act of 2004 is that at the end of the nine years of uninterrupted education programme, every child should have acquired appropriate and relevant literacy, numerical and life skills that would enable them contribute their quota to the nation's development. The fundamental objective of the UBE programme is to serve as a forerunner of national movement for the actualization of the nation's universal basic education vision, working in consonance with stakeholders (Obasi & Madu, 2018). The UBE bill was signed into law in 2004, following its passage by the National Assembly. The formal school system of the UBE Programme is divided into lower basic education which is for children between the ages of 6-11 years and upper basic education for children between the ages of 12-14 years. However, the scope of this study is limited to lower basic education, conventionally called elementary or primary education (Ohia & Obasi, 2016)

Lower basic education is the foundation upon which all the other levels of education stand. Whatever happens at this level can either make or mar the other levels of the education system (Osah, 2021). The Federal Government of Nigeria (2014) in her National Policy on Education stated the objectives of this level of education, inter alia, to inculcate permanent literacy, numeracy and the ability to communicate effectively, to lay a sound basis for scientific, critical and reflective thinking, to instil social, moral norms and values in the child. It is also meant to develop in the child the ability to adapt to the changing environment, manipulative skills that will enable the child function effectively in the society within the limits of the child's capacity (Obasi, & Madu, 2018). Lower basic education provides children with basic understanding of various subjects as well as the skills they will use throughout their lives.

As acknowledged by the United Nations Children's Fund (2019), providing children with this education has many positive effects that include decreasing poverty, decreasing child mortality rates, encouraging gender equality and increasing environmental concern. Lower basic schools provide children with some of their first opportunities to meet people from different religions, races and socio-economic statuses, as well as people with different disabilities. Elementary school teachers therefore, have a unique chance to teach children about tolerance and respect (Learning.org, 2021). Commenting on the critical role of basic education, Study International (2020) remarked that children undergo the most remarkable brain growth up until the age of eight. Hence, education at this stage is crucial in developing their emotional, social, cognitive and physical foundation for lifelong learning and wellbeing. In the same vein, McGee (2018) stated that the fundamental goal of a quality basic education is to establish, create and offer opportunities to kids of various ages as they enter the education system. Through a balanced curriculum, it is intended to provide emotional and cognitive instruction and to assist in social development (Igbokwe, 2015). A quality basic education allows a child to thrive, to learn how to participate and to study and master the basics of the main course subjects. A very important aspect of lower basic education that is often overlooked is the social skills that come from interacting with teachers, pupils and others (Igu, Ogba, & Igwe, 2014).

Lower basic education is therefore an opening stage for the child to actively participate in subsequent levels of education. Uma, Ike-Inegbu and Uduma (2018) noted that lower basic education is made available for children and is planned to give pupils solid basis in reading, writing and mathematics along with an elementary understanding of other subjects such as history, geography, natural science, social science, religion, art and music. These subjects help to build pupils' skills in obtaining and processing information needed to exist well in the home and society (Igu, *et al*., 2014). Formal schooling at this level of basic education does not require any previous formal education; however it is becoming ever more common for children to have attended a pre-primary programme before entry into lower basic schools (Osah, 2021). Access to basic education involves making schools to be within the reach of all irrespective of gender, socio-economic status, physical challenge or tribe (Obasi, 2018). Universal access to and completion of basic education is a right of all school age children. That is why the spatial distribution of schools has received serious interest in recent times (Obasi, & Madu, 2018).

Proper spatial distribution of schools is vital to enhance access. Distribution of schools has an effect on the participation rate and access to schools (Obasi, 2019). Ikpasaja (2014) observed that the government has not taken into account inequalities existing among regions, social groups and geographical areas in the distribution of basic education schools in Nigeria. Construction of schools should be done with both national and international standards of school's placement. Duze (2010) noted that many schools are situated around noisy areas and vulnerable to traffic accidents on the adjacent of main roads. Some schools are also located on steep slope and rigid areas. Some schools also concentrate only in the centre of the town while others are far from the residential houses of students. Schools need good environment for effective learning outcomes. Hence, schools need to be located on fitting location; these fitting locations should also be the most advantageous and economical to the public in terms of accessibility. Bukhari, Rodzi and Noordin (2010) reported that location of schools has always been done without the use of any scientific methods and has led to sprouting of schools in unsuitable locations.

A foremost scientific method for identifying the locations of schools is Geographical Information System (GIS). Aschale (2017) submitted that a GIS is a special purpose digital database in which an ordinary spatial coordinating system is the primary reference. Also, Jamal (2016) observed that GIS technology supports the selection of suitable and appropriate location of institutions by incorporating and taking into account both national and international selection site standards. GIS technology collects, stores, integrates and analyses spatial data. Data from maps, aerial photos, satellite images or field data, retrieval, and search of data, transformation of data, analysis and modelling and spatial statistics are things required when using the GIS technology (Bivand, Pebesma, Gomez-Rubio, & Pebesma, 2013). One of the main objectives for using GIS technology is to enable policy makers locate schools in order to establish the spatial pattern of distribution and identify proposed site for new schools. A GIS application can be used to improve the provision of educational and instructional support services to pupils (Osah, 2021). This should be done in the implementation of educational programmes to reduce the number of out-of-school children that cannot access basic education institutions in order to ensure equity and equality of access (Richards, 2014). The equity concept can be operational by minimizing variability of access to educational services (Osah, 2021). Variability can be measured in terms of the standard deviations or variance of residence to place of educational services. Hence, the more the schools, the closer each potential user is to the one serving him or her (Rawls, cited in Wazzan, 2017). The Nearest Neighbour Analysis (NNA) is a descriptive statistical tool used to determine the spatial pattern of schools distribution after they have been located.

Nearest neighbour analysis is a concept that was originally developed by plant ecologists Clark and Evans in 1954 towards the distribution of various developed plant species over the earth surface (Osah, 2021). The method indicates the degree to which any observed distribution deviates from what may be expected, if the distributions of points are random. The Nearest neighbour tool measures the distance between each feature and its nearest neighbour's. Then the average distance of the entire nearest neighbour is taken (Osah, 2021). If the average nearest neighbour index is < 1, the pattern exhibits clustering. If the index is > 1, the trend is toward dispersion. However it is regular when it is =2.15. The average nearest neighbour index is calculated as the observed mean distance divided by the expected mean distance (Osah, 2021). This can help to determine if the pattern of schools distribution is clustered, dispersed or random (Tanveer, Balz, Sumari, Shan, &Tanweer, 2019). A clustered spatial pattern shows that the schools are not evenly distributed. An uneven distribution means that most pupils in the area would not have access to schools (Mustapha, Akintunde, Alaga, Badru, Ogbole, Samuel, & Samuel, 2016). A dispersed spatial pattern of schools distribution reveals that the schools are evenly distributed which is a strong indicator of equal access to schools (Valenzuela, Bellei, & Ríos, 2014). A random spatial pattern of schools distribution means that the distribution is neither clustered non dispersed (Osah, 2021).

Statement of the Problem

Educational facilities are essential to educational development and human capacity building. Both the educational institutions and other educational resources are critical components in the education process. In ensuring unfettered access to basic education which is the right of every child, it is the responsibility of the government to provide these facilities in such a manner that no child of school age, irrespective of his or her gender, racial background, religion or socio-economic status is left behind. However, the distribution of schools in most part of Nigeria and Rivers state in particular is mostly determined based on political affiliation and convenience that is devoid of equity and economic rationality.

The obvious consequence is gross imbalance in their provision resulting to overutilization and underutilization of educational institutions in a particular area. These imbalance in the provision of educational institutions impacts negatively on access, participation, completion rates and ultimately, the Universal Basic Education programme. It is obvious that lower basic schools in most areas had been established without considering how they are distributed in order to guarantee access and economic efficiency. Lack of map showing the distribution pattern of the schools in the study area has made it very difficult for educational planners and policy makers to see at a glance how these schools are spread. This dangerous situation was the fundamental reason for this study to examine the spatial distribution of lower basic schools in Rivers State.

Purpose of the Study

This study sets out to identify the spatial pattern of distribution of existing lower basic schools in Rivers State

Research Questions

What is the spatial pattern of distribution of existing lower basic schools in Rivers State?

Methods

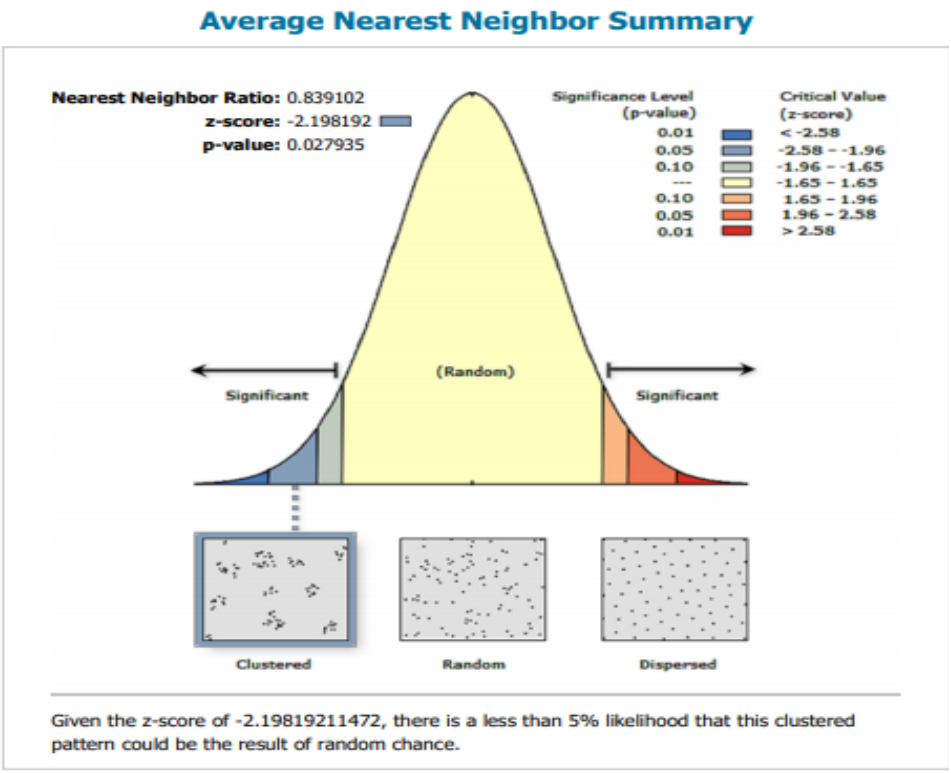
The research design used for this study was the descriptive survey. The population for the study was the 942 public lower basic schools in the 23 Local Government Areas in Rivers State, Nigeria. A sample of 289 schools was used for the study. Stratified random sampling technique was used to draw the sample for the study. The twenty three Local Government Areas were stratified into upland and riverine areas. Simple random sampling was used to draw four (4) Local Government Areas from each sub-group. All the schools in each of the selected Local Government Areas were used for the study. A handheld Global Positioning System (GPS) receiver was the instrument used for the study. The handheld GPS receiver was used to determine the geographical locations of all the public lower basic schools in Rivers State to determine the pattern of distribution. The nearest neighbour analysis was used to answer the research question. When Rn (average nearest neighbour index) is less than 1, the pattern is clustered. When Rn is greater than 1, the trend is towards dispersion and when Rn is equal to 2.15 the trend is regular.

Results

Research Question: What is the spatial pattern of distribution of existing lower basic schools in Rivers State?

Figure 1

Average Nearest Neighbour Summary of Public Lower Basic Schools in Abua/Odual Local Government Area



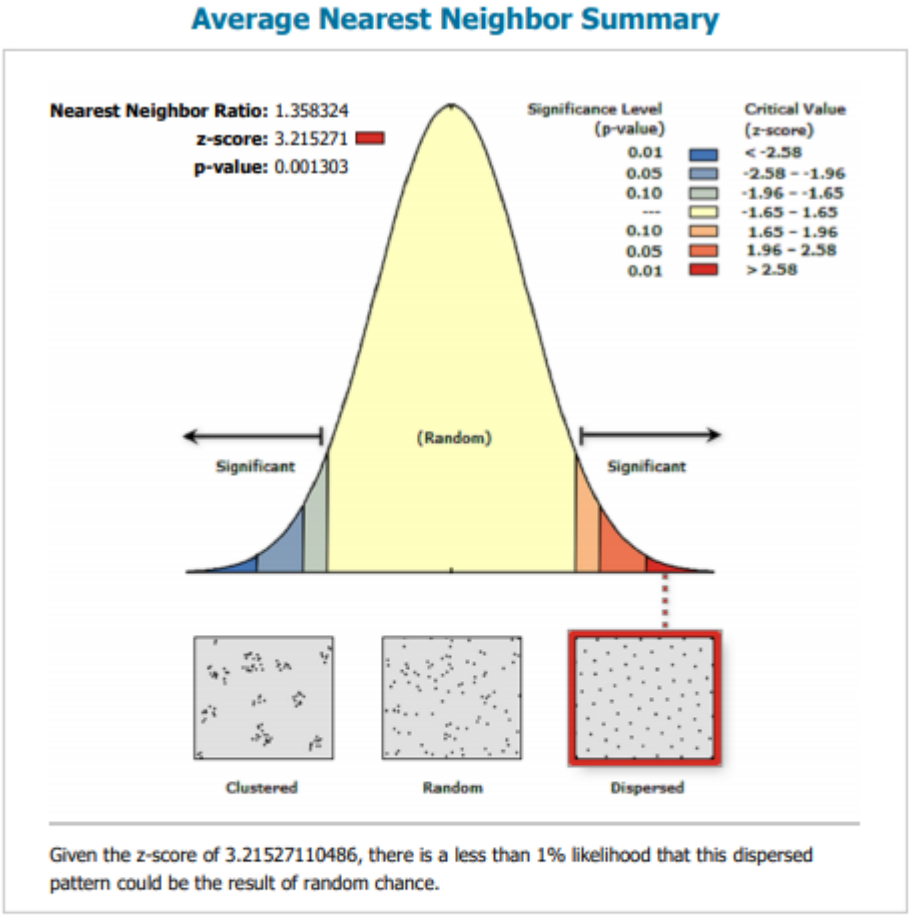
Average Nearest Neighbor Summary

Observed Mean Distance:	1804.8913 Unknown Units
Expected Mean Distance:	2150.9787 Unknown Units
Nearest Neighbor Ratio:	0.839102
z-score:	-2.198192
p-value:	0.027935

From figure 1, the average nearest neighbour index (Rn) for Abua/Odual Local Government Area is 0.84 and the calculated z-score is -2.198. Since Rn< 1 and the calculated z-score is within the critical values of < -2.58, the spatial pattern of public lower basic schools distribution is clustered, however there is a less than 5% likelihood that this clustered pattern could be as a result of random chance.

Figure 2

Average Nearest Neighbour Summary of Public Lower Basic Schools in Akuku-Toru Local Government Area



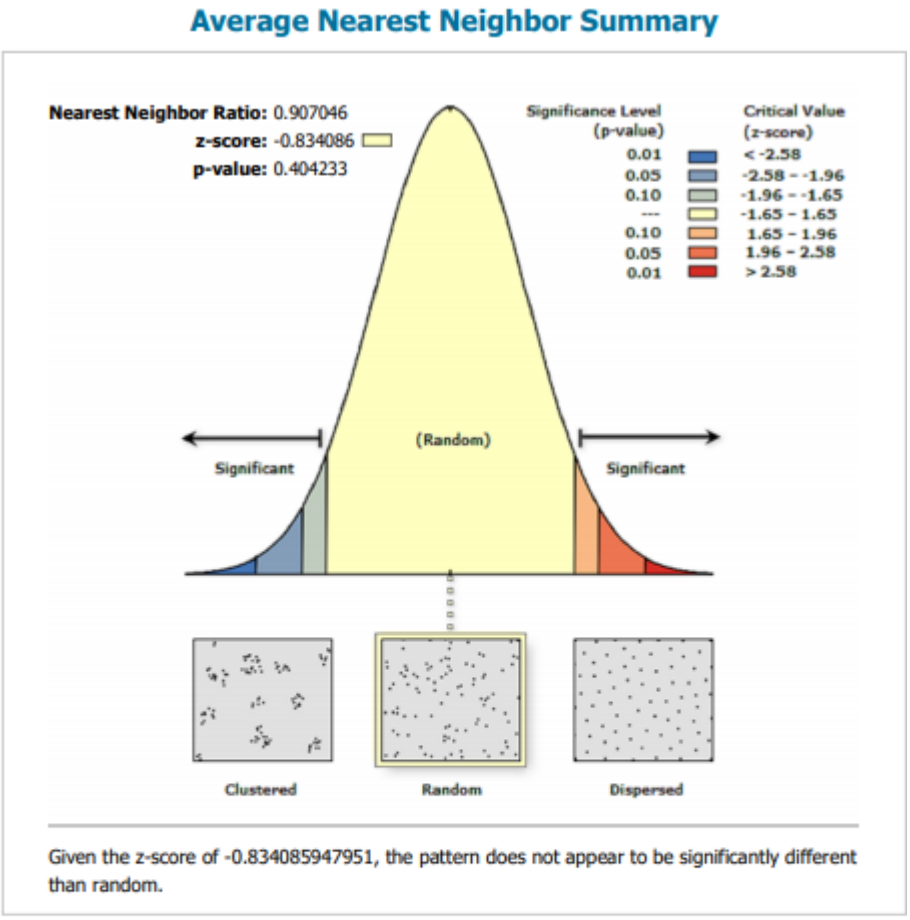
Average Nearest Neighbor Summary

Observed Mean Distance:	18756.8119 Unknown Units
Expected Mean Distance:	13808.7951 Unknown Units
Nearest Neighbor Ratio:	1.358324
z-score:	3.215271
p-value:	0.001303

From figure 2, the average nearest neighbour index (Rn) for Akuku-Toru Local Government Area is 1.36 and the calculated z-score is 3.22. Since Rn>1 and the z-score is within the critical values of > 2.58, the spatial pattern of public lower basic schools distribution is dispersed, however there is a less than 1% likelihood that this dispersed pattern could be the result of random chance.

Figure 3

Average Nearest Neighbour Summary of Public Lower Basic Schools in Bonny Local Government Area



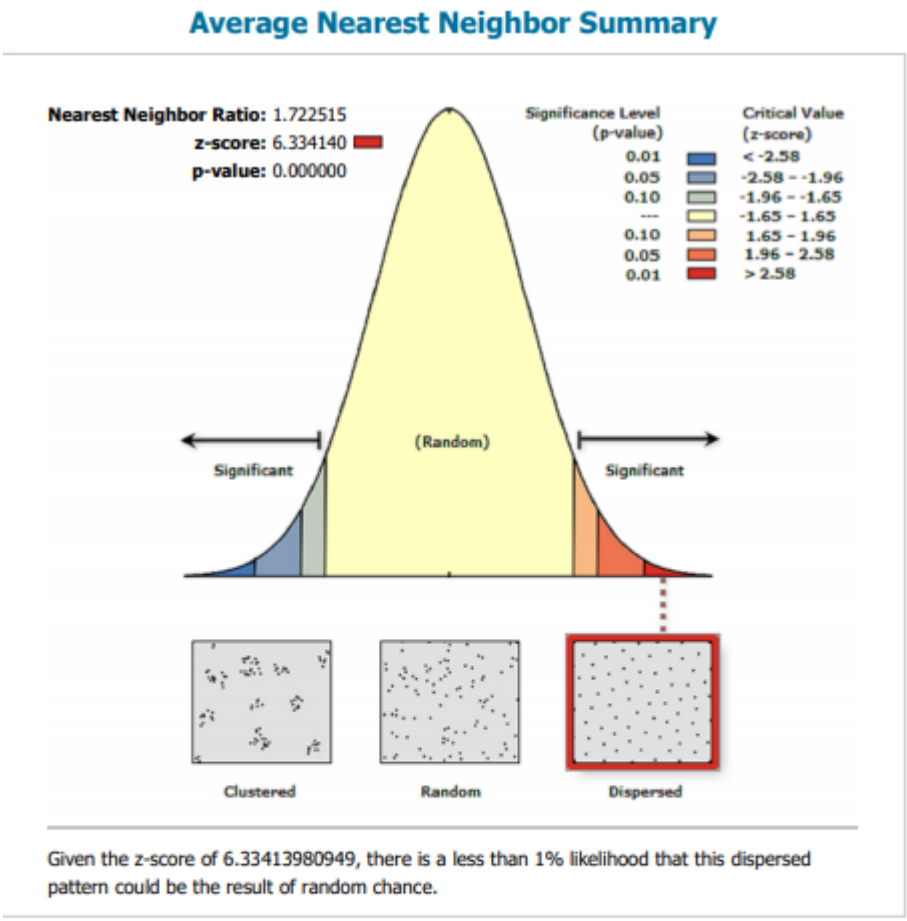
Average Nearest Neighbor Summary

Observed Mean Distance:	1738.4072 Unknown Units
Expected Mean Distance:	1916.5592 Unknown Units
Nearest Neighbor Ratio:	0.907046
z-score:	-0.834086
p-value:	0.404233

From figure 3, the average nearest neighbour index (Rn) for Bonny Local Government Area is 0.91 and the calculated z-score is -0.834. Since Rn< 1 and the z-score is within the critical values of -1.65 to 1.65, the spatial pattern of public lower basic schools distribution does not appear to be significantly different than random.

Figure 4

Average Nearest Neighbour Summary of Public Lower Basic Schools in Degema Local Government Area



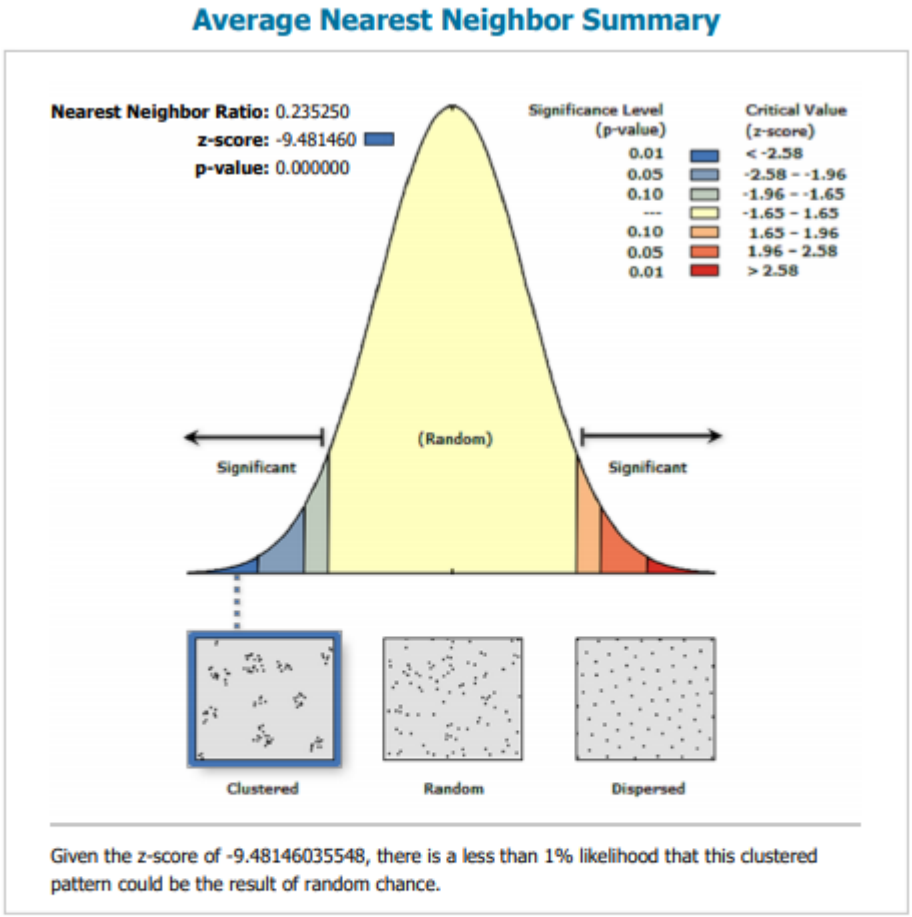
Average Nearest Neighbor Summary

Observed Mean Distance:	25962.1909 Unknown Units
Expected Mean Distance:	15072.2546 Unknown Units
Nearest Neighbor Ratio:	1.722515
z-score:	6.334140
p-value:	0.000000

From figure 4, the average nearest neighbour index (Rn) in Degema Local Government Area is 1.73 and the calculated z-score is 6.33. Since Rn>1 and the z-score is within the critical values of > 2.58, the spatial pattern of public lower basic schools distribution is dispersed, however there is a less than 1% likelihood that this dispersed pattern could be the result of random chance.

Figure 5

Average Nearest Neighbour Summary of Public Lower Basic Schools in Ikwerre Local Government Area



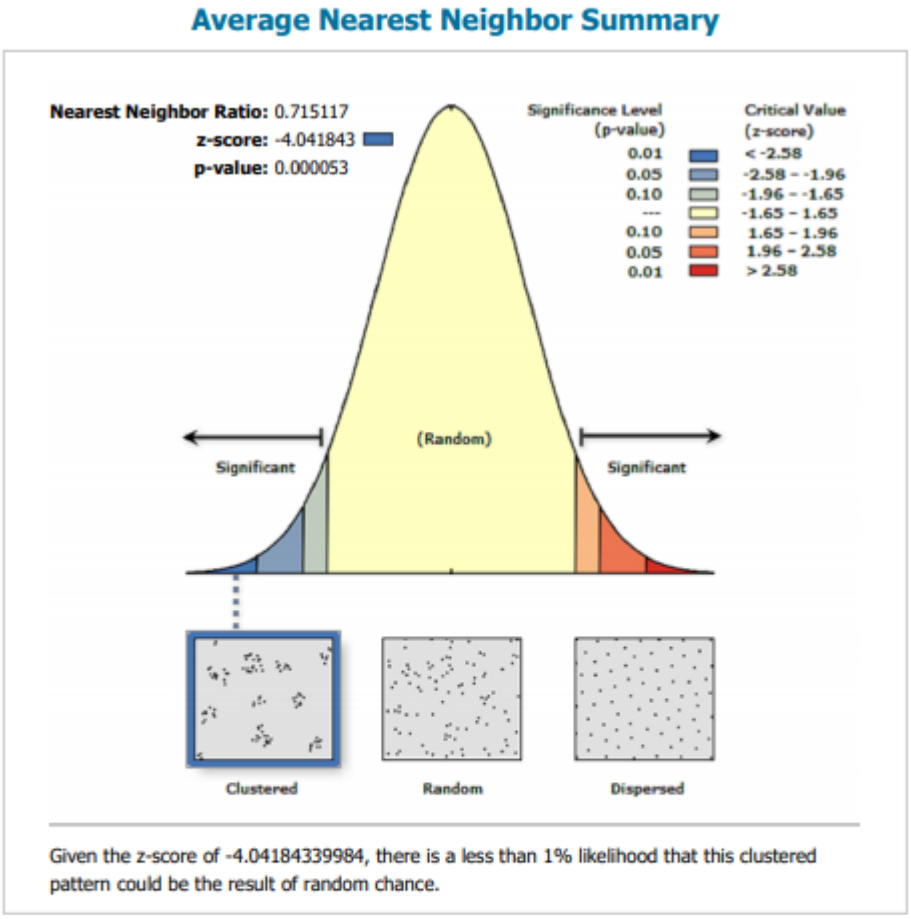
Average Nearest Neighbor Summary

Observed Mean Distance:	970.1837 Unknown Units
Expected Mean Distance:	4124.0608 Unknown Units
Nearest Neighbor Ratio:	0.235250
z-score:	-9.481460
p-value:	0.000000

From figure 5, the average nearest neighbour index (Rn) in Ikwerre Local Government Area is 0.24 and the calculated z-score is -9.48. Since Rn< 1 and the z-score is within the critical values of < -2.58, the spatial pattern of public lower basic schools distribution is clustered, however there is a less than 1% likelihood that this clustered pattern could be the result of random chance.

Figure 6

Average Nearest Neighbour Summary of Public Lower Basic Schools in Obio/Akpor Local Government Area



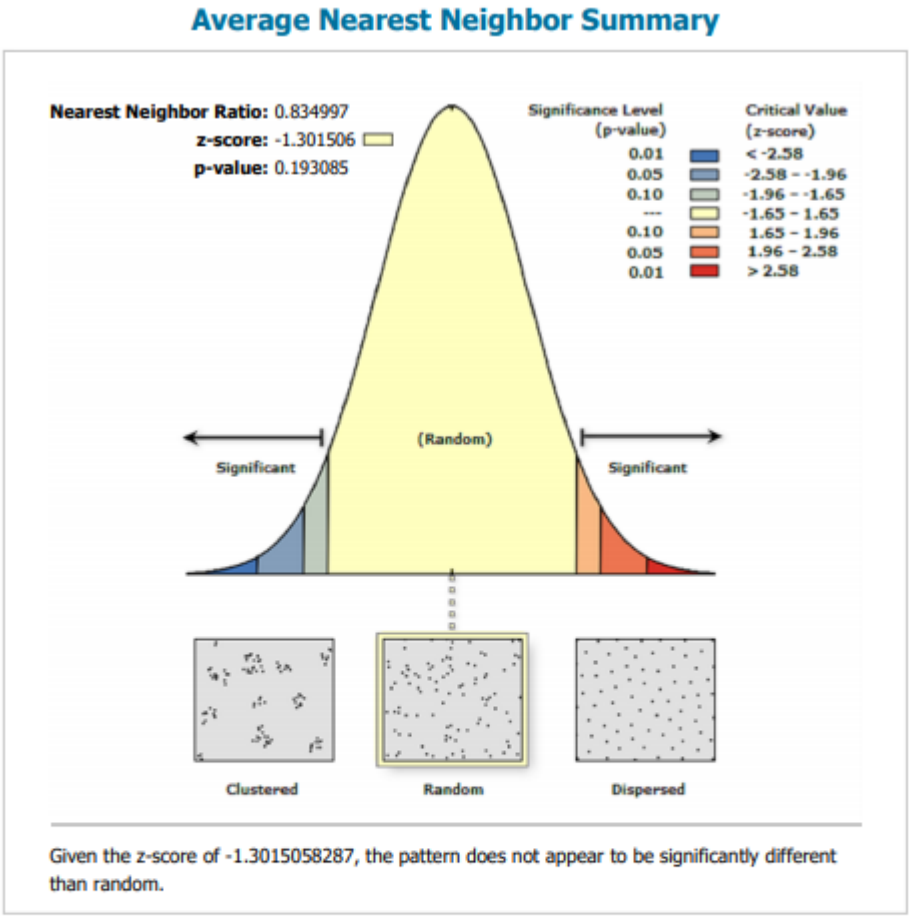
Average Nearest Neighbor Summary

Observed Mean Distance:	865.3040 Unknown Units
Expected Mean Distance:	1210.0182 Unknown Units
Nearest Neighbor Ratio:	0.715117
z-score:	-4.041843
p-value:	0.000053

From figure 6, the average nearest neighbour index (Rn) in Obio/Akpor Local Government Area is 0.72 and the calculated z-score is -4.042. Since Rn< 1 and the z-score is within the critical values of < -2.58, the spatial pattern of public lower basic schools distribution is clustered, however there is a less than 1% likelihood that this clustered pattern could be the result of random chance.

Figure 7

Average Nearest Neighbour Summary of Public Lower Basic Schools in Opobo/Nkoro Local Government Area



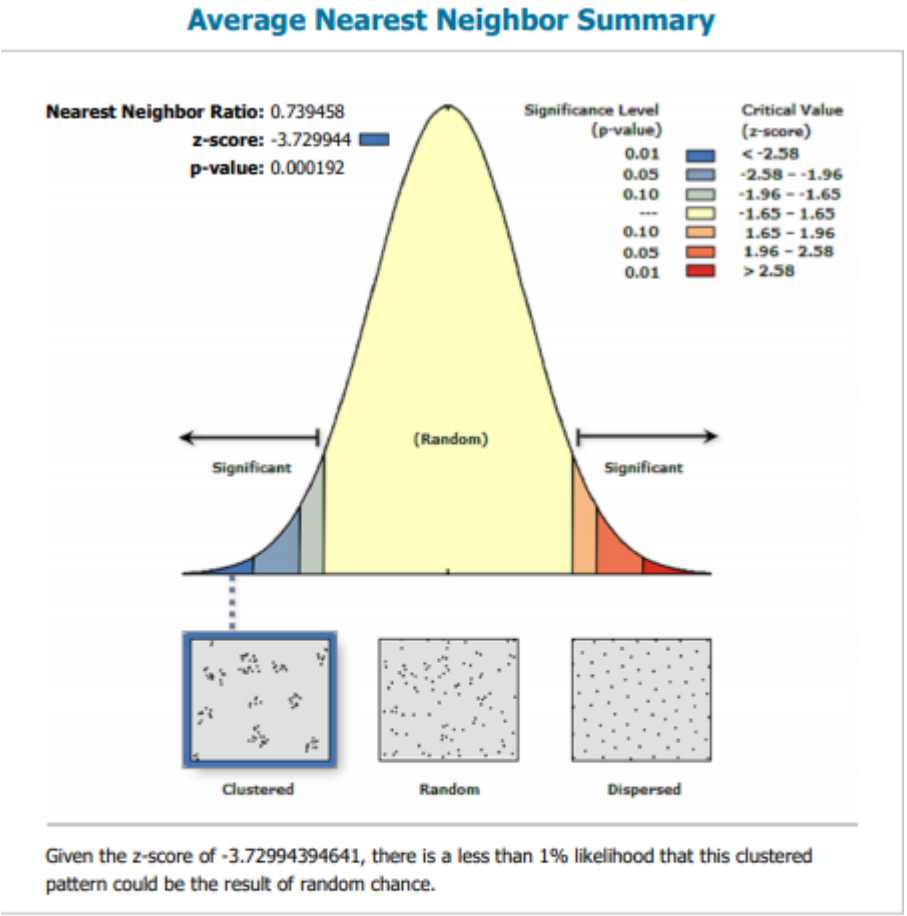
Average Nearest Neighbor Summary

Observed Mean Distance:	1295.5606 Unknown Units
Expected Mean Distance:	1551.5744 Unknown Units
Nearest Neighbor Ratio:	0.834997
z-score:	-1.301506
p-value:	0.193085

From figure 7, the average nearest neighbour index (Rn) in Opobo/Nkoro Local Government Area is 0.83 and the calculated z-score is -1.302. Since Rn< 1 and the z-score is within the critical values of -1.65 to 1.65, the spatial pattern of public lower basic schools distribution does not appear to be significantly different than random.

Figure 8

Average Nearest Neighbour Summary of Public Lower Basic Schools in Port Harcourt Local Government Area.



Average Nearest Neighbor Summary

Observed Mean Distance:	439.9948 Unknown Units
Expected Mean Distance:	595.0232 Unknown Units
Nearest Neighbor Ratio:	0.739458
z-score:	-3.729944
p-value:	0.000192

From figure 8, the average nearest neighbour index (Rn) in Port Harcourt Local Government Area is 0.73 and the calculated z-score is -3.739. Since Rn< 1 and the z-score is within the critical values of < -2.58, the spatial pattern of public lower basic schools distribution is clustered, however there is a less than 1% likelihood that this clustered pattern could be the result of random chance. From Figures 1-8, the nearest neighbour analysis for the distribution of lower basic schools in the study area revealed a clustered pattern for the overall distribution of lower basic schools in Rivers state.

Discussion

Finding from the study showed that the pattern of distribution of existing lower basic schools in Rivers State is clustered. This is in agreement with the studies of Ibara (2019), Oloko-Oba *et al*. (2016) and Abba (2010). Their studies on spatial distribution of schools in Funtua educational zone of Kastina state, Ilorin West Local Government Area of Kwara State, and Rivers State respectively revealed a clustered pattern. Also, in a study carried out in Bida City, Nigeria by Haruna and Banki as reported by Wazzan (2017), findings showed that their distribution patterns were not guided by population distribution in the wards (L.Q varied between 0-6.8 for primary schools and 0-27.2 for secondary schools). This implied that some areas in Bida City are

deficient in basic education institutions and quite a number of the inhabitants have inadequate access to these institutions. However, the findings of Aliyu, Shahidah and Aliyu(2013) and Hafeez, Akinola and Nzere (2019) who carried out a related study in Yola North Local Government Area of Adamawa State and Ibadan, Oyo State were different. Findings from their study showed that the pattern of school distribution was random.

The clustered pattern of distribution observed in the study area shows that there is an uneven distribution of lower basic schools in Rivers state as a whole. Schools are not equally accessible by all pupils of school age, leaving pupils to travel long distances to school. It appeared that priority was not given to the parameters of school location by the agencies saddled with the responsibility of approving and locating schools. Duze (2010) stated that closeness to homes for approval and location of schools is a very important consideration since too far a distance to school could lead to complete dropout from the school system. Walking long distances to school creates avenues for poor academic performance, poor participation, poor attendance which eventually leads to repetition and withdrawals. Poor access to schools and other educational facilities also leads to loss of potential manpower, wastages and an increase in private cost of transporting oneself to school. In this case, both access and economic rationality is grossly compromised which is inimical to the UBE programme. The nearest neighbour index in most of the local governments sampled was lower than the z-score and the probability value of the eight local government sampled was below 5%. These further provided evidence that the finding of the study was statistically significant and not as a result of random chance.

Conclusion

Based on the findings of the study, it was concluded that there is an uneven distribution of public lower basic schools in Rivers state. This is as a result of poor consideration to spatial factors.

Recommendations

On the strength of the findings of the study, the following recommendations were made:

- The governments of the states, through the various Ministries of Education should make specific policies that should guide the establishment of schools and also ensure their strict compliance.
- Since school mapping is an integral part of micro planning, every local government should have a comprehensive school map of its area that should be updated at least every decade.
- School mapping should be regularly carried out especially with the introduction of new education programmes or when structural changes are to be carried out in the school system.
- The services of professional educational planners should be utilized by the Ministry of Education and modern equipment deployed for this exercise.

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