# ACCESS AND UTILIZATION OF ANTIRETROVIRAL DRUGS CENTRES IN BENUE STATE, NIGERIA

**BY**

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**A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES AHMADU BELLO UNIVERSITY ZARIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS OF SCIENCE DEGREE IN REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM**

**DEPARTMENT OF GEOGRAPHY**

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## DECLARATION

I hereby declare that this thesis entitled "Access and Utilization of Antiretroviral Drugs Centres in Benue State, Nigeria" is entirely my own composition, and where works of other persons have been used or referred to, such have been duly acknowledged

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## CERTIFICATION

This thesis entitled **"Access and Utilization of Antiretroviral Drugs Centres in Benue State, Nigeria"**, written by Ayoo Nicholas Terfa meets the requirements governing the award of Masters Degree in Remote Sensing and Geographic Information System in Ahmadu Bello University, Zaria, and is approved for its contribution to knowledge and literary presentations.

| | | |
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## DEDICATION

I joyfully dedicate this project to God Almighty who have been my source of inspiration and guidance throughout the period of my study and my grandmother Esther Nduur

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**ABSTARCT**

The study was conducted on access and utilization of Antiretroviral drugs centres in Benue State, Nigeria. The objectives of the study are to determine the location of ART centres, map out all ART centres, create a spatial database for ART centres, assess the distribution of ART centres in relation to people living with HIV/AIDS and to assess the utilization of ART centres. A list of ART centres for individual LGAs was obtained from Ministry of Health Makurdi. The population data was obtained from National Population Commission, which is based on 2006 National Census. The population data was used to calculate the estimated number of PLWHA in each LGA. The administrative map of the study area was collected from Ministry of Land and Survey Makurdi which served as a base map. Structured questionnaire was administered to 400 respondents. Four hundred PLWHA were randomly selected from fifteen purposively selected ART centres in the three LGAs one from each senatorial district. A global positioning System was used to obtain the geographical coordinates of ART drug Centres. ArcGIS software version 10.1 was used in conjunction with MS Excel for mapping and SSPS version 20.1 was used for statistical analysis. Point maps were then generated using ArcGIS, and then joined with other map layers so as to perform GIS analysis. GIS analysis tools used were, query analysis, overlaid analysis and nearest neighbour analysis to determine the location and distribution of ART centres, assess the spatial distribution of ART drug centres providing ART services in relation to the number of PLWHA and the distribution pattern. Comparisons were made between the distribution of ART centre with population and estimated number of PLWHA. The study reveals that, there were 46 ART drug centres in the study area with 15.2% of them located in Makurdi the State capital. The study also reveals that 93.5% of the ART drug centres are located in urban areas while 6.5% were located in rural areas. Also, 58.7% were Government owned while 41.3% were privately owned. The study further reveals that, 84.8% of ART drug centres that offered ARV services are of the secondary type of healthcare facilities while 10.9% and 4.3% were of primary and tertiary healthcare facility type. The pattern of distribution of ART drug centres in the study was done using nearest neighbour analysis in ArcMap with an index of -1.080209 which shows the pattern does not appear to be significantly different than random with P- Value of 0.280049. The study recommends that, more centres should be cited in rural areas and LGAs areas with disproportionate centres.

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background to the Study

Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) is one of the biggest public health concern worldwide. The epidemic causes tremendous human suffering and has adverse effects on the economic growth, social and political stability and health systems of many countries (Mayala, Mshana and Mboera, 2012). The infection so far has affected mostly adults in the most economically productive age group of 15-39 years (Idigbe, 2006). HIV has the potential of hindering the realization of the Millennium Development Goals (MDGs) and its spread promotes poverty. It has unleashed immense suffering on individuals, families, communities, and different countries worldwide (National Agency for the Control of AIDS (NACA), 2010). It is a major threat to national development; therefore it has been declared a national disaster (WHO, 2011).

Efforts have been made to increase the number of care and treatment centres for HIV/AIDS, yet variation in access to healthcare continues to be an important concern. The geographical gaps in HIV/AIDS prevention, HIV testing, social services and medical intervention may leave many people with fewer choices for obtaining health care. Health care analysts have long been involved with questions of location, such as deciding where to locate new health service resource, and how best to improve service locations. The distribution and convenient access to healthcare in terms their location are important factors in healthcare utilization and patient decision making (Mayala *et al.,* (2012). HIV/AIDS was first recognized in 1981 in the United States of America in young homosexual men. The HIV/AIDS virus has been linked to the moral and sexual decadence prevalent in the western countries such as homosexuality and intravenous drug use (Piot, Kapita and Wabitsch, 1992). According to the

World Health Organization (2011), 33.4 million adults and children are living with AIDS worldwide and 22.8 million or 68% are from sub-Saharan Africa, a region with only 12% of global population. AIDS has become a major public health crisis in Nigeria. By 2010, Nigeria was said to be occupying the 2nd position in the number of people living with HIV/AIDS after South Africa (UNGASS, 2010).

According to the 2010 HIV/AIDS Sentinel Survey, Benue State in central Nigeria has the highest of (12.7%) HIV/AIDS seroprevalence rate in the country, the rate is almost three times higher than the national average rate of 4.1% (Federal Ministry of Health, 2010). The HIV prevalence trends by states shows that the rate for Benue State keeps rising from 9.3% in 2003 to 10.0% in 2005, and from 10.06% in 2008 to 12.7% in 2010 (NACA, 2011). It has been noted that, almost 4 million people living with HIV/AIDS in Africa are receiving antiretroviral therapy from 8,278 health facilities in the Continent. However, there is still a gap in the services provided and the coverage of these services due to poorly developed health care facilities in many developing countries (WHO, 2011). The number and distribution of health facilities providing antiretroviral therapy are important indicators of the scaling up of and access to treatment services. In 2010, 128 low and middle income countries reported a total of 22,369 health facilities providing antiretroviral therapy. Of these facilities, 78% were in the public sector and 8% in the private sector (14% were unspecified) (WHO, 2011).

According to the WHO (2010), antiretroviral therapy refers to the delivery of antiretroviral as part of care interventions, which include the provision of co-trimoxazole prophylaxis, the management of opportunistic infections and co-morbidities, nutritional support and palliative care. In this study, ART refers to the prescription and taking of antiretroviral, at the time intervals, on a daily basis of one's entire life. It also implies laboratory monitoring and management of opportunistic infections, adhering to food prescriptions, and taking generally

good care of one's health. ART involves keeping follow-up clinic visits and maintaining available supplies of antiretroviral drugs.

The primary goal of therapy is improvement of quality of life consequent to the reduction in morbidity, a result of treatment induced immune recovery. The goals of therapy can therefore be summarized as follows: improvement of the patient's quality of life, reduction of HIV related morbidity and mortality, restoration and or preservation of immunologic function and maximal and durable suppression of the viral replication (FMH, 2005).The drugs do not kill the virus (Tindyebwa *et al*, 2005). However, they slow down the growth of the virus. When the virus is slowed down, so is HIV disease. When such drugs, typically three or four, are taken in combination, the approach is known as highly active antiretroviral therapy (HAART).

Antiretroviral therapy (ART) programmes began to be implemented by the Government of Nigeria providing ART at a subsidized rate from 20 sites in tertiary health institution in 2002 (NACA, 2010). As at December 2011, as a result of expanded access initiative, the number of sites has increased to 446 Antiretroviral Therapy (ART), 684 Prevention of Mother to Child Transmission (PMTCT) and 1064 Health Counselling and Testing HCT Centres (NACA, 2011). Nigeria has about 26% of ART coverage and ranked 4th in the world in terms of people accessing treatment with a population of 359,181 people that are receiving ART (NACA, 2011). The total number of people receiving ART in line with the national guideline keeps increasing. In 2006, an estimated 100,572 people were receiving treatment in Nigeria, this increased to 124,567 in 2007, 231,079 in 2008 and 302,971 in 2009.At the end of 2010, 359,181people were receiving the drugs out of an estimated 1.5million people that need the drugs (NACA, 2011).Although antiretroviral therapy (ART) is not a cure and it presents challenges related to adherence and toxicity, it has greatly decreased transmission and changed perceptions of HIV/AIDS as a plague from a fatal incurable disease to a manageable

chronic illness (Palella, Delaney, Moorman, Loveless and Fuhrer,1998). This treatment causes improvement in immunological status and reduction in the viral load, thus reducing the incidence of hospitalization and mortality (Paterson, Swindell, Mohr, and Vergis, 2000).

In order to achieve the Millennium Development Goal (MDGs) six which is to combat HIV/AIDS, malaria and other diseases requires improving access to antiretroviral therapy coverage rate(WHO, 2011). It is noted that many countries in low and middle income countries had achieved universal antiretroviral therapy coverage (defined as providing antiretroviral therapy to at least 80% of patients in need). These countries are Botswana with (95%), Nicaragua (95%), Cuba (95%), Namibia (92%), Cambodia (92%), Croatia (89%), Chile (88%), Guyana (84%), Rwanda (88%) and Slovakia (81%) coverage of antiretroviral therapy just to mention few. Nigeria's antiretroviral therapy coverage is 26% which shows that Nigeria is lagging behind and to meet the target of MDGs, this requires a strenuous effort (WHO, 2011).

Mapping of antiretroviral therapy centres is a very pertinent indicator in the scaling up of access to treatment. Maps are heuristic models, used to communicate, interpret, and explain data. They aid in the visualization of differences, clustering, heterogeneity, or homogeneity within data. Spatial patterns can be perceived and correlations visualized through the use of maps. Symbols and colours can communicate detail or the relative importance of certain features. Mapping, or the symbol making process, organizes knowledge and how information is symbolically represented can shape the character of a place (Coetzee, Craig, and Le Sueur, 2000). Maps not only present characteristics of a place, but the mapping process itself is a means by which knowledge can be gained about a particular place or places. This knowledge is structured in a certain and important way that is developed through the choices made about what is put on maps and how that information is represented. This knowledge is not necessarily 'read from the map.

Where a person lives is the primary geographic distribution considered in public health and e pidemiology

Mapping case locations at the individual or population level are important to public health research because the spatial distributions provide insights into the environment where potential exposures of health risks may be encountered (Cromley and McLafferty, 2002). According to Cromley and McLafferty, (2002) Public health applications of GIS are used to map the source and distribution of disease agents, identify areas where people may be exposed to environmental and biological contaminants, and analyze the spatial and temporal patterns of different health outcomes Health, Census, economic, income, unemployment labour, crime, transportation and other vital statistics are easily related to a geographic database using GIS.

## 1.2 STATEMENT OF THE RESEARCH PROBLEM

Antiretroviral coverage in Nigeria has improved from 11% in 2003 to 26% in December 2010 (NACA, 2011). However, access to ART remains low in Benue State which is one of the States with the highest prevalence rate in the country. In Benue State, as at April 2010, only 12% of the estimated 192,400People Living With HIV/AIDS (PLWHAs) requiring treatment were enrolled in an ART programme and there were 24 ART sites in 12 out of the 23 LGAs, that had a health centre providing ART services (Omenka, 2010).

Health professionals working within ART programmes tend to concentrate on adherence issues since this is directly related to their own role. Cater (2005) defines adherence as the taking of all ARV pills in the correctly prescribed doses at the right time and in the right way by observing some dietary restriction. However, access and coverage should also be an important concern because these same professionals are also often the champions of expanded ART (Monjok, Smensny, Okokon, Mgbereand and Essien, 2010). There are studies

on adherence but very few on access and coverage to ART in Africa and Nigeria. Paquette (2008) looked at the need of ART in sub Saharan Africa, as well as the existing coverage and ways of addressing the obstacles preventing ART distribution. The study looked at both provider and patient related obstacles using questionnaire. The study shows that provider-related obstacles are specifically related to limited availability of drugs, total cost, lack of health care staff and facilities, lack of organization and government regulations, while patient related obstacles include; cost of transportation, geographic proximity to health care facility, hospital related factors, cultural beliefs, lack of adequate counselling and drug resistance. This study was not done using GIS method.

Adeneye *et al.,* (2006) examined factors that impede effective delivery and utilization of ART in Nigeria using questionnaire and focus group discussion. The result showed that most of the factors are travel time, long distance to hospital, disbelief of test results, absence of antiretroviral treatment in every site, lack of knowledge of where to get services and absence of symptoms of illness yet. No GIS analysis was performed. Sangowana *et al.,* (2005) in their study on the factors that influenced peoples' access to antiretroviral drugs in Ibadan, used participatory methods of in-depth interview and focus group discussion. The study identified factors influencing peoples' access to ART drugs to be lack of knowledge of where to get the required service. This study failed to show if there were centres where drugs are administered.

Chiegil (2012) examined the quality of antiretroviral therapy in public health facilities and the perceptions of the end user across the six geopolitical zones of Nigeria using structured focus group discussion. The study shows that the end user were satisfied with uninterrupted antiretroviral drug supplies, courtesy treatment and quality counselling services but identified gaps in ART services provision, weak health leadership, non-attractive ART services infrastructure, frequently interrupted laboratory services, inadequate health care workers, and

long waiting time. This study did not have a database that showed the number of health personnel in the hospitals and the number of people enrolled for the programme whether there are inadequate medical personnel at these hospitals.

A study on medication adherence and non-adherence in HIV infected patients in Maitaima District Hospital Abuja by Agu, Okojie, Oqua, and King (2011) revealed that all the participants reported have been counselled on the benefits of ART and medication adherence at ART initiation but identified factors that hinder their adherence to being busy at work or school, forgetfulness, fasting and travelled away from home. This study did not adopt any GIS technique in their analysis.

Omenka (2010) looked at the factors influencing access to ART drugs centres in Benue State. The study explored some of the barriers preventing people living with HIV/AIDS from accessing treatment in Benue State. The results showed that factors influencing access are free cost and increased number of sites, beneficial effects of ART, membership in a group and having a treatment partner while factors considered to be barriers are stigma and discrimination, hunger, poverty and transportation cost. This study was not done in a GIS environment. Tamen, Kpamor, Nyitor,and Ayebe, (2007) studied antiretroviral drugs therapy in Benue State. The study looked at the age range of people receiving antiretroviral drugs at private hospitals in Gboko Local Government Area of the State. The result revealed that most people receiving drugs at these centres are aged between 11 and 40 years. Both studies used conventional and participatory methods. A careful examination of these studies reveals that, most of these studies like Tamen *et al.,* (2007) and Omenka (2010) did not apply GIS technology in their analysis and none of them looked at the utilization of these centres. It is this gap in research that this study intended to fill. Against the issues in the study, the study attempted to address the following questions:

i. How many antiretroviral drugs centres are in Benue State?

ii. Where are the locations of antiretroviral drugs centres in Benue State

iii. What types of health care facilities render the service of antiretroviral drugs?

iv. How many people receive treatment at each centre?

v. Which of these centres have the highest number of patients and health personnel?

vi. Is there any relationship between the spatial distributions of antiretroviral drugs centre and people living with HIV/AIDS?

vii. What is the distance travelled by HIV patients to antiretroviral centres?

## 1.3 AIM AND OBJECTIVES OF THE STUDY

The aim of this study is to examine access and utilization of antiretroviral drugs centres in Benue State using GIS techniques. The following objectives are set toward achieving the aim of the study which is to:

i. determine the location of antiretroviral centres in Benue State.
ii. map out all antiretroviral centres in Benue State
iii. create a spatial database of antiretroviral centres in Benue State.
iv. assess the spatial distribution of antiretroviral drugs centres in relation to the number of persons living with AIDS
v. assess the utilization of ART drugs centres in Benue State.

## 1.4 JUSTIFICATION FOR THE STUDY

This study used Geographic Information Systems (GIS) as an analytical tool to graphically display antiretroviral drugs centres location throughout the state. It provides the first state

wide analysis of antiretroviral drugs centres locations using (GIS). In an effort to address issues of information asymmetry, this study provides a baseline data on the geographic distribution of antiretroviral drugs centres in the state, and the number of people receiving ART in various centres. Viewing the geographic distribution of antiretroviral drug centres in Benue State through GIS mapping systems will create data that may assist the Benue State AIDS Control Agency (BENSACA) and other development partners with potential strategic placement of needed ART centres across the state. It is assumed that many of the antiretroviral drug centres are located in the heavily populated areas of the State, as opposed to rural areas where HIV prevalent rate may be scanty. Many times, rural areas exhibit a higher HIV prevalence rate than the urban areas (NACA,2011).Obtaining data to confirm or refute this assumption is necessary in developing a strategic approach to advancing antiretroviral treatment coverage research in the state and determining if there are vast disparities in antiretroviral drug centres availability in specific areas. This will further stir the interest on the use of GIS as a decision tool in health planning.

## 1.5 THE SCOPE OF THE STUDY

The study focused on access and utilization of antiretroviral drug centres in Benue State. The State is made up of 23 LGAs which are divided into three senatorial districts. Two of the senatorial districts have 7 LGAs each, while the other senatorial district is made up of 9 LGAs. The study looked at the location of ART centres, number of ART drug centres, medical personnel and people's enrolment as well as the utilization of these centres. The study was confined within 12 years i.e from 2002 to 2012

# CHAPTER TWO

# CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

## 2.1 Introduction

This chapter reviewed the extant literature on antiretroviral drugs and GIS application in public health in different part of the world. The first part of this section reviewed literature on the concept of antiretroviral drugs, GIS mapping and analysis in public health, importance of GIS in healthcare planning and the review of previous works on the application of GIS in public health from different parts of the world.

## 2.2 Conceptual Framework

### 2.2.1 Antiretroviral Therapy

Antiretroviral Therapy (ART) is treatment for AIDS that helps the body's immune system recover from the damage caused by infection with HIV. Although ART cannot cure AIDS, persons on ART will begin to feel better, eat more, and put on weight. Their bodies will recover the ability to fight infections. They may remain well for many years, but must continue to take Antiretroviral (ARVs) for the rest of their lives. Thus, ART is an important component of the global response to AIDS (Ruth, 2007).

Keiser *et al* (2001) looked at antiretroviral therapy as a treatment for AIDS to enable them to live productive lives. Antiretroviral therapy (ART) has effectively decreased HIV/AIDS related Morbidity and mortality and improved the quality of life of people living with HIV/AIDS (PLWHA). Antiretroviral therapy refers to all the drugs developed to prevent Human Immunodeficiency Virus from replicating. These drugs suppress the HIV but are not able to destroy it (Wilson, Naidoo, Bekker, Cotton and Maartens, 2002).

### 2.2.2 Accessibility

Access to healthcare is a function of many variables, including patients' financial resources, education, race, age, gender, access to medical insurance, availability of providers, cultural and linguistic understanding, knowledge of how and when to access providers, recommendations of friends and family, familiarity with the hospital, geographic location of healthcare services, distance to the facility, transportation facilities, and travel costs.

Some definitions of access focus on its spatial components (Knox, 1979). For example, access may be defined as an individual's ability to travel to care in a timely and acceptable fashion (Luo & Wang, 2003, Talen, 2003 Wang, 2007,Apparicio *et al,* 2008). Such dimensions of access are generally measured in terms of distance or time to a provider. However, abilities and desires to utilize health services are also highly influenced by needs, attitudes, beliefs and past experiences with the health care system (Gulliford *et al,* 2003). As such, access to care also has aspatial components that might be social, cultural, economic or other and that may supersede the distance between one's residence and a doctor (Penchansky and Thomas, 1981).

Accessibility has been defined as the relative degree of ease with which a location may be reached from other locations (Morril, 1970). Similarly, Ariyo and Datong, (1996) conceived it as the ease with which people in area can obtain necessary services. From these two definitions, it is clear that, the concept may not necessarily be restricted to the spatial aspect of separation between points. Ariyo and Datong 1996) and Okafor (1997) stated that the concept has four dimensions. These are ; physical, financial, social and time dimensions. The physical dimension concerns the space aspect of accessibility, which include distance, nature of intervening terrain. On this, Okafor (1997) is of the view that rural dwellers are isolated and distant from opportunities and for some of them 'circulation' costs could be prohibitive.

On the other hand, financial (sometimes called economic) accessibility has to do with the financial capability of a people to pay for certain goods or services. Again, Okafor (1997) is of the opinion that the rural communities with poor transport facilities incur high movement costs. This according to him reduce the amount of money rural people can spend on goods and services other than travel. The social dimension has to do with things like the literacy level of the individual, nature of occupation, and socio- cultural influences on individual. For instance, all things being equal, the higher the literacy level of individual, the easier he will interact and utilize health facilities, and vice versa. Again, in many cases, people involved in the primary economic sector are less likely to utilize modern health facilities than university graduates. Pertinently, it has been observed that rural areas are poorly endowed with and in many cases are physically removed from those opportunities like education, non primary employment and others which enhance socio economic status and therefore reduce social distance.

Finally, the time dimension of accessibility has to do with the amount of time taken to get access to some basic services. This, in a way, is affected by physical, economic and social dimensions, especially in Nigeria. That is, it could be in the number of hours spent to reach the location of service or amount of time it takes to be attended to, or money one might have spent on transportation and or offer as bribe. It could also be social, where the highly educated easily read directives to various sections of a service facility and enquire freely about any unclear situation. The factor of distance was found to have an effect on the nature of utilization of the General Hospital in Pankshin, where EPL Centre is located.

### 2.2.3 Utilization of Healthcare Services

Utilization measures the population's usage of healthcare services available to them. This includes the utilization of Hospital resources, Personal Care Home (PCH) resources, and

physician resources. Health care utilization and health status are used to examine how efficiently a health care system produces health in a population. People use health care services for many reasons: to cure illnesses and health conditions, to mend breaks and tears, to prevent or delay future health care problems, to reduce pain and increase quality of life, and sometimes merely to obtain information about their health status and prognosis. Health care utilization can be appropriate or inappropriate, of high or low quality, expensive or inexpensive (Bernstein *et al.,* 2003)

Utilization of healthcare facilities was also found to differ between rural and urban areas. Van Etten (1976) has observed that government Hospitals in major towns in Mwanza region had higher attendance than rural hospitals. For instance in 1970 in Mwanza town 10 out- patients visits per inhabitant were recorded as against one such visit per inhabitant in Geita district (rural area). He observed that not only was there a difference between the pattern of medical consumption in rural and urban areas but also among people living at different distances from the individual hospitals. Hence, it was found that all the hospitals (in Mwanza region) received the bulk of their out- patients from the division in which they were located and that divisions are further distance from the hospital represent a relatively small proportion of the total attendance.

According to Flynn, Nolte and Davis (2002) health care utilization also has evolved as the population's need for care has changed over time. Some factors that influence need include aging, socio demographic population shifts, and changes in the prevalence and incidence of different diseases. As the prevalence of chronic conditions increases, for example, residential and community-based health-related services have emerged that are designed to minimize loss of function and to keep people out of institutional settings. Health care utilization rates are important indicators of what general types of care specific populations seek, and they also indicate how services may be shifting from one site to another.

It is very pertinent to acknowledge the fact a recent development in the determination of geographical accessibility has brought the use of Geographic Information System in the determination of accessibility. This is clearly examined below.

### 2.2.4 GIS Mapping and Analysis in Public Health

Mapping in simple terms could be said to be the representation of real life geographic features using organized symbols (Pickles, 1999). The history of mapping has progressed from the era of representation on clay tablets to computer generated maps of today. The relationship between public health and mapping began in the mid nineteenth century. Using maps to show the geographic origins of disease is nothing new in public health. As far back as 1854, British physician John Snow drew map to help him analyse a spike in cholera death in London. Snow determined that all cases seemed clustered around a particular public water pump. He convinced local authorities to disable the pump, which was found to be contaminated and thus helped end outbreak (Colledge, Maxwell, Parker and Morse, 1996).

Today, public health practitioners continue to apply the same scientific principles as John Snow by using maps to address the spread of infectious disease. However, technology enables them to perform much more sophisticated analyses. For Family Health International, a recent initiative using state of art Geographic Information Systems (GIS) offers an existing way to use data to improve outcomes in our HIV/AIDS programme. Public health practitioners use basic GIS applications to map the location of health facilities or ART patients in district. They can use the maps to analyse different pieces of data in relation to each other, forming and testing hypotheses about interventions that may improve services. For instance, if maps created using GIS showed most ART patients in a district lived far from facilities providing services, healthcare professional would posit that they may need to improve patients access (Veneziano, 2011).

Interest in public health mapping has increased over the last decade. In fact, new disciplines devoted specifically to public health and GIS are emerging from common interests of epidemiologists, geographers, and cartographers to produce meaningful maps that provide insight into the underlying processes of disease (Stacey, 2005). Maps and mapping are a set of tools individual researchers use to explore, analyze, or display a particular set of characteristics. Maps produced by linking attributes to coordinate systems help to generate hypotheses about potential relationships between environmental phenomena and health outcomes. Visualizing some aspect of the effect by using map-based techniques such as "dot, dot density, choropleth, or isopleths" maps and etc. gives clues about possible causes of disease. Using map-based techniques also enables officials to educate the public and policy makers easily and effectively by conveying complex information in a more understandable format (Jerrett *et al* 2003; Kraak and Ormeling, 2006).

Since 1993, the WHO's Public Health Mapping and GIS programme has been leading a global partnership in the promotion and implementation of GIS to support decision-making for a wide range of infectious disease and public health programmes (Richard, Croner, Rushton, Brown and Fowler, 1999). It is noteworthy to mention that GIS is much more than maps. A GIS can perform complicated analytical functions and then present the results visually as maps, tables or graphs, allowing decision-makers to virtually see the issues before them and then select the best course of action. The term GIS and Mapping Applications are used interchangeably and the advent of GIS have broadened the application areas of mapping (Manase, 2008).

GIS mapping technologies can generate maps for health in desktop or Web applications. The mapping technologies can produce interactive interfaces for users, with the support of GIS basic functions such as zoom in, zoom out, pan, and hyperlink (Sheng, 2010). This thesis

differentiates two types of mapping technology: static mapping and dynamic mapping, based on whether maps are generated on demand or not.

Static mapping is a passive mapping process. The cartographic representation and mapping variables are pre-defined. The maps already exist or are rendered. Many Web mapping applications use the static mapping strategy, as it allows quick interaction between the GIS server and clients. As an example of this static mapping technique, the World Health Organization's Global Health Atlas platform maintains an electronic library which provides mapping on public health in the form of publications, statistics, and static maps categorized by geographical area and topics (WHO, 2010)

Dynamic mapping is an active mapping process, in which the cartographic representation and map variables can be set by users interactively. It is often used in both desktop and Web applications. As an example of a desktop dynamic mapping technique, SIGEpi is a statistical, analytical, and geographical information system software package developed by the Pan American Health Organization, a regional office of the World Health Organization (Pan American Health Organization, 2003). The SIGEpi software program is a cooperative project that includes technical support in the development of GIS applications, analytical methods, and training materials in medical epidemiology and public health (Sheng, 2010).

Historically, medical geographers and public health professionals were not the first to create maps of disease. Statisticians and political economists invented thematic mapping in the early 19th century to provide knowledge about populations that enabled the governing of large masses of people (Foucault 2000; Crampton, 2004).The process of mapping statistics was a form of governance and builds on Foucault's concept of governmentality that describes the concept of governing of oneself and of governing others. Geographic governance is a term given to the use of mapping as it pertains to the political decision making process of

government. When applied in geography, geographic governance can be used to understand the political implications of mapping by political boundaries as constructed by choropleth mapping (Crampton, 2004).

The French political economist Charles Dupin used the first known choropleth map in1826; he shaded administrative districts to represent the relationship between the prosperity of France and the ratio of male children that were in school. The choropleth map was quickly adopted to represent information collected by the newly formed census that provided social knowledge of colour, race, sex, age, marital status, and illiteracy, ownership of homes, occupations, and prevalence of disease. This information provided a picture of where things were so the appropriate disposition of resources and policies could be developed to govern and regulate the territory (Stacey, 2005).

GIS has changed from been just a tool for mapping physical geographic features to a tool that can map just about any feature – from physical to socioeconomic, as long as it can be tied to some geography (location). GIS mapping makes it easier to update information instantly and to identify the trouble spots at given locations. This approach was utilized in the tribal state of India for national malaria control programme. This process aided in the identification of hot spots of malaria prevalence and spatial analysis of the disease (Aruna *et al.,* 2009). In ESRI 2003, GIS is mapping software that links information about where things are with information about what things are like. Unlike paper map, where 'what you see is what you get' a GIS map can combine many layers of information. These features make this style of mapping different from the traditional mapping. Other outstanding features of traditional mapping are, maps produced are static, difficulty of handling large quantities of information, address a single theme, and are current only at the time they are drafted. More importantly, there is no underlying database, and it is therefore impossible to query a paper map in the manner of a digital archive (Rytkonen, 2004). GIS Mapping allows for sophisticated forms of

spatial analysis functions to be used for health studies, including geo-coding functions, overlay functions, generalization functions, proximity analysis functions, network analysis functions, geostatistics analysis functions, spatial statistics functions, raster analysis functions, and so on. In health studies, one or a combination of several analysis functions may be applied to specific applications (Sheng, 2010).

GIS has strong capabilities in mapping and analyzing not only spatial data, but also non spatial data, and can integrate many kinds of data to greatly enhance disease surveillance. It can render disease data along with other kinds of data like demographic and environmental data, representing the differences with various cartographic styles. GIS aids in faster and better health mapping and analysis than the conventional methods (Noor, 2005) It gives health professionals quick and easy access to large volumes of data. It provides a variety of dynamic analysis tools and display techniques for monitoring and management of epidemics. GIS has a vital role to play in the future (Babara, 2008).The possibilities that can be explored are limitless, depending on the skill and imaginative use of the researchers and the willingness of health sector management to resource its implementation. Health administrators, professionals and researchers need training and user support in GIS technology, data and epidemiological methods in order to use GIS properly and effectively (Johnson and Johnson,2001).

### 2.2.5 Importance of GIS in Public Health

Geographical Information System (GIS) technology is increasingly being used in many areas of health care research and planning. The applications range from the study of “classic” infectious diseases such as malaria, schistosomiasis, and tuberculosis, to cancer such as leukaemia (WHO, 2003). GIS has proven to be one of the most useful tools in public health research. It has been widely used in disease surveillance and monitoring, research hypotheses

generation, identification of high-risk area and population at-risk, targeting resources and the monitoring of interventions (Gupta *et al* 2003) Geographic Information system (GIS) software makes it possible to undertake a sophisticated visual approach to data analysis that, if done by traditional methods, would require unthinkable drudgery (Zvia, 2005). Examples of GIS studies in health care planning include examining disease rates, examining variations in health and the use of health services. Wilkinson, Grundy, Landon and Stevenson (1998) address the potential applications of GIS in health geographical studies. These applications are: disease mapping and geographical correlation studies, patterns of health service use and access, environmental hazards and disease clusters and the modelling of the health impacts of environmental hazard. According to Boulos (2004), GIS is playing an increasingly important role in public health care and management around the world. The ability to spatial link health, population and environmental data into one system creates a powerful tool that gives public specialists the ability to analyze health data in a clear, convenient and easy to comprehend form.

Early applications of GIS in the health field focused on epidemiological issues, the distribution and determinants of health and disease in groups; more recently, GIS has been applied to the planning and management of health care services and applications ranging from the creation of health profiles to the location of centres and route planning. Geographic information systems and remote sensing from earth-observing satellites are sophisticated and powerful technologies that are finding applications far beyond those originally intended. According to the World Health Organization (2003), both are products of the Cold War developed by the departments of defence for military purposes. Cromley (2002) affirmed that, remote sensing and GIS have also increased their importance and utility in health-related studies.

As the application of GIS in public health and epidemiology increased, practitioners began developing GIS compatible information systems to make data integration simpler. For example, Nobre*et al* (1997) developed an information system, GISEpi designed for representation and elementary analysis of epidemiological data. GIS is a powerful technology used to support public health decisions. Given the importance of analyzing, comparing, interpreting and assessing the relationship between various characteristics of a place and the health of the population that resides there, this is an excellent tool for identifying regional discrepancies within a country, and for assessing and intervening in public health care system (Costa, Santana, Freitas, Almendra and Loureiro,2011).

Geographic Information System (GIS) is an innovative technology, ideal for generating data suitable for analysis both with respect to space and time (Rajiv, Murthy and Satyanarayana, 2009). Since much of the data used and generated by health and social service agencies has a spatial dimension, Geographic Information System (GIS) is particularly useful to health professionals and administrators in planning and day-to-day management. For example, GIS can be used to evaluate the location of existing health and their accessibility, the concomitant utilization of health care services and spatial structure of disease patterns in both static and dynamic forms (Moore and Carpenter, 1999). The study by Wang, McLafferty, Escamilla and Luo (2008) for example, evaluated the role of access to health care in explaining the variation of late-stage diagnosis of breast cancer in Illinois using GIS and spatial analysis methods. In Finland, GIS systems have been used in health services research for studying small-area variation in mortality in an urban area and in mapping studies of non-communicable diseases (Rytkonen, Rusanen and Nayha, 2001, Rytkonen *et al* 2003).

GIS mapping helps in conducting spatial analysis, which is an innovative approach that adds value to traditional survey techniques. Depicting facility locations and services available in the context of geographic distribution and population density allow in identifying gaps in

services and to acknowledge added barriers, such as distance to facilities and the availability of specific services in more remote or less populated areas (USAID, 2006).

Although GIS methodology forms part of the basis of many public health and epidemiological initiatives in the developed world (Bullen, Moon and Jones, 1996), the developing world, especially Africa, lag far behind in the application of GIS to the study of health problems (Oppong, 2000). The elevated disease burden in developing countries and proportion of that burden attributed to infectious diseases (often with well-defined and spatially varying covariates) make the inherent potential of GIS in developing countries considerable. In addition due to infrastructure and cost constraints, many developing countries suffer from lack of reliable statistic and disease reporting. GIS can help significantly in this area by filling the gaps with empirical disease modelling techniques. Public health practices need information to implement appropriate actions and GIS is therefore considered an appropriate technology for developing countries, despite the fact that it appears to contradict the principles of appropriate technology (because it can require high costs and levels of expertise).

GIS also offer an extremely useful method for establishing the degree to which existing health care services fulfil the needs of the population, indicating where new services should be created and which current services should be reduced or closed down (Hugo and Alyward, 1999). This also helps in planning infrastructure, to create new facilities based on gap analysis which can be determined on the basis of the spatial distribution of existing facilities (Rajiv, Murthy and Satyanarayana, 2009)

Chirowodza *et al* (2009) affirmed that understanding both physical and social environment is a prerequisite to planning and implementing of community-based research. The visualization

capacity of information management tools such as Geographical Information Systems (GIS) will assist researchers in capturing the broader spatial and social contexts of communities.

Queralt and Witte (1998) stated that, GIS software allows a social agency to produce meaningful, attention-grabbing maps that visually show important administrative, policy and practical issues. The software also makes it possible for administrators and practitioners to uncover new insights. For example, gaps in service delivery, areas of low service take up rates, transportation problems, and location of areas of new demand for services. Birkin, Clarke, Clarke and Wilson (1996) buttress that health planner need "intelligent GIS", including a modelling capacity to answer "what if" questions and the functionality to produce performance indicators. They posit that demographic and financial pressures on healthcare system are encouraging greater emphasis on measuring health needs accurately and dealing with them in ways that are both clinically effective and cost effective.

Another important area in which GIS is increasingly being applied is in the design and evaluation of health care programmes. This application is becoming more common not only in communities of industrialized countries, but in economically marginalized communities of developing countries as well. The increasing availability of remotely sensed data sets and other digital databases, combined with declining hardware and software prices and improvement of global positioning system (GPS) accuracy, have encouraged more widespread use (Hightower *et al* 1998). According to Costa *et al*, (2011) with the help of this (GIS) system it is easy to monitor the health infrastructure across the state, up to the village level. The spread of disease in a particular area and availability of infrastructure facilities in the same area are brought together at the same level to find out critical areas demanding immediate attention. Rytkonen *et al* (2003) discusses GIS application for analysing the incidence of type 1 diabetes among children in Finland. They observed the incidence of type

1 diabetes per 100,000 persons separately in urban areas, urban-adjacent rural areas, rural health and remote areas.

With GIS, the department of health managers will be able to map health facilities based on serviceable area, proximity to available facilities and population distribution, identify the distribution of resources and discrepancy of service distribution in spatial domain, recognize the deprived areas and locate areas for future investments based on accessibility and social status(Rajiv *et al,*2009). GIS technology offers varied solutions including ones that improve field data collection and reporting and others that support disease surveillance and analysis with online mapping and spatial statistics. In addition, GIS, improve the ability to communicate with several health situations, such as environmental contamination, to decision makers. GIS helps in making the presentation of data more attractive than traditional static maps, and through considering geographical (spatial) factors, the analysis becomes "finer" and more precise, increasing the likelihood that ensuing strategies more pertinent (DeGrauwe, 2002).

Additionally, visualization of the distribution and evaluating the accessibility to health facilities might be useful for health practitioners to evaluate the suitability of the location of existing health facilities or plan for the upgrading or building new facilities at more appropriate locations (Murad, 2007).In order to incorporate spatial component, a global positioning system (GPS) can be used to record the geographical location of patients based on their addresses (Wang, McLafferty, Escamilla and Luo 2008).This data can then be mapped using GIS software to visualize the distribution, evaluate the patterns of cases and identify possible clusters. Such an approach allows for the generation of maps that show the incidence in different areas and for the ability to communicate the information more effectively (Moore and Carpenter, 1999). Visualization can be used in novel ways to explore the results of traditional statistical analysis. Displaying the results of database queries on a digital map not

only increases productivity over manual map generation, but provides unique perspective, and insight to reams of tabular reports. Displaying the locations of outlier and influential values on maps and showing variation in values over space can add a great deal to epidemiologic research (Ansariadi and Alimuddin, 2004).

Furthermore, in evaluating spatial distribution of disease, GIS and spatial analytical capabilities may be help in the study of healthcare and health care delivery. The availability of statistical and other information in spatially referenced form and the functions provided by a GIS also allow analyses that were previously too expensive or impossible to perform. Spatial analysis in public services such as measuring quality of services, observing patterns and variability, identifying shortage areas, and observing relationship between different sets of variables can be easily performed through GIS. These analyses have been demonstrated in recent studies (Love and Lindquist, 1995; Luo and Wang, 2003), by implying GIS as a core tool in exploring the public services in user defined areas (McLafferty, 2004). Measure of accessibility helps in reducing inequalities in healthcare.

Boulos (2004) affirmed that GIS analytical approach can reveal relationship and trends that might not be evident when data is viewed in tabular format. Epidemiological data can be mapped allowing users to detect and explore any potential spatial patterns of disease outbreaks. Gap in health care access can be quickly identified by locating populations that do not have access to health facilities located within a reasonable travel distance. The Geographic Information System (GIS) is distinguished from other information systems by its unique spatial analysis functions. These functions help to answer some questions, called queries in the GIS environment, about the real world.

Generally, geographic or spatial analysis allows us to study real world processes by developing and applying models. These models may be used to determine new or previously

unidentified relationship within the GIS database or between different databases hence enhancing our understanding and knowledge of the real world. The real strength of GIS comes in when a relational database is linked with the graphics in real time hence this stage of the work involves all the various forms in which the data was analyzed to produce the desired result( Omogunloye and Ayeni, 2012).

Kandwal, Garg, and Grag ( 2009) summarised the importance of application of GIS in public health into12 phases (i) geographical distribution and variation of diseases (ii) analysis of spatial and temporal trends (iii) identifying gaps in immunizations (iv) mapping of population at risk and stratifying risk factors (v) documenting health care needs of a community and assessing resource allocations (vi) forecasting epidemics (vii) planning and targeting interventions (viii) monitoring diseases and intervention over time (ix) managing patient care environment (x) monitoring the utilization of health centres (xi) route health workers, equipments and supplies to services locations and (xii) publishing health information using maps.

## 2.3 Literature Review

### 2.3.1 The Application of GIS in Health Issues.

The use of GIS within health services research offers exciting potentials (Albert et al 2005). Love and Lindquist (1995) used GIS in their study to measure the distance of aged population to hospitals in Illinois in United States of America. They argue that crude access measures based on data for large areal units are no longer necessary given developments in GIS and spatially referenced data. They calculate the potential accessibility of the elderly, geographically referenced to the centroids of 10.796 census blocks, to 214 point-referenced hospitals, 67 with specialised geriatric services, in Illinois, USA. They use simple accessibility measures based on straight line distances to the nearest five hospitals for each

block. Rural residents were found to have substantially inferior access compared to their metropolitan counterparts.

Vinnakota and Lam (2006) used GIS to integrate data about the socioeconomic inequality of mortality of colorectal, lung, breast and prostate cancers in the USA defined at different spatial resolutions as well as to visualize and analyze the results from the association of rule mining process with GIS technology in order to identify regions that need further attention.

Rajiv *et al* (2009) used GIS in mapping of health infrastructure in Andhra Pradesh State. The study reveals the spatial distribution of existing health facilities in Andhra Pradesh State. The study analyzed these health facilities in a serviceable area with proximity to their respective village.

Similarly, Lee (1996) assessed the relative distance of San Francisco's homeless population to clinic and hospitals in United States of America using MapInfo. He created a map showing clinic locations relative to the distribution of homeless population using a one-mile buffer around hospital with emergency room; he noted that most homeless shelters and free food were within these zones. The study revealed that most homeless were geographically accessible to healthcare. Forbes and Todd (1995) used GIS to evaluate potential locations for a new radiotherapy unit for cancer treatment in northwest England. Travel time isochrones for five potential locations were estimated using assumed speeds over links in a digital road network and were overlaid onto census areas to defined travel time zones. Population and post coded cancer registration and admissions data were attached to the census areas to allow the calculation of population and patient numbers within various time bands. The study assumes access to facilities is by private transport or ambulance. Hodgson (1988) also applies such a model in an exploratory way to locate primary health care facilities among settlements of varying size in a rural area of Goa, India.

Gatrell *et al* (1995) show how uptake of screening for breast cancer can be found for doctors' practices in South Lancashire, UK. Post coded patient data, including details of screening status and doctor, were linked to small census areas, for each of which a deprivation score was calculated. For each doctor's practice, an average deprivation score was calculated from the area scores associated with each patient. Using regression analysis, uptake rates for screening were related to the practice deprivation score and the number of female doctors. Large residuals from the regression are of potential policy relevance for identifying practices performing well or poorly after allowing for deprivation and the availability of female doctors. Barbara (2010) used GIS to determine the contribution of distance to hospitals with Cardiac Interventional Services (CIS) to county age- adjusted myocardial infarction (MI) mortality rates (CAMR) in Alabama and Mississipi counties.

Krause, Frate and May (2005), analyze the availability of dentists in Mississippi by county over four decades to determine the geographic distribution of dentists, shifts in their distribution over time and how this distribution relates to population demographics using standardized z scores and GIS technology. Their results can assist current and future practicing dentists, dental school administrators and policy-makers in making informed decisions for determining suitable practice locations, dental school admissions criteria and areas to target for public health initiatives.

Jones and Bentham (1995) used GIS to test for a relationship between health outcomes and accessibility. Using grid referenced police records on serious and fatal road traffic accidents and a digital road network for Norfolk, England, a routine procedure simulated the dispatch of ambulances from their stations to accident sites and then to hospitals, and estimated associated travel times. A logistic regression was subsequently used to test whether the probability of fatal rather than serious injury could be explained by ambulance access times,

whilst simultaneously considering other possible influences, such as age of victim and speed limit on each road. Murad (2011) also established the use of GIS for evaluating the location of health services and demand in Jeddah city. He recommended GIS as tool for health care planning for the healthcare planners in Jeddah city. The created application is considered as a spatial decision support for health planners in Jeddah city.

Bullen, Moon and Jones (1996) have shown how GIS can be used to define localities for West Sussex in southern England. This involved: digitising and then rasterising the perceived neighbourhood of 500 residents to identify common community areas; defining theoretical school catchments using Thiessen polygons linking patient postcodes to census areas and doctors' location and isolating the dominant patient doctor linkages. Subsequent overlays revealed close correspondence between the school catchments and the patient doctor connection. Hirschfield, Brown and Bundred (1995) used such an approach in their study of community health services in Wirral, UK

Geanuracos *et al* (2007) used GIS to plan HIV prevention interventions for high risk youth. They found that maps produced with GIS software offer unique method for visualizing an array of community characteristics, communicating them to non technical audiences and incorporating them into planning process. Maps produced during the project were used to support decision-making and spat community discussion about data collection. Parker (2008) used GIS to analyze the cancer clinical trial locations in the state of Georgia. The study examined cancer clinical trial locations by county, incidence rates, racial patterns and mortality rates of the four major cancer types of breast, colorectal, lung and prostrate. Findings from the study, shows that there was higher densities of cancer clinical trials in Metro-Atlanta counties and there were little or no cancer clinical trials available in counties with the highest rate of overall incidence, African American incidence and overall mortality.

Kohli *et al* (1995) used GIS to compute aerial or straight-line distances as a crude measure of geographic accessibility to PHC facilities in Sweden. The Swedish annual population registration records, the national property register and the local health authorities were the main data sources. Each individual was linked to the property centroid and distances between each centroid and the health facility location were computed to assign population to the nearest health facility. Hewitt & Tinline (2004) used GIS to model spatial accessibility of cancer clinics in Ontario, Canada. This study was used to project a new site for a cancer clinic to improve overall accessibility in the Hamilton region of Ontario. Currently, some regions in California, USA, are using large, multi-layered GIS patient care and room management system which incorporates digital hospital floor plans, work-flow analysis and patient data visualisation. The system assigns patients to rooms and monitors discharge processes.

Perry & Gesler (2000) used GIS to assess physical access to PHC in the remote, hilly and impoverished region of Andean Bolivia. The result showed significant variation in physical access to PHC across three study sites in the region. The analysis resulted in the development of a model of health personnel distribution to maximise physical access. In Costa Rica, a study was carried out to assess equity in access to healthcare and its impact on health reforms using GIS. Traditional measurements of access based on the distance to the nearest health facility were used. From this a comprehensive index of accessibility resulting from aggregation of all facilities weighted by their size, proximity and characteristics of both the population and the facility was developed. Half of the population were found to be less than 1km from an outpatient care facility and 5 km away from a hospital. In equity terms, 12-14% of the population were undeserved based on three indicators: having outpatient outlet within 3 km, hospital within 5 km and 0.2 doctor yearly hours per person. The study was used to

pinpoint underserved areas where improved access would have the greatest impact (Rosero-Bixby, 2004).

Lin, Allen and Penning (2002) studied access to hospitals in British Columbia in an area characterised by mountains and limited road network. They produced a tabular output by districts which also incorporated existing utilization data to weight the model. Christie and Fone (2003) used the same methodologies (GIS) to look at access to tertiary hospital services in Wales. In their study, they used GIS to help tabulate travel time by social groups (weighted by deprivation score) to look at equity of access to very specialist services, which surprisingly was biased towards the more affluent urban dweller, a finding consistent with much accessibility modelling work.

Narimah *et al* (2010) demonstrated the application of GIS in mapping and evaluating the accessibility to health facilities of breasts cancer cases in Penang State of Malaysia. The results suggest that new health facilities with screening and treatment services should be built in the south of Seberang Perai and Blik Pulau areas.Perera *et al* (2012) in their study demonstrated the use of GIS to assess the distribution of public dental clinics in Sri Lanka by developing a baseline population based on geographic model. The study revealed that the distribution of public dental clinics in Sri Lanka has obvious limitations in serving rural poor people. Jayakumar and Malarvannan (2013) used GIS in spatial mapping of cholera in Chennai, in India over a period of 2000- 2011. Geographical Information System (GIS) was used to map cholera-epidemic prone areas and determine the predisposing factors in Chennai district, Tamil Nadu. A database was developed to store spatial and non-spatial data showing the source and spread of cholera. The results of this study indicated that Tondiarpet, Basin Bridge, Pulianthope areas had the highest cholera incidences. However there was a

decreasing trend in 2003, 2005 to 2009 and 2011 and highest incidence was associated with heavy rainfall.

In Africa, the application of GIS in health has been focused on mapping the distribution and control of vector borne diseases using climatic data only of recent development that expanded the use of the software for other health applications. An early application of GIS in disease mapping was the UNICEF Guinea worm eradication programmes within the 18 countries' Guinea worm belt' of West Africa (Noor, 2002). Mbarki *et al* (1995) asserted that GIS has been used to investigate the spatio-temporal dynamics of zoonotic cutaneous leishmaniasis by a programme run by the Pasteur Institute and the Tunisian Department of Public Health in Tunisia. Robinson (1998) used GIS to prioritise areas for tsetse and trypanosomiasis control in Zambia, where the emphasis has changed from widespread eradication to smaller-scale, community-based interventions. Digital maps of land tenure, stocking rates and relative arable potential were combined within a GIS to identify areas where trypanosomiasis was a direct constraint to agricultural development and where the presence of tsetse prevents access to areas adjacent to those under high pressure from livestock and agriculture.

To address the challenge of providing treatment to HIV/AIDS in Tanzania, PEPFAR uses GIS as an information management and analytical tool to improve HIV/AIDS programme delivery by facilitating the integration and analysis of spatially referenced data by mapping. GIS help PEPFAR answer essential questions such as where are the highest HIV prevalence districts in the country. What is the geographic distribution of counselling and testing service delivery points? How many people live within the catchment areas of facilities that currently offer ARVs? Where should PEPFAR expand its services in order to maximize coverage or equity (PEPFAR, 2004).

Hay, Guerra, Tatem, Noor and Snow (2004) used GIS in the mapping process of the global distribution of malaria. This technique helps define populations at risk for appropriate resource allocation to combat the disease. They further overlaid historical maps of malaria risk to create a single global distribution map of malaria risk which illustrated range changing from 1900 to 2002.Markus *et al* (2008) used GIS for the surveillance of infectious diseases. Spatio-temporal clusters of disease detected by computer assisted cluster analysis (SaTScan™) were visualized on maps. The EpiScanGIS (epidemiology software) enables dynamic generation of animated maps. The system is based on open source components; its architecture is open for other infectious agents and geographic regions. It exemplifies GIS applications and early-warning systems in laboratory surveillance of infectious diseases.

Abdalla (2011) used GIS to map the geographical distribution of Pulmonary Tuberculosis cases in Khartoum state over a two years period of2007-2008 and also observed variations in population density, disease incidence, and prevalence of PTB. The study found that the distribution of PTB cases were attributable to several characteristics of the socio-political and socio-economic realities of Khartoum State. Similarly Aster (2010) used GIS and Remote Sensing in his study of malaria risk mapping for Boricha Woreda in Ethiopia. The study was for mapping malaria hazard areas at Boricha woreda where seven parameters were selected. The parameters included rainfall, temperature, altitude, soil, slope, distance from swamp areas, and distance from rivers. The resulting malaria hazard map depicts that 14.5%, 74.3%, and 11.2% , of the total areas are subject to moderate, high and very high level of malaria hazard.

Larri (2011) used GIS in his study of malaria epidemiology in the Amanse West district of Ghana. He used GIS to create the risk surfaces and overlays in the study. A buffered distance of 500m, 1000m, 1500m, and 2000m was used to overlay the distance risk map with forest, rivers/streams to find out its effects with the disease prevalence. Kofie (2007) also used GIS

in his study of surveillance and monitoring of Buruli Ulcer as well as the determination of geographical accessibility to health care services in Ga district in Ghana. The result shows association between disease and some environmental factors. Another study by Onsi, (2004) also used remote sensing and GIS technology to identify health facilities and delineate associated health risks, demonstrated the practical and successful application of remote sensing and GIS in assisting decision-making for health and development and the effectiveness of map making. USAID (2006) used GIS in mapping of midwives and services availability in Ghana. The study examined the location and distribution of facilities offering maternal and neonatal services in each district, they were able to identify areas that are underserved and focus on border areas where some districts gaps could be eased by access to facilities in neighbouring districts.

Wycliff (2009) used GIS in determining the location of health facilities in Embaksi Division in Kenya. The study revealed that some health facilities were to be closed and others upgraded. This study also reveals that most of the population lives within 5km of the health facilities. Similarly, Noor, Gikandi, Hay, Muga and Snow (2004) used GIS to define the population's overall access to Government's health services and their use of these services for treatment of paediatric fevers in Kenya through straight-line distance analysis. The study revealed that more than 60% of the patients in the four districts (Kwale, Makueni, Kissi and Bando) attended health facilities within a 5-km range. The result also shows users from rural communities travelled greater distance of health facilities than those in urban communities.

Tanser and Le Sueur (2002) in their study on the application of GIS in public health problems in Africa affirmed that, surprisingly, there are few published examples of the use of GIS in health systems research in Africa. Indeed Zwarenstein, Krige and Wolff (1991) they used GIS to study inequalities in population per bed ratios and the implications of open access to the private and the formerly white hospital services in the province of KwaZulu-Natal, South

Africa. Catchment areas for hospitals were generated and access to services quantified. While the population-per-bed ratios suggested that hospital bed resources were racially unequal but adequate nonetheless, the GIS method revealed the widespread inadequacies in the allocation of hospital beds, worse for black communities in the province of Kwa zulu/Natal.

Tanser (2002) in his study used GIS to equitably distribute fieldworker workload in a large health survey. The methodology predicted average inter-homestead walking time and divided the heterogeneous study area into units of equal workload. The author suggests that an extension of the same methodology can be used to optimally distribute community health workers and tuberculosis Directly Observed Treatment (DOT) supervisors.

Another study analyzed modal patterns of fixed and mobile clinic attendance across an integrated rural health district (Tanser 2002) where indices to analyze the relative attraction and repulsion by the various clinics in the district were developed. The most important outcome of the research was the development of a composite measure of clinic usage and inter-clinic interaction based on the ratio of total actual versus predicted distance travelled to attend clinic. The same data set was used to validate a model of travel time to the various clinics based on a network analysis of the road network. Relative clinic attraction and inter-clinic interaction were again studied using travel time as the denominator in the index (Tanser and Le Sueur, 2002). De Savigny *et al.,(*2001) utilizes network analysis a similar methodology in the Rufiji district of Tanzania to investigate the relationship of wealth quintiles and health outcomes to travel time to the nearest health facility. Studies of health status and quintiles of income/poverty have revealed that the upper income quintile group lived nearer to health facilities than the lower income quintile group.

Noor *et al.,* (2004) also used GIS to investigate the relationship between clinic access and maternal and child health indicators in rural Kwa-Zulu Natal South Africa (Tanser and Le

Sueur, 2002). In four districts of Kenya, GIS was used to captured and model both population's access and utilization of health services with a view to increasing the effectiveness of malaria treatment coverage (Noor *et al*, 2004).

Kalipeni and Zulu (2008) used GIS to examine the progression of HIV/AIDS in Africa for the period from 1986-2010. The results indicated that the HIV/AIDS epidemic for many countries in Africa has reached the saturation or maturity level as evidenced by the typical S-shaped curves in the trends over time with examples of countries like Uganda, Burundi, Rwanda, and Zimbabwe. Ahmed (2008) used GIS in mapping of HIV/AIDS in susceptible areas of Addis-Ababa in Ethiopia. The result from the HIV/AIDS susceptibility map of Addis-Ababa showed four major susceptibility zones from highest, higher, high and low which shows that majority of Addis-Ababa is found in low susceptible zone.

Busgeeth and Rivette (2004) in their study in Gugulethu township Cape Town, South Africa in the management of HIV/AIDS in communities and data in hospital discovered that a number of hospitals have started this process using convention approach to collect information about patients using paper –based system. The purpose of the study was to design and developed a database which was embedded in GIS. The study discovered that 27% of the 325000 resident of Gugulethu township were HIV positive, this clearly called for the implementation of HIV/AIDS database embedded in GIS which was used in determining where and when to intervene, improving the quality of care for HIV patients, increasing accessibility of services and delivery a cost effective mode of information.

Ivan (2012) used GIS in assessing the maternity waiting home in increasing institutional deliveries in six districts of Cabo Delgado Province of Mozambique. The findings suggest that maternity home could contribute to increasing institutional deliveries coverage. Lwasa (2006) carried out a study to demonstrate the use of GIS technologies in the provision of

information required for planning of health infrastructure in Uganda with the ability to enhance access to the public as well as the understanding of spatial distribution of facilities.

In Nigeria context, there are few studies on GIS application in Health planning and other related healthcare issues. Jimoh and Azubike (2012) used GIS to study the distributional pattern of health care facilities in Ilorin, Kwara State of Nigeria. The study revealed that health care facilities in Ilorin were not evenly distributed. Alabi (2011) used GIS to study the spatial distribution of health centres in lokoja, Kogi State. The result shows a random distribution of facilities and also revealed that accessibility is not uniform. A cursory observation shows most of the health facilities were clustered within the north eastern and south western part of the city.

Abbas, Auta and Naiye (2012) applied GIS mapping in health care facilities in Chikun Local Government, Kaduna State Nigeria. The results show that there were 41 health care centres in the study area with 23 been private care centre and 18 been public health care centres and they went ahead to proposed sites for health care expansions in the Local Government based on WHO health guideline for establishing of health care facilities.

Abdullahi *et al* (2007) used GIS in mapping of Urinary Schistosomiasis in Kano State, Nigeria. The study was conducted using GIS to integrate the demographic, parasitological and site location data of 132 towns and villages, in the 44 Local Government Area of Kano State. The result revealed that, out of the 44 Local Government Areas of Kano State, the highest prevalence rate of 64% was observed in Kura Local Government Area and the least of 18% was observed in D/Tofa Local Government Areas. Also males were observed to have a higher prevalence rate (48.7%) than female (29.7%). Agaja (2012) used GIS to map the spatial distribution of primary healthcare centres in Ughelli and Warri South Local Government Area of Delta State, Nigeria. The result showed random distribution pattern of

distribution. Usman and Ahmed (2012) used GIS to examine the distribution of primary healthcare facilities in Kano Metropolis of Kano State, Nigeria. The result of the study shows that most of the healthcare facilities were clustered within Kano Municipal, Nassarawa, Turauni and some part of Fagge Local Government Areas. The underserved areas were Rajiyan Zaki, Bakin, Bulo, Banbare, and other areas like Yan Raki.

# CHAPTER THREE

# THE STUDY AREA AND RESEARCH METHODOLOGY

## 3.1 Introduction

This section of the research describes the location of the study area and some peculiar geographical settings of the physical settings such as geology, relief and drainage, soils and vegetation, climate, historical background, population, people and culture, health care delivery, economy and livelihoods. Similarly, the methodology adopted was discussed.

## 3.2 The Study Area

### 3.2.1 Location

Benue state lies between Latitudes 6° 25' and 8° 8' north and Longitudes 7° 47' and 10° 0' East with a total landmass of 33,955km and is located on the eastern side of the middle belt of Nigeria. The location of the state is strategic, it is a gateway state between the south-east and the north and shares boundaries with six states namely, Nassarawa to the North, Taraba to the East, Enugu, Ebonyi and Cross-Rivers to the South and Kogi to the West. The south-eastern part of the state boundary stretches with the Republic of Cameroon. This can be seen in Figure 3.1

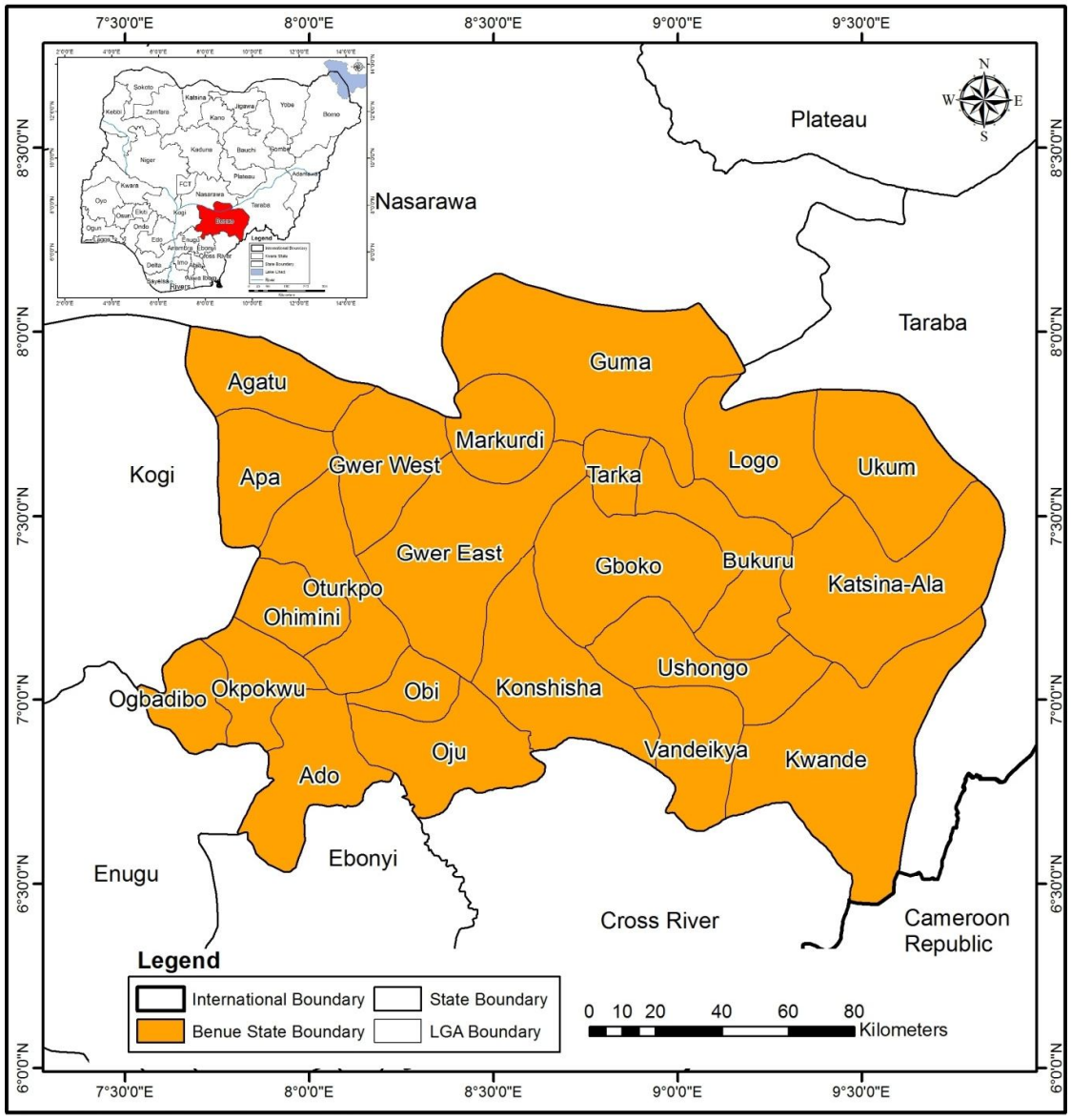



**Figure 3.1: Benue State Showing LGAs**

**Source: Adapted from the administrative map of Benue State, 2014**

### 3.2. 2 Historical Background

Benue State as it exists today is a surviving legacy of an administrative entity which was carved out of the protectorate of northern Nigeria at the beginning of the twentieth century. The territory was initially known as Munshi Province until 1918 when the name of its dominant geographical feature, the 'River Benue' was adopted **(**Zasha, 2010).

As an administrative unit, Benue State was first created on February 3, 1976. It was one of the seven states created by the military administration headed by the late General Murtala Mohammed, which increased the number of states in the country from 13 to 19.At its inception, the state comprised of only seven local governments namely; Gboko, Katsina-Ala, Makurdi, Ankpa, Dekina, Idah and Otukpo. In 1991 its boundaries were adjusted with the creation of Kogi State. The state is presently made up of 23 local government areas namely; Ado, Agatu, Apa, Buruku, Gboko, Guma, Gwer, Gwer-west, Katsina-Ala, Konshisha, Kwande, Logo, Makurdi, Obi, Ohimini,Oju,Okpokwu,Otukpo,Tarka, Ukum,Ushongo and Vandeikya(Our Benue, our future blueprint, 2012).

Makurdi, the state capital was established in the early twenties and gained prominence in 1927 when it became the headquarters of the then Benue Province. Being a river port, it attracted the establishment of trading depots by companies such as UAC and John Holt Limited. Its commercial status was further enhanced when the Railway Bridge was completed and opened in 1932. In 1976, the town became the capital of Benue State and presently serves also as the headquarters of Makurdi Local Government Area (Our Benue, our future blueprint, 2012).

### 3.2.3 Geology, Relief and Drainage

A large part of Benue state is made up of plains which lie around the rivers Niger and Benue and open up into the undulating eastern plains along the Katsina-Ala/ Benue trough. River Benue is the dominant hydrological system in the state. River Katsina-Ala is the longest tributary of River Benue. Other minor streams that drain the state include Amile (Tamen and Kiliki) in Kwando LGA, Dura in Buruku LGA, Mu in Makurdi LGA, Konshisha in Konshisha LGA, Loko in Katsina –Ala LGA, Nagi in Gwer East LGA,Gwer in Gwer LGA, Okpokwu in Okpokwu LGA, Aya and Sambe in Vandeikya LGA. In the north central part of Benue which is predominantly occupied by the Tiv people, the landscape rises from 400m to

750m and also over 1200m ( Mkar hill which is a granitic extrusion), down south the landscape reduces to 200-500m above sea level (Agatu) and is underlined by sedimentary rocks. This area is predominantly occupied by the Idomas. The drainage pattern in the areas is dendrite in nature (Nongo, 1999).

### 3.2.4 Soils and Vegetation

The soils of this area are highly textured and heavy. Nongo (1999) had cause to describe the soils of Benue as been fertile but noted that soil deterioration is mostly due to wasteful and destructive method of cultivation adopted by the people. This observation appears to be corroborated by Ortyoyande (2005), who also felt that shifting cultivation is one of the biggest problems in this area. The area is dominated by loamy sandy soil type. Other soil type such as; dystric, nitosols, aerosols and ferric aerosols occur in patches. The PH mean value is +5.4 to 6.5. The soils are derived from the basement complex and old sedimentary rocks. The soils are thin and dry with surface horizon of friable granular loan. The soils are highly permeable enhancing high infiltration and underground drainage with low runoff. This explains the water condition of the state and can be used for planning purposes especially towards agriculture (Our Benue, our future blueprint, 2012).

The climatic climax vegetation is of guinea savannah. It is characterized by leafy shrubs and grasses. Dominant among the grasses are spear grass, *Imperata cyrindrica*, elephant grass, *Andropogon, gayanus*, *Schizchyanu, Serum berga,* etc scattered trees and some stands of residual gallery forest. The trees have long tap root system and develop thick bark which consists bush fires and ensures their survival during the 4-5 months of dry season. Dominant trees found here include; Locust bean, *Isoberlina doka, Nanchea cotifocia, Bennaricum telliitola, Termanndus, Indika,* Mango, Teak, Gmalina e.tc. Climax has been replaced by derived savannah due to man influence and activities (Nongo 1999).

### 3.2.5 Climate

Benue state belongs to the AW Koppen's classification of climate. Based on Koppen's Scheme of Classification, Benue State lies experiences two distinct seasons, the wet/rainy season and the dry/summer season. The rainy season lasts from April to October with annual rainfall in the range of 100-200mm. The dry season begins in November and ends in March. Temperatures fluctuate between 23 - 37˚C in the year. The south-eastern part of the state adjoining the Obudu-Cameroun mountain range, however, has a cooler climate similar to that of the Jos Plateau. (Ministry of information, 2012)

### 3.2.6 Population, People and the Culture

The 2006 National Population Census figures indicate that Benue State has a total population of 4,219,244 persons with an annual growth rate of three percent (3%) **(**Official Gazette, 2006).This makes Benue the 8$^{th}$ most populous state in Nigeria. With 3.1million living in the rural areas and with a population density of 124 person per sq.km. The state's population shows a slight imbalance in favour of male with 51.3% and women with 48.7 % (National Population Commission, 2009).

The state is made up of two major ethnic groups, the Tiv and Idoma with other minority ethnic groups like the Igede, Etulo, Abakwa, Jukun, Hausa, Akweya and Nyifon. The Tivs are found in local governments like Gboko, Guma, Gwer, Gwer-West, Katsina-Ala, Konshisha, Kwande, Logo, Makurdi, Tarka, Ukum Ushongo and Vandeikya. While the Idomas are found in Ado, Agatu, Apa, Ogbadibo, Ohimini, Okpokwu, and Otukpo. Smaller groups like Igede are found in Obi and Oju. Etulo and Nyifon are found in Buruku. Jukuns are found in Guma and Makurdi (Zasha, 2010). There are two traditional councils in the state, the Tiv Traditional Council headed by the Tor Tiv and the Idoma Traditional Council headed by the Ochi Idoma.

Majority of Benue citizens are Christians. In short over 95% of the population is Christian, divided among the different Christian denominations. Apart from the traditional Christian denominations, like the Catholics, Nongu Kristu u Ser hen Tiv (N.K.S.T), Anglicans, and Methodists that have a large followership, the Pentecostal Churches are fast growing and attracting new members in great numbers (Abela, 2012).The people of the state are famous for their cheerful and hospitable disposition as well as rich cultural heritage

Benue State possesses a rich and diverse cultural heritage which finds expression in colourful cloths, exotic masquerades, supplicated music and dances. Traditional dances from Benue State have won acclaim national and international cultural festivals. These dances include Ingyough, Ange, Anchanakupa and Swange among the Tiv, and Anuwowowo and Odabaru among the Idoma. The Tiv kwagh-hir theatre provides memorable entertainment in its dramatization of Tiv folklore and social commentary (Our Benue, our future blueprint, 2012).

The socio-religious festivals of the state are equally famous. The Alekwu ancestral festival of the Idoma for instance, is an occasion when, it is popularly believed the ancestors emerge from the spirit world to re-establish contact with the living in forms of masquerades. Marriage, funerals and other rites of passage provide occasion for rich displays of the people's cultural heritage. Fishing festivals and communal hunting expeditions are colourful and memorable social events among various communities. The Igede Agba (a new yam festival) and the Ujo festival are the most important social occasions among the Igede and Igumale/Agila people respectively. The first organized state-wide kwagh-hir competition festival dates back as far as December 1981 and was initiated by the then Chairman of the Benue State Council for Arts and Culture, Dr. Iyorwuese Hagher, a university professor (Our Benue, our future blueprint, 2012).

Among the Tiv speaking people of Benue State of Nigeria the word "kwagh-hir" literally means the folktale or simply something magical. It is a unique form of theatre in the generic concept of folktales told in traditional societies all over the world. Folktales are told in virtually all societies all over the world with trickster characters like the rabbit, or the tortoise or the cat dominating their plots and playing unassailable roles. The objectives of these folktales and stories are not only to entertain young children at bedtime but to also teach some morals on contemporary issues. The kwagh-hir theatre is therefore an enactment of the Tiv folktales. Since the Tiv people are good hunters, their stories and imaginations are full of bush animals (Nyam). Some of the episodes of the kwagh-hir feature highly imaginative forms of wild beasts that dance to the melodious tunes of the humans. Tiv folktales are not only told about animals, but spirits (Azov) and puppets (Eev) as well.

Spirits in the world-view of African societies are a reality. Africans believe in the existence of the spiritual world of various people made by the Almighty God, lesser gods, good spirits, evil spirits and ancestors. In fact, human beings who live virtuous lives and die at a ripe old age transform into the state of ancestors who must be appeased anytime a social occasion is to start. In the imagination of the Tiv kwagh-hir theatre, spirits manifest in many fantastic forms performing various activities as are carried among human beings.

What perhaps distinguishes the kwagh-hir theatre from any other theatre in the world is its composite nature bringing together the role of carvers, drummers, singers, masquerades dancers, manipulators and actors. It features a rich repertoire of marionettes performing various human activities with a view to making comment or teaching morals in the Tiv society

In essence, the kwagh-hir theatre is a unique fusion of the human world, the spiritual world, the animal world and the world of fantasy. All these characters share common music and

instrumentation, common beliefs, common world view and common virtues. Although the kwagh-hir performance may not have a single plot as in formal drama, each enactment has its own characters, action and message existing independently (Our Benue, our future blueprint, 2012).

### 3.2.7 Healthcare Delivery

Federal, State and Local governments, and the organized private sector provide healthcare services in Benue state. Efforts have been made by the state government, private owners and the Christian missions especially the NKST and the Catholic faith in providing health care service in the state. The government, whose responsibility it is to provide adequate health care to the citizens has to some extent, done her part in such in that regard. Suffice it to say that the present state of health care in Benue State can be described as generally as not meeting both the international and national standards. A good percentage (78%) of the citizenry does not have access even to the barest minimum health care. The goal of the National Health Policy is the provision of access not only to the Primary Health Care, but also to the Secondary and Tertiary Health Care Systems. However many barriers such poor staffing, dilapidated structures and Government inability to provide drugs stand in the way of achieving such goals in Benue, leaving patients in the hands of either private health care providers or quack and native health providers (Abela, 2012).

Added to these are mission health care providers, formal private providers, informal private providers, traditional healers and faith healers. Formal private providers include hospitals, private doctors, nurse-delivered services (including birthing), pharmacists and other support services. Informal ones refer mainly to the traditional practitioners, itinerant drug sellers, and so called ‘quacks’.

Benue's health system, like that of Nigeria as a whole, is failing to guarantee to the basic health services to its citizens, especially the poor and vulnerable. Deteriorated equipment and facilities, a lack of drugs, poor standards of care, unmotivated staff and relatively high prices of services mean that very few people are now using government health services (Abela, 2012).

Health Services in Benue State are rendered under various departments under the Ministry of Health which include the Directorate of Hospitals and Clinical Services, Social Welfare, Directorate of Pharmaceutical Services, Nursing Service, Public Health Care and Disease Control. Subunits of the department include Expanded Programme on Immunisation (EPI), Onchocerciasis (River blindness), Malaria, Trypanosomiasis (sleeping sickness), Schistosomiasis (bilharziasis), Tuberculosis (TB) and Leprosy Control, Guinea Worm Eradication, Epidemic diseases surveillance, cholera, AIDS control, family planning and drug abuse control. There are 784 government owned primary health care centres across Benue State. These centres are essentially inadequate and do not cover the whole state. The existing primary health centres share the same problems experienced in the maintenance of primary health care in the country namely: pressure, decay of existing health care structures and apathy from the local communities who stay away from health centres due to non-performance. Most of the centres are deserted with few or no staff to attend to patient's needs, drugs are not available and no ambulance services to convey emergency cases to the nearest hospitals. Most facilities are not well maintained hence leaking roofs and poor sanitation abound. All these contradict the philosophy of the primary health care system for the improvement of life in the local communities (Abela, 2012).

The hospital Management Board is a parastatal of the Ministry of Health and it is responsible for the day to day running of Government hospitals (classified as secondary health care facilities). Presently there are 23 Government General Hospitals in the State.

The principal providers of healthcare in Benue state are private hospital which constitute 32 percents (32%), while the public and traditional healers constitute 23 and 20 percent (23 and 20%) respectively. About one third of the population had access to health facility (defined as being less than 30 minutes away by transportation commonly used by the household). Significantly, community health centres are used by only 5 percent of patients, all from rural areas and many are dissatisfied with the treatment which they received (BENSEEDS, 2004)

### 3.2.8 Economy and Livelihood

The main occupation in the state is agriculture. In fact, between 70-75% of the state's population is engaged in subsistence agriculture. This informed by the fact that the state is largely an agrarian society. It is strategically located in the middle belt of the country with vast fertile land and has advantage and capacity to produce virtually all major food crops of the nation. The State is a major producer of yams, rice, sesame, soya bean, sorghum, maize, guinea corn, beans, cassava, groundnuts and bambara nuts. Tree crops like oil palm, mango, orange, cashew, kola nuts, etc also thrive very well in the State; and the state is a major supplier of fruits in the country. About 75% of the populations are rural dwellers who are farmers that cultivate their farms using traditional implement such as hoes, cutlasses, and axe (Ministry of information, 2012)

Initially, farming in the area was subsistence in nature but recently, the state has embarked on agricultural expansion programme to increase crop yield and production. These include provision of agricultural services and incentives to the people such as granting of loans to farmers, construction of feeder roads to link the rural areas and urban areas, provision of high hybrid seeds capable of high yield with a short planting period. The presence of parastatals such as Benue Agricultural and Rural Development Authority (B.A.R.D.A) which is entrusted with the procurement and marketing of agricultural chemicals, fertilizers and Benue Agricultural Cooperative and Benue Tractor Hiring Agency (BENTHA). These programmes

yielded a lot of positive results, large scale soya beans, groundnuts and rice production which gave it the name "FOOD BASKET OF THE NATION". There is a great deal of livestock resources - goats, poultry, sheep, pigs, as well as fish and other aquatic resources which remain largely untapped as the traditional methods of exploration guarantee only a small catch. Benue State maintains a leading status in agricultural production against' the background of a largely subsistence orientation (Ministry of Information, 2012).

River Benue provides great employment opportunities for a lot people in Benue state. It provides good opportunity for fishing. The main people in the fishing industry are the Jukun and the Agatus. Benue is known for its local boat building before the advent of modern boats (Nongo, 1999).

## .3.3 METHODOLOGY

### 3.3.1 Reconnaissance Survey

A reconnaissance survey was carried out by the researcher to identify those centres that offered antiretroviral services, where the researcher met with the medical directors to brief them about the research work and seek for their approval to authorize the study in their respective Hospitals. A structured checklist was given to the Data managers at each centre to collect information on number of people enrolled for ART service at each centre and some other relevant questions that were useful for this work. The survey also helped to determine the sampling size to be employed in selecting the sampling area and number of respondents.

### 3.3.2 Types of Data

Types of data obtained are

Primary data include:

- Location and the names of antiretroviral centres

- Number of people receiving antiretroviral drugs at each centre
- Number of medical personnel at each centre
- Administration map of Benue State

Secondary data include:

- Journals
- Unpublished and published theses
- Internet downloading of materials
- List of antiretroviral centres

### 3.3.3 Sources of Data

The data on health care centres and their addresses for individual local government that render antiretroviral drugs services in Benue State were obtained from Ministry of Health and Benue State AIDS Control Agency (BENSACA). Administrative map of Benue State was sourced from the ministry of Land and Survey to serve as the base map. A Garmin 75C5X Handheld global positioning system Receiver (GPS) was used to collect coordinate points of the antiretroviral centres in the State.

A well structured questionnaire was designed for the HIV/AIDS patients that were receiving drugs at these centres. The questions were on information like sex, age, and level of education, income rate and the utilization of these centres**.** The population data was sourced from National Population Commission.

### 3.3.4 Sampling Techniques

Purposive sampling was adopted because only healthcare facilities that render antiretroviral drug treatment services in the study areas were the target of this work.

In order to select the respondents for questionnaire survey, the twenty three LGAs were grouped based on the three senatorial zones in the state. In the course of selecting the Local Government Area, Purposive sampling was used because only Local Government Areas with the highest number of ART centres in three senatorial zones were chosen. This method was employed considering the time frame and financial involvement required for this work, since Vandeikya and Oturkpo selected Local Government Areas both have ART drugs centres that are private and Government owned ART centres and also have centres that were located in Urban and Rural settings. A total number of 15 ART centres were selected for administering of questionnaire. This was as the result of the selected LGA from the three senatorial districts because Vandeikya LGA from Benue- North East senatorial Zone has 4 ART centres, Makurdi has 7 ART centres from Benue-North central Senatorial Zone and Otukpo LGA has 4 ART centres from Benue-South senatorial District as shown in (Table 3.1).

For the purpose of determining the sample size of the questionnaire to administered, Yemen (1967) formula for sample size determination was used. $\frac{N}{1+N\,(e)^2}$

Where N = number of population under study (72968) in Table 3.1

e = proportion of population given as (0.05%)

$$\frac{72968}{1 + 72968\,(0.05)^2}$$

$= \frac{72968}{182.4225}$

$= 399.9410$

$= 400$

Using the above formula, a total of 400 respondents were obtained and copies of questionnaire were administered to the chosen sample.

Finally, to determine the proportion of the respondents, this formula was used.

$$\frac{n}{N}x400$$

Where n = population of patients at each selected ART centre in each LGA (Table 3.1).

N = total population of patients at each selected ART centres in the selected LGAs

A respondent was randomly selected at the points of their meetings and collection of ART drugs in the hospital. Potential study participants were informed that the aim of the study was to explore their perceptions about the utilization of ART services they were receiving at the centre; they were assured that their participation was voluntary and confidential and their refusal to participate would not jeopardize their care in any way. The researcher was at the drugs collection points and administered the questionnaire to the willing respondents until the target sample size was achieved.

**Table: 3.1 Senatorial zones, selected LGAs, selected ART centres and the proportion of population to be sampled.**

| Senatorial Zone (District) | Local Government selected | Names of the selected ART centres from each LGA | Population of patients at each centre | Number of questionnaire to be administered at each centre |
|---|---|---|---|---|
| Benue- North East senatorial Zone | Vandeikya | General Hospital Vandeikya | 6348 | 35 |
| | | St.Thomas Hospital Ihugh | 3801 | 21 |
| | | NKST Hospital Mbaakon | 1747 | 10 |
| | | Sev-AvFoundation Clinic Vandeikya. | 1057 | 06 |
| Benue-North central Senatorial Zone | Makurdi | Federal Medical Centre Makurdi | 18567 | 102 |
| | | General Hospital North-Bank | 7670 | 42 |
| | | FSP Clinic and Maternity | 1021 | 5 |
| | | BSU Teaching Hospital Makurdi | 1034 | 6 |
| | | Bishop Murray Hospital Makurdi | 7352 | 40 |
| | | 45 NAF Hospital Makurdi | 8906 | 49 |
| | | Madonna Hospital | 1732 | 9 |
| Benue-South senatorial District | Otukpo | General Hospital Otukpo | 10671 | 58 |
| | | St.Charles's Clinic Adoka | 1061 | 6 |
| | | St.Joseph Clinic Ogobia | 1204 | 7 |
| | | Sev-Av Foundation Clinic | 806 | 4 |
| **Total** | | **15** | **72968** | **400** |

**Source: Author, 2013**

### 3.3.5 Method of Data Analysis

The administrative map of Benue State was scanned and geo-referenced using ARC Map 10.1 On screen digitization of features such as State boundary, Local Government boundary were digitized as polygon features. Local Government and antiretroviral drugs centres were

digitized as Points using different symbols. These spatial data were organized in layers. The coordinate's data of the antiretroviral drugs centres were copied in Micro-soft Excel, saved and later exported into dbase format where by database tables were created. These tables were then imported into a geo-database generated using ArcCatalog. The ART data was also exported into dbase format, and then imported into Arc Map so as to allow linking with GPS data. A point map was then generated using Arc GIS, and join with other map layers so to perform GIS analysis.

The questionnaire was analyzed using SPSS software. The collected data were coded and entered into Statistical Package for Social Science (SPSS) version 20.0. The descriptive statistic described the characteristics of respondents through the tables and percentages.

**(i) Database Creation**

The database was created using 16 fields which are; Facility name, Location/local government, Category, Ownership, Level of the hospital, Number of medical Doctors, Nurses, Laboratory Technologist, Nutritionist, Counsellors, Pharmacist, Number of person enrolled for antiretroviral therapy, Number of people living with HIV/AIDS in each Local Government, the year of establishment of the hospital, year of commencement of ART services, Population of the Local Government, Names of antiretroviral drugs in stocks at each centre and x and Y coordinates of antiretroviral centres.(Easting and Northing). In the development of database, the attribute data necessary for each of antiretroviral drug centre was entered into its theme's attribute table. This was done by adding the required number of field (columns) to the table and entering the data for all the antiretroviral drug centres in their corresponding rows in MS Excel. All these were exported to Arc Map 10.1 environment for analysis.

**(ii) Overlaying Analysis**

Overlay is a process in geographic data processing that involves registering and combining layers of thematic data to form a new composite layer. Overlay has been widely regarded as one of the oldest map analysis methods. Map users have long history of putting one map on top of another in order to detect the association between their contents (Lo and Yeung, 2005).

The geographic coordinates of ART drug centres were overlaid on base map of Benue State to show the spatial distribution of the study area. The approach that was adopted in mapping the distribution was point pattern. It was then determined whether the spatial distributions of ART sites are in relation with people living with HIV/AIDS or population figures.

**(iii) Query**

According to Lo and Yeung (2005), query is an input to the computer that aims to retrieve data from a database. This is done with the aid of a database management system (DBMS).Database query is also referred to as the selection of various combination tables for examination; it involves the retrieval of information stored in the database using structured query language (SQL). SQL is a database sublanguage for querying and modifying relational databases (RDBMS).

For a geographic data stored in external DBMS, the Structured Query Language (SQL) is the standard query language.SQL is implemented using three key operations which are "SELECT, PROJECT, and JOIN". Select is operation that extracts data items in specified rows of tables, Project is operation that extracts data items in specified columns of a table while Join which is also known as "RELATIONAL JOIN" is operation that mergers two tables on the basis of the values in the common columns of the table( Lo and Yeung,2005).

Two types of queries were generated for the purpose of this project.(a) Single Criteria Analysis (b) Multiple Criteria Analysis

The single criteria analysis refers to the situation whereby a single condition is used to query a database. For example, select all the ART centres in the database, etc. Implementing the single criteria query required the process of specifying a condition for the retrieval of information. The query process was performed by selecting the 'select by attribute' item under the selection menu in the ArcMap 10.1 environment. After this the condition is specified in the select by attribute window and when applied it is reflected on the drawing in the view in a specified colour.

Multiple Criteria Analysis is a process where more than one condition is used to perform spatial search. This involves process of carrying out queries of more than one condition. Such spatial queries bring out more flexibility in the management of information. More information about a feature can be retrieved at the same time.

The spatial search operation for this work was carried out through query generation to retrieve information stored in the database pertaining to certain systematically defined attributes within the database to answer some spatially related questions.

This operation involved the link between the database and the composite map of the study area. This is important in order to confirm certain attributes within the neighbourhood, which must be logically defined. To demonstrate the effectiveness of the database created, it was subjected to a number of spatial queries by attributes. Since the graphic and the corresponding attribute tables were linked, it was possible to query the attributes. This query was emphasized upon as it provides answers to likely questions that would be required by the relevant authorities in making decisions.

Queries were performed to identify antiretroviral drugs centres that are public and those that are private, the types of hospitals that render antiretroviral drugs services, their location whether in rural or urban, using query builder.

**(iv) Statistical Analysis of the Data**

A spatial statistics tool in ArcMap was used to identify the location pattern of antiretroviral centre in Benue State. Nearest neighbourhood analysis was used to compute the Z-Score and to determine the pattern of the distribution.

The Nearest Neighbour analysis was generated using ArcGIS 10.1. Given a set of features and an associated attribute, the nearest neighbour analysis tool in ArcGIS evaluates whether the pattern expressed is clustered, dispersed, or random. The Average Nearest Neighbour tool measures the distance between each feature centroid and its nearest neighbour's centroid location. It then averages all these nearest neighbour distances. If the average distance is less than the average for a hypothetical random distribution, the distribution of the features being analyzed is considered clustered. If the average distance is greater than a hypothetical random distribution, the features are considered dispersed. The average nearest neighbour ration is calculated as the observed average distance divided by the expected average distance (with expected average distance being based on a hypothetical random distribution with the same number of features covering the same total area).

The equation used to calculate the average nearest neighbour distance index and the z-score are based on the assumption that the points being measured are free to locate anywhere within the study area (for example, there are no barriers, and all cases or features are located independently of one another). The p-value is a numerical approximation of the area under the curve for a known distribution, limited by the test statistics. Both z-scores and p-values are associated with standard normal distribution.

Charts, tables, graph and maps were used to show better information representation as regards the distribution of ART drugs centres in Benue State, the medical personnel and

people enrolment for ART drugs services. ArcMap10.1 was used to produce the graph to pattern of distribution of ART Centres in the study area.

# CHAPTER FOUR

## RESULTS AND DISCUSSION

### 4.1 Introduction

This chapter considers the results on the socio demographic characteristics of the respondents from selected ART centres in Benue State. The results were then discussed and appropriate inference made to improve on antiretroviral drug centres planning and management in Benue State. The chapter also look on the location and distribution of ART drug centres as well as utilization.

### 4.2 Socio Demographic Characteristics

#### 4.2.1 Sex Distribution

Table 4.1 shows the distribution of sex of respondent. Age and sex are important demographic variables and are the primary basis of demographic classification (National Population Commission, 2008).

**Table 4.1: Distribution of Respondents by Sex**

| Sex | Frequency | Percentage |
|---|---|---|
| Male | 173 | 43.3 |
| Female | 227 | 56.8 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

Table 4.1 reveals that most of the respondents are female which constitute 56.8 percent of the total respondents with 227 respondents found to be females while 43.3 percent of the respondents are males. Recent studies have revealed that women are exposed to high risk of sexual behaviour as a result of several factors, including cultural practices such as polygamy,

traditional bias, early marriage of young girls, and lack of power of young married women to insist upon the use of condom during sex (Population Council, 2007)

### 4.2.2 Age Distribution

The Table below shows the age distribution of the sampled people living with HIV/AIDS in Benue State.

**Table 4.2: Distribution of Respondents by Age**

| Age Group(years) | Frequency | Percentage |
|---|---|---|
| <15 | 15 | 3.8 |
| 15-19 | 42 | 10.5 |
| 20-24 | 91 | 22.8 |
| 25-29 | 46 | 11.5 |
| 30-34 | 64 | 16.0 |
| 35-39 | 32 | 8.0 |
| 40-44 | 41 | 10.3 |
| 45-49 | 38 | 9.5 |
| 50+ | 31 | 7.8 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

Table 4.2 indicates that majority of PLWHA are between the ages of 20-24 years. This is followed by the age groups of 30-34 years and 25-29 years with 16 percent and 11.5 percent of the respondents respectively. Respondents in the age group of 15-19 and 40-45 constitute 10.5 percent and 10.3 percent of the respectively, while those within the age group of 45-49, 35-39, and 50 year above are 9.5, 8, and 7.8 percent in that order. Also, 3.8 percent of the respondents fall within the age group of less than 15years being the least age group that access treatment at the centres, the reason may be as the result of their less involvement in sex activities as compared to the other age groups. This study concurs with that of Idigbe (2006) which stated that HIV/AIDS affects adult most in economically productive age group of 15-39 years.

### 4.2.3 Marital Status

The Table shows marital status among the sampled respondents.

**Table 4.3: Distribution by Marital Status of Respondents**

| Marital status | Frequency | Percentage |
|---|---|---|
| Single | 139 | 34.8 |
| Married | 186 | 46.5 |
| Divorced | 22 | 5.5 |
| Window | 21 | 5.3 |
| Separated | 32 | 8.0 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

Table 4.3 reveals that 34.8 percent of the sampled population are single, 46.5 percent of the respondents are married, 8 percent are separated, while those who are divorced and widowed are 5.5 percent and 5.3 percent respectively. This finding is in line with the findings of Anslem (2009) in which 48 percent of the people living with HIV/AIDS were married.

### 4.2.4 Marital Union

Table 4.4 shows that 47.3 percent of those with HIV are in monogamous, 18.3 percent in polygamous union and 34.5 percent did not state the type of marital union. This may be those that are single. It is obvious that, there is dominance of monogamous union in the study area.

**Table 4.4.Distribution of Respondents by Marital union**

| Type of marital union | Frequency | Percentage |
|---|---|---|
| Polygamous | 73 | 18.3 |
| Monogamous | 189 | 47.3 |
| Others | 138 | 34.5 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

This may be as a result of the fact that majority of the people in the state are Christians and Christianity supports the marriage of one man to one wife. Although the result concurred with the study of Laah (2003) on the study of Demographic and Socio-economic effects of

HIV/AIDS in Kaduna State which revealed that 71.6 percent of the respondents were in monogamous marital union. The result may be as a the result of the composition of the state which clearly shows that 95 percent of the people are Christian and Christianity as religion frowns at marrying more than one wife.

### 4.2.5 Educational Attainment of the respondents

The educational attainment of PLWHA in selected ART drugs centres is also presented in table 4.2.5.

**Table 4.5.Distribution of Respondents by Educational Attainment**

| Education Attainment | Frequency | Percentage |
|---|---|---|
| None | 97 | 24.3 |
| Quranic | 16 | 4.0 |
| Primary | 40 | 10.0 |
| Secondary | 126 | 31.5 |
| Tertiary | 121 | 30.3 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

Table 4.5 shows that 31.5 percent have secondary school, 30.3 percent attained tertiary institution while 24.3 percent have no formal education and 10 percent attained primary school education. Those with Quranic education constitute 4 percent of the respondents. It can be deduced from the result that, the literacy level of individuals determines how they interact and utilize ART Centres and vice versa. Education is a key determinant of the lifestyle and societal status and it is a major indicator of human development. Studies have consistently shown that educational attainment has strong effect on health behaviours and attitude (NPC, 2008).

### 4.2.6 Occupation of the Respondent

The table reveals the occupation status of the sampled PLWHA in selected ART centres

**Table 4.6 Distribution of Respondents by Occupation**

| Occupation | Frequency | Percentage |
|---|---|---|
| Civil/public service | 111 | 7.8 |
| Farming | 104 | 26.0 |
| Petty trading | 131 | 32.8 |
| Full time housewife | 53 | 13.3 |
| Others | 1 | .3 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

Table 4.6 reveals that most of the sampled respondents that receive treatment in the selected centres are petty traders with 32.8 percent of the total respondents, followed by civil/public servants with 27.8 percent; farmers' constitute 26 percent while 13.3 percent of the sample population are full time house wives. The relatively high proportion of petty traders is because of the fact that most centres are located in urban area

### 4.2.7 Income Distribution

**Table 4.7: Distribution of Respondents by Income**

| Income Per Month (₦) | Frequency | Percentage |
|---|---|---|
| <5000 | 121 | 30.3 |
| 5000-10000 | 116 | 29.0 |
| 11000-15000 | 37 | 9.3 |
| 16000-20000 | 21 | 5.3 |
| 21000-25000 | 41 | 10.3 |
| 26000+ | 64 | 16.0 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

Table 4.7 shows the respondents by income, 30.3 per cent of the respondents have monthly income of less than N5, 000, while 29.0 percent have a monthly income of between N5, 000 and N10, 000. A total of 16.0 per cent earn a monthly income N26000 and above, while 10.3 per cent earn between N21, 000 and N25, 000. Those who earn between N11, 000 and N15, 000 are 9.3 per cent and 5.3 per cent earns between N16, 000 and N20, 000 respectively.

Income status of the patients can be one barrier at times when they don't have fare to enable them board a public transport. This may negatively affect the uptake. According to Preston (1975) income plays an important role in life expectancy of individual.

### 4.2.8 Number of Children

**Table 4.8: Distribution of Respondents by Number of Children**

| Number of Children | Frequency | Percentage |
|---|---|---|
| None | 6 | 2.3 |
| 1-2 | 59 | 22.3 |
| 3-4 | 114 | 43.0 |
| 5-6 | 69 | 26.0 |
| 7-9 | 8 | 3.0 |
| 9+ | 9 | 3.4 |
| **Total** | **265** | **100.0** |

Source: **Author, 2013.**

Table 4.8 shows the number of children born by the respondents. A total of 43.0 per cent have between 3 and 4 children, while 26.0 per cent have between 5 and 6 children. Also 22.3 percent of the respondents have between 1-2 children. Those who have 9 and above children constitute 3.4 percent, also 3.0 percent of the respondents have between 7-9 children. In all 2.3 percent do not have a child. This group will include to those who are not married. It can be deduced from the data that are average number of children is between 3 and 4. This is relatively moderate fertility could be as a result of high literacy rate.

### 4.2.9 Household Size

The table shows the household composition of the sampled people living with HIV/AIDS.

**Table 4.9 Distribution of respondents on Household Size**

| Household Size | Frequency | Percentage |
|---|---|---|
| 1-3 | 71 | 17.8 |
| 4-6 | 184 | 46.0 |
| 7-9 | 94 | 23.5 |
| 10+ | 51 | 12.8 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

The size of household is very important characteristic in household welfare. Economic resources are often more limited in larger households. Moreover, where the size of the household is larger, crowding also can lead to health problems (NPC, 2008). Table 4.9 reveals that 46.0 per cent have a household size of between 4 and 6, while 23.5 per cent of the sampled respondents have a household size of 7 to 9, while 17.8 per cent of the respondents have a household size between 1 and 3. The household with the largest size of 10 and above have 12.8 percent. This study is in line with 2008 NPC which indicates that the average household size is 4.4 persons, compared with 5.0 persons in the 2003 NPC. The result is in agreement with the result of the National Modular Child Labour Survey in Nigeria which was conducted by International Labour Organisation in conjunction with Federal Office of Statistic in Nigeria in 2001. The survey revealed that, the household size in Benue State was5.4 and that states in the Northern part of Nigeria have larger household size than their counterpart in the Southern part of the country (FOS/ILO/SIMPOC, 2001).

### 4.3. Location and Distribution of ART Centres in Benue State.

Table 4.10 reveals that Makurdi Local Government Area which is also the State capital contributed 15.2% of the total number of ART drug centres in Benue State followed by Vandeikya, Gboko,and Otukpo have 8.7% of the ART drug centres each. Ukum Local

Government Area has 6.5% of the ART drug centres, while LGAs like Kwande, Oju, Okpokwu, Gwer-East,Gwer-west, and Logo have two ART drug centres which contribute 4.3% each. Twelve LGAs have one (2.2%) ART drug centre with each. These LGAs include Ado, Agatu, Apa, Buruku, Guma, KatsinaAla, Konshisha, Ogbadibo, Ohimini, Obi, Tarka and Ushongo. This can be seen in Figure 4.1

**Table 4.10: Distribution of ART Centres in Benue State**

| Local Government Area | Number of ART Drugs Centres | Percentage |
|---|---|---|
| **Ado** | 1 | 2.2 |
| **Agatu** | 1 | 2.2 |
| **Apa** | 1 | 2.2 |
| **Buruku** | 1 | 2.2 |
| **Gboko** | 4 | 8.7 |
| **Guma** | 1 | 2.2 |
| **Gwer-East** | 2 | 4.3 |
| **Gwer-West** | 2 | 4.3 |
| **Katsina-Ala** | 1 | 2.2 |
| **Konshisha** | 1 | 2.2 |
| **Kwando** | 2 | 4.3 |
| **Logo** | 2 | 4.3 |
| **Makurdi** | 7 | 15.2 |
| **Obi** | 1 | 2.2 |
| **Ohimini** | 1 | 2.2 |
| **Oju** | 2 | 4.3 |
| **Okpokwu** | 2 | 4.3 |
| **Oturkpo** | 4 | 8.7 |
| **Ogbadibo** | 1 | 2.2 |
| **Tarka** | 1 | 2.2 |
| **Ukum** | 3 | 6.5 |
| **Ushongo** | 1 | 2.2 |
| **Vandeikya** | 4 | 8.7 |
| **Total** | **46** | **100.0** |

**Source: Author, 2013.**

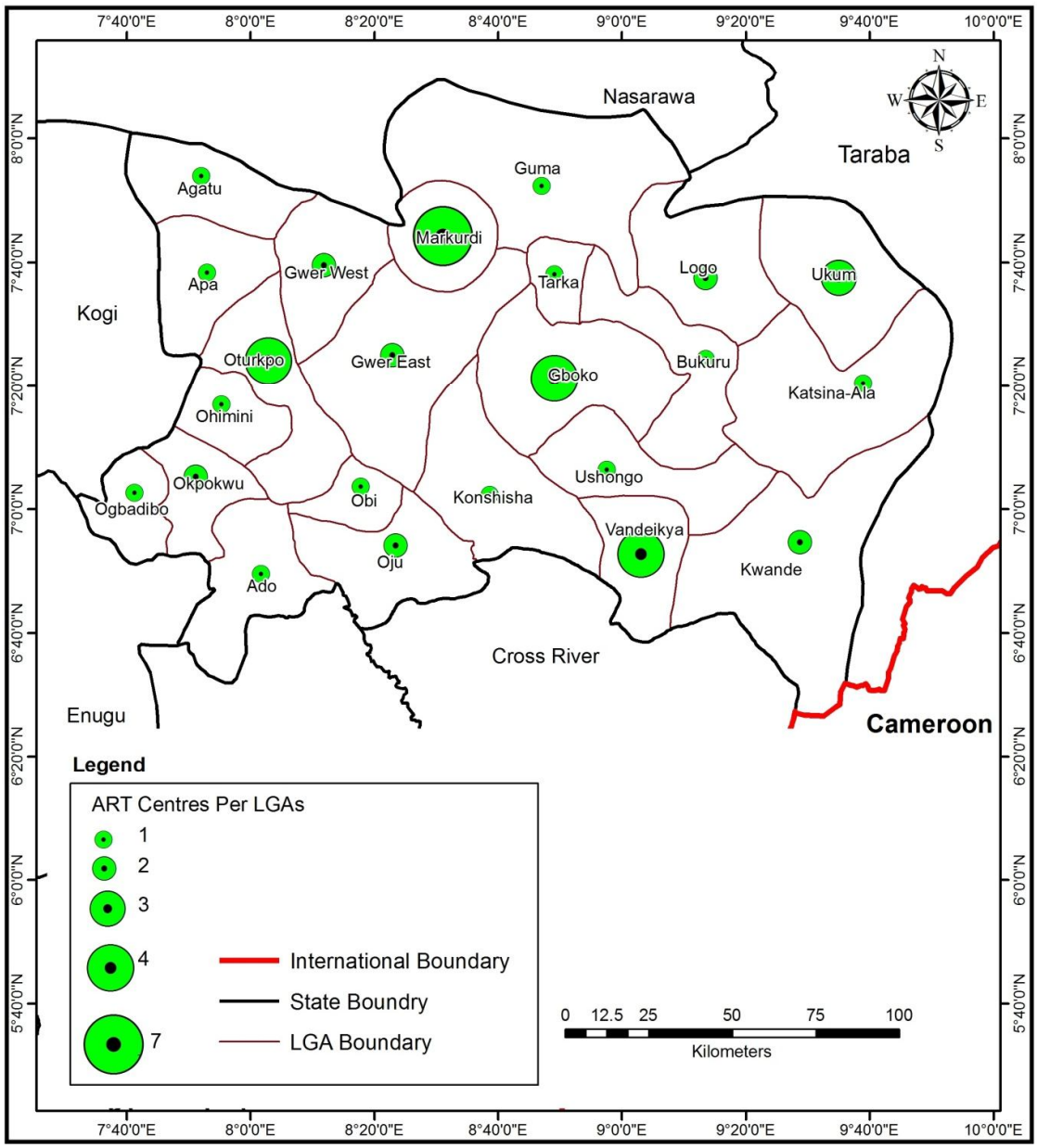



**Figure 4.1: Location and Distribution of ART centres in Benue State**

**Source: Field Survey, 2013**

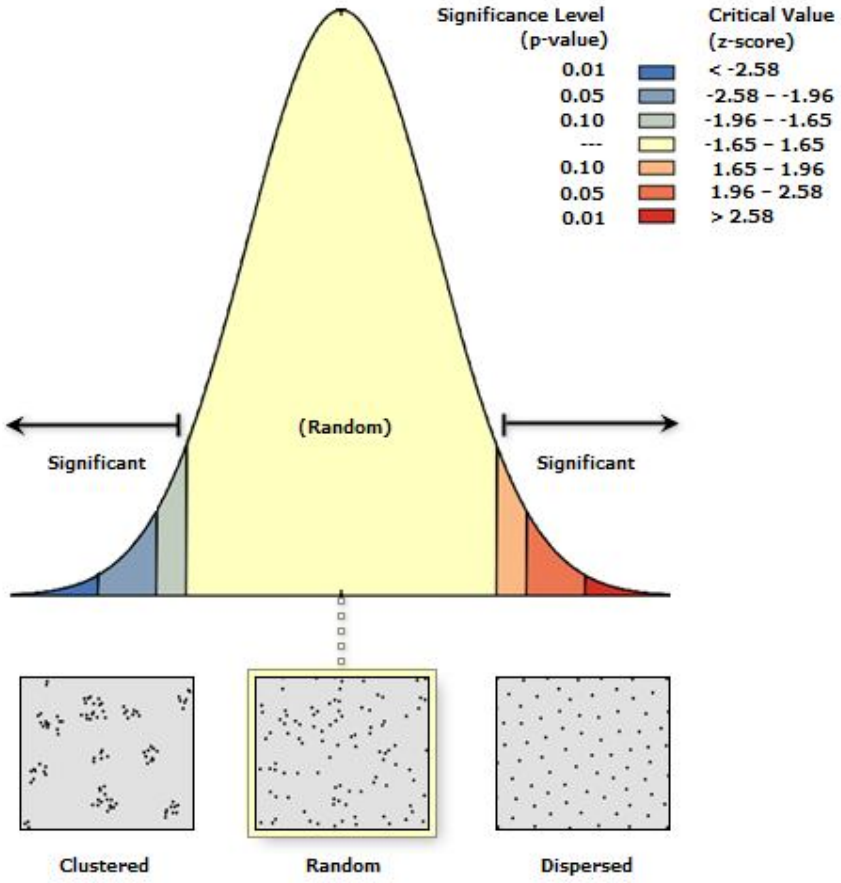



**Figure 4.2**: **Spatial Distribution pattern of ART Centres in Benue State**

Given the z-score of -1.08, the pattern does not appear to be significantly different than random.

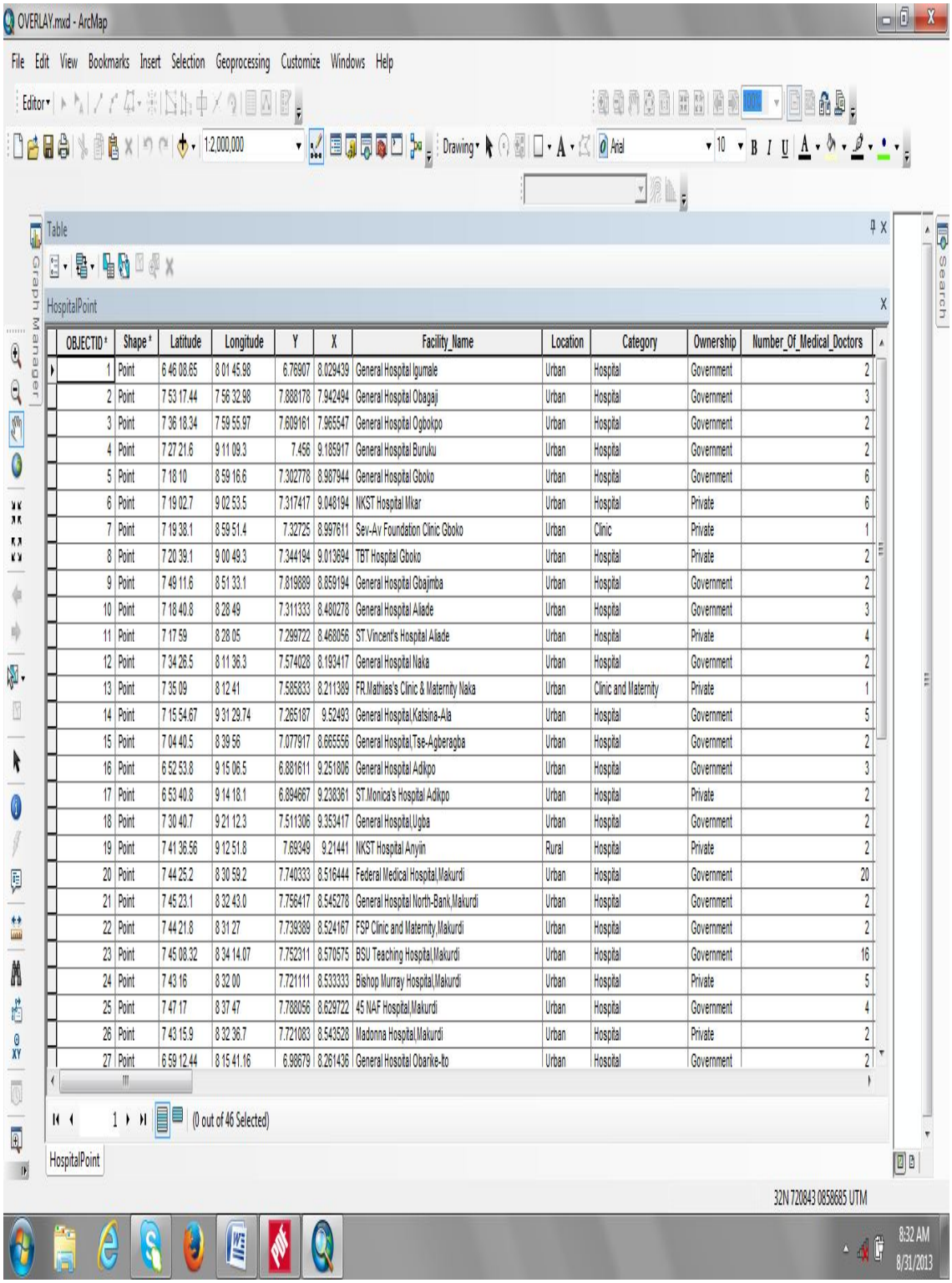
| **Average Nearest Neighbour Summary** | |
|---|---|
| Observed Mean Distance: | 0.098064 Degrees |
| Expected Mean Distance: | 0.106970 Degrees |
| Nearest Neighbour Ratio: | 0.916747 |
| z-score: | -1.080209 |
| p-value: | 0.280049 |

| **Dataset Information** | |
|---|---|
| Input Feature Class**:** | ART Centres |
| Distance Method: | Euclidean |
| Study Area: | 2.105417 |

The Average Nearest Neighbour tool returns five values: observed mean distance, expected mean distance, nearest neighbour index, z-score and p-value as shown in the Figure 4.2. A total number of forty six ART centres were visited in Benue State. The Nearest Neighbour Analysis of the ART centres here revealed an Rn = 0.916747 with N=46, area of study = 2.105417, Observed Mean distance = 0.098064, while Expected mean distance =0.106970. The spatial distribution of these ART drugs centres indicates random pattern in the distribution of ART centres. The test significance, Z= -1.080209 which shows the pattern does not appear to be significantly different than random with a P-Value of 0.280049.

From the result displayed in Figure 4.2, it means that the observed spatial pattern of ART drugs centres is as a result of random process. This means that there is a continuous random process going on in terms of the spatial distribution of ART drugs centres in Benue State and this process likely to continue in this fashion except if there a set of national or international standard for location of ART drugs centres within specified distance.

### 4.3.1 Spatial Database of ART Drugs Centres in Benue State.




| OBJECTID * | Shape * | Latitude | Longitude | Y | X | Facility_Name | Location | Category | Ownership | Number_Of_Medical_Doctors |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Point | 6 46 08.65 | 8 01 45.98 | 6.76907 | 8.029439 | General Hospital Igumale | Urban | Hospital | Government | 2 |
| 2 | Point | 7 53 17.44 | 7 56 32.98 | 7.888178 | 7.942494 | General Hospital Obagaji | Urban | Hospital | Government | 3 |
| 3 | Point | 7 36 18.34 | 7 59 55.97 | 7.609161 | 7.965547 | General Hospital Ogbokpo | Urban | Hospital | Government | 2 |
| 4 | Point | 7 27 21.6 | 9 11 09.3 | 7.456 | 9.185917 | General Hospital Buruku | Urban | Hospital | Government | 2 |
| 5 | Point | 7 18 10 | 8 59 16.6 | 7.302778 | 8.987944 | General Hospital Gboko | Urban | Hospital | Government | 6 |
| 6 | Point | 7 19 02.7 | 9 02 53.5 | 7.317417 | 9.048194 | NKST Hospital Mkar | Urban | Hospital | Private | 6 |
| 7 | Point | 7 19 38.1 | 8 59 51.4 | 7.32725 | 8.997611 | Sev-Av Foundation Clinic Gboko | Urban | Clinic | Private | 1 |
| 8 | Point | 7 20 39.1 | 9 00 49.3 | 7.344194 | 9.013694 | TBT Hospital Gboko | Urban | Hospital | Private | 2 |
| 9 | Point | 7 49 11.6 | 8 51 33.1 | 7.819889 | 8.859194 | General Hospital Gbajimba | Urban | Hospital | Government | 2 |
| 10 | Point | 7 18 40.8 | 8 28 49 | 7.311333 | 8.480278 | General Hospital Aliade | Urban | Hospital | Government | 3 |
| 11 | Point | 7 17 59 | 8 28 05 | 7.299722 | 8.468056 | ST.Vincent's Hospital Aliade | Urban | Hospital | Private | 4 |
| 12 | Point | 7 34 26.5 | 8 11 36.3 | 7.574028 | 8.193417 | General Hospital Naka | Urban | Hospital | Government | 2 |
| 13 | Point | 7 35 09 | 8 12 41 | 7.585833 | 8.211389 | FR.Mathias's Clinic & Maternity Naka | Urban | Clinic and Maternity | Private | 1 |
| 14 | Point | 7 15 54.67 | 9 31 29.74 | 7.265187 | 9.52493 | General Hospital,Katsina-Ala | Urban | Hospital | Government | 5 |
| 15 | Point | 7 04 40.5 | 8 39 56 | 7.077917 | 8.665556 | General Hospital,Tse-Agberagba | Urban | Hospital | Government | 2 |
| 16 | Point | 6 52 53.8 | 9 15 06.5 | 6.881611 | 9.251806 | General Hospital Adikpo | Urban | Hospital | Government | 3 |
| 17 | Point | 6 53 40.8 | 9 14 18.1 | 6.894667 | 9.238361 | ST.Monica's Hospital Adikpo | Urban | Hospital | Private | 2 |
| 18 | Point | 7 30 40.7 | 9 21 12.3 | 7.511306 | 9.353417 | General Hospital,Ugba | Urban | Hospital | Government | 2 |
| 19 | Point | 7 41 36.56 | 9 12 51.8 | 7.69349 | 9.21441 | NKST Hospital Anyiin | Rural | Hospital | Private | 2 |
| 20 | Point | 7 44 25.2 | 8 30 59.2 | 7.740333 | 8.516444 | Federal Medical Hospital,Makurdi | Urban | Hospital | Government | 20 |
| 21 | Point | 7 45 23.1 | 8 32 43.0 | 7.756417 | 8.545278 | General Hospital North-Bank,Makurdi | Urban | Hospital | Government | 2 |
| 22 | Point | 7 44 21.8 | 8 31 27 | 7.739389 | 8.524167 | FSP Clinic and Maternity,Makurdi | Urban | Hospital | Government | 2 |
| 23 | Point | 7 45 08.32 | 8 34 14.07 | 7.752311 | 8.570575 | BSU Teaching Hospital,Makurdi | Urban | Hospital | Government | 16 |
| 24 | Point | 7 43 16 | 8 32 00 | 7.721111 | 8.533333 | Bishop Murray Hospital,Makurdi | Urban | Hospital | Private | 5 |
| 25 | Point | 7 47 17 | 8 37 47 | 7.788056 | 8.629722 | 45 NAF Hospital,Makurdi | Urban | Hospital | Government | 4 |
| 26 | Point | 7 43 15.9 | 8 32 36.7 | 7.721083 | 8.543528 | Madonna Hospital,Makurdi | Urban | Hospital | Private | 2 |
| 27 | Point | 6 59 12.44 | 8 15 41.16 | 6.98679 | 8.261436 | General Hospital Obarike-Ito | Urban | Hospital | Government | 2 |

**Table 4.11: A sample of Database for ART centres in Benue State.**

The database for ART drugs centres in Benue State contains information about the respective centres on the Geographic coordinates (latitude and longitude) which are tagged X and Y, Facility Name, Location, Category, Ownership, number of Medical Doctors, number of Nurses, number of Laboratory Technologists, number of nutritionist, number of Counsellors, number of Pharmacists, number of people enrolled for ART services, LGAs Population, number of people living with HIV Per LGA, ARV drugs in stock, Year of commencement of ART services, Year of establishment and type of hospital or level of the hospital. The database created shows the total number of hospitals that offer comprehensive ART services in Benue State. The database contains forty-six ART drugs centres spread amongst the twenty-three LGAs in Benue State.

### 4.3.2 Spatial Queries on Location, Ownership and Types of Healthcare Facilities in ART Services in Benue State.

#### 4.3.2.1 Rural – Urban Distribution of ART Centres

Query analysis in ArcGIS were done to reveal the location of the ART drug centres whether they are located in urban or rural areas of the state, ownership of the centres and types of health care facilities that render ART drug services in Benue State.

**Table 4.12: Location of ART Centres in Benue State**

| Location of ART Centres | Number of ART Centres | Percentage |
|---|---|---|
| Urban | 43 | 93.5 |
| Rural | 3 | 6.5 |
| **Total** | **46** | **100** |

**Source: Author, 2013.**

Table 4.12 reveals that, 93.5% of 46 ART drug centres are located in urban areas while 6.5% of them are located in rural areas. The three ART drug centres located in rural areas are found in Vandeikya, Logo and Otukpo LGAs of Benue State. All the three centres located in rural areas are privately-owned ART centres by faith-based organisations of Catholic and NKST (Protestant) churches. The result shows that, all the seven centres in Makurdi and four in Gboko LGAs are located within the headquarters, while those in other LGAs are located in the headquarters or other important towns in the LGAs.

In addition, all the Government owned General Hospitals are located in the LGA headquarters. This shows that all the twenty three General Hospitals that render ART services are located within the urban areas of the LGAs. This is shown in Figure 5.5 and 5.6 Since the population in rural areas is estimated to be 73%, one can conclude that PLWHAs in Benue State are not well served with ART drugs based on the 2006 census which revealed that, 3.1 million people in Benue State are living in rural parts of Benue State (NPC, 2009)

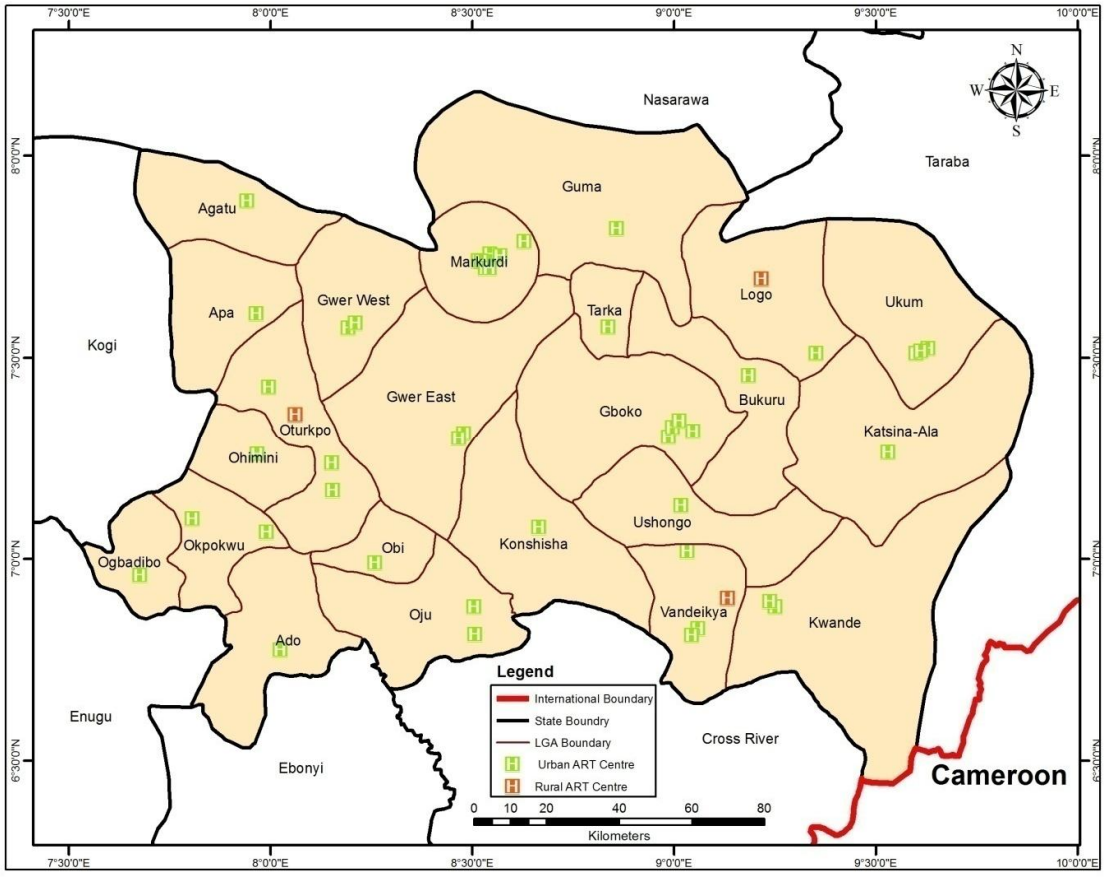



**Figure 4.3: Urban and Rural Distribution of ART Centres in Benue State**

**Source: Field Survey, 2013**

**4.3.2.2 Ownership of ART Centres in Benue State**

**Table 4.13: Ownership of ART Centres in Benue State**

| Ownership | Number of ART Centres | Percent |
|---|---|---|
| Government-Owned | 27 | 58.7 |
| Privately-Owned | 19 | 41.3 |
| **Total** | **46** | **100** |

**Source: Author, 2013.**

Table 4.13 shows that out of the 46 ART centres in Benue State, 58.7% (27) are owned by Government while 41.3% (19) are owned by private organisations. The nineteen (19) ART centres Privately-owned are either by individuals, Faith-Based Organisations (FBOs) or NGOs. This result concurred with WHO (2011) which revealed that 78% ART are offered in the public sector and 8% in the private sector (14% were unspecified). Based on the analysis,

out of the seven (7) ART drug centres located in Makurdi LGA, five of them are Government-owned centres while the remaining two are privately-owned. For the other LGAs, there is at least one Government-owned centre which is General hospital which is established in all the twenty three (23) LGAs. Those owned by faith based organisations are either catholic or the NKST (protestant) churches. The two faith based organisations have contributed immensely in health services delivery in the State, however the two denominations deserve special mention due to the numerous activities they offer in the State.

ART drug centres owned by individuals are Madonna hospital, TBT hospital and Bethesda Hospital located in Makurdi, Gboko and Oju LGAs. The remaining three privately-owned ART drug centres are NGOs centres established by the wife of the Benue State Governor Mrs. (ARC.) Yemisi Dooshima Suswam. There is a centre each in the three Senatorial districts of the State namely (Sev-Av Foundation clinic) located in Vandeikya (Senatorial district A) Gboko (Senatorial district B) and Otukpo (Senatorial district C) LGAs.

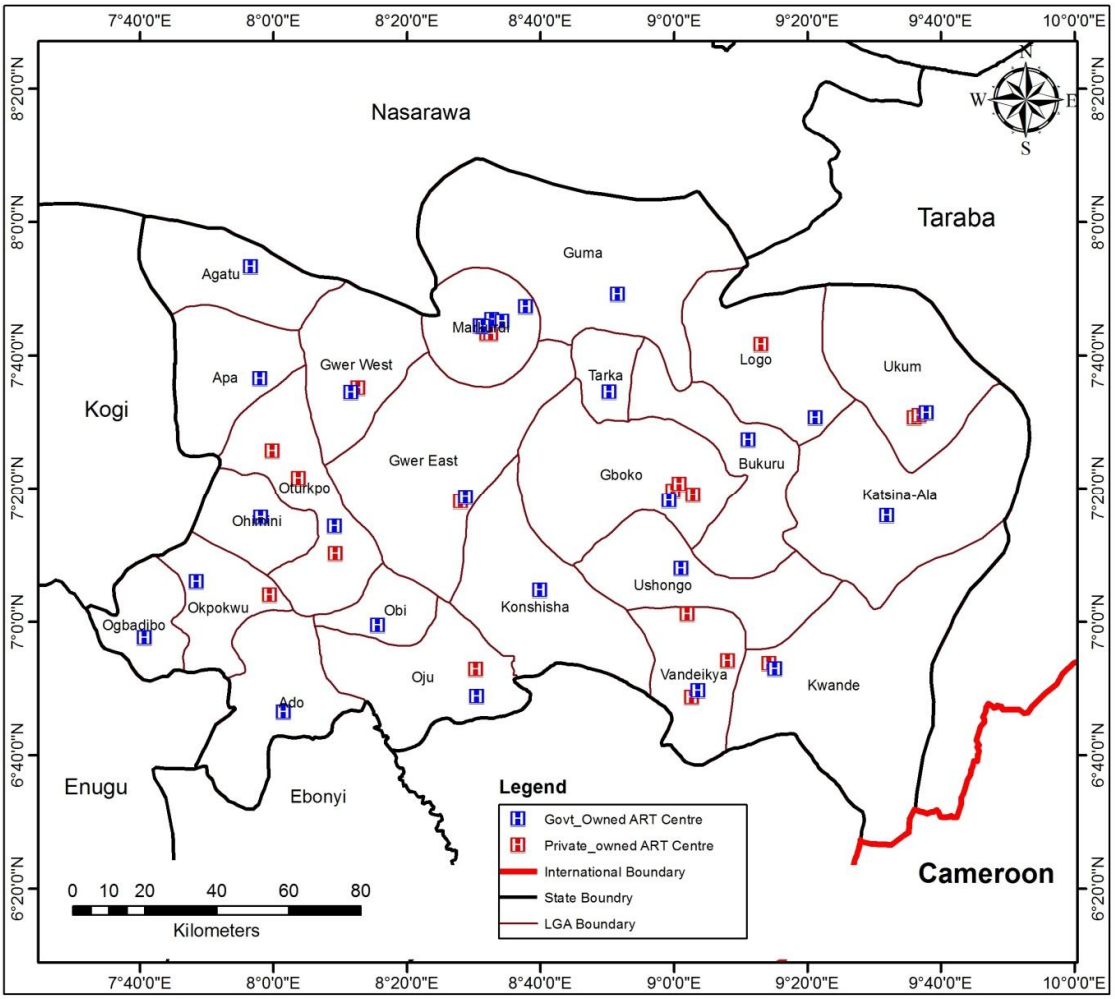



**Figure 4.4: Location of Government and Private owned ART centres in Benue State**
**Source: Field Survey, 2013**

### 4.3.2.3 Types of Healthcare Facilities

**Table 4.14: Healthcare facilities**

| Types | Number of ART Centres | Percent |
|---|---|---|
| Primary | 5 | 10.9 |
| Secondary | 39 | 84.8 |
| Tertiary | 2 | 4.3 |
| **Total** | **46** | **100** |

**Source: Author, 2013.**

Table 4.14 shows that 84.8% of healthcare facilities that render ART services in the area belong to the secondary category, 10.9% are in the primary category while 4.3% of the healthcare facilities belong to the tertiary group. According to Pavignani (2007), the

healthcare delivery comprises a range of institutions which are classified on the basis of their specialization, sophistication and the level of care they can provide. Basically, there are three main levels identified as Primary, Secondary and Tertiary healthcare delivery systems

For the primary healthcare level, five out of the forty six ART drug centres fall within this category. The five centres are Sev-Av Foundation Clinics in Vandeikya, Gboko and Otukpo LGAs while the remaining two are Fr,Mathias clinic and Maternity Naka, Gwer West and St. Joseph's Clinic and Maternity Ogobia, in Otukpo LGAs of Benue State. This is shown in Figures 4.10 and 4.13. On the secondary healthcare institutions that render ART drug services in Benue State, which constitute the highest percent of (84.8%) with all the twenty three General hospitals falling in this category are spread across the twenty three LGAs.

Finally, on the tertiary healthcare category, there are only two types of Hospitals in Benue State that involve in rendering ART drug services. These are the Federal Medical Centre Makurdi and Benue State Teaching hospital all located in the State capital. Federal Medical Centre happened to be one amongst the 25 pioneer centres in the country when the Government of Nigeria initiated ART drug programme in the year 2002 (HERFON,2007).

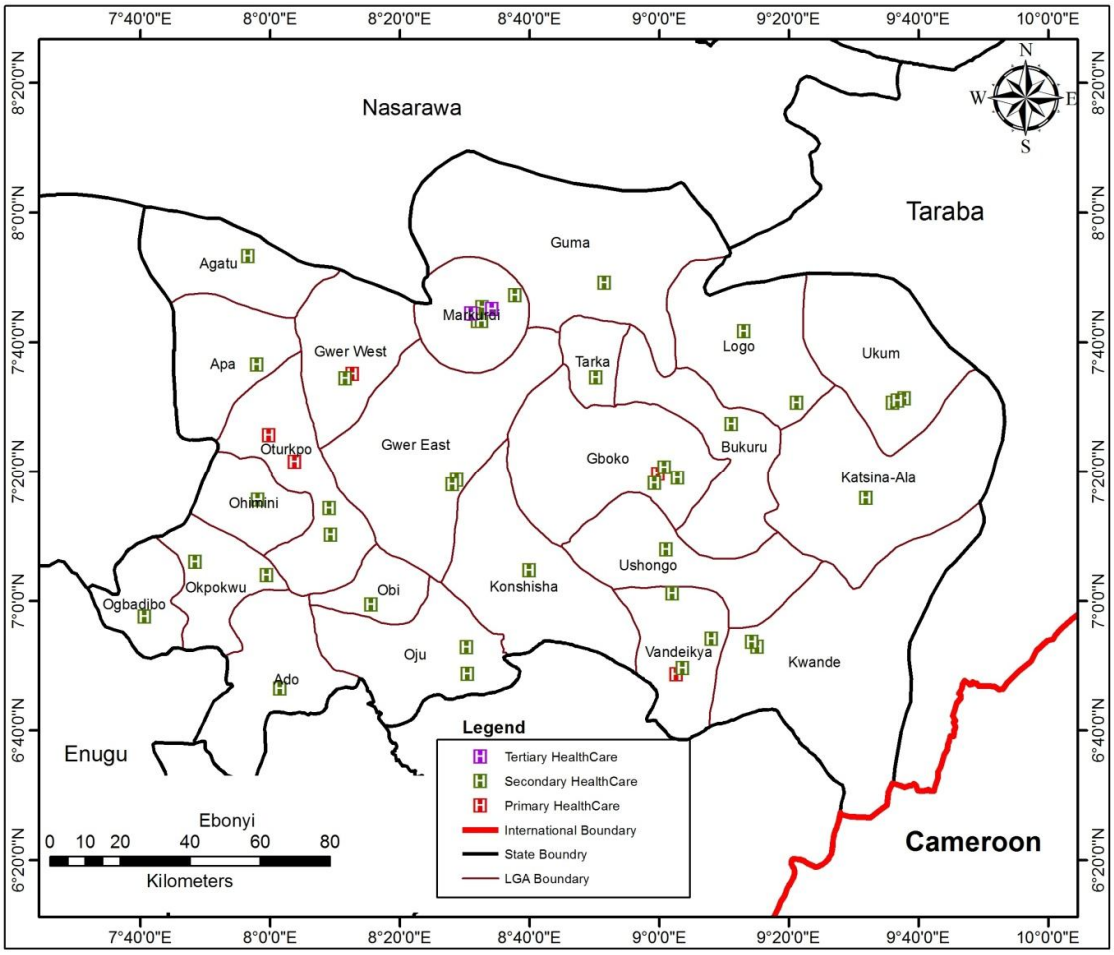



**Figure 4.5:Types of healthcare facilities rendering ART services in Benue State**

**Source: Field Survey, 2013**

### 4.4 People Enrolment ART Services

The number of people that enrolled for ART services within the designated centres varies from one centre to another. Amongst the centres, the centre with the highest number of patients is the Federal Medical Centre Makurdi with 10.2 percent of people enrolment for ART drug services; this may be attributed to the fact that this was the first ART centre in Benue State and its location. This is followed by General Hospital Gboko with 8.4 percent. This can be seen in Figure 4.6 below

It can deduced from the survey that, the population from these centres is associated with year of commencement of ART drug services and the contiguous nature of these centres from

other LGAs that by the time such centres were located, there was no centre in the contiguous LGA.

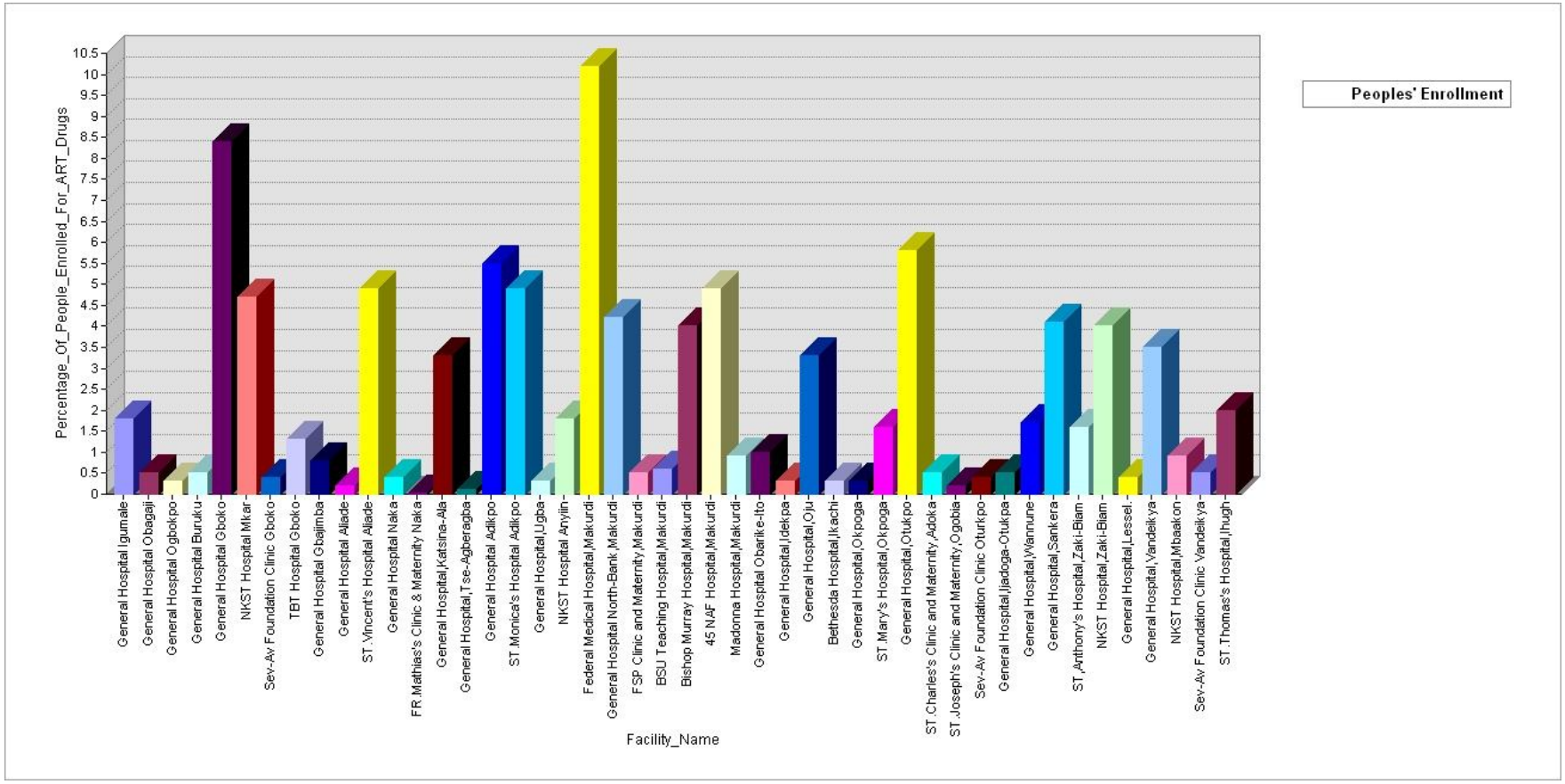



**Figure 4.6: Percentage Distribution of people enrolled for ART services.**

**Source: Field Survey, 2013**

### 4.5 Medical Personnel's at Hospitals that offer ART drugs Services in Benue State.

For effective and efficient management of HIV/ AIDS patients, medical personnel are involved. They play important roles in one way or the other. This includes medical doctors, nurses, laboratory technologists, nutritionists, counsellors and pharmacists.

#### 4.5.1 Medical Doctors

A Doctor is responsible for diagnosis and shares responsibility for defining treatment plans and objectives with other team member. The doctor also works with the pharmacist to emphasise the importance of treatment adherence, identify ways of overcoming adherence barriers and ensure individuals meet their obligations regarding doctor visits and laboratory tests. Deduction from Figure 4.7 shows the spread of medical personnel in the 46 ART drug centres. The results show that Federal Medical Centre, Makurdi and Benue State Teaching hospital have the highest number of medical doctors with 13.5 percent and 10.8 percent each. This is followed by General Hospital, Gboko, General Hospital, Otukpo and NKST Hospital, Mkar both have 6 medical doctors each, (4.1 percent). General Hospital Katsina-Ala and Bishop Murray Medical centre Makurdi have 5 medical doctors each (3.4percent). The least centres are Sev av foundation Clinics in Gboko,Vandeikya, and Otukpo as well as Fr.Mathias have a medical doctor ( 0.7 percent) each

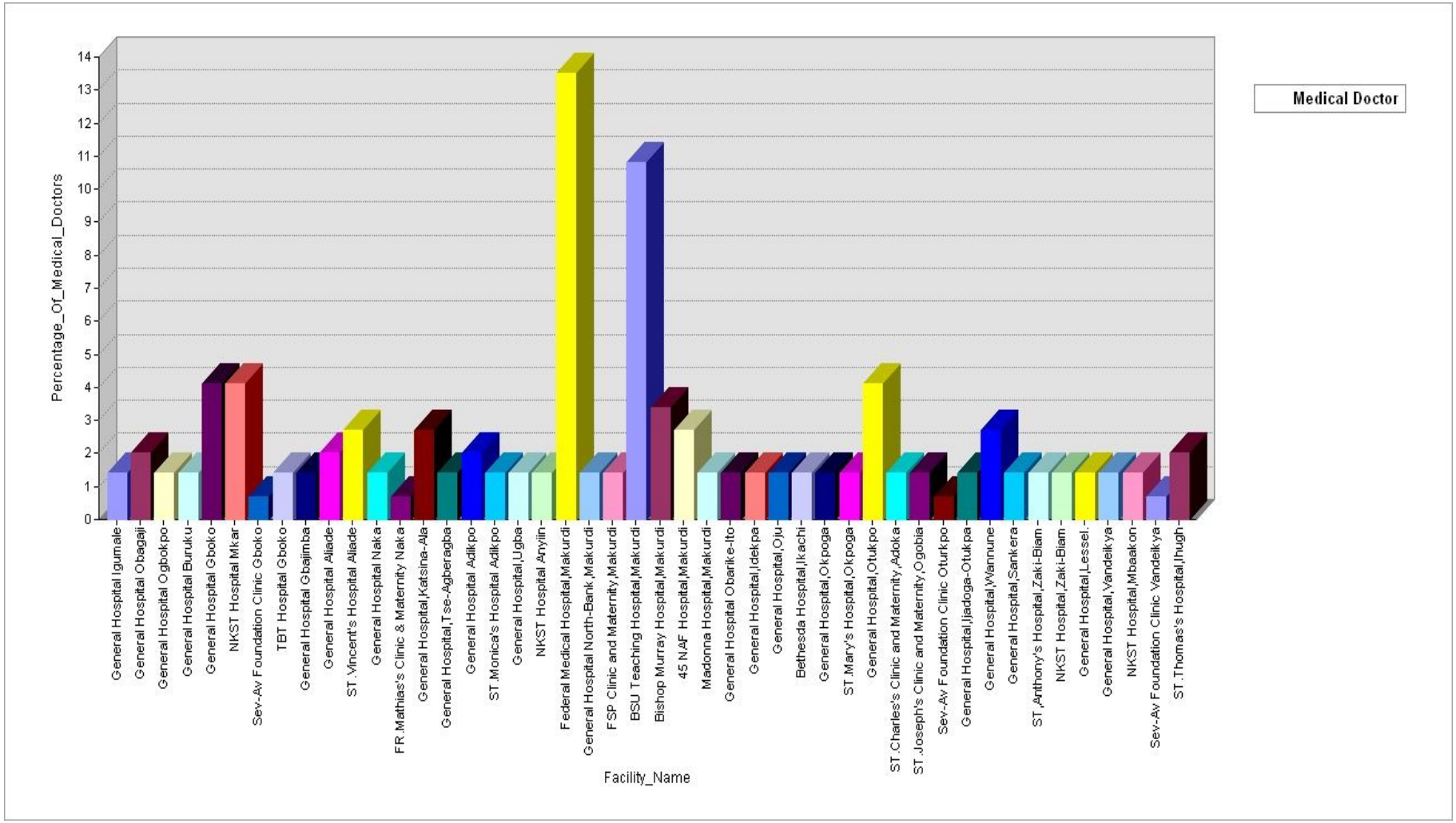



**Figure 4.7: Percentage Distribution of Medical Doctors in ART Centres in Benue State**.

### 4.5.2 Nurses

The nurses work with the doctors by augmenting some activities and in most centres, they are the ones trained as counsellors. On the nurses, their population is higher than the medical doctors in these centres. The result from Figure 4.8 shows that, Federal Medical centre and BSU Teaching Hospital have 15.4 percent and 10.7 percent each number of nurses. The sequence of nurses from other centres shows that this with General Hospital Gboko, NKST Hospital Mkar and General Hospital Adikpo have 5.5percent, 3.8percent, and 3.6 percent nurses' each in that order of number of nurses. Fr. Mathias has the least number of nurses with 0.3 percent. The reveal shows that the two tertiary healthcare institutions have the highest numbers of nurses which is followed by the secondary healthcare institutions while the primary healthcare institutions have the least number of nurses in their centres.

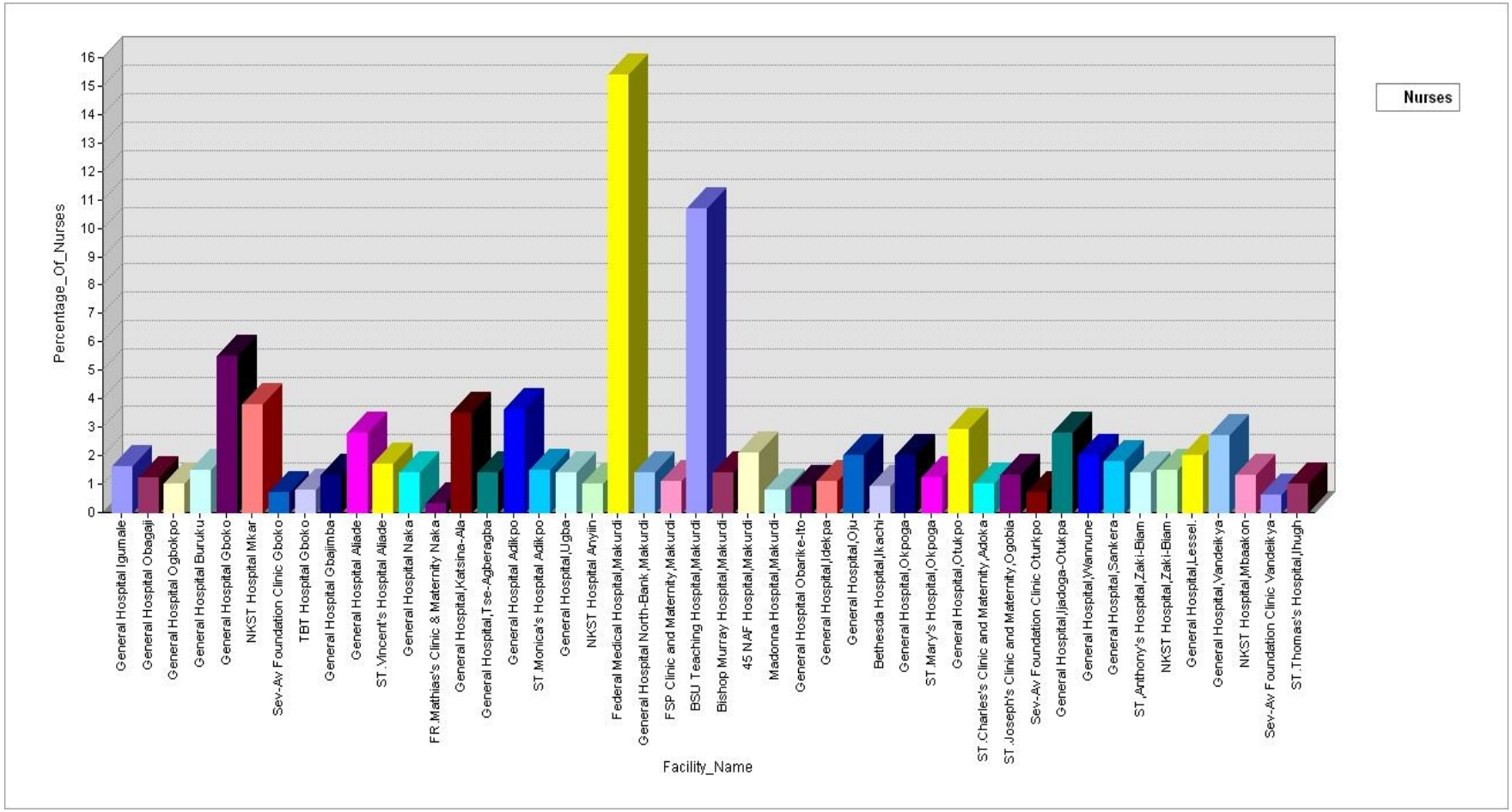



**Figure 4.8: Percentage Distribution of Nurses in ART Centres in Benue State**

**Source: Field Survey, 2013**

### 4.5.3: Laboratory Technologists/Scientists/Technicians

They play a pivotal role in HIV/AIDS, management by conducting series of tests for patients to know their CD+ status of patients. The laboratory Technologists/Scientists/Technicians in the Hospitals that renders ART drugs services from Figure 4.9 shows that, the two tertiary institutions still have the highest number of laboratory personnel with BSU Teaching hospital and Federal Medical Centre both in Makurdi having 21.5 percent and 18.5 percent each. This is followed by NKST Hospital Mkar, General Hospital Gboko and St.Anthony's Aliade with 3.9 percent and 3.6 percent laboratory personnel each).

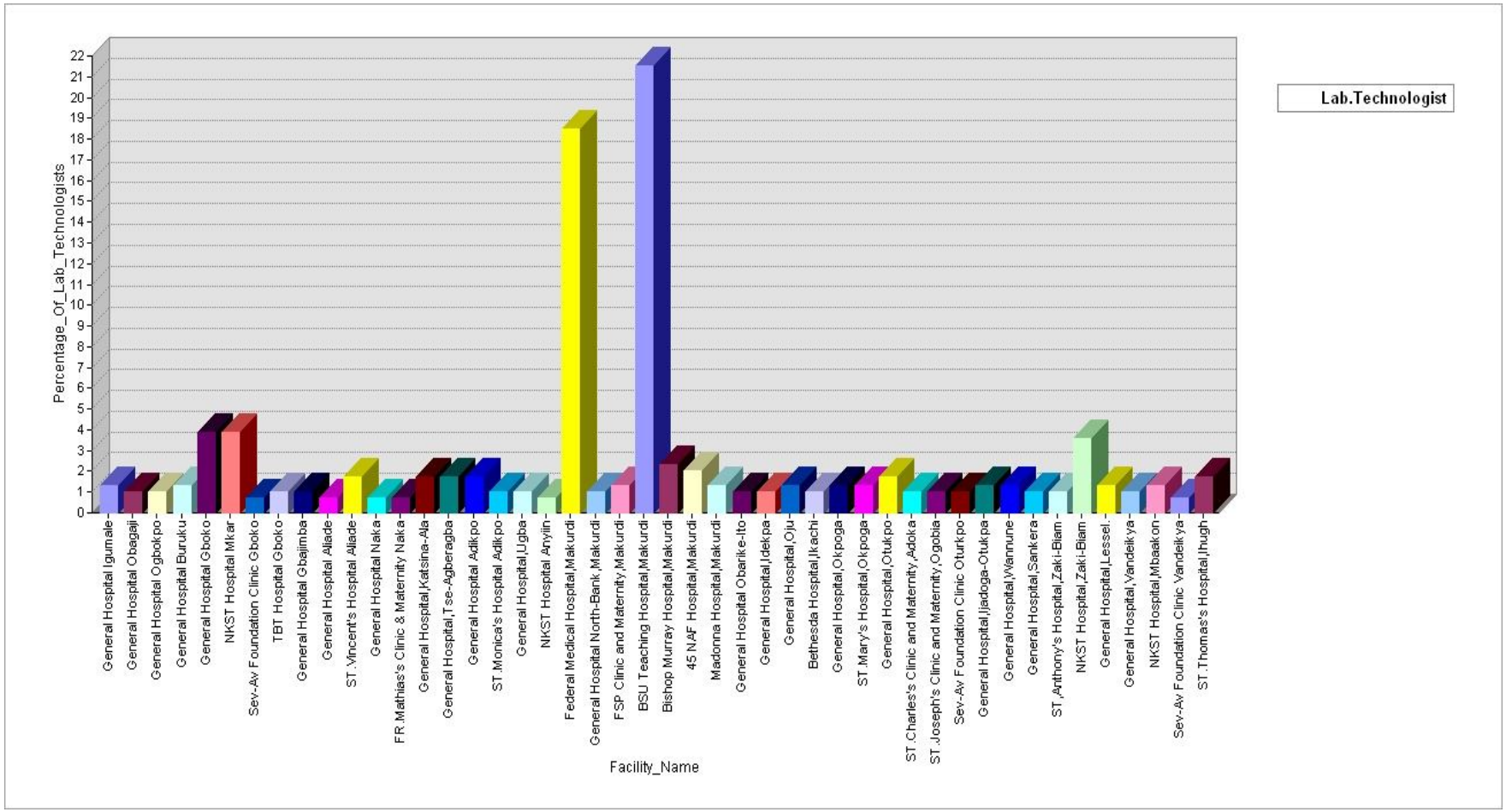



**Figure 4.9: Percentage Distribution of Laboratory Technologist in ART Centres in Benue State Source**

### 4.5.4: Nutritionists

A nutritionist is responsible for all aspects of care related to diet and exercise. The nutritionist works with pharmacist to recommend drug therapies in people experiencing nutritional complications such as AIDS wasting or lipodystrophies. The pharmacist works with the nutritionist to ensure that nutritional interventions did not interfere with drugs therapy. The result from Figure 4.10 shows the number of nutritionists from the centres with only five out of the forty-Six (46) having nutritionists. These centres are Federal Medical centre Makurdi with 46.1 percent, Benue State Teaching Hospital has 38.4 percent, NAF Hospital Makurdi constitute 7.6 percent while FSP Clinic and Bishop Murray Medical Centre have 3.8 percent each.

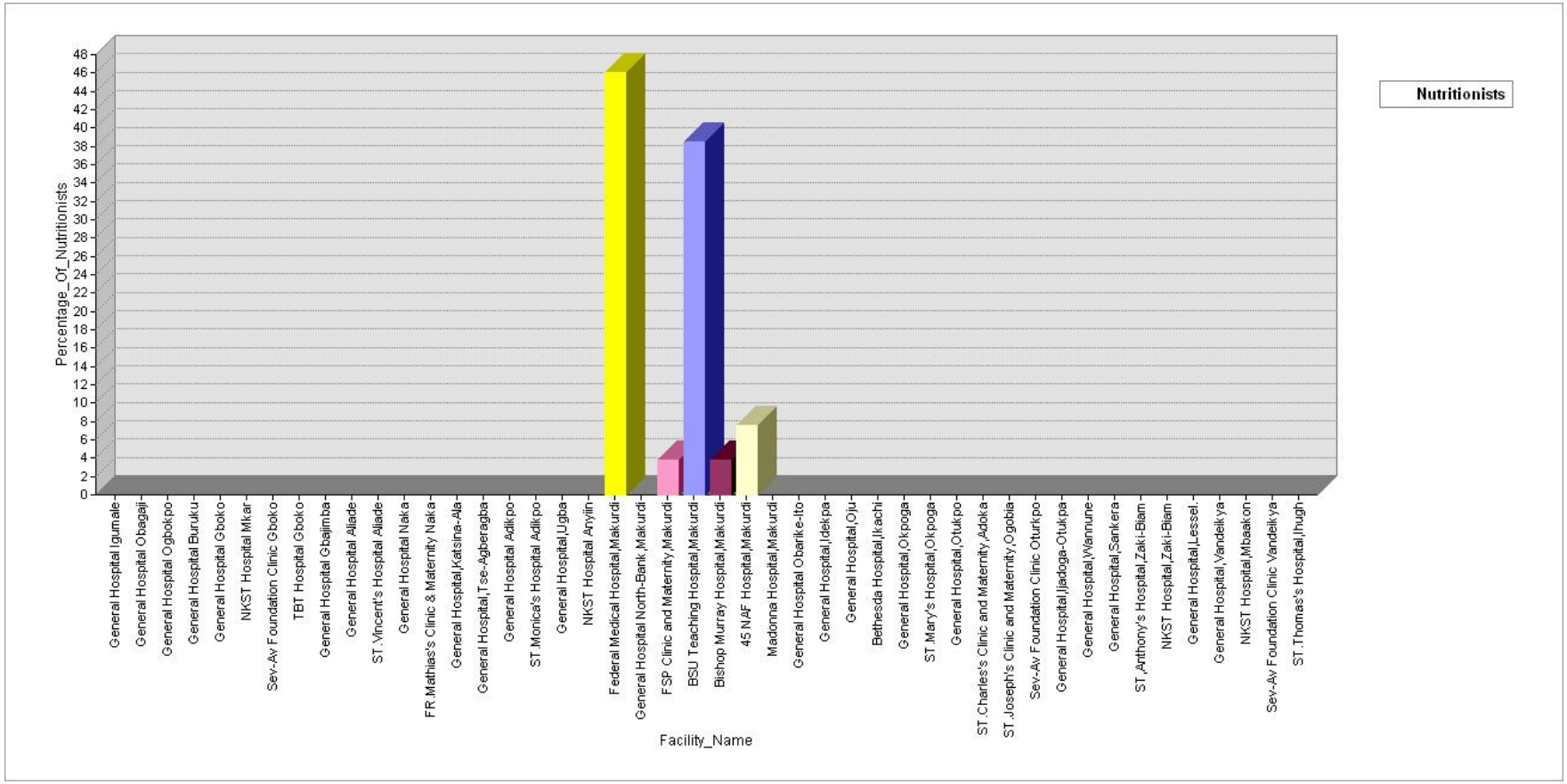



**Figure 4.10: Percentage Distribution of Nutritionists in ART Centres in Benue State**

### 4.5.5 : Counsellors

Counsellors are another group of medical personnel at ART centres; they help the infected individual, family and friends to handle possible emotional reactions to HIV/AIDS (e.g grief, anger, fear and denial). Figure 4.11 shows that, Federal Medical Centre Makurdi and BSU Teaching Hospital have the highest number of counsellors with 19.1 percent and 11.1 percent of counsellors each. This is followed by General Hospital Adikpo with 6.7 percent, General Hospital Gboko and NKST Hospital Mkar with 3.6 percent each while General Hospital North-Bank and Bishop Murray Medical Centre Makurdi with 2.7 percent counsellors respectively. Other centres like General Hospital Katsina-Ala, General Hospital Ugba, Bethesda Hospital, 45NAF Hospital Makurdi, and General Hospital Oju constitute 2.2 percent each.

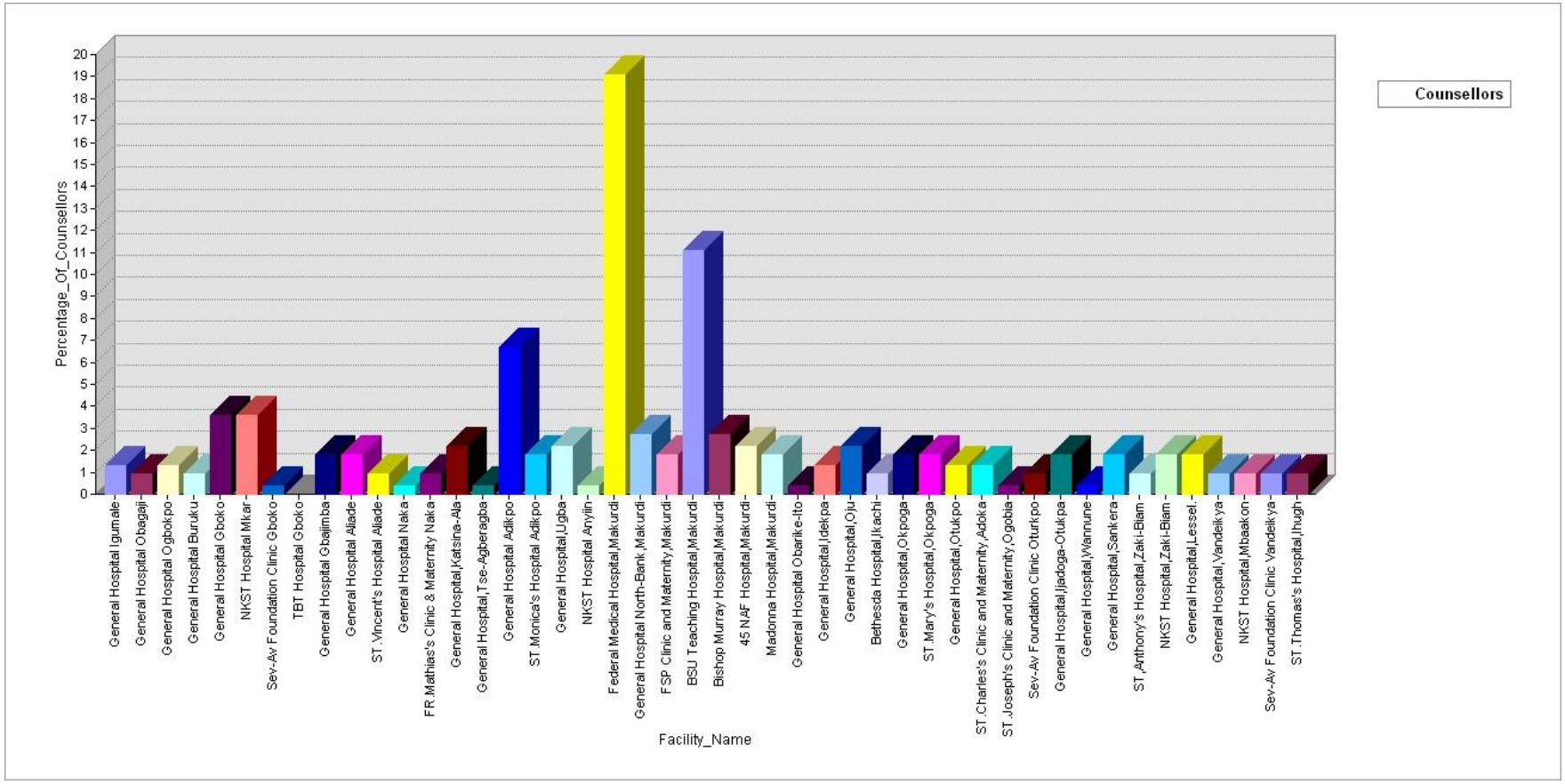



**Figure 4.11: Percentage Distribution of Counsellors in ART Centres in Benue State**

**Source: Author's Analysis**

### 4.5.6: Pharmacists

Pharmacists occupy a pivotal position in HIV/AIDS disease management programmes for numerous reasons. A pharmacist is an expert in the management of people with HIV/AIDS and takes responsibility for all the drugs- related activities. These include reviewing prescription for rational prescribing, recommending changes when appropriate, monitoring adherence to therapy and removing barriers, and managing any adverse events. Other responsibilities of a pharmacist are educating the rest of the team on new drugs information and clinical trials and ensuring the availability of medications, other required therapies and educational materials. The number of pharmacists from Figure 4.12 shows that the two tertiary healthcare facilities have the highest number of pharmacists with Federal Medical Centre Makurdi and BSU Teaching Hospital with 16 percent and 24.3 percent each to the total number of pharmacists in ART centres in Benue State. General Hospital Gboko and 45NAF Hospital Makurdi have 4.2 percent each, while NKST Hospital Mkar has 3.5 percent of the pharmacists. General Hospital Katsina-Ala, General Hospital Sankera and Bishop Murray Medical Centre Makurdi have 2.8 percent each.

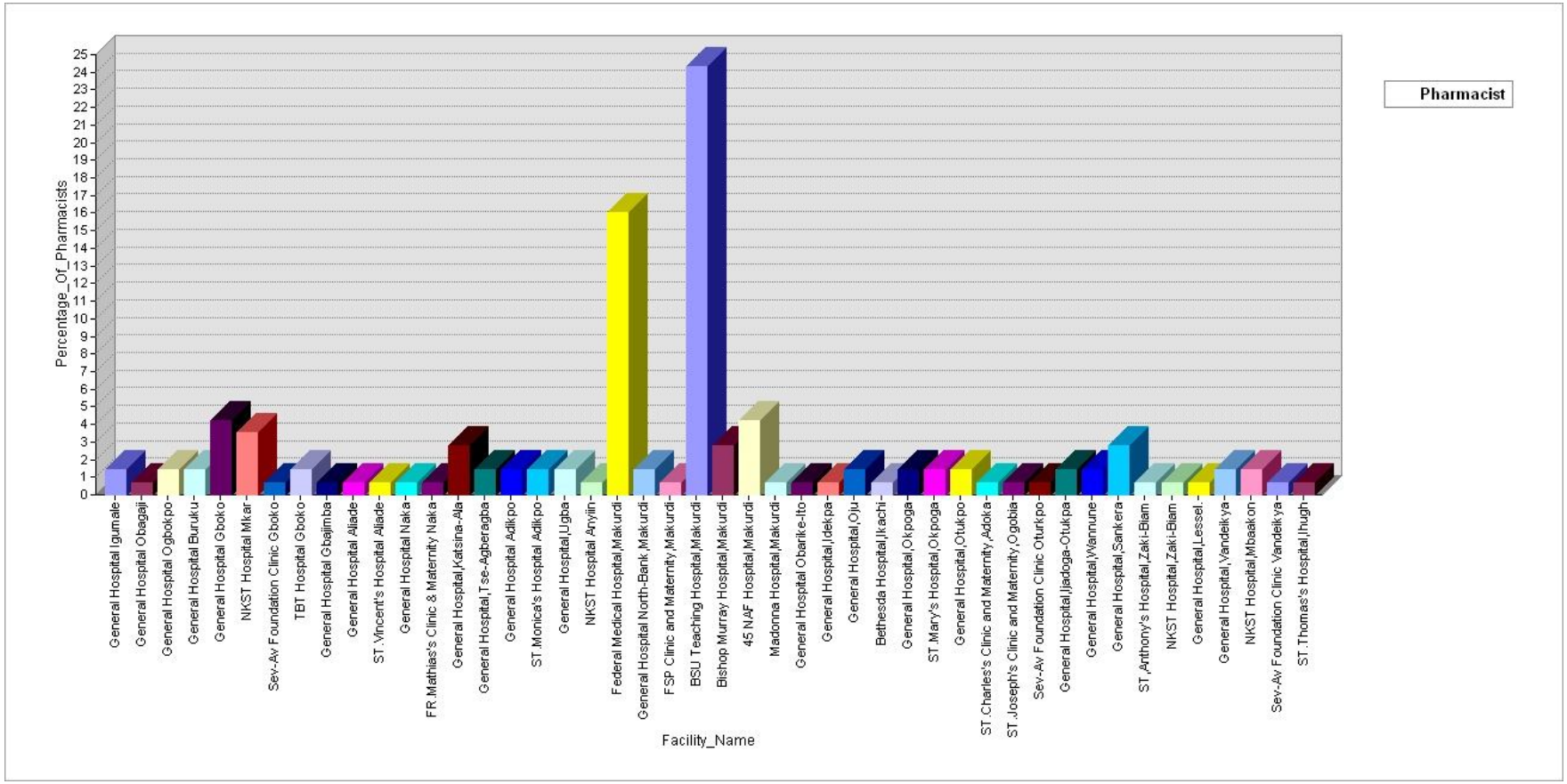



**Figure 4.12: Percentage Distribution of pharmacist at ART centres in Benue State**

**Source: Author's Analysis, 2013**

### 4.6. Assessing the Spatial Distribution of ART drugs Centres in Benue State.

**Table 4.15: Distribution of ART Centres in relation to PLWHA and Population Census figures in Benue State**

| Local Government Areas | Number of ART Centres | Estimated number of PLWHA | Population Census Figures (2006) |
|---|---|---|---|
| Ado | 1 | 22718 | 178882 |
| Agatu | 1 | 14671 | 115523 |
| Apa | 1 | 12289 | 96765 |
| Buruku | 1 | 25872 | 203721 |
| Gboko | 4 | 45584 | 358936 |
| Guma | 1 | 24333 | 191599 |
| Gwer-East | 2 | 20783 | 163647 |
| Gwer-West | 2 | 15512 | 122145 |
| Katsina-Ala | 1 | 28539 | 224718 |
| Konshisha | 1 | 28660 | 225672 |
| Kwande | 2 | 31584 | 248697 |
| Logo | 2 | 21471 | 169063 |
| Makurdi | 7 | 37769 | 297398 |
| Obi | 1 | 12554 | 98855 |
| Ohimini | 1 | 9078 | 71482 |
| Oju | 2 | 21619 | 170236 |
| Okpokwu | 2 | 22434 | 176647 |
| Oturkpo | 4 | 33231 | 261666 |
| Ogbadibo | 1 | 16345 | 128707 |
| Tarka | 1 | 10095 | 79494 |
| Ukum | 3 | 27550 | 216930 |
| Ushongo | 1 | 23919 | 188341 |
| Vandeikya | 4 | 29225 | 230120 |
| **Total** | **46** | **507175** | **4219244** |

**Source: Author, 2013.**

Table 4.15 shows the distribution of ART centres in relation with population figures and estimated number of PLWHA in the twenty-three LGAs. This was done to determine whether the spatial distribution of ART drugs centres and number of centres have any relation with people living with HIV/AIDS. This was done by overlaying the Census population map and population map of people living with HIV/AIDS with the point map of ART centres.

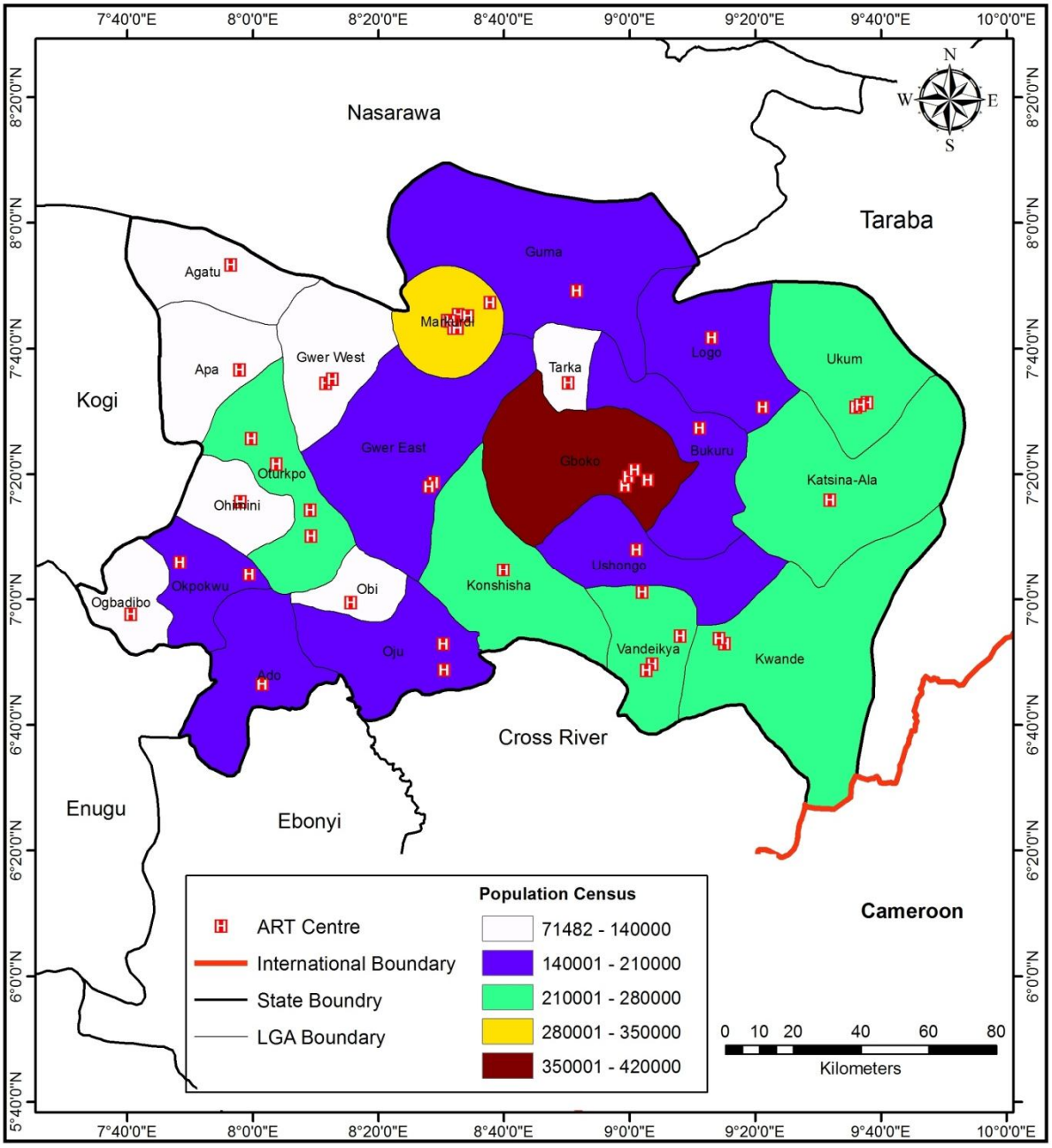



**Figure 4.13: Distribution of ART Centres in relation to population Census figures in Benue State**

**Source: Field Survey, 2013**

The cursory reveal from the figures 4.13 shows that there is imbalance in the spatial distribution of these centres on the Census population figures of the LGAs in Benue State. This is because

there are some LGAs with higher population figures but with fewer centres. This implies that the location of ART Centres among LGAs in Benue State is not on population.

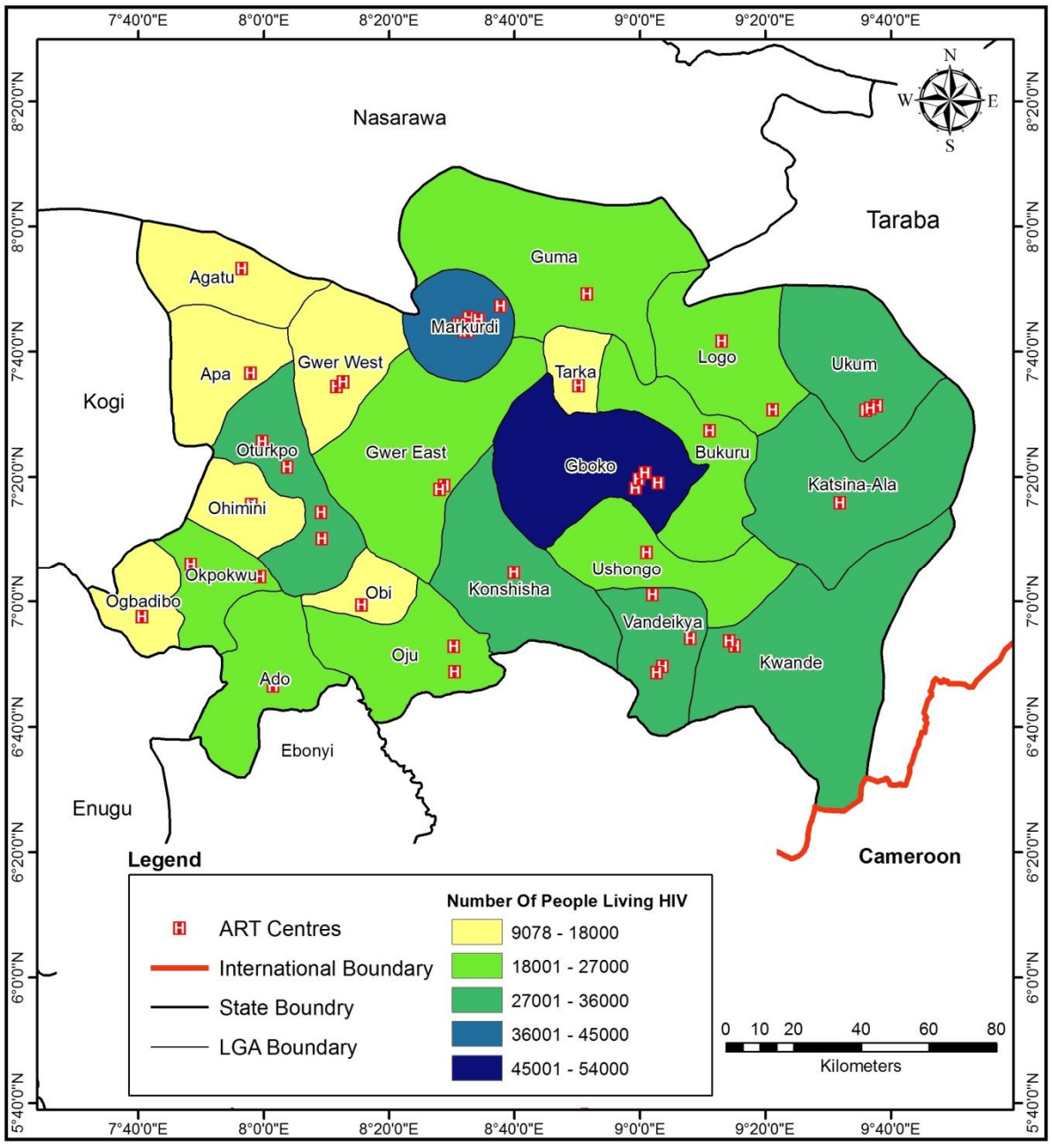



**Figure 4.14: Distribution of ART Centres in relation to PLWHA figures in Benue State**

**Source: Field Survey,2013**

The figure 4.14 shows that, some LGAs with lesser number of PLWHA have higher number of centres than LGAs with higher number of PLWHA. This shows that the spatial distribution of ART centres is not in relation to the population figures of LGAs or estimated number of PLWHA in Benue State. The implication for this arbitrary location of ART centres makes other areas underserved.

### 4.7. Utilization of Antiretroviral Services in Benue State

#### 4.7.1 Source of information

**Table 4.16: Distribution of Respondents by Sources of Information on the ART Centres.**

| Source | Frequency | Percentage |
|---|---|---|
| Radio/television | 121 | 30.3 |
| Newspaper/magazine | 51 | 12.8 |
| Friends | 92 | 23.0 |
| Hospital | 101 | 25.3 |
| Faith based organization | 35 | 8.8 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

Table 4.16 shows multiple responses in relation to the sources of information about the ART centres, the data revealed a wide range of information sources available to PLWHA. However the Radio/Television was their main source of accessing information for ART services. About 30.3 percent of the respondents testified that, they got to know about the ART services at the centres through Radio/Television (electronic media). Paek *et al* (2008) found that exposure to health related radio programme was significant predictor of Family planning and other related maternal health services. Those who attested that, they got their information through the hospitals constitute 25.3 percent of the respondents, while 23 percent of the respondents attested that it was through their friends that, they got to know about the ART centres. About 12.8 and

8.8 percent reveal that it was through newspaper/magazine (printed media) and faith based organisations that they know about the services render at the centres.

These sources to a large extent influenced the utilization of ART services by PLWHA. Based on the data therefore, the researcher concluded that more of such sources available, the higher the utilization of ART services among HIV people. Therefore, the media, hospital, FBOs played a vital role in mobilizing PLWHA toward utilization of ART services.

### 4.7.2 Visit to ART centres

**Table 4.17 Distribution of Respondents by Frequent Visit to ART Centres**

| Responses | Frequency | Percentage |
|---|---|---|
| Very often | 85 | 21.3 |
| Often | 195 | 48.8 |
| Not often | 101 | 25.3 |
| Not at all | 1 | .3 |
| Can't say | 18 | 4.5 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

Table 4.17 based on visitation to ART centres for treatment shows that, 48.5 percent of respondents often visit these ART centres for collection of drugs, while 25.3 percent do not visit these centres often for accessing drugs. Also, 21.3 percent of the respondents said that, they very often visit these centres for treatment while 4.5 percent of them said they cannot recollect how frequent the visit the centres. The reasons for these variations on their visit to ART centres may be on the severity of their status

### 4.7.3 Distance Travelled

**Table 4.18: Distribution of respondents on Distance Travelled to Access ART Drugs**

| **Distance** | **Frequency** | **Percentage** |
|---|---|---|
| <5KM | 119 | 29.8 |

| | | |
|---|---|---|
| 5-50KM | 178 | 44.5 |
| 51KM+ | 103 | 25.8 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

Table 5.11 shows that 29.8 percent access their ART drugs within a distance of less than 5km. Also, 44.5 percent of the total responses travelled up to 5-50 km to access ART drugs while 25.8 percent travelled a distance of 51km and above to access treatment for HIV/AIDS. This result shows that large percent of PLWHA travelled long distance to access ART drugs. Travelling such distance can be a problem, and may therefore, result into drop out of ART. The result differ with the work of Cromley and Mc Lafferty (2002) which revealed that people who live close to a healthcare facility are more likely to use the facility than those who live far away, so utilization decreases as distance increases. In this study, most people access ART centres that are far from their place of residence because of fear of stigmatization Travelling distance to the ART centre was used as a proxy because the majority of the PLWHA were not able to give the actual distances they had to travel from their homes to access ART services. Also, Bisallash (2002) in his work on problems responsible for the poor performance of healthcare system identified inadequate coverage, mal-distribution of healthcare facilities and limited accessibility among the problems. We can deduce from the data that, PLWHA came from distances far and near to access ART services at these centres

### 4.7.4 Medium of Transportation

**Table 4.19: Distribution of Respondents by Medium of Transportation**

| Mode of transportation | Frequency | Percentage |
|---|---|---|
| Walk | 45 | 11.3 |
| Car | 55 | 13.8 |
| Bicycle | 1 | .3 |
| Public bus | 226 | 56.5 |

| | | |
|---|---|---|
| Motor cycle or Okada | 58 | 14.5 |
| Others | 15 | 3.8 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

Table 4.19 shows that, the most highly transportation media used by PLWHA to access treatment at various centres in Benue State is the public buses with 56.5 percent while 14.5 percent used motor cycle popularly called "Okada" to access treatment and 11.3 percent trekked to where they access their treatment. The least used transportation media is the bicycle with 0.3 percent. Also 3.8 percent did not state the mode of transportation they used to access treatment.

### 4.7.5: Accessing of ART services from place of residence

**Table 4.20: Distribution of Respondents by Access of ART Services**

| Responses | Frequency | Percentage |
|---|---|---|
| Yes | 130 | 32.5 |
| No | 270 | 67.5 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

Table 4.20 reveals that 67.5 percent do not access ART services that are nearest to their place of residence while 32.5 percent access drugs at centres that are located nearest to them. This study concurs with Atuah *et al* (2012) on accessibility of antiretroviral therapy in Ghana which most of the respondents attested that they do not access services near their homes. They pointed out that, some of the patients actually chose to access services far away from their home because of HIV-related stigma even when ART services became available in centres near their homes and the providers suggested transferring them to these centres, some of the PLWHA refused to go.

### 4.7.6 Reasons for choosing a Centre

**Table 4.21: Distribution of Respondents by Reasons for Choosing a Centre**

| Reasons | Frequency | Percentage |
|---|---|---|
| Availability of more Qualified personnel | 18 | 6.7 |
| I cannot be identified by someone who knows me | 89 | 33.0 |
| Better care service | 28 | 10.4 |
| My family or a member of my Family is staying in this town | 60 | 22.2 |
| I started here before a center was allocated to my area | 58 | 21.5 |
| This center has regular supply | 8 | 3.0 |
| No space in the center close to me | 9 | 3.3 |
| **Total** | **270** | **100.0** |

**Source: Author, 2013.**

Table 4.21 shows responses in relation to reasons for choosing a particular centre used by PLWHA. However, 33 percent of the respondents said that, they chose their centres on the reason of they do not want to be identified by someone who knows them. This result is in line with the findings of Atuah *et al* (2012) in which most of the respondents were on the view that, they do not want to be known, while 22.2 percent chose a centre on the reason of their family or a member of their family is staying in the town that housed the centre and 21.5 percent said that the reason was they started here before a centre was allocated close to them. For others, it was because of better care services and qualified medical personnel at the centre that make them to choose such centre with 10.4 percent and 6.7 percent. Also, 3.3 percent and 3.0 percent said they

chose their centre on the reason of lack of space in the centre close to them and regular supply of drugs respectively.

### 4.7.7 Service Satisfaction

**Table 4.22 Distribution of Respondents by Service Satisfaction**

| Responses | Frequency | Percent |
|---|---|---|
| Yes | 102 | 25.5 |
| No | 298 | 74.5 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**

Table 4.15 reveals that 74.5 percent of the PLWHA are not satisfied with services rendered at these ART centres while 25.5 percent of the persons reveal that they are satisfied. This result differs to the finding of Atuah *et al.,* (2012) which revealed that, majority of patients were satisfied with the quality of services but further revealed that, those who really have problems or are not satisfied are the new ones and some of them are kind of stressed out before coming.

### 4.8.10 Reasons for not being satisfied

**Table 4.23 Distribution of Respondents by Reasons for Not Being Satisfied with services**

| **Reasons** | **Frequency** | **Percent** |
|---|---|---|
| Long waiting time | 176 | 59.1 |
| Attitude of healthcare workers | 31 | 10.4 |
| No enough personnel | 63 | 21.1 |
| No confidentiality in service | 26 | 8.7 |
| Others | 2 | 7 |
| Total | **298** | **100.0** |

**Source: Author, 2013.**

Table 4.16 shows that 59.1 percent identified the reason for not being satisfied with services rendered at centres because of long waiting time. The reason given by the respondents corroborated with the findings in the studies carried out by Adeneye (2006), Omenka (2010), Atuah *et al.,* (2012) and Chiegel (2012) which all identified long waiting time as a reason for not being satisfied, while 21.1 percent were not satisfied on the account of not having enough medical personnel which is in line with the findings of Adeneye (2006) and Paquette (2008) in their respective works. Another reason was the attitude of the healthcare workers not encouraging, which constitute 10.4 percent. About 8.7 percent gave their reason for not being satisfied with services rendered because there is no confidentiality in service at the centres while other 0.7 percent of the respondents reveal that, there is irregular supply of drugs.

### 4.7.9 Time Spent to Access Service

**Table 4.24: Distribution of Respondents by Time Spent at ART Drugs Centre to access services**

| Time spent | Frequency | Percentage |
|---|---|---|
| <30mins | 14 | 3.5 |
| 30-1hour | 68 | 17.0 |
| 1-2hour | 48 | 12.0 |
| 2-3hours | 109 | 27.2 |
| 3-4hours | 161 | 40.3 |
| **Total** | **400** | **100.0** |

**Source: Author, 2013.**.

Table 5.17 shows that, 40.3 percent of PLWHA spent 3-4 hours to access services at ART drugs centres, while 27.2 percent spent 2-3 hours at centre to access services. Also,12 percent of PLWHA said that, they spent between 1-2 hours at a centre to access treatment, while 17 percent and 3.5 percent access services within a time of 30-1hour and less than 30 minutes respectively.

# CHAPTER FIVE

## SUMMARY, CONCLUSION AND RECOMMENDATIONS

### 5.1 Introduction

This chapter describes the summary of the major findings of this study, conclusion derived from the findings and recommendations for enhancing service delivery in ART drugs Centres in Benue State as well as areas of further research.

### 5.2 Summary of Major findings

The study provided insight on the spatial distribution of ART drug centres in Benue State, Nigeria. This study used GIS as an analytical tool in most of the analysis and a structured questionnaire to derive other information on socio economic and demographic characteristics of the respondents and the utilization of these centres by people living with HIV/AIDS. The socio demographic characteristics of the respondents reveal that 56.8 percent of the PLWHA are female. This may be as the result of factor like early marriage and unprotected sex. The study also found that over 20 percent of the people with HIV are between the age group of 20-24.

On marital status of the respondents, 46.5 percent are married and 47.3 percent are in monogamous union. The study also reveals that 31.5 percent of the PLWHA are secondary school holders. Most of them are petty traders with 32.8 percent and 30.3 person earn <₦5000 monthly. The number of children bore by respondents shows that, 43 percent of the PLWHA had 3-4 children while 46 percent had a household size of 4-6.

The study shows that 93.5 percent of ART Centres are located in urban areas.The pattern of distribution of these ART centres is random in nature and 58.9 percent of ART centres in the

State are government owned. The most available government owned centres are the General Hospitals which are spread across the twenty three LGAs of the State. Also, 84.8 percent of health care facilities used for ART services are of the secondary type which includes all the General Hospitals are part of the secondary types and some other privately owned centres. The population of people utilizing ART services at ART centres across the Benue State shows that 10.2 percent of the respondents utilized Federal Medical Centre Makurdi.

It was also found out that, 30.3 percent of the PLWHA got to know about these centres by radio/television and 48.8 percent of the respondents often visit ART centres for treatment. The study also found that 52.5 percent PLWHA reside in urban areas. This may be as the results of most centres are located in urban areas. Also, the study reveals that 44.5 percent of the PLWHA travelled up to5-50km to access treatment. This could be as a result that, they do not want to be known as People living with HIV/AIDS.

About 56.5 percent of the people with HIV used public buses as a medium of transportation to access drugs at various centres. This may be as the results of 67.5 percent of the PLWHA do not access ART services near their homes with 33 percent of them giving reason that, they do not want to be identified by someone who knows them. About 74.5 percent of the respondents confirm that, they are not satisfied with services rendered at ART centres in  with 59.1 percent of them giving reason of long waiting time. Most of the respondents (40.3 percent) said that, they spent between 3-4 hours at centre to access drugs.

## 5.3. CONCLUSION

The result of this study reveals that, most of ART drug centres are located in urban areas which are detrimental to a state with 78.3 percent of his populace living in rural areas. The study also

revealed that, the distribution of ART drug centres in Benue State across LGAs is not in relation with the population of the LGA or estimated number of PLWHA because most LGAs with higher population and higher estimated number of people living with HIV/AIDS have fewer ART centres allocated to them than LGAs with lesser population and lesser estimated number of PLWHA having more ART centres. The spatial distribution shows disproportionate share of ART centres amongst the twenty-three LGAs in Benue State. The pattern of distribution of these centres showed to be randomly without a defined pattern or specified distance for allocation of one centre to another.

The study confirms that most of the ART drugs centres are owned by Government, although there are other centres that are privately owned by individuals, NGOs and Faith Based Organisations (Catholic and NKST churches).The study also reveal that most people travelled long distance to access treatment to centres that are not close to them because of the reason that, they do not want to be identified by someone's who knows them (fear of stigmatization). Most of the PLWHA were not satisfied with the services offered at these centres. The paramount reason affirmed by most respondents was on the account of long waiting time at the centres.

## 5.4. RECOMMENDATIONS

Based on the identified gaps in the spatial distribution of ART drugs centres in Benue State in our study, the following are recommended.

- Government should cite more centres in the rural areas of Benue State whose population constitutes 78.3 percent of the total population of Benue State. With reference to Makurdi and Gboko LGAs where all the centres are located within the urban areas, there should be even distribution of these centres to other rural areas of the LGAs.

- The Government should expand his ART drug services to cover primary healthcare facilities spread across the state, since there are 784 Government-owned primary healthcare systems across Benue State.
- The private healthcare providers in the state, especially the mission (faith based organisations) need to be aided by the Government to bring treatment closer to people living with HIV/AIDS. This is because of the availability of healthcare facilities owned by these organizations scattered across the nook and cranny of Benue State.
- More medical personnel should be allocated to the ART units in the hospitals that offer ART drug services to facilitate efficiency in services delivery.
- More centres should be cited to LGAs with disproportionate ART centres.

**Area for further research studies**

It is therefore recommended that future research should explore these areas:

- The use of antiretroviral drugs in ART drug centres in Benue State
- A comparative analysis on services efficiency of Government owned and privately owned ART drugs Centres in Benue State
- The role of medical personnel in the management of people living with HIV/AIDS

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## APPENDICE 1

## CHECKLIST

## ACCESS AND UTILIZATION OF ANTIRETROVIRAL DRUGS CENTRES IN BENUE STATE, NIGERIA

The researcher is an M.Sc Student, conducting a research on the acess and utilization of the antiretroviral drugs centres in Benue State Nigeria as part of the requirement for the award of M.Sc degree in GIS and Remote Sensing, at Ahmadu Bello University, Zaria.

Any information given by you will be treated with utmost confidentiality.

**Antiretroviral drug centre attributes**

Facility Name _____

Location of the centre _____

Category of the Hospital: (a) Hospital (b) Clinic (c) Maternity & Dispensary (d) Medical Centre

Ownership: (a) Private (b) Public

Level of the Hospital: (a) Primary (b) Secondary (c) Tertiary

**Medical Personnel**

1. Number of Medical Doctors _____
2. Number of Nurses _____
3. Number of Laboratory Technologists _____
4. Number of Nutritionist _____
5. Number of Counsellors _____

6. Number of Pharmacists _____

**Statistics of Patients and Drugs at the centre**

Numbero persons enrolled for antiretroviral therapy at the centre _____

Types of ARVs in stock (names)

i_____

ii_____

iii_____

iv_____

v_____

vi_____

vii_____

**For Researcher's use only**

Coordinate of the centre: (i) X coordinate (Easting) _____

(ii) Y coordinates (Northing) _____

Population of the Local Government _____

Population of People living with HIV/AIDS in the Local Government_____

## APPENDICE II

| S/n | Names of Local Government Area | Estimated number of People Living with HIV/AIDS (PLWHA) |
|---|---|---|
| 1 | ADO | 22718 |
| 2 | AGATU | 14671 |
| 3 | APA | 12289 |
| 4 | BURUKU | 25872 |
| 5 | GBOKO | 45584 |
| 6 | GUMA | 24333 |
| 7 | GWER | 20783 |
| 8 | GWER WEST | 15512 |
| 9 | KATSINA-ALA | 28539 |
| 10 | KONSHISHA | 28660 |
| 11 | KWANDE | 31584 |
| 12 | LOGO | 21471 |
| 13 | MAKURDI | 37769 |
| 14 | OBI | 12554 |
| 15 | OGBADIBO | 16345 |
| 16 | OHIMINI | 9078 |
| 17 | OJU | 21619 |
| 18 | OKPOKWU | 22434 |
| 19 | OTUKPO | 33231 |
| 20 | TARKA | 10095 |
| 21 | UKUM | 27550 |
| 22 | USHONGO | 23919 |
| 23 | VANDEIKYA | 29225 |
| **Total** | 23 | 507175 |

**Source: Ministry of Health, Makurdi**

## APPENDICESIII

**Table 4.1 List of comprehensive ART centres and enrolment per centre in Benue State**

| S/NO | NAME OF ART CENTRE | LOCAL GOVERNMENT AREA | ENROLLMENT PER CENTRE |
|---|---|---|---|
| **1.** | General Hospital Igumale. | Ado | 3431 |
| **2.** | General Hospital Obagaji. | Agatu | 906 |
| **3.** | General Hospital Ogbokpo. | Apa | 501 |
| **4.** | General Hospital Buruku. | Buruku | 1050 |
| **5.** | General Hospital Gboko. | Gboko | 15377 |
| **6.** | NKST Hospital Mkar. | Gboko | 8561 |
| **7.** | Sev-Av Foundation Gboko | Gboko | 809 |
| **8.** | TBT Hospital,Gboko | Gboko | 2534 |
| **9.** | General Hospital Gbajimba | Guma | 1452 |
| **10.** | General Hospital Aliade. | Gwer East | 505 |
| **11.** | ST.Vincent's Hospital Aliade. | Gwer East | 8987 |
| **12.** | General Hospital Naka. | Gwer West | 852 |
| **13.** | FR.Mathias's Clinic and Maternity Naka | Gwer West | 46 |
| **14.** | General Hospital Katsina-Ala | Katsina-Ala | 6115 |
| **15.** | General Hospital Tse-Agberagba. | Konshisha | 286 |
| **16.** | General Hospital Adikpo. | Kwando | 10013 |
| **17.** | ST.Monica's Hospital Adipose | Kwando | 8971 |
| **18.** | General Hospital Ugba. | Logo | 667 |
| **19.** | NKST Hospital Anyiin. | Logo | 3298 |
| **20.** | Federal Medical Centre | Makurdi | 18567 |
| **21.** | General Hospital North-Bank | Makurdi | 7690 |
| **22.** | FSP Clinic and Maternity | Makurdi | 1021 |
| **23.** | BSU Teaching Hospital | Makurdi | 1034 |
| **24.** | Bishop Murray Medical Centre | Makurdi | 7352 |
| **25.** | 45 Nigerian Airforce Hospital | Makurdi | 8906 |
| **26.** | Madonna Hospital | Makurdi | 1723 |
| **27.** | General Hospital Obarike Ito. | Obi | 1806 |
| **28.** | General Hospital Idekpa. | Ohimini | 586 |
| **29.** | General Hospital | Oju | 6053 |
| **30.** | Bethesda Hospital,Ikachi | Oju | 598 |
| **31.** | General Hospital Okpoga | Okpokwu | 689 |
| **32.** | ST.Mary's Hospital,Okpoga | Okpokwu | 3068 |
| **33.** | General Hospital Otukpo | Otukpo | 10671 |
| **34.** | ST.Charles's Clinic and Maternity Adoka,Otukpo | Otukpo | 1062 |
| **35.** | ST.Joseph's Clinic and Maternity Ogobia, | Otukpo | 478 |
| **36.** | Sev-Av Foundation Clinic Otukpo | Otukpo | 816 |
| **37.** | General Hospital Ijadoga-Otukpa | Ogbadibo | 896 |
| **38.** | General Hospital Wannune | Tarka | 3207 |

| | | | |
|---|---|---|---|
| **39.** | General Hospital Sankera | Ukum | 7556 |
| **40.** | NKST Hospital Zaki Biam | Ukum | 3013 |
| **41.** | ST.Anthony's Hospital Zaki Biam | Ukum | 7260 |
| **42.** | General Hospital Lessel | Ushongo | 891 |
| **43.** | General Hospital Vandeikya | Vandeikya | 6348 |
| **44.** | NKST Hospital Mbaakon | Vandeikya | 1747 |
| **45.** | Sev-Av Foundation Clinic Vandeikya | Vandeikya | 1057 |
| **46.** | ST.Thomas Hospital Ihugh | Vandeikya | 3801 |

**Source: Field work,2013**

## APPENDICES IV

## QUESTIONNAIRE

The researcher is an M.Sc Student in the Department of Geography, ABU Zaria conducting a research on the Access and Utilization of antiretroviral drugs centres in Benue State, Nigeria as part of the requirement for the award of M.Sc Degree in GIS and Remote Sensing, at Ahmadu Bello University, Zaria. Any information given by you will be treated with utmost confidentiality.

Thank you.

**SECTION A: SOCIO DEMOGRAPHIC CHARACTERISTIC OF RESPONDENTS.**

1. Sex: A. Male [ ] B. Female [ ]

2. Age: A. <15 [ ] B. 15- 19 [ ] C. 20-24 [ ] D.25-29 [ ] E.30-34 [ ] F. 35 -39 [ ] G.40 -44 [ ]

   H. 45-49 [ ] I. 50 above [ ]

3. Marital Status: A. Never married [ ] B. Married [ ] C. Divorced [ ] D. Widowed [ ]

E. Separated [ ] F. Others (Specify)_____

4. Type of Marital Union: A. Polygamous [ ] B. Monogamous [ ] C. Others (Specify) _____

5. Educational attainment:A .None [ ] B. Quranic [ ] C. Primary [ ]
D. Secondary [ ] E. Tertiary [ ] F. Others (Specify) _____

6. Occupation: A. Civil/ Public Servant [ ] B. Farmer [ ] C. Petty trader [ ] D. Full time housewife [ ] F. Others (Specify) _____

7. Income Per month: A < 5,000 [ ] B. 5,000 -10,000 [ ] C. 11,000 -15,000 [ ] D. 16,000 – 20,000 [ ] E. 21,000 -25,000 [ ] F.26, 000 above [ ]

8. Number of Children ever born: A. None [ ] B. 1-2 [ ] C. 3-4 [ ] D. 5-6 [ ] E. 7-8 [ ]

F. 9 above [ ]

9. Household Size: A 1-3 [ ] B. 4-6 [ ] C. 7-9 [ ] D. 10 Above

**SECTION B. UTILIIZATION OF ANTIRETROVIRAL SERVICES**

10. Facility Name _____

11. How did you get information on the services provided in this centre?

A. Through Radio/ Television [ ] B. Through Newspaper/ Magazine [ ] C.Through Friend [ ] D.Through Hospital [ ] E. Through Faith based Organization [ ] F. Others (Specify) _____

12. How often do you go to the centre for treatment?

A. Very Often [ ] B. Often [ ] C. Not Often [ ] D. Not at All [ ] E. Can't Say [ ]

13. Where do you stay?

A. Urban [ ] B. Rural [ ] C. Others (Specify) _____

14. What is the distance from your home to where you access drugs/ treatment?

A. < 5km [ ] B. 5-50km [ ] C. 51km above [ ]

15. What transportation media do you used?

A. Walk [ ] B. Car [ ].C. Bicycle [ ] D. Public Bus [ ] E. Motor cycle or Okada [ ]

F. Others (Specify) _____

16. Is this the nearest ART centre to you? A. Yes [ ] B. No [ ]

17. If No, what is the reason for choosing this centre?

A. Availability of more qualified medical personnel's [ ]

B. I cannot be identified by someone who knows me [ ]

C. Better care service. [ ]

D. My family or a member of my family is staying in this town. [ ]

E. I started here before a centre was allocated to my area.[ ]

F. This centre has regular supply drugs [ ]

G. No space in the centre close to me [ ]

H. Others (Specify) _____

18. Are you satisfied with services rendered at this centre? A. Yes [ ] B. No [ ]

19. If No, what are the reasons?

A. Long waiting time [ ]

B. Attitude of healthcare workers not encouraging [ ]

C. No enough Personnel [ ]

D. No confidentiality in services [ ]

E. Others (Specify) _____

20. What is the average time you spend to access services?

A. < 30Minutes [ ] B. 30 -1 hour [ ] C. 1- 2 hours [ ] D.2- 3 hours [ ] E.3 -4 hours [ ]

21. In your views how can antiretroviral services be improved?

_____

_____

_____

_____

## APPENDICE V

**Table 4.1 List of comprehensive ART centres in Benue State**

| | NAME OF ART CENTRE | LOCAL GOVERNMENT AREA |
|---|---|---|
| **1.** | General Hospital Igumale. | Ado |
| **2.** | General Hospital Obagaji. | Agatu |
| **3.** | General Hospital Ogbokpo. | Apa |
| **4.** | General Hospital Buruku. | Buruku |
| **5.** | General Hospital Gboko. | Gboko |
| **6.** | NKST Hospital Mkar. | Gboko |
| **7.** | Sev-Av Foundation Gboko | Gboko |
| **8.** | TBT Hospital,Gboko | Gboko |
| **9.** | General Hospital Gbajimba | Guma |
| **10.** | General Hospital Aliade. | Gwer East |
| **11.** | ST.Vincent's Hospital Aliade. | Gwer East |
| **12.** | General Hospital Naka. | Gwer West |
| **13.** | FR.Mathias's Clinic and Maternity Naka | Gwer West |
| **14.** | General Hospital Katsina-Ala | Katsina-Ala |
| **15.** | General Hospital Tse-Agberagba. | Konshisha |
| **16.** | General Hospital Adikpo. | Kwande |
| **17.** | ST.Monica's Hospital Adipose | Kwande |
| **18.** | General Hospital Ugba. | Logo |
| **19.** | NKST Hospital Anyiin. | Logo |
| **20.** | Federal Medical Centre | Makurdi |
| **21.** | General Hospital North-Bank | Makurdi |
| **22.** | FSP Clinic and Maternity | Makurdi |
| **23.** | BSU Teaching Hospital | Makurdi |
| **24.** | Bishop Murray Medical Centre | Makurdi |
| **25.** | 45 Nigerian Airforce Hospital | Makurdi |
| **26.** | Madonna Hospital | Makurdi |
| **27.** | General Hospital Obarike Ito. | Obi |
| **28.** | General Hospital Idekpa. | Ohimini |
| **29.** | General Hospital | Oju |
| **30.** | Bethesda Hospital,Ikachi | Oju |
| **31.** | General Hospital Okpoga | Okpokwu |
| **32.** | ST.Mary's Hospital,Okpoga | Okpokwu |
| **33.** | General Hospital Otukpo | Otukpo |
| **34.** | ST.Charles's Clinic and Maternity Adoka,Otukpo | Otukpo |
| **35.** | ST.Joseph's Clinic and Maternity Ogobia, | Otukpo |
| **36.** | Sev-Av Foundation Clinic Otukpo | Otukpo |
| **37.** | General Hospital Ijadoga-Otukpa | Ogbadibo |

| | | |
|---|---|---|
| **38.** | General Hospital Wannune | Tarka |
| **39.** | General Hospital Sankera | Ukum |
| **40.** | NKST Hospital Zaki Biam | Ukum |
| **41.** | ST.Anthony's Hospital Zaki Biam | Ukum |
| **42.** | General Hospital Lessel | Ushongo |
| **43.** | General Hospital Vandeikya | Vandeikya |
| **44.** | NKST Hospital Mbaakon | Vandeikya |
| **45.** | Sev-Av Foundation Clinic Vandeikya | Vandeikya |
| **46.** | ST.Thomas Hospital Ihugh | Vandeikya |

**Source: Ministry of Health, Makurdi**

## APPENDIX VI

## Physical data modelling for ART drugs Centres

| Attributes | Data type | Width |
|---|---|---|
| X- Coordinate(Easting) | Integer | 10 |
| Y-Coordinate (Northing) | Integer | 10 |
| Facility Name | Text | 30 |
| Location | Text | 20 |
| Category | Text | 10 |
| Ownership | Text | 10 |
| Medical Doctors | Integer | 5 |
| Nurses | Integer | 5 |
| Laboratory Technologist | Integer | 5 |
| Nutritionist | Integer | 5 |
| Counsellor | Integer | 5 |
| Pharmacists | Integer | 5 |
| People enrolled for ART services per centre | Integer | 5 |
| Estimated people living with HIV/AIDS per LGA | Integer | 10 |
| LGA population | Integer | 10 |
| ARV drugs in stock | Text | 150 |
| Year of establishment of the healthcare facility | Integer | 5 |
| Year of commencement of ART services | Integer | 5 |
| Type of hospital or Level | Text | 20 |