

A Gis-Based Analysis of Police Stations Distributions in Kano Metropolis

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Abstract: The paper examines the spatial distribution of police station in Kano Metropolis. Global Positioning System (GPS) was used to measure the coordinates (latitude and longitude) of the stations in the area, while the data pertaining to the number of police personnel in each station were sourced from interview and documented data sourced. The data were analysed using simple and inferential statistics. Also ArcGIS 9.3 (Version) Software was used to draw the map of the distribution. A nearest neighborhood analysis has shown that the distribution of stations is random in the area. One and two kilometer buffer zones were generated and the result shows that the old city of Kano and the eastern part of the metropolis were fully served while the west and southern part were underserved. The ratio of police officer to population in the area is 1: 539 in the area which is far below the United Nation recommended figure of 450. It was also discovered that there is neither significant relationships between the numbers of the station nor between the number personnel in the station and population in the area. The research recommends the needs for population consideration in citing station in the areas as one of the means for achieving better security situations.

Keywords: Police, Kano Metropolis, Manpower, GIS

I. Introduction

Security needs is one of the basics for human survival; indeed it is second to food and clothing. According to Abraham Maslow's theory of hierarchy of human needs security is the second need, only proceed by physiological need which include food and shelter. Since men learn to live together and cater for the security, both of life and property. Police are law enforcing agents whose main function is to provide security and maintain law and order in the societies, states and nations.

In Nigeria prior to the onset of colonization by the British in 1861, there was existence of security via traditional African policing. These methods were rooted in communities and closely interlinked with social and religious structures. The enforcement of traditional customs and believes was carried out by community structures, such as age grades (formal organization whose membership is based on pre-determined age range), secret societies or vocational guilds, such as hunters, farmers or fishers. Through this system of diffused crime control, law and order was maintained. Those days' guards are stationed at locations relative to settlements, such as the king's palace, main entrances into the villages or towns and market places.

According Human right watch (2005) as British sought colonial expansion; they established colonial decentralized forces, with a varied composition which depended on location. In the modern world and Nigeria in particular, there is no way efficient security will be guaranteed without considering the relationship between location and pattern of distribution of security (police stations), demography and size of the community. Identifying such importance, this research found it worthwhile to investigate the distribution pattern of the stations in Metropolitan Kano. This is because life protection and security would not be guaranteed unless police and policing are adequately provided.

According to human right watch (2005), police has been unable to meet the safety and security need of the local community in Nigeria. It further says, as British sought colonial expansion, they established local decentralized force, with a varied composition which depended on location.

Kano metropolis is one of the most densely populated cities in Nigeria. Like all major cities in developing nations, the cities battle with criminal acts due to influx of people. One of the dailies reported that the city has more than one million *almajiris*, the stranded people that are neither employed nor employable.

Fajemirokun *et al*, (2006) in the same view, opined that the level of development in any community depends to a large extent on its state of security. He maintained over the years, the rate of crime in Nigeria has been on the increase and these crimes are being carried out with more perfection and sophistication, due to lack of adequate and modern technology and sufficient manpower.

In Nigeria, the role of geography is under estimated in the police force, which is to a large extent responsible for the inability of the police to prevent and control the alarming increase of crime and criminal activities in the society. It was established that a large proportion of the men of the Nigerian Police Force can hardly ascertain the areas under the jurisdiction of their stations or define the shortest route from their stations to be specific. Police are charged with very many difficult duties which relate mainly to the maintenance of law and

order and the security of the state. Generally these duties include, the prevention and detection of crimes, the apprehension of offenders, the preservation of law and order, the protection of property and the enforcement of all laws and regulations with which they are directly charged. They are regarded as part of the defense forces of the Republic. On the roads, under the sun or rain, a police officer regulating traffic is a familiar sight in large towns. The planning of ways to ease traffic congestion in these towns, the promotion of safety on the roads ... the testing of commercial vehicles for road worthiness and in some places, the testing of persons wishing to obtain driving license are all the duties of the police. Apart from other duties, police women can be seen in large towns assisting in directing traffic, working in juvenile welfare centers and assisting school children to cross busy roads (Okonkwo, 1966). Police has been unable to meet the safety and security need of the local community in Nigeria (Human Right Watch, 2005). In the same vein, Nigerian Policemen are not particularly effective in foreseeing where and when specific future crimes will take place. Therefore, geography plays an important role in law enforcement and criminal justice. Policing agencies are not particular at foreseeing where and when specific future crime will take place (Fattah, 1997).

These problems are attributed to some factors. Among these factors is that the Nigerian Police Force experiences endemic problems with recruiting, training, inefficiency, and indiscipline, and it lacked expertise in specialized fields (Ansalin, 1998). The need to account for spatial effects is critical in the context of geographic phenomena such as crime meanwhile, another scholar added that regional planner, policy makers and policing agencies, all recognizes the importance of better understanding the dynamics of crime. GIS and spatial analysis techniques in particular, are proving to be essential for studying criminal activities (Murray et al., 2001).

Hirschfield *et al* (1995) observed that. It is clear that pattern detection approaches are critical in the analysis of criminal activities. From descriptive point of view, the clustering of objects and events and the apparent associations between them as seen on maps may be accidents of geography or urban structure (Carter, 1994). He added, it is necessary to organize the data so that geographic relationships between objects and events can be measured and quantified. In the 1980s, the rate of crime occurrence grew sharply to nearly epidemic proportions, particularly in Lagos and other urbanized areas due to population explosion (Murray *et al*, 2001).

Geographic Information System (GIS) can be used as a tool by police personnel to plan effectively for emergency response, determine mitigation priorities, analyze historical events, and predict future events (Johnson, 2000). In addition it can help crime officers determine potential crime sites by examining complex seemingly unrelated criteria and displaying them all in a graphical, layered, spatial interface or map. Applications of GIS to crime mapping and management have been successful in many developed countries (Murray *et al*, 2005).

Spatial analysis can reveal descriptive associations between events and places providing a preliminary look at potential causal associations between problems and places. The locations and geographic distributions of these events and survey outcomes can be mapped and their geographic relationships quantified by querying the GIS database (*ibid*).

Anne (2004) opined that the point of using GIS technologies is to allow officers to make better-informed decisions about which areas of the city need additional police power. Crime analysis and crime maps, achieved by GIS, have a major role in reducing crime and improving the effective police activities. GIS allows police personnel to make plans effectively for emergency response, determine mitigation priorities, analyze historical events, and predict future events; it helps crime officers to determine potential incident sites and facilitates to explore the relationship between incident and land use (Ajemirokun, *et al*, 2006).

This study tends to link up two fundamental parameters to consider for effective security. These are number of stations present in the area and the strength of the station in term of manpower. The aim is to use GIS principles to analyse the Spatial Distribution of Police Stations in Kano Metropolis. The paper inventories the number of police stations and man power in each station in the study area. Comparison was also made between police personnel and population distribution in the area.

Study Area

The study area, Kano metropolis lies between latitude $11^{\circ}5' N$ to $12^{\circ}7' N$ and longitude $8^{\circ}23' E$ to $8^{\circ}5' E$ and altitude 472 meters above sea level. Kano Metropolis bordered by Minjibir LGA on the North East and Gezawa LGA to the East, while Dawakin Kudu LGA to the South East, Madobi and Tofa LGAs to the South West. Kano metropolis is the second largest industrial and commercial centre in Nigeria after Lagos and its experience rapid population growth rate, the population of metropolis at (year 2000) is 1.6 million (Maiwada 2000). However the population data shows that in 2003 the population raised to 2.3 million (approximately) and in 2006 to 2.8 million. The area covers almost 499 square kilometers. The Kano Metropolis will be regard as urban Kano, as the sprawling of the expansion is swallowing the peripheral area vis-à-vis. The surrounding lands will be gradually taking over by urban structure site acquire an urban character. Urban Kano is located at the center part of Kano closed settled zone, as the urban Kano is located at the center of this zone it is therefore having the highest density, as a result of industrialization and other economic development, it has also through

time become a cosmopolitan city with all the ethnic groups across the city. Kano is situated in semi-arid climate zone. The study area includes Dala Local Government, Fagge Local Government, Gwale Local Government, Kano Municipal Local Government, Kumbotso Local Government, Nassarawa Local Government, Ungogo Local Government, and Tarauni Local Government. The population of the local government based on 2006 census are Kano municipal (371,243), Dala Local Government (418,759), Nassarawa Local Government (596,411), Fagge Local Government (200,095), Gwale Local Government (357,827), Tarauni Local Government (221,844), Kumbotso local Government (294,391), Ungogo Local Government (365,737) total of (2,826,307) (national population commission 2006).



Source: Cartography and GIS Unit, BUK

Figure1: Map of Kano Metropolis

II. Materials And Methods

Sources of Data

The primary data were collected by oral interview with police officers, through carefully selected questions. Also, global positioning system (GPS) was used as to collect the co-ordinates of each of the (31) police stations in the study area. The co-ordinates of the police state headquarter and the metropolitan offices were also collected. The secondary data were collected from the police headquarter here in Kano, from where the names and addresses of all the 31 police stations (divisions) together with their strength where collected. Demographic data of the population of the area were collected from the National Population Commission (NPC), Kano.

Data Analysis

The data were summarized using simple descriptive statistics to get the percentage and proportions. Frequency distribution table were used for data presentation. In one case inferential statistics Chi square test was used to test for whether exist significant relationships between the number station and police stations. An analogue map of Kano metropolis was obtained, scanned, digitized and then Geo-referenced. The digitized map was then imported to ArcGIS 9.3 software. The co-ordinates of the police stations obtained using GPS which was saved in the Microsoft Excel 2007 was also imported to the ArcGIS 9.3 for analysis, integration and presentation of maps.

III. Results And Analysis

The study assessed the spatial distribution of police stations in Kano metropolis. Data collected through field work and other sources were analyzed and are fashioned towards answering the questions and objectives for the study.

Police Stations and Population Distribution

The total number of police stations in the area is thirty three (table 1). The stations are not even distributed, also the number of personnel.

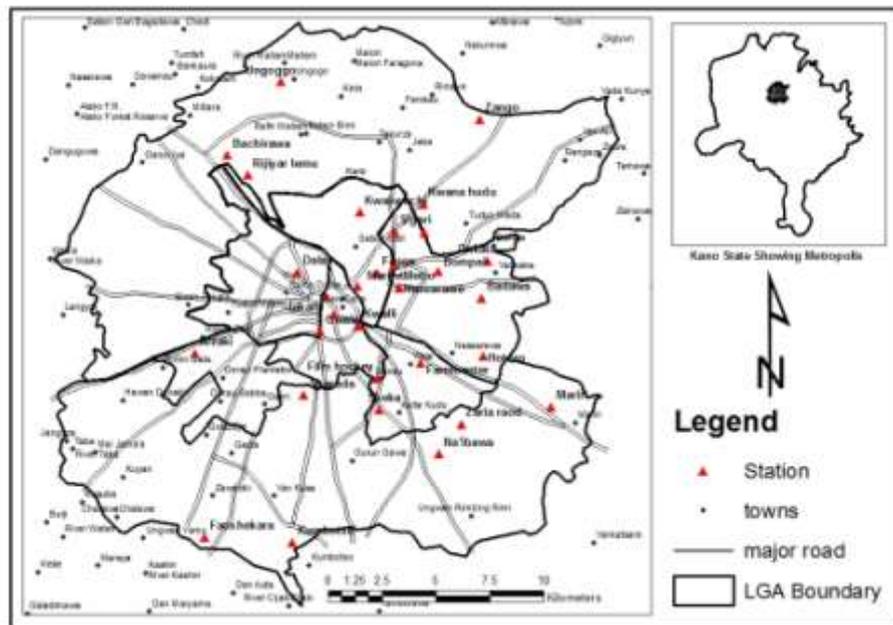
Table1: Number of Police Stations and Population Distribution

S/n	LGA	No. of Police Stations	No. of Outpost	Population of the area (2006 census)
1	Nassarawa	8	9	596411
2	Tarauni	4	4	221844
3	Gwale	2	2	357827
4	Dala	1	4	418759
5	Kumbotso	5	8	294391
6	Ungoggo	4	8	365737
7	Kano Municipal	4	11	371243
8	Fagge	5	6	200095

Source: field work, 2011

Dala local, although has the highest population among the eight local government is very much underserved. About 25 percent of the stations are in Nassarawa local government; this may be attributed to historical factor. Being the former colonial government and Native authority headquarter Nassarawa housed most of the police station and continue to do that even at present.

The result of the spatial distribution of police stations in Kano metropolis shows an uneven distribution of police stations in the metropolis (map2), the map which shows this distribution also revealed that the concentration of the police stations is within the central part of the area. The concentration of the police stations within the central area cannot be explained by the Christellars central place theory, which explains that, the location of services is base on seize of community, population, accessibility and proximity, putting into consideration, threshold and range.



Source: Cartography and GIS Unit, BUK 2012

Figure 2: DISTRIBUTION OF POLICE STATION IN KANO METROPOLIS

To ascertain this unevenness spread of the distribution, nearest neighborhood analysis was used. The result shows that the pattern of the distribution is random. In other words, the police stations are not distributed evenly.

Distribution of Manpower

Like the number of police stations, man power is not evenly distributed in the area. Nearly half of the personnel (47%) are found in Nassarawa local government area, while the remaining half is shared by the seven other local government areas. Even though Dala has the highest population it is the lowest in term of personnel power (figure 3).

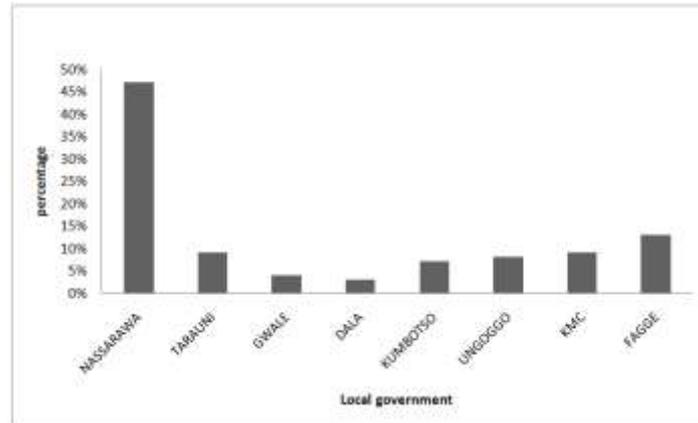
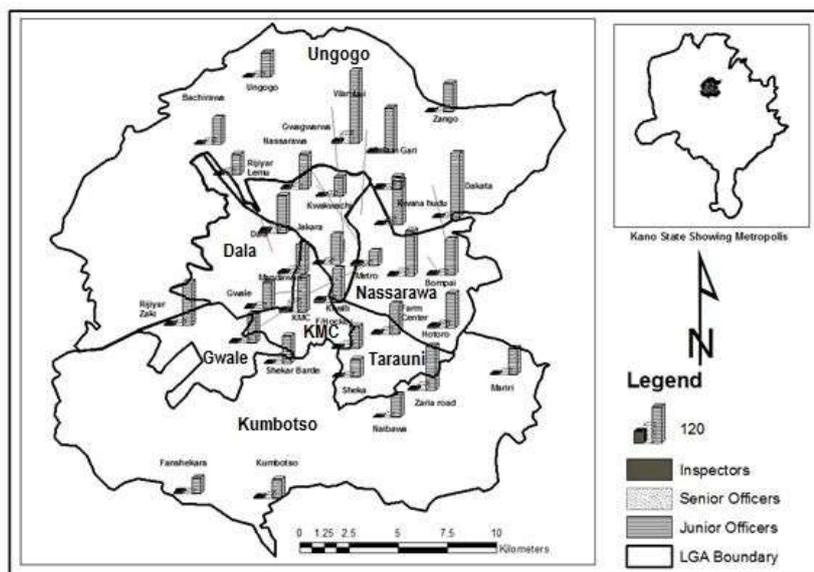


Figure: Police Personnel Power in Kano Metropolitan Local Government

Comparison was made between the different police officers by rank, the officer are categorized into three ranks. The senior officers include the Assistant Superintendent and the rank above; the inspectors and junior officer (below inspector ranks) (see figure 4).



Source: Cartography and GIS Unit, BUK 2012

Fig 4: POLICE MANPOWER DISTRIBUTION

The research findings revealed that in all station there are more junior officers than inspectors and senior officer. Divisions in Nassarawa Local Government are having more staff strength and more number of senior staff in the area. Nassarawa local government alone occupies 50% of the senior officers in the entire metropolis, followed by Tarauni local government which has 18% then KMC and Fagge local gov. having 10% each. Kumbotso 8%, Ungoggo 6%, then Gwale and Dala has 4% each. Dala is the least area with senior police officers, even though it is the second most populous local gov. in the metropolis.

Inspectors are the intermediary officers of the Nigerian police force; they are neither classified under junior nor senior officers. The distribution is uneven, with Nassarawa local gov. having the highest number of inspectors, representing 51% of the total, followed by Fagge, Tarauni, KMC, Kumbotso and Tarauni. Gwale and Dala have three percent each.

The distribution of junior police officers followed similar patterns, with Nassarawa having highest and Dala having lowest personnel number.

Ratio of Police Men to Population

Chi square test was used to test for the significance of the relationship between police stations (personnel) distribution and population distribution. After the analysis, it revealed that, there is no significant relationship between police stations (personnel) distribution and population distribution.

Table 2: Ratio of Police Personnel to Population

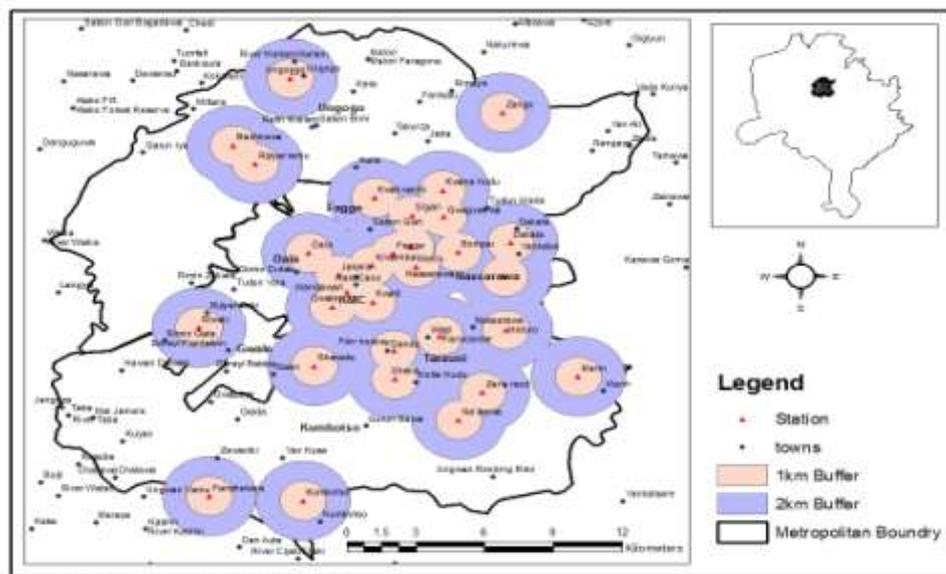
LOCAL GOVT	RATIO
Nassarawa	252:1
Tarauni	452:1
Gwale	1754:1
Dala	2755:1
Kumbotso	753:1
Ungoggo	841:1
Kano Municipal	821:1
Fagge	293:1
Metropolis (2006 population)	539:1
Metropolis (2011 projection)	611:1

Source: field work 2011

From the above table using the 2006 population census, Nassarawa local government area has the least ratio of population to police strength 252:1, followed by Fagge local government area, Tarauni, Kumbotso, KMC, Ungoggo, Gwale, and Dala with 293:1, 452:1, 753:1, 821:1, 841:1 and 1754:1, 2755:1 respectively. Dala records the highest population/police ratio in Kano metropolis. In total, the metropolis is 539:1. In essence only Nassarawa and Fagge local government are meet the standard of one police officer to four hundred personnel.

Buffer Zones

There is no standard distance for citing stations in the country. But a 1 and 2 km buffers were created on the map to identify area that are fully served or not (figure 5).



Source: Cartography and GIS Unit, BUK 2012

Figure 5: Buffer Zone Analysis of Police Stations in Kano Metropolis

This revealed that the areas inside the old city are fully serve, considering both 1 and 2 km buffer. Areas in the east of metropolis are under served and in most of the area people have to travel morethan a km or two to the nearest police station.

IV. Conclusion

It was discovered that that the pattern of distribution of police stations in the metropolis is generally random and uneven, with a little clustering at the center, and as one moves away from the center, the sparser the police stations become. *Neighborhood analysis* of the area gives is 0.733, as such, ascertains the randomness in the distribution of the police stations in the metropolis. The high strength of police in Nassarawa local government area according to this research, can be attributed to the large population and presence of the police state headquarter, which has 7 departments, and each of the departments has a good number of personnel, which are higher than the strength of some police stations. Dala local government area has the least number of police stations (just 1 station) and obviously has the least in police strength. It represents only 3% of the total police personnel in the metropolis. Chi square test shows that, there is no significant relationship between the

distribution of Police stations (personnel) and population distribution in Kano metropolitan, both at 0.01 and 0.05 level of significance, with calculated value of 8.477 and table values of 12.59 at 0.05 and 16.81 at 0.01 level of significance.

Recommendations

The research makes the following as its recommendations:

- ✓ Population distribution should be a considerable factor in the distribution of police stations and police personnel.
- ✓ There is need for deployment of more police personnel and erection of stations in the areas that are do not meet the UN recommendation of 1 police man to 450 populace (1:450) most urgently, are Dala and Gwale local government areas.
- ✓ More studies should be done to verify the exact factors considered in the distribution of police stations and personnel, since population according to this study is not a considerable factor.
- ✓ Geography is under estimated in the police force, which contemporarily, is to a large extent responsible for the inability of the police to prevent and control the alarming rate of crime and criminal activities in the society. Therefore, this discipline should be made one of the criteria to meet before the recruitment of new personnel, while those on board should undergo serious training on how to utilize its application for a smooth service delivery.

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