

# Mapping of Health Resources in Lower Manya Krobo Municipality in the Eastern Region of Ghana

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## Research Article

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# Abstract

**Background:** Variations in the distribution of health facilities have resulted in differences in health outcomes within the administrative districts of Ghana of which the Lower Manya Krobo Municipality (LMKM) is no exception.

**Aim:** The primary objective of this study was to examine the distribution of health care resources in the Lower Manya Krobo Municipality in the Eastern Region of Ghana.

**Methods:** A single case study approach was adopted, involving all health resources, facilities, and their supporting service centers in the LMKM. All functional health facilities in the municipality during the time of the study were included in the study. The study partly utilized records of generated coordinates using the Geo-positioning system (GPS) of other resources and services.

**Results:** The Municipality had a total of 16 health facilities and 29 supporting centers. There were 285 clinical health workers in the municipality. Odumase and Akuse, had higher percentages of clinical health personnel. The population per single health worker ratio for the whole municipality was found to be 13201:1. Agomanya had the highest number of facilities and support centers. The population per health facility ratio was 15,086 per facility.

**Conclusion:** The study demonstrated disparities in the distribution of health facilities across the municipality. There is a need to ensure the distribution of all health resources corresponds to the population size and the health needs of the Lower Manya Krobo Municipality.

## Background

Access to health care is an important component of the health system and has a direct impact on the burden of disease that affects many countries in the developing world. Measuring accessibility to health care contributes to a wider understanding of the performance of health systems within and between countries which facilitates the development of evidence-based health policies (Black et al. 2004).

Managing scarce resources and health care effectively and efficiently is an important part of this story. Experience has shown that, without strategic policies and focused spending mechanisms, the poor and other ordinary people are likely to get left out. The use of GPS as a tool to enhance public sector performance is well documented in other sectors of the economy. The extension of this experience to the health sector is more recent and lessons learned are now being successfully applied to developing countries. (Diderichsen, 2004).

A profile of health care resources within communities describes the health status and availability of resources that promote health within communities (Yonek and Hasnain-wynia n.d.). Poor people shoulder the greatest burden of disease but receive a smaller share of health care resources than do the healthy and wealthy. In other words, health care resources are distributed inversely in relation to need. This phenomenon is known as “the inverse care law.” It holds true from country to country and within countries

across socioeconomic groups (Diderichsen, 2004). Improved understanding of geographic variation and inequity in health status, wealth, and access to resources within countries is increasingly being recognized as central to meeting development goals. Mapping provides an alternative need approach to the more common need or deficit model for service. Mapping focuses on what communities have to offer by identifying resources that can be used for building systems (Tatem et al. 2014). The benefits of resource mapping are many. By taking part in this process, communities can develop a more results-driven system that supports and improves their available resources (Crane and Skinner n.d.)

Geographic information systems (GIS) and global positioning system (GPS) technologies have greatly rejuvenated studies of distribution, accessibility, and utilization of health facilities, especially in the developing world. Studies have developed methods for comparing the distribution of health service provision with respect to the Latin American populations being served. These studies used GIS to analyze physical distribution and accessibility to health care. There are three main dimensions of accessibility to primary healthcare, namely the supply of healthcare providers, the demand for healthcare service and the distance-time impedance between the locations of the population and the healthcare providers (Manortey and Kwarteng, 2016).

We do not only want to allocate resources proportionate to the greater morbidity among the poor but also want to reduce the social inequalities in health care. hence, we must look more closely at the vertical aspects of equity (Diderichsen, 2004). In other words, deprived groups should receive a preferential allocation of health care resources to achieve more rapid improvements in their health, thereby reducing inequalities in their health vis-à-vis richer groups. This distinction between horizontal and vertical aspects of health equity is thus intricately linked to two different issues in health policy: how to reduce inequities in access to health care and inequities in health status. (Anon, 2015). The inequitable distribution of health facilities and personnel in Ghana has resulted in a situation where more than three-quarters of urban households have good access to health facilities compared to a low 42% of rural households (Manortey and Kwarteng, 2016). A further 78% of the urban poor live within 30 minutes of a health facility compared to 27% of rural households (MOH, 2011). This is worrying because the time required to reach a health facility could be critical in the survival of a sick person, especially in emergency situations. Variations in the distribution of health facilities have also resulted in differences in health outcomes between the administrative regions of the country (Manortey and Kwarteng, 2016).

## Methods

A single case study approach was adopted, involving all health resources, facilities, and their supporting service centers in the LMKM. All functional health facilities in the municipality during the time of the study were included in the study. The study partly utilized records of generated coordinates using the Geo-positioning system (GPS) of other resources and services. A discussion was held with facilities administrators of the municipality to deliberate on issues of available resources. These included (hospitals, clinics, Community Based Health Planning Services (CHPS) compounds, health centers,

Maternity homes, Pharmacies, Licensed chemical drugs shops, Clinics, and Private laboratories). Traditional healers and herbal treatment centers were excluded from the study.

## Data Analysis

Geo-information system (QGIS 2.10.1) software was used to display the distribution of health facilities and health personnel. Data entry was done using excel 2010, and STATA statistical software (Stata Corp. 2007. Stata Statistical Software Release 14 Stata Corp LP, College Station, TX, USA) was used for all univariate and multivariate analyses. The geographical coordinate of health facilities was converted to a shapefile format and launched into the QGIS software to display the position of health facilities within the map of the Lower Manya Krobo municipality.

To explore the influence of the geo-political zones on the number and type of health facilities that were provided, data on health facilities and sub-district populations were both categorized and subjected to a chi-square analysis. The dependent variable was the number of health facilities and the independent variable was the resident population in every sub-district. Pearson Correlation analysis was applied to investigate the relationship between the population and the number of health facilities as well as the relationship between the population and the health personnel. Tables and graphs were used to display the data.

## Ethical Consideration

### Ethical approval

was obtained from the Ethics Review Committee of the Ensign College of Public Health. Local permission was sort from the Municipal Health Directorate of the Lower Manya Krobo, and Administrators of the identified facilities in the Municipality. Consent was sorted from all respondents.

## Results

Table 1.1 showed the population distribution of the Lower Manya Krobo municipality by sub-districts

*Table. 1.1 Lower Manya Krobo municipality population distribution by sub-district*

SUB DISTRICT	POPULATION	PERCENTAGE DISTRIBUTION (%)
<b>Odumase</b>	28,935	27.4
<b>Agormanya</b>	30,731	29.1
<b>Kpong</b>	24,500	23.2
<b>Asitey</b>	5,703	5.4
<b>Akuse</b>	9,504	9
<b>Oborpa</b>	6,231	5.9
<b>Total</b>	105,604	100

Table 1.2 Summary of study variables

VARIABLE	FIGURE
<b>RECORDED Population</b>	
105,604	
<b>Area</b>	1,476 km
<b>Population density</b>	71.54
<b>GPS waypoint</b>	Latitude 6.05S and 6.30N and Longitude 0.08E and 0.20W
<b>Total number of health facilities and supporting centers</b>	45
<b>Total number of health personnel</b>	416

## Distribution of health facilities

Health facilities were classified into two broad areas: **Main health facilities and supporting health centers**. The main health facilities included hospitals, health centers, and CHPS and the supporting centers include pharmacies and licensed chemical shop.

Table 1.3 Percentage distribution of categories of health facilities

	(%)
<b>Main facilities</b>	16(35.55)
<b>Supporting centers</b>	29(64.44)
<b>Total</b>	<b>45(100)</b>

## **Geographical distribution of health facilities across LMKM**

### **1. Distribution of CHPS compounds**

The distribution of CHPS compounds in the municipality showed a major disparity in terms of the distribution of health resources. Sub-districts such as Agomanya and Kpong recorded more than half of the CHPS compound in LMKM. Asitey sub-district had only one CHPS (Ayermesu CHPS) for 5703 habitants and Oborpa sub-district also had one CHPS for 5965 population. Akuse sub-district despite its huge population of about 26,788, only one structured CHPS served the entire population.

### **2. Distribution of Hospitals and Health Centers across LMKM**

There were 2 government hospitals and 1 mission hospital in the municipality. The map in Figure 1.3 displays an uneven distribution of hospitals across the LMKM. The northern and southern part of the municipality also has relatively poor hospital distribution, with virtually no hospital located in the northern sector of LMKM. Kpong sub-district, Oborpa sub-district, and Asitey sub-districts have 1 health center each. The other three sub-districts do not have health centers which happen to be one of the most affordable and accessible health services to the community members.

### **3. Distribution of pharmacies and chemical shops**

Pharmacies seemed to be the most important health support services. Despite its importance, LMKM does not have enough subsequently making them unequally distributed across the municipality. As observed in figure 1.5, the northern and southern parts of the municipality completely lacked pharmacies making access to medication exceedingly difficult. Two of the pharmacies in the municipality were located in Odumase sub-district; one was located at Kpong and another in Agomanya. Almost all the chemical shops were clustered in Agomanya and Odumase sub-districts.

### **4. Distribution of main health facilities per sub-district**

Table 1.4 showed the distribution of the main health facilities by sub-district. CHPS compounds formed most of these facilities followed by health centers. RCH centers and maternity homes were the least with only 1 each found in the Agomanya and Odumase sub-districts, respectively. It was observed that the Kpong, Oborpa and Asitey sub-districts were without hospitals and RCH centers. The number of chemical shops in the LMKM was on the high side compared to other facilities.

*Table. 1.4 Distribution of main health facilities per sub-district*

SUB DISTRICT	No. OF HOSPITAL	No. OF HC	No RCH	No. OF CHPS	MATERNITY HOME	TOTAL
Odumase	1	1	0	0		1 3
Agomanya	1	0	1	2		0 4
Kpong	0	1	0	2		0 3
Oborpa	0	1	0	1		0 2
Akuse	1	0	0	1		0 2
Asitey	0	1	0	1		0 2
Total	3	4	1	7		1 16

## 5. Distribution of Health facility per population ratio per sub-district

Table 1.5 showed the health facility per population ratio in LMKM per sub-district. In computing the ratios, priority was given to the main health facilities specifically to those with high numbers in the municipality. The ratio for hospitals, health centers, and CHPS compounds was computed and displayed by virtue of the high numbers of CHPS compounds in LMKM relative to hospitals and health centers, the ratio of the population per number of CHPS (15,086:1) was by far better than that of hospitals and by extension health centers.

Table. 1.5 Health facility per population ratio per sub-district

SUB DISTRICT	POPULATION	HOSPITALS	HC	CHPS
Odumase	28,935	28,935:1	26,935:1	0
Agomanya	30,731	30,731:1	0	15,366:1
Kpong	24500	0	24,500:1	2042:1
Oborpa	5965	0	5965:1	5965:1
Akuse	26788	26,788:1	0	26788:1
Asitey	5703	0	5703:1	5703:1
Total	105,604	35,201:1	26,401:1	15,086:1

## 6. Distribution of clinical health personnel

The study found that there was a challenge with clinical health personnel distribution in LMKM. For a population of 105,604, there were a total of 285 clinical workers: 9 doctors, 203 nurses, 65 midwives, and

8 physician assistants. Odumase and Akuse had the highest number of health personnel 107 and 91, respectively. Agomanya which was the most populated sub-district had fewer personnel of 47 as compared to 107 for Odumase. The doctor to population ratio of the LMKM stood at 11,734:1, a figure which was significantly less than the regional average of 17,438:1 (Ofosu, 2012). Sub-districts such as Kpong, Oborpa, and Asitey had extremely poor doctor population ratios. The nurse to population ratio in the municipality stood at 520:1, this is significantly better than the regional average which stood at 701:1.

*Table. 1.6 Frequency distribution of clinical health personnel in the LMKM*

SUBDISTRICT	POPULATION	DOCTORS	NURSES	MIDWIVES	PHYSICIAN ASSISTANTS	TOTAL
ODUMASE	28,935	3	81	20	3	107
AGORMANYA	30,731	2	27	18	0	47
KPONG	24500	0	16	5	1	22
OBORPA	5965	0	9	1	0	10
AKUSE	26788	4	63	20	4	91
ASITEY	5703	0	7	1	0	8
<b>TOTAL</b>	<b>105,604</b>	<b>9</b>	<b>203</b>	<b>65</b>	<b>8</b>	<b>285</b>

## 7. Correlation between population and health personnel

A correlation analysis was conducted to examine the relationship between clinical health personnel and the LMKM population.

*Table. 4.12 Pearson's correlation analysis of clinical health personnel against population*

Health Personnel	Pearson's correlation (r)	P-value
Doctors	0.70594	0.1170
Midwives	0.67391	0.1422
Nurses	0.87067	0.0240
Physician Assistants	0.54569	0.2627

For all categories excluding nurses, there was no significant relationship between the population and the number of doctors, midwives, and physician assistants as p-values 0.1170, 01422, and 0.2627 were recorded, respectively. There was a strong positive relationship between the number of nurses and the

population ( $r = 0.87$ ,  $p < 0.05$ ), implying an increase in population was followed by a corresponding increase in the number of nurses in LMKM.

## Discussion

Generally, the Eastern region falls short with regard to the distribution of health facilities especially when it comes to hospitals. The distribution of CHPS compounds in the municipality indicated a major disparity in terms of health resources among sub-districts in LMKM. Sub-districts such as Agomanya and Kpong sub-district recorded more than half of the CHPS compounds while Asitey sub-district has only one CHPS (Ayermesu CHPS) for 5703 habitants. Oborpa sub-district had also one CHPS for the 5965 population. Akuse sub-district despite its huge population of about 26788 is covered by one structured CHPS compound.

Hospitals seemed to be weighed more in the Southern and middle sections of the Eastern region compared to its Northern section (Manortey and Acheampong, 2016; Ofosu, 2012). A similar trend was observed in the LMKM facilities, in general, tend to be more clustered in the South. There were 2 government hospitals and 1 mission hospital in the municipality. The hospitals in LMKM were not evenly distributed across the municipality which inhibits good access to healthcare, especially in the southern part of the municipality.

Looking at the health center distribution, Kpong sub-district, Oborpa sub-district, and Asitey sub-district had 1 health center each. Again, the other three sub-districts were not given any chance to seek health care from health centers which is often providing affordable and accessible health services to the communities. In addition to the hospital and health center, Odumase had one maternity home.

Pharmacies seemed to be the most important health support services. However, LMKM does not have enough. The Northern and Southern part of the municipality completely lacked pharmacies hence the poor access to drugs in the municipality. Two of the pharmacies in the municipality were located in Odumase sub-district; one is located at Kpong and the last one at Agomanya. Almost all the chemical shops are clustered between Agomanya and Odumase sub districts. The LMKM has the majority of its population in rural areas (Osires, 2010). Rural areas tend to be characterized by a lack of infrastructural development such as poor road networks and so forth (Vissandjée et al., 1997; Umar and Bolanle, 2015; Sulemana and Dinye, 2014). The poor distribution of pharmacies and chemical shops in this respect is therefore an expected phenomenon (Sulemana and Dinye, 2014; Adedayo and Yusuf, 2012) and hence the need to address the situation.

The study found that there was a challenge with clinical health personnel distribution in LMKM. For a population of 105,604, there were a total of 285 clinical workers: 9 doctors, 203 nurses, 65 midwives, and 8 physician assistants. This finding is similar to the findings of the study on the distribution of health personnel in the Eastern region of Ghana with nurses forming the category with the highest number of these workers representing 77% of workers, followed by midwives at 541. Doctors counted were 151, representing a meager 3% of the health labor force (Manortey and Acheampong 2016). The doctor and

physician assistant population in the Eastern region remains a problem and by extension the LMKM. It is prudent to address this poor distribution of doctors and physician assistants to facilitate better healthcare service delivery.

There was a strong positive relationship between the number of nurses and the population ( $r = 0.87$ ,  $p < 0.05$ ), implying an increase in population was followed by a corresponding increase in the number of nurses in LMKM. A result that shows that the number of nurses in the LMKM was properly distributed across the population. The number of doctors, midwives, and physician assistants was not evenly distributed in the municipality ( $p$ -values 0.1170, 01422, 0.2627) were recorded, respectively. (Manortey and Acheampong – 2016) observed that there was no variation in the number of medical doctors, physician assistants, nurses, or midwives across the populations of the districts. There was no significant difference in the number of health personnel and population across the Eastern region. This study in effect confirms the poor distribution of health personnel in the Eastern region and specifically the LMKM.

## Conclusion And Recommendation

The findings discussed above have revealed that there were inequalities with respect to the distribution and accessibility of health facilities and services in the LMKD. Government must speed up efforts in renovating, building, and equipping more health centers, CHPS compounds, and clinics, especially in largely rural districts where the availability of these facilities is either low or non-existence. Regarding the distribution of the clinical health personnel, attention should be given to the redistribution of health personnel in other to achieve social justice and reduce disparity among community members. This could be achieved by providing motivation to the health personnel living in the rural areas.

## Declarations

**Ethics approval and consent to participate:** Ethical approval was obtained from the Ethics Review Committee of the Ensign College of Public Health. Local permission was sort from the Municipal Health Directorate of the Lower Manya Krobo, and Administrators of the identified facilities in the Municipality. Consent was sorted from all respondents.

**Consent for publication:** Not applicable

**Availability of data and materials:** Data sharing is not applicable to this article,

**Competing interests:** The authors declare that they have no competing interest in the publication of this paper.

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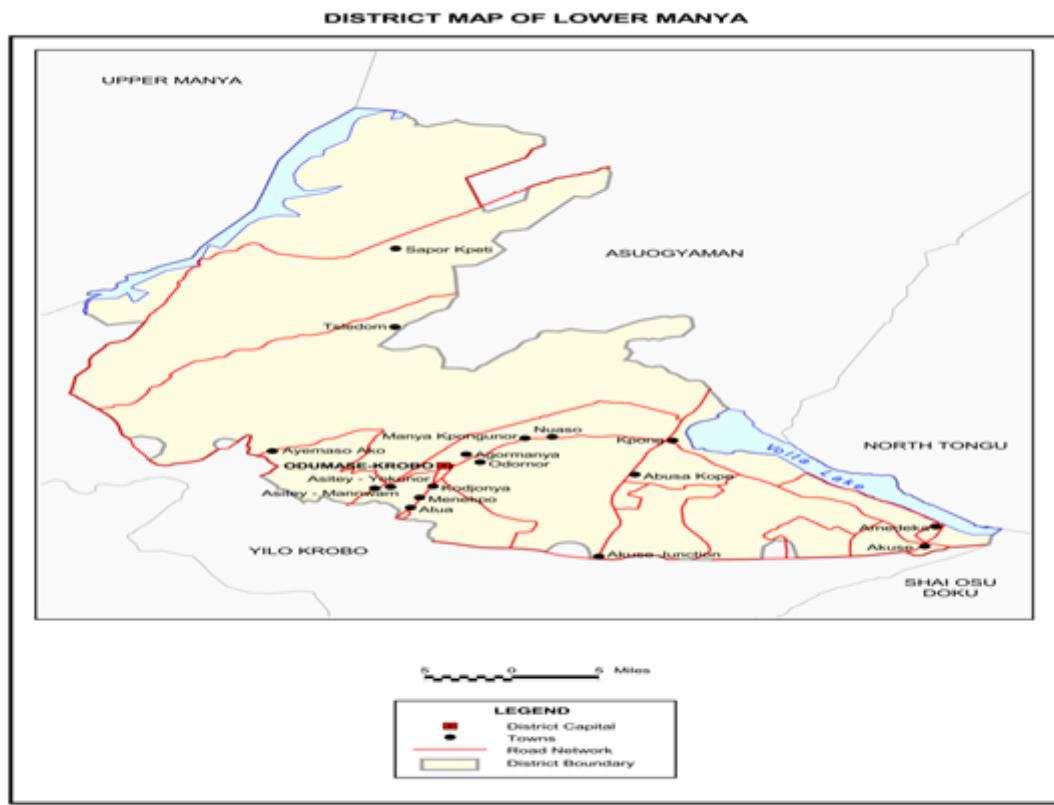
**Authors' contributions:** All authors contributed to the development and final review of the manuscript

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## Figures



**Figure 1**

### 1.1 District map of the Lower Manya

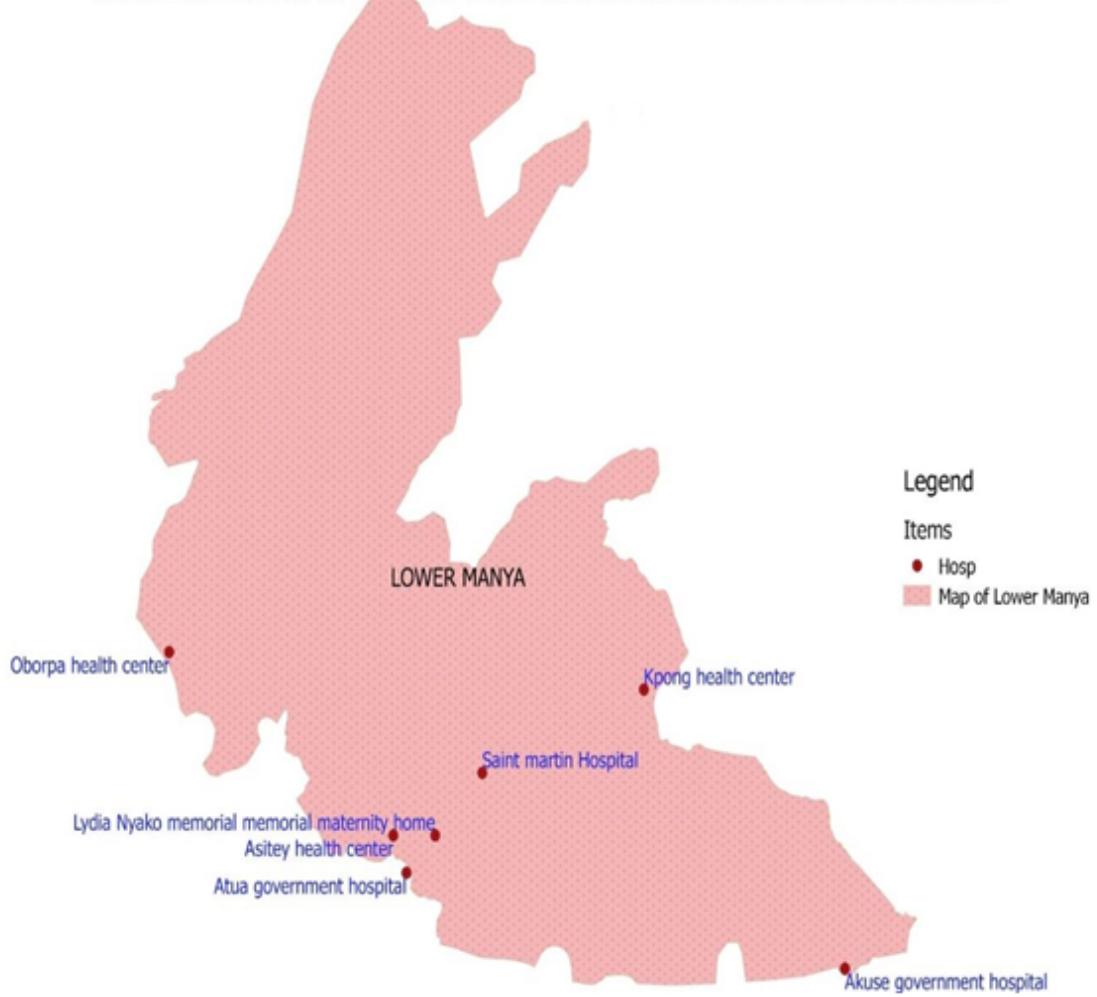
### LOWER MANYA MAP SHOWING CHPS FACILITIES



**Figure 2**

1.2: showing distribution of CHPS compounds in LMKM

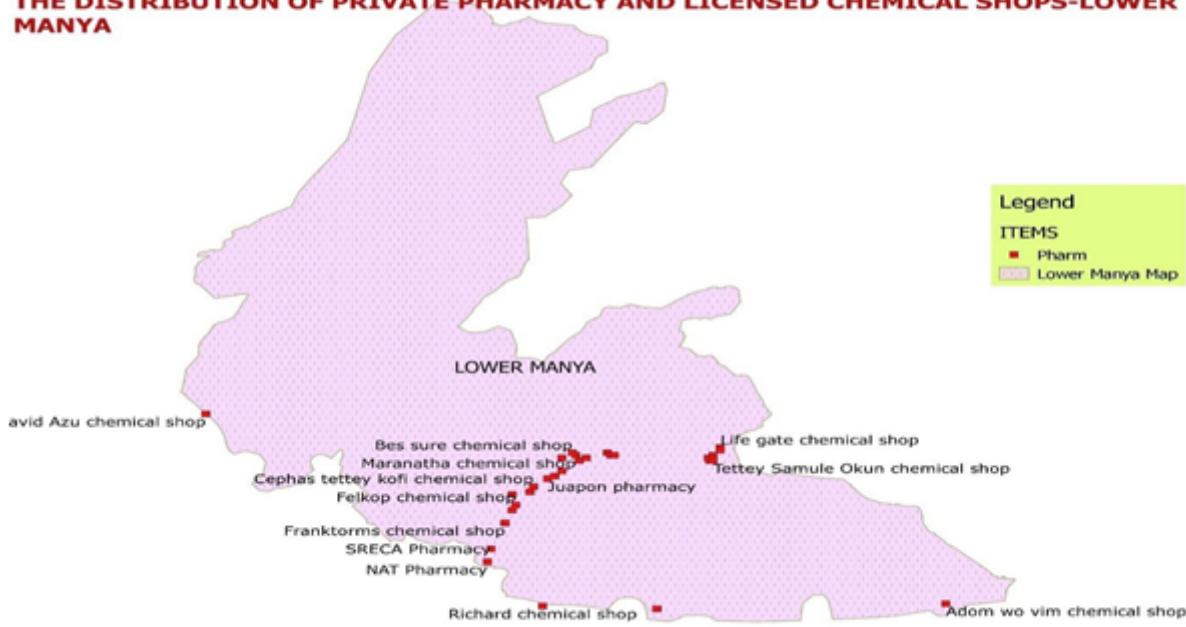
### THE DISTRIBUTION OF HOSPITALS AND HEALTH CENTRES ACROSS LOWER MANYA



**Figure 3**

1.3 Distribution of hospitals and Health centers across the LMKM

## THE DISTRIBUTION OF PRIVATE PHARMACY AND LICENSED CHEMICAL SHOPS-LOWER MANYA



**Figure 4**

1.4 Distribution of Pharmacies and Chemical shops