Spatial Distribution and Accessibility to Healthcare Workforce in Niger State, Nigeria

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Abstract

This study examined the spatial distribution and accessibility to healthcare workforce in Niger State. The study became necessary due to the State's worrisome decline in several key health indicators. Secondary data were collected from Niger State Ministry of Health and National Population Commission. ArcGIS 10.4.1 software was used to produce various distribution maps of health workforce. According to the study, disparities in the distribution of healthcare workforce exist in Niger State with Niger East having better access to doctors, nurses/midwives and community health extension workers than Niger South and Niger North. Additionally, 53% of doctors work and reside in four local government areas of Chanchaga, Suleja, Tafa and Rafi in Niger East. Regarding the population ratio to the health workforce, Niger State lacks adequate doctors, nurses, and midwives, as it did not meet the average targets of the World Health Organization and Sub-Saharan Africa. However, the State has sufficient community health extension workers regarding the population ratio, which meets the national average target. The implication is that Niger North and Niger South are grossly underserved in terms of access to a healthcare workforce that will cater to their health needs compared to Niger East. The study recommends that more healthcare workers should be recruited and that the state and local governments should offer various incentives, including rotational services, the provision of suitable housing, transportation allowance, and performance bonuses, to encourage more healthcare workers to work in public hospitals in rural areas of the State.

Keywords: Spatial distribution, Accessibility, Health workforce, Population ratio

1.Introduction

Health is a crucial component of human well-being. It is a concept that relates to and describes a person's state of well-being and not simply absence of disease. The World Health Organization (2023) defines health as the complete physical, mental and social well-being and not merely the absence of disease or infirmity. It is the journey towards the highest levels of mental, emotional and physical stability. The health of the people not only contributes to better quality of life but is also essential for the sustained economic and social development of a country as a whole (Federal Ministry of Health, 2010).

Healthy population and access to healthcare services are significant factors influencing economic development and prosperity. Thus, accessibility to healthcare facilities describes people's ability to use healthcare services when and where they are needed. Healthcare decisions are strongly influenced by the type and quality of services available in the local area and the distance, time, cost, and ease of traveling to reach those services (Haynes, Bentham, Lovett and Gale, 2003). Accessibility is sometimes measured in waiting time, which can be hours in a medical reception room for some people, and even days for people in the developing world who have already walked with sick children for many miles (Melinda and Michael 2010). In the utilization of these healthcare services, various parameters tend to have influence. These include population of healthcare personnel in relation to the population of a

given location, physical distance, race, ability to pay, and social distance among others. The language used by doctors, the ability to understand and be understood, and the attitude of medical staff toward patients' matters a lot (Melinda and Michael 2010).

Nigeria has numerous healthcare providers, both in the public and private sectors that offer healthcare services. As at December 2020, Nigeria had a total of 40,399 healthcare facilities located in all 36 states and the Federal Capital Territory. Most of these facilities (85%) were primary healthcare facilities, 14% were secondary healthcare facilities, and only 1% were tertiary healthcare facilities. Over 66% of these facilities were owned by the government, specifically the Federal Ministry of Health (Federal Ministry of Health, 2020). Most primary healthcare facilities in Nigeria lack essential equipment and amenities, including reliable electricity, emergency transportation, and proper waste management (National Health Policy, 2016).

The distribution of healthcare workforce and increasing trend of professionals leaving Nigeria has led to critical shortages and low health indicators compared to other developing nations (National Primary Healthcare Development Agency, 2015). The under-5 mortality rate is 138 per 1000 live births, while the maternal mortality ratio is 840 per 100,000 live births. This contrasts a regional ratio of 620 per 100,000 live births and a worldwide average of 260 per 100,000 live births (National Health and Development Survey, 2012).

Evidence points to the fact that areas with lowest concentration of health professionals have the worst health indices in the country (FMOH, 2012). People in Nigeria including Niger State die of minor illness that could have been prevented with proper diagnosis and simple medication (FMOH, 2005). This situation is sad especially when one realizes that these people are dying as a result of lack of access to good healthcare services. The structure of healthcare delivery in Niger State has been altered by an unequal distribution of healthcare facilities and manpower. About 70 per cent of the people in the state lack access to adequate healthcare services, only people living in urban areas of the state were privileged to have good healthcare services because of the presence of general hospitals (Niger State Government, 2015).

Between 2011 and 2016, Niger State recorded worrisome decline in maternal and child health. Infant and under five mortality rates increased and the percentage of births attended by skilled professionals declined by almost one-third. Immunisation rates dropped from 28% to 20%. Full immunisation coverage slightly increased from 13.4% to 13.8% (Accelerated Action for Impact, 2018). There is a significant shortage of skilled healthcare workers and a pressing need for more functional health facilities (Accelerated Action for Impact, 2018).

Numerous studies have investigated the uneven spatial distribution and access to healthcare facilities. For example, Owoyele et al. (2015) researched service radii and accessibility of healthcare facilities in Suleja, Niger State, Nigeria, and found that the ratio of healthcare workers to the population, including doctors, nurses, and midwives, needs to be well-balanced. Similarly, other studies by Fanan and Felix (2014), Mukhtar et al. (2018), Kibon and Ahmed (2013), and Agaja (2012), have also suggested that the spatial distribution of healthcare facilities is not evenly distributed in their respective study areas. However, most of these studies solely focus on the spatial distribution of healthcare facilities without analyzing the healthcare workforce. Few studies have attempted to analyze the spatial distribution of healthcare workforce (Abdulkarim *et al.*, 2017, Abdurrahman and Nurünnisa, 2013 and Ismaila 2011). Most of these studies

were conducted outside the study area, with only the work of Owoyele *et al.* (2015) conducted within Suleja Local Government Area of Niger State. Even this study did not examine the entire state. This study, therefore, aimed to examine the spatial distribution and accessibility to healthcare workforce in Niger State, Nigeria. The assessment of accessibility involved analyzing the healthcare workforce population in relation to the population of the State and LGAs. This analysis utilized the World Health Organization (WHO) and Sub-Saharan African minimum benchmark as a reference point for measuring accessibility.

2.Study Area

Niger State lies between latitude 8° to 11° 30' North and Longitude 3° 30' and 7° 40' East. The State shares a border with the Republic of Benin (West). Within Nigeria, it is bordered by the Federal Capital Territory (FCT) in the South-East, to the North by Zamfara State, North-West by Kebbi State, South by Kogi State, South-West by Kwara State and North-East by Kaduna State (Niger State Government, 2015), (Figure 1). The State houses the three major hydroelectric power stations in Nigeria, namely, Kainji, Jebba and Shiroro stations hence the official slogan of "Power State".

The population of Niger State as of 1991 was 2,421,581 people. The 2006 population and housing census put the State's population at 3,954,772 (National Population Commission, 2008). However, as of 2020, the population of the state is put at 6,222,944 (Author's Projected Population, 2020). Niger state is populated mainly by the Nupe people in the south, the Gwari in the east, the Busa in the west, and Kamberi (Kambari), Hausa, Fulani, Kamuku, and Dakarkari (Dakarawa) in the North. The people of Niger State are predominantly Muslims and Christians, with very few traditional religionists (Niger State Government, 2015).

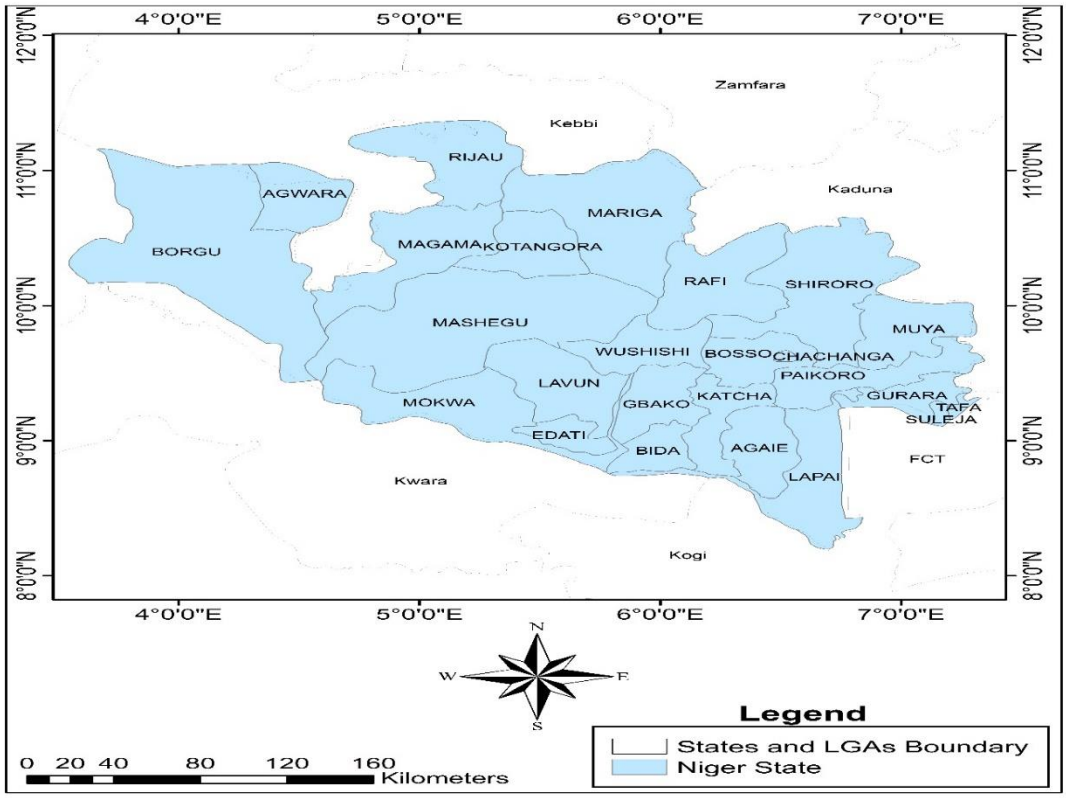

Figure 1: The Study Area
Source: Cartography Lab, Geography Department BUK (2020).

3. Methods

Data Collection and Sources

The data used for the study includes the coordinates (longitude and latitude) of the individual healthcare facilities, the healthcare workforce (doctors, nurses, midwives, and community health extension workers), the place of employment of the healthcare workforce (government and private), the population of Niger State, the World Health Organization and Sub-Saharan African healthcare facility population ratio, the number of maternal, child, and under-five mortality cases. The 2006 population data were sourced from National Population Commission (NPC) publications. The data for measuring the level of accessibility to healthcare workforce in relation to the population were obtained from the records of the World Health Organization bulletin and publications.

The population of Niger State were projected to 2020 using an exponential growth model at a growing rate of 3% per annum as provided by National Population Commission. The formulae adopted from the work of Adamu and Sani (2017) was used for the projection:

$$Pi=P2006(1+X)n \qquad 1$$

Where,
Pi is population for year of interest,
P2006 is the population of 2006,
X is the annual growth rate of the state, and
n is the number of years between 2006 and the year of interest.

This generated the population for each local government area since the ward-level population was unavailable.

Data Analysis

Data collected from the Niger State Ministry of Health were presented in tables to show the numbers, types and places of work of the healthcare workforce in Niger State. The coordinate data for healthcare facilities were then inputted in Microsoft Excel, including the attribute data such as names, type, place of work and location of the healthcare facilities, and saved as Text (ms Dos) format in Excel. These data were then imported into ArcGIS 10.4.1 environment and merged, forming the database for the analysis. A distribution map of the Healthcare workforce was generated from the database showing the distribution of doctors, nurses/midwives, community health extension workers and their place of work. In addition, tables were used to present the population ratio to the available health workforce. The following formulas was used to determine the ratio of the population to the health workforce.

$$A. \frac{\text{Number of Health Workers}}{\text{Total population}} \times \frac{100{,}000}{1}$$

4.Results and Discussion

Distribution of Healthcare Workforce in Niger State

The number of available healthcare personnel in healthcare facilities is one of the factors determining the capacity of healthcare facilities (HCF) to deliver medical services. Healthcare personnel, according to WHO (2010), are persons who have special education in healthcare and who are directly related to the provision of healthcare services. Healthcare personnel such as Doctors, Midwives/Nurses and Community Health Extension Workers available at the various healthcare facilities were examined to see their distribution across the State. Table 1 and Figures 2, 3 and 4 show the distribution of the healthcare workforce in Niger State per LGA and senatorial districts.

Distribution of Doctors in Niger State

Niger State has 375 medical doctors as of 2020 (Niger State Ministry of Health, 2021) (Table 1). Out of these, 221 (59%) doctors work at public healthcare facilities, while 154 (41%) work at private healthcare facilities (Figure 2). The distribution of doctors in the State shows that Niger East has the highest number of doctors, with 233

(62%), followed by Niger South with 78 (21%), and Niger North with the least at 64 (17%). These figures are for doctors practicing at both public and private medical facilities. Suleja and Chanchaga LGAs in Niger East have the highest number of doctors in the State, with 87 (23%) and 62 (17%), respectively. This was followed by Bida in Niger South with 51 (14%). Niger State has a doctor-to-population ratio of 1:16,594 when the doctor-to-population ratio is considered. The state average of 6 doctors to 100,000 population is below the WHO global target, national and Sub-Saharan Africa averages of 230:100,000, 38:100,000 and 15:100,000, respectively (National Health Policy, 2016) (Table 1).

However, it is interesting to note that 202 (53%) out of the 375 doctors reside and work within the four LGAs of Chanchaga, Suleja, Tafa and Rafi in Niger East, and only 173 (47%) work in the remaining 21 LGAs (Table 1). This is because Chanchaga, Suleja, Tafa and Rafi have the presence of general hospitals (Appendix 1). They are also highly cosmopolitan and urbanized compared to LGAs in other zones. Suleja is also the only LGA with the highest number of private secondary healthcare facilities, which is above that of the public healthcare facilities, and has more private medical doctors than the public (Figure 2). Chanchaga is also one of the two LGAs that constitute Minna, the state capital, giving it an advantage due to the influence of the administrative activities in the seat of power and the presence of social amenities. Regarding the regional distribution of

Table 1: Distribution of Health Workforce in Niger State

Senatorial District	LGA	Population 2020	Number of Doctors	Ratio Per 100000	Nurses/ Midwives	Ratio Per 100000	Number of CHEW	Ratio Per 100000
Niger East (Zone B)	Bosso	233072	6	3	18	8	146	63
	Chanchaga	318080	62	19	164	52	355	112
	Gurara	143024	10	7	36	25	124	87
	Muya	162848	8	5	22	14	167	103
	Paikoro	248864	4	2	23	9	84	34
	Rafi	292880	21	7	53	18	153	52
	Shiroro	370832	3	1	24	6	238	64
	Suleja	338464	87	26	282	83	329	97
	Tafa	131936	32	24	79	60	111	84
	Zone B Total	**2,240,000**	**233**	**10**	**701**	**31**	**1707**	**76**
Niger North (Zone C)	Agwara	90272	2	2	4	4	76	84
	Borgu	271936	27	8	79	29	129	47
	Kontagoro	239120	19	5	46	19	131	55
	Magama	285600	5	2	29	10	92	32
	Mariga	314048	4	1	15	5	112	36
	Mashegu	338576	0	0	6	2	57	17
	Rijau	277312	3	1	13	5	83	30
	Wushishi	128688	4	3	18	14	75	58
	Zone C Total	**1,945,552**	**64**	**3**	**210**	**11**	**755**	**39**
Niger South (Zone A)	Agaie	207872	2	1	31	15	63	30
	Bida	291984	51	17	145	50	47	16
	Edati	251440	2	1	7	3	102	41
	Gbako	199584	1	1	6	3	135	68
	Katcha	190176	4	2	21	11	135	71
	Lapai	184128	8	4	45	24	112	61
	Lavun	330064	5	2	29	9	133	40
	Mokwa	382144	5	1	25	7	120	31
	Zone A Total	**2,037,392**	**78**	**4**	**309**	**15**	**847**	**42**
	TOTAL	**6,222,944**	**375**	**6**	**1220**	**20**	**3309**	**53**

Source: Niger State Ministry of Health (2021)

Doctors, Niger East dominate with 10:100,000, compared with 4:100,000 for Niger South and 3:100,000 for Niger North. Out of the 9 LGAs in Niger East, 5 LGAs have a doctor-to-population ratio above the state average (Table 1). Only Borgu in Niger North and Bida in Niger South have a doctor population ratio above the state average with 8:100,000 and 17:100,000, respectively.

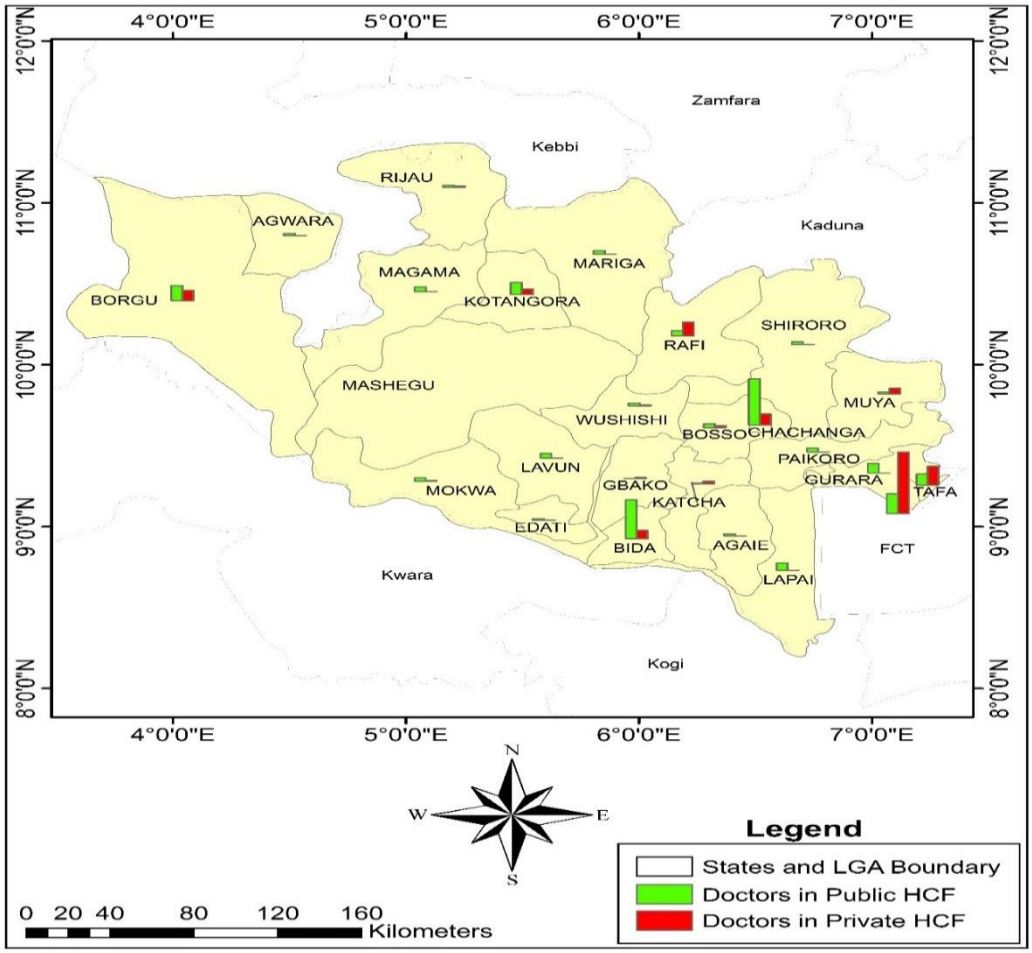

Figure 2: Distribution of Doctors by Healthcare Facilities in LGAs

It is important to note that in the entire State, only Mashegu LGA in Niger North has zero (0) number of medical doctors (Table 1). This is because Mashegu LGA had no (0) presence of secondary healthcare facilities (General Hospital), and the mandate of primary healthcare facilities does not include the recruitment of medical doctors (Appendix 1). The implication is that Mashegu LGA is denied access to general and specialized services (treatment) when needed, which may also lead to patients' apathy in utilizing modern healthcare services. It is also interesting to note that most of the LGAs that have doctors to population ratio above the state average also have the presence of a general hospital or tertiary healthcare facilities (General Hospital and IBB Specialist Hospital in Chanchaga, Suleja General Hospital, Federal Medical Centre Bida, Umar Musa Yar'Adua General Hospital Tafa, General Hospital Kagara in Rafi and New Busa General Hospital in Borgo among others (Appendix 1). This confirms the findings of Adamu *et al.* (2017) and Niger State Government (2015), who states that people living in urban areas of the State have been more privileged to have good healthcare services because of the presence of general hospitals. The implication is that Niger South and Niger North are grossly underserved in terms of doctors, thereby limiting their chances of getting good healthcare services that will cater to their health needs compared to the Niger East.

Distribution of Nurses/Midwives in Niger State

Nurses and midwives constitute a vital component of any healthcare service delivery system. In rural areas, emphasis is made on this category of healthcare workforce due to the absence of medical

doctors. This study found that Niger State has 1220 nurses and midwives (Table 1). Out of these, 841 (69%) of them work at public healthcare facilities, while 381 (31%) work in private healthcare facilities (Figure 3). The pattern of distribution of nurses and midwives in the State shows that Niger East has the highest number of nurses and midwives, with 701 (57%), followed by Niger South with 311 (25%), and Niger North with 210 (17%) (Table 1). These figures are for both public and private HCF. Suleja and Chanchaga LGA in Niger East have the highest number of nurses and midwives in the State, with 282 (23%) and 164 (13%), respectively, followed by Bida in Niger South with 146 (12%).

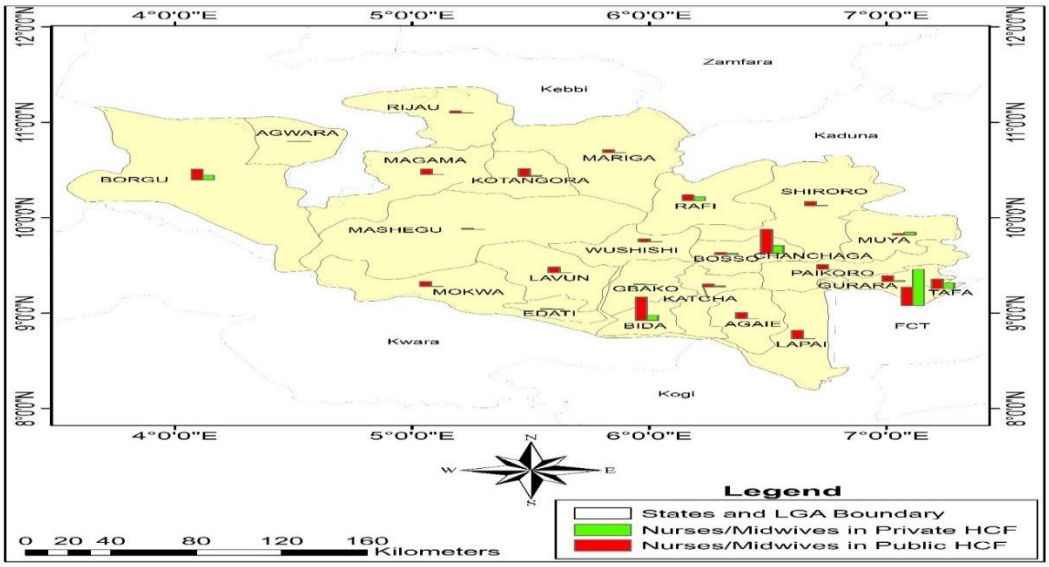

Figure 3: Distribution of Nurse/Midwives by healthcare facilities in LGAs

Looking at the distribution pattern closely, the nurses and midwives mirror the distribution pattern of medical doctors already discussed. This is because nurses and midwives work closely together in general hospitals and private secondary healthcare facilities with medical doctors. It is only in rare cases that you will find nurses and midwives working in primary healthcare facilities in Niger State.

Moreover, even when they are present most often, they work at primary healthcare facilities in towns and urban areas. When the nurse and midwives population ratio is considered, Niger State has a nurses and midwives population ratio of 1:5100. The state average nurse/midwives population ratio is 20:100,000. This figure is lower than the national and Sub-Sahara African average of 148: to 100,000 and 72:100,000, respectively (National Health Policy, 2016).

The distribution pattern of nurses and midwives shows that Niger East has more nurses and midwives at 31 per 100,000 population, with Niger South and North having 15:100,000 and 11:100,000, respectively. In addition, only Niger East senatorial district has a nurse/midwife population ratio above the state average of 31:100,000. However, when we look at the individual figures across the three senatorial districts, we will notice that several LGAs have more nurses/midwives per population ratio than the state average. The concentration of nurses and midwives within Niger East is because the nurses and midwives work together with doctors; within the Niger East, we have more doctors in general and private hospitals (Appendix 1). The implication is that Niger South and Niger North senatorial districts

are once again deprived of good and efficient healthcare services rendered by nurses and midwives. The role and functions of nurses and midwives should be emphasized. They serve as the engine block of healthcare personnel at general hospitals and some primary healthcare facilities. They provide support services to medical doctors and perform most of the work after medical doctors have attended to the patients.

Distribution of Community Healthcare Extension Workers in Niger State

Unlike the doctors and nurses/midwives that were concentrated within a particular senatorial region of the State. The community healthcare extension workers (CHEW) were dispersed across the senatorial regions and are more pronounced in LGAs of rural settings. It is also important to note that the CHEW are more visible in rural areas and are the engine block that manages the primary healthcare facilities, especially in rural areas of the State. The State has 3309 CHEWs, twice the combined figure of doctors and nurses/midwives, at 1595 (Table 1). Out of these numbers, 2803 (85%) CHEW work at public healthcare facilities, while 506 (15%) work at private healthcare facilities (Figure 4). The pattern of distribution of CHEW in the State shows that Niger East has the highest number of CHEW with 1707 (51.5%), followed by Niger South with 847 (25.5%) and Niger North with 755 (22.8%) (Table 1). These figures are for both CHEW working at public and private healthcare facilities.

The CHEW population ratio in Niger State is 1 per 1880 when the CHEW population density is taken into account. 53 people per 100,000 is the state average for CHEW population. This figure is higher than the national average of 25:100,000 (National Health Policy, 2016). The distribution pattern shows that Niger East have more CHEW at 76:100,000, with Niger South and North having 42:100,000 and 39:100,000, respectively. In addition, only the Niger East senatorial district has a CHEW population ratio above the state average of 76:100,000.

Regarding the place of work, 15% of the CHEW work in private healthcare facilities, and most of these private healthcare facilities are located in urban areas of these LGAs (Figure 4). The remaining 85% of the CHEW that works at public healthcare facilities are primarily located in the State's rural areas.

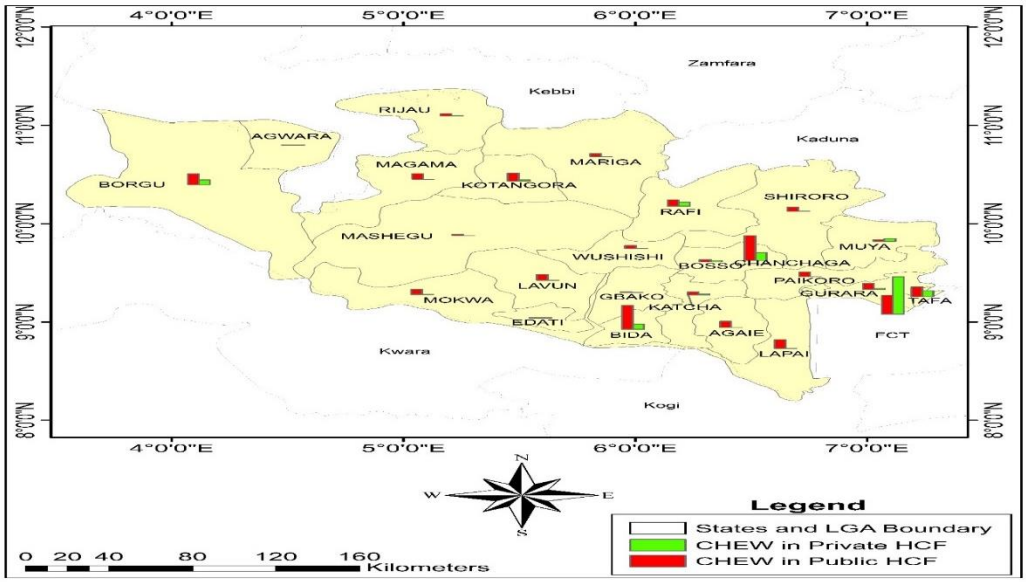

Figure 4: Distribution of CHEW by Healthcare Facilities in LGAs'

Several studies have shown that health workers perceive rural life as difficult and lack the desire to work in primary healthcare facilities located in rural communities. Reasons include lack of basic amenities that characterizes rural areas; poor personnel and equipment, leading to difficult working conditions and dissatisfaction; lack of electricity and water in the facilities, leading to poor quality of care and performance; and inadequate supply of drugs, which is a considerable constraint to service delivery (Obembe *et al.,* 2014, O'Neill, Edim and Obarein 2014, Abimbola *et al.,* 2015). Separation from families is another significant challenge for health workers who have to leave their families and social responsibilities to work in rural areas (Department of International Development, 2010). These factors have a negative impact on job satisfaction, staff performance and healthcare service delivery, and consequently lead to high staff turnover. The implication of these is that the rural populace is deprived of good and quality healthcare services that the medical doctors, nurses and midwives are supposed to provide, leaving them at the mercy of CHEW who are trained to provide auxiliary services only, related to community health. The effect of these is an increase in maternal mortality and infant mortality, complications arising from wrong diagnosis and treatment and apathy in the utilization of healthcare services among others from the rural populace.

5.Conclusion and Recommendations

The healthcare workforce in Niger State is unevenly distributed across the three senatorial districts of the State and between the local government areas. Niger East has the majority of doctors, nurses and community health extension workers, followed by Niger South and Niger North with the least. In addition, 53% of the medical doctors reside and work in four Local government areas of Chanchaga, Suleja, Tafa and Rafi in Niger East, leaving the remaining 21 LGA with 47%. Regarding the population ratio to the healthcare workforce, Niger State lacks adequate doctors and nurses/midwives as it did not meet the average targets of the World Health Organization and Sub-Saharan Africa. However, the State has sufficient community health extension workers in-terms of population ratio, which meets the national average target. In addition, variation exists across the senatorial districts and Local government areas regarding population ratio to health workforce as some Local government areas meet the WHO, Sub-Sahara African and National average while others do not. The implication is that Niger North and Niger South will be grossly underserved in-terms of access to a healthcare workforce that will cater for their health needs compared to Niger East. The study, therefore, recommends that more healthcare personnel be recruited by the state and local government areas, especially at the primary healthcare facilities of rural areas, to add to the capacity of the existing ones. In addition, various incentives such as rotational services, provision of befitting accommodation, transport allowance and performance bonuses, amongst others, should be provided by the State and LGAs to encourage more healthcare personnel to work in public hospitals of rural areas in the State. Further studies also need to be conducted to examine the utilization pattern of the various healthcare services across the State.

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