



Place, People and Diseases: Association Between Geography and Diseases in Ghana

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ABSTRACT There is a growing field of literature addressing the relationship between geography and health. A person's physical environment has the potential to present various risks or protective factors that may influence health. Exploring this relationship within Ghana's Ledzokuku-Krowor municipality broadens the field of literature on this topic as it relates to West African communities. Identifying frequently reported diseases from health care professionals and residents provides a look into the major health outcomes in the region. This manuscript is exploratory and could lay the groundwork for future researchers to further investigate potential risk factors that contribute to high rates of disease (e.g., malaria, hypertension, rheumatism).

KEY WORDS Geography, Disease, Healthcare & Ghana

INTRODUCTION

Africa provides an unbounded scope for the practice of geography (place of residence and work), disease and health. The nature and purpose of the nexus between geography and disease varies in definition (McGlashan, 1972; Hunter, 1974; Pyle, 1976; Abalo et. al., 2018; Tutu & Busingye, 2020). Africa provides infinite examples of the nexus between geography and disease. In the continent, man and environment are closely linked in a complex relationship which frequently presents conditions of disequilibrium whereby diseases flourish and health is impaired (Tilley, 2004; Emmanuel et. al., 2011). These conditions can be found not only in rural areas, where the majority of the population is at risk, but also in the urban areas, into which increasing numbers of people are being drawn (Prothero, 1981; Fobil et. al., 2012; Satterthwaite, Sverdlík, & Brown, 2019).

The range of diseases encountered in Africa is particularly wide. It includes the classic contemporary diseases of the tropics and the sub-tropics like malaria, tuberculosis, sleeping sickness, cholera, schistosomiasis, trachoma, and yaws, due to Africa's favorable physical environment and also because of contributing socio-economic conditions (De Magny et al., 2007; Courtin et al., 2008; Shean et al. 2008; Pond, 2013; Stoler et al., 2014; Dabo et al., 2015; Ghinai et al., 2015). In addition, there is growing evidence for an increased prevalence of diseases in Africa which were previously figured more largely in developed economies - cancers, degenerative diseases of the circulatory system, and psychiatric disorders (Stein et al., 2008; Opoku, Benwell, & Yarney, 2017). Directly and indirectly associated with both of the above groups of diseases, a very high proportion of people in Africa suffer from chronic and acute malnutrition (Ehrhardt et al., 2006; Lelijveld et al., 2016). Strikingly, in the last decade, it has been shown that food shortages in various parts of the continent causing severe under-nutrition may still occur (Abalo et. al., 2018; Tutu & Busingye, 2020).

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The means to combat disease and promote health in Africa are limited almost everywhere. There is a high demand for medical services of all kinds, but to meet this demand, resources are scarce. In modern curative services, ratios of available doctors and hospital beds to population are everywhere poor, and they are vastly more unfavorable in rural areas than in urban areas (Atkinson et al., 1999; Dell & Kahn, 2017). The majority of people in rural areas have very little access, if any, to either doctors or hospitals, and they must rely on the services of paramedical personnel at health centers or dispensaries, or on traditional health care. Though urban populations are better served, the need for optimum location of any services that can be made available is great, in order to make them accessible to the maximum number who need them (Agyemang, 2006; Anyamele, 2009).

Preventive medicine is practiced in a variety of ways. Indirectly, but nonetheless of great importance, are improvements in water supply, sewage and waste disposal, playing the positive roles they did, in raising standards of health in western Europe and North America in the 19th century and the early part of the 20th century (Prothero, 1981; Renzetti, 1999). The impact of these improvements is inevitably greater in towns than in the rural areas of Africa. Campaigns to control and eradicate disease and protect the people's health have had varying degrees of success. In most instances, they have had some positive impact. In the successful global campaign to eradicate smallpox, promoted by the World Health Organization, some of the last reported cases were in the Horn of Africa, one of the most difficult parts of the continent in which to organize health improvements (Geddes, 2006; World Health Organization, 2007). The global eradication of malaria, which was planned in the 1950s and 1960s, has proven to be impossible; the problems that have to be faced in Africa are as great—if not greater—than in any other of the malaria-infected areas of the world (World Health Organization, 2008; Nájera, González-Silva, & Alonso, 2011).

In Ghana, as in many developing countries, communicable diseases such as malaria and diarrhea are still the leading cause of death. However, evidence clearly indicates that noncommunicable diseases are catching up very fast. For example, in 2003, stroke was the sixth most common cause of death in the Ashanti region of Ghana (Cappuccio et al., 2004; Agyemang, 2006). Mattah et al., (2018), also identified that geography affects the health of humans by studying two metropolitan areas (Accra and Takoradi) in southern Ghana. This study also identified that citizens in these areas are aware of how their environment is affecting their health. Despite the importance of these studies, there are still gaps in the literature about how geography affects the health of humans. Against the background materials provided above, this study explores the relationship between geography, disease, and health within the Ledzokuku-Krowor municipality in Ghana. The study is important because it broadens the field of literature on this topic as it relates to West African communities. The study also identifies frequently reported diseases from health care professionals and residents, providing a look into the major health outcomes in the region. This study is exploratory and could lay the groundwork for future researchers to further investigate potential risk factors that contribute to high rates of disease (e.g., malaria, rheumatism) in Ghana and Africa.

LITERATURE REVIEW

There is a growing field of literature addressing the relationship between geography and health. A person's physical environment has the potential to present various risks or protective factors that may influence health. Problems of disease and health have important geo-medical aspects. These are at least recognized, even if not always sufficiently, by members of the medical profession, as well as by geographers (Prothero, 1981; Abalo et al., 2018; Tutu & Busingye, 2020). The vast medical literature on Africa contains many important and penetrating insights into the geographical aspects of disease and health problems. Examples from the past are largely focused on the work on cholera in Africa (Swerdlow, D. L., & Isaacson, 1994; De Magny et al., 2007; Mintz & Tauxe, 2013; Weill et al., 2017), malaria in Africa (Trape et al., 2002; Hopkins et al., 2007; Snow et al., 2012), and hypertension in Africa (Kaufman, & Barkey, 1993; Adedoye & Basquill, 2014) among other diseases. However, geographical factors have not always received the attention they deserved. There is evidence of the failure on the part of those planning for malaria eradication in Africa to take sufficient account of the human geographical factors involved. Of the three interrelated elements in malaria - parasite, vector and host - it can be shown that the first two of these have received far more expert attention than has the third, which has been grossly neglected (Prothero, 1981; Abalo et al., 2018; Tutu & Busingye, 2020).

The work of geographers on geomedical problems in Africa to date has been limited, inevitably, by the relatively small numbers of those who have been involved. The nature and scope of this involvement is varied. For example, May, in his global reviews of disease, included consideration of African material and gave more attention to it in his work on the ecology of malnutrition (May, 1965, 1968). Earlier in the 1960s, Prothero (1961, 1963,

1965, 1968) worked as a consultant to the World Health Organization on problems of relationships of population mobility to the transmission and diffusion of malaria and sleeping sickness, and on population mobility as a factor in programs for malaria control and eradication. This work was undertaken on a variety of scales - continental, sub-continental, national, regional, and local; such variety has been evident in the work of other medical geographers.

There have been continent-wide review articles of the medical geography of schistosomiasis (Kloos and Thompson, 1979) and sleeping sickness (Knight, 1971). At the sub-continental scale, McGlashan (e.g. 1969 a, 1969 b, 1975) worked for a decade or more on a variety of problems in Southern Africa Cook and Birkett (1971) on cancers in Eastern Africa, and Prothero (1967, 1972) on significant relationships between pastoralism, politics and public health in the Horn of Africa. There are many examples of this work at the national scale: Hall and Langland's (1975) Atlas of Disease Distribution in Uganda and several Medizinische Länderkunde (Geomedical Monograph Series) of the Heidelberg Academy of Sciences. Of the latter, volumes on Libya (1967), Ethiopia (1972), and Kenya (1978) have been published, and one on Nigeria (Prothero, 1976). Each of these monographs is a valuable contribution to understanding related medical and geographical factors, but the level of integration achieved in the volume on Kenya is outstanding.

At more micro level of study, the range of work undertaken has been very considerable and it is possible to do no more than instance some examples. One of the earlier, and still one of the most important studies, was a discussion on the cyclical retreat and advance of settlement in Northeast Ghana consequent upon the impact of river blindness and other diseases balanced against the countervailing pressures of population on land (Hunter, 1966). At a more micro-scale Bradley (1976) examined relationships between settlement, economy, and river blindness in the Hawal Valley of north-eastern Nigeria. Both studies involved a historical perspective, which is predominant in an essay on tick-borne disease in East Africa (Good, 1978), in a work concerned with the disease history of Africa (Hartwig and Patterson, 1978). However, it is important to note that the work of Hunter and Bradley is not only descriptive, analytical, and explanatory, but also predictive; these elements are also to be found in a study of cholera diffusion in Africa (Stock, 1976). The theme of population mobility in medical problems - as an active factor in the transmission and diffusion of disease and in the planning of health programs, and as being promoted by the impact of disease - is explored in all the examples just given. Movements at and between different altitudes and their significance for medical problems has been examined by Roundy (1976) in parts of Ethiopia, providing classic African examples.

These studies indicate a variety of approaches by medical geographers to medical problems and human health. In all of them there are important elements of description, in each there is analysis and interpretation; in some there are elements of prediction, in all there is some degree of prescription. They all have important contributions to make to the problems which they confront; these contributions are additional to what might be expected from the expertise and experience of those in the medical profession. It may seem trite to say that all human diseases and all activities to promote the health of human beings involve human factors which are related to the environment in which they are set and of which they are part. It may seem even more trite to say that all these factors need to be given full attention. However, it is a fact that this attention is frequently not given. Medical geography has contributed, and may further contribute, to what is lacking and what is needed. It is a field of study of long standing; it has now come of age in Africa and elsewhere. Yet, we are seeing only fragments of its potential contribution to the understanding and solution of contemporary problems, and hopefully, to the prevention of problems in the future.

Ledzokuku-Krowor Municipality

The Ledzokuku-Krowor Municipal area was created from Kpeshie, a suburb of the Greater Accra region in Ghana, West Africa on November 1st, 2007. The municipality was inaugurated on February 29th, 2008, approximately four months after its creation in 2007. The municipality was created under the Legislative Instrument (LI 1815). The Ledzokuku-Krowor Municipal area covers a total land area of 50 square kilometers. The southern boundary of the municipality is the Gulf of Guinea from the Kpeshie lagoon to the Mukwe lagoon, which is close to the Regional Maritime Academy (RMA). Furthermore, this boundary continues from RMA to join the Accra-Tema road through to the Nungua Police Station. The boundary turns right from the Nungua Police Station to the Ashiaman road and continues to Lashibi junction and then branches left on the Spintex road and moves all the way through the Coca Cola roundabout to the Kwame Nkrumah motorway. The road continues left along the motorway and branches south along the Tetteh Quarshie Interchange and moves south towards the starting point at the Kpeshie lagoon (LEKMA 2020).

The municipality lies in the Savannah zone and experiences a double maxima rainy season pattern. The average annual rainfall is about 730 mm, which falls primarily during two rainy seasons. The first season begins in May and ends in mid-July, while the second season begins in mid-August and ends in October every year. The rain falls are usually characterized by quick and short intensive storms. The vegetation of the municipality currently is made up of only a few remnant trees surviving due to a multiplicity of factors relating to rapid urbanization and limited enforcement of laws protecting the terrestrial vegetation. The estimated population of the Municipality, as of 2019, is 280,924. With a total land area estimated at 50 square kilometers, the general population density is 5,619 persons per square kilometer. With the socio- cultural background of the residents, there are a mixture of artisans, traders, farmers (poultry) and civil servants. Most of the indigenes are fishermen. Economic activity in the municipality is dominated by a few industries such as Coca Cola and Maracuja Fruit Juice factories. Other economic activities include fishing, medium and small-scale manufacture, and commercial trading, wholesale and retail. Another employment sector comprises small-scale businesses and vocational enterprises such as carpentry, tailoring, hairdressing, auto-electrical, auto-mechanic, and welding (LEKMA MHD report, 2019). The socio-economic status is averagely poor with low educational background, more-so with those living along the coast—a factor that contributes to high unemployment amongst the youth (LEKMA MHD report, 2019). The Municipality has two main road corridors made up of the main Teshie-Nungua Beach Road and the Spintex Road which both link the Municipality to the Accra Metropolitan Assembly on the west and Tema Metropolitan Assembly on the east. Figure 1 shows the map of the research area.

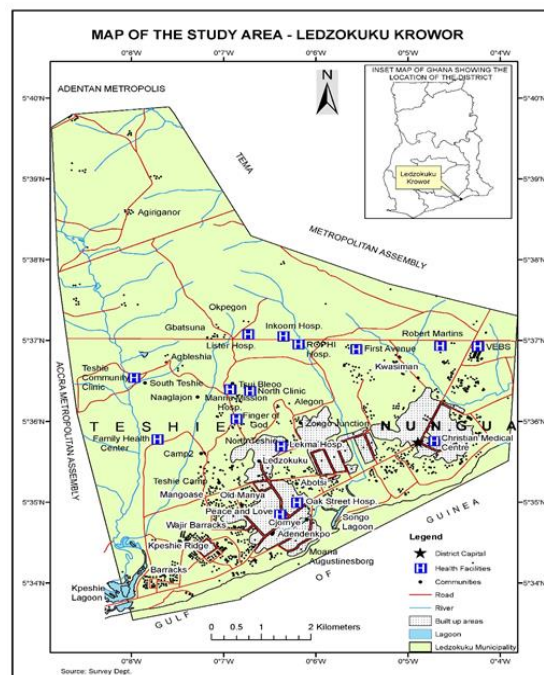


Figure 1: Geographical Map of Ledzokuku-Krowor Municipality showing some Healthcare Facilities

In conclusion, the municipality is divided into three health sub-zones for the purpose of health planning, policymaking, delivery of healthcare services and evaluation or monitoring. These three sub-zones are Teshie North, Teshie South, and Nungua (LEKMA MHD Report, 2019). The report also shows that the majority of the healthcare facilities are located in the urban areas of the municipality compared to the rural areas making access to healthcare difficult for rural folks.

MATERIALS AND METHODS

Data

The data for this study was collected from two major groups (healthcare professionals & residents in the municipality) through two major approaches. First, an in-depth qualitative interview methodology was used to collect data from 20 healthcare administrators in the Ledzokuku-Krowor municipality. Healthcare administrators were interviewed on topics like location decisions of healthcare facilities, capacity of the facility, attendance rate,

diseases most often reported, and factors which could possibly influence a patient’s access to healthcare facilities, among others. Second, questionnaires were distributed to 300 residents from 100 households in the municipality to collect data on the demographic characteristics of the respondents, rate of visits to healthcare facilities in the municipality by based on specific diseases, access and barriers to healthcare among others. The households and respondents were randomly selected for the survey from Teshie, Nungua, Baatsona and Spintex residence of the municipality. A total of 320 respondents were interviewed and surveyed together for this study. The study utilized in-depth interviews and questionnaires to allow for nuance in the data collected, enrich the data and validity of the data collected from both healthcare administrators and residents in the municipality.

Data Analysis

This study employs a means comparison approach to analyze the data collected for the study. A means comparison approach was selected for because it allowed the study to present its results in a concise manner and it allowed for easy comparisons of two or more variables and results for easy conclusions. Though means comparison approach is not a strong statistical approach to establishing a strong correlation between geography and disease prevalence, it is a good method in comparing two more diseases and results from both healthcare administrators and residents to arrive at common results in both datasets.

RESULTS AND ANALYSIS

The results for this study are grouped into three categories: demographic results for the 300 respondents surveyed through questionnaires in the municipality, the distribution of healthcare facilities in the municipality according to ownership (public versus private), type (hospital versus clinic) and location (Teshie, Nungua, Spintex & Baatsona).

Demographic Results for Residents Surveyed

The demographic results from the questionnaires that were administered to the 300 respondents from 100 households in the municipality are presented below (see Table 1). This covers the age, gender and educational distribution as well as the employment status of the respondents. According to the data collected from the questionnaires, 34% of the respondents range from 18-25 years, 40% of respondents fall between the ages of 26-35, and 26% of the respondents are above 40 years old. This means that the most vulnerable group (18-25 and above 40) form 60% of the population, making healthcare delivery very important for the municipality. The male-female respondents’ ratio was 53: 47, which is very representative of the population. The educational status of the respondents was 6% have primary education, 54% have SHS/Technical education, 36% have Tertiary education and 1% have no formal education. With employment, 78% of the respondents are employed, 16% are unemployed and 6% are retired persons. Logically, it can be argued that the majority of the respondents can access healthcare because of their employment status.

Demographic Characteristics	%	No. of Respondents
Gender		
Male	53	159
Female	47	141
Age		
18 – 25	34	102
26 – 35	40	120
40+	26	78
Educational Status		
No formal Education	1	3
Primary/JHS	6	18
SHS/Technical	54	162
Tertiary	36	108
Others	3	9
Employment Status		
Employed	78	234
Unemployed	16	48
Retired	6	18

Geographical Areas		
Spintex	12	36
Baatsona	20	60
Teshie	22	66
Nungua	46	138

Table 1: Distribution of Demographic Characteristics of Respondents

Distribution of Healthcare Facilities from Interviewing Healthcare Administrators

According to the 2019 annual report of the municipality, most public and private health facilities are concentrated in urban sections, with few located in rural areas. Distribution patterns of public, private, traditional and other healthcare facilities in the municipality were examined. Table 2 lists the healthcare facilities, type and location under the Ledzokuku-Krowor Municipal Health Directorate.

No.	FACILITY	PUBLIC/PRIVATE	TYPE	LOCATION
1.	LEKMA HOSPITAL	PUBLIC	HOSPITAL	TESHIE
2.	TESHIE COMMUNITY CLINIC	PUBLIC	CLINIC	TESHIE
3.	CHRISTIAN MEDICAL CENTRE	PRIVATE	HOSPITAL	NUNGUA
4.	FAMILY HEALTH HOSPITAL	PRIVATE	HOSPITAL	TESHIE
5.	LISTER HOSPITAL	PRIVATE	HOSPITAL	SPINTEX
6.	ROBERT MARTINS	PRIVATE	CLINIC	SPINTEX
7.	FIRST AVENUE CENTRE	PRIVATE	CLINIC	SPINTEX
8.	FINGER OF GOD	PRIVATE	CLINIC	TESHIE
9.	MANNA MISSION HOSPITAL	PRIVATE	HOSPITAL	TESHIE
10.	NORTH CLINIC	PRIVATE	CLINIC	TESHIE
11.	VERBS	PRIVATE	CLINIC	SPINTEX
12.	ROPHI	PRIVATE	CLINIC	SPINTEX
13.	INKOOM	PRIVATE	HOSPITAL	SPINTEX

14.	OAK STREET HOSPITAL	PRIVATE	CLINIC	TESHIE
15.	PEACE AND LOVE	PRIVATE	CLINIC	TESHIE

Table 2: Distribution of Healthcare Facilities in Healthcare facilities in Ledzokuku-Krowor Municipality by Ownership/Type & Location

Note:

Total number of healthcare facilities in Ledzokuku-Krowor = 15 (100%)

***Break Down by Ownership:**

Total number of *public health facilities* in Ledzokuku-Krowor = 2 (13%)

Total number of *private healthcare facilities* in Ledzokuku-Krowor = 13 (87%)

***Break Down by Type of Facility:**

Total number of *hospitals* in Ledzokuku-Krowor = 6 (40%)

Total number of *clinics* in Ledzokuku-Krowor = 9 (60%)

***Break Down by Location of Facility:**

Total number of located in Teshie = 8 (53%)

Total number of located in Spintex = 6 (40%)

Total number of located in Nungua = 1 (7%)

According to Table 2, the municipality has two public health facilities (13%) serving the population of the area, the Teshie Community Clinic and LEKMA Hospital, which serves as a Malaria Research Centre. These healthcare facilities are located within the Teshie community which provides services to the residents in the municipality. These facilities provide clinical/preventive services and functions, ranging from outpatient and in-patient health services, reproductive and child health services, nutrition, pharmacy, surgery, laboratory tests to X-Rays. Due to the availability of only two public facilities, health services are also sought at La General Hospital, the nearest public hospital in the La sub-metro. Furthermore, the distribution of private healthcare facilities (87%) within the municipality is relatively fair compared to that of the public facilities. There are thirteen private health institutions in the locality: four hospitals (Family Health, Christian Medical Centre, Lister Hospital and Manna Mission hospitals), four clinics (Oak Street, Teshie North, Verbs, Teshie Community) and one maternity home (Finger of God). Other health facilities include Rophi, Inkoom, Peace and Love and Robert Martin. They provide obstetric and gynecological functions, pharmaceutical services as well as catering services. With reference to the table above, eight of the private facilities are located at Teshie, followed by Spintex, which has six private facilities and Nungua, having only one private healthcare facility. Nungua happens to be the town with the largest population of about 84,119 (2019) representing 29.94% but has the least number of healthcare facilities. By implication, it means residents within the Nungua Township will have to travel longer distances to access these facilities. Finally, traditional healthcare facilities are fairly distributed within the Ledzokuku-Krowor Municipal Area. Their services range from small shops that sell traditional herbs and concoctions, to clinics where patients are diagnosed and treated. In addition, there are no traditional healthcare facilities in the high-class areas such as the Estates. Moreover, most of these facilities (herbal shops) are in the urban sections along major roads of the locality.

Geographical Location & Disease Prevalence: Comparison of Results for Healthcare Administrators and Residents

From Table 3 below (results for healthcare administrators), malaria continues to be the most prevalent disease in the Ledzokuku-Krowor Municipality in both 2019 and 2018. In 2018, the municipality recorded 42,718 malaria cases, representing about 88% of the top ten diseases, compared to 20,162 cases recorded in 2019, representing 51% of the top ten diseases in the municipality. The average 31,440 cases of malaria were reported in 15 hospitals in the municipality between 2018 – 2019. The average number of hypertension and rheumatism cases were 4,532.5 and 1398, respectively. Again, between 2018 – 2019, the average number of cases for intestinal worm, diarrhea/cholera and diabetes were 1,245.5, 1,237 and 1,122.5, respectively. The average anemia cases for these two years was 956, compared to the average asthma cases of 895. Finally, the average typhoid and chicken pox cases recorded in the municipality from 2018 – 2019 were 647 and 599, respectively.

Diseases	Total	M	SD	95% Confidence Level of M (Standard Error)
Malaria	62880	31440	15949.50	143300.58 (11278)
Hypertension	9065	4532.5	2447.30	21988.09 (1730.5)
Rheumatism	2796	1398	1446.74	12998.45 (1023)
Intestinal Worms	2491	1245.5	1670.89	15012.38 (1181.5)
Cholera/Diarrhea	2474	1237	903.68	8119.26 (639)
Diabetes	2245	1122.5	895.90	8049.38 (633.5)
Anemia	1912	956	462.45	4154.93 (327)
Asthma	1790	895	773.57	6950.29 (547)
Typhoid	1294	647	627.91	5641.55 (444)
Chicken Pox	1198	599	749.53	6734.29 (530)

Years of comparison = 2018 – 2019

Total Number of cases in 2018 = 48,295

Total Number of cases in 2019 = 39,850

Table 3: Top Ten Disease Reported at Outpatient Department (OPD) from 2018 – 2019 in Ledzokuku-Krowor Municipality by Healthcare Professional

Table 4 illustrates results from the survey of 300 residents in the Ledzokuku-Krowor municipality. Residents were asked about the frequency of visits to the 15 healthcare facilities in the municipality for malaria, hypertension, diarrhea/cholera, anemia, rheumatism, intestinal worms, typhoid and diabetes. That rate was measured by a 4-scale frequency matrix, i.e. 1 = most frequent; 2 = more frequent; 3 = frequent and 4 = less frequent. The total visits to healthcare facilities in the municipality for malaria cases using the 4-scale frequency was 176. Hypertension was 118 and diarrhea/cholera was 74. Anemia and Rheumatism were 64 and 33 visits, respectively. Intestinal worms was 36, typhoid was 22 and diabetes was 20 visits.

Diseases	Most Frequent	More Frequent	Frequent	Less infrequent	Total
Malaria	126	28	12	10	176
Hypertension	64	26	20	8	118
Diarrhea & Cholera	30	22	16	6	74
Anemia	22	20	14	8	64

Rheumatism	12	12	8	1	33
Intestinal Worm	16	8	8	4	36
Typhoid	8	6	4	4	22
Diabetes	6	6	4	4	20

N = 300

Table 2: Type of Diseases and how they Influence Visits to Health Facilities in 2019 collected from Respondents

According to the results presented in Table 2 and 3, it can be argued that geography determines the prevalence of specific diseases such as malaria, hypertension, rheumatism, intestinal worm, diarrhea/cholera, diabetes, anemia, asthma, typhoid and chicken pox in the Ledzokuku-Krowor municipality. Malaria continues to be a leading disease and cause of death in Africa (Fobil et al., 2012). Intuitively and empirically, the identification of malaria as a leading disease by the 20 healthcare administrators and 300 residents in the municipality supports the existing literature. Also, diarrhea, cholera and intestinal worm related diseases are also common on the continent (De Magny et al., 2007). It is worthwhile that both healthcare administrators and residents identified these three diseases as prevalent in the Ledzokuku-Krowor municipality. The rise of hypertension, rheumatism, and other major diseases common in the municipality, needs further study by researchers interested in examining the impact of geography on human health.

DISCUSSION AND CONCLUSION

The relationship between geography (place of residence/work), diseases and human health continues to intrigue scholars and practitioners. In recent years, there has been an increase in studies that seek to examine this relationship in Africa (Abalo et al., 2018; Tutu & Busingye, 2020). These studies have broadened the scope of literature and provide useful insight to both scholars and practitioners. However, there are still some gaps in the literature, especially regarding specific countries like Ghana. This study is exploratory in nature and seeks to add to the growing literature in the field. Before we discuss the findings of this study, we would like to acknowledge some of the limitations and caveats of this study that readers must consider when using the findings. The study utilizes self-reported data concerning the prevalence of certain diseases within the Ledzokuku-Krowor municipality. However, self-reported data can be biased since respondents can give inaccurate responses for various reasons. Though this study attempts to resolve this challenge by interviewing about 20 healthcare professionals in the municipality, we still acknowledge that a sample size of 20 is very small to fully help mitigate this challenge. This study also employs a means comparison method to analyze the data, which is not a strong, robust way of identifying a correlation between geography and the prevalence of diseases in the Ledzokuku-Krowor municipality. However, despite these limitations, the findings of this study are important and can be a foundation for future studies. An important observation from this is the prevalence of malaria as the leading disease within the geographical area of study. Though this finding is not surprising, because malaria is a leading cause of death in Ghana and Africa, (Fobil et al., 2012), it provides the foundation for future studies to examine the variables that promote high malaria cases in Ledzokuku-Krowor. An initial area to start from would be to examine the correlation between the numerous water bodies that surround the municipality and how citizens are using the water bodies. The municipality is surrounded by the Gulf of Guinea from the Kpeshie to Mukwe lagoon. The Kpeshie and Mukwe lagoon are waste disposal sites for residents and a fertile breeding ground for mosquitoes that spread the malaria parasite. The water source also serves as a source for fishing farming and water for drinking, cooking and washing for residents who do not have access to portal water from the Ghana Water Corporation. This can be one of the many reasons why diarrhea/cholera are prevalent in the municipality. Open defecation and lack of toilet facilities in public homes and in the municipality can also be another reason for the high levels of cholera outbreaks recorded between 2018 to 2019. Boadi & Kuitunen (2005), argues that flush toilets are a luxury in Ghana that can be afforded by the wealthy, hence a majority of Ghanaians do not have access to proper defecation facilities.

This study identified that hypertension continues to affect the health of residents in the municipality. Dosoo et al., (2019), argues that high levels of hypertension in the Ghanaian community can be associated with tobacco use, blood sugar or glucose levels, excess cholesterol in the blood and prediabetes. These factors are consistent with some of the factors raised by the healthcare professionals interviewed for the high levels of hypertension in Ledzokuku-Krowor. Additionally, stress was another major factor highlighted by healthcare professionals. Residents of Ledzokuku-Krowor travel to other parts of Accra to work daily which requires early mornings and

very late-nights, due to the heavy traffic in Accra. Future studies can examine these factors and how they affect the high levels of hypertension in the municipality.

This study draws the attention of all stakeholders in the municipality to the challenges of waste disposal, preserving the water bodies in the municipality and the need to develop the transport and healthcare systems in the municipality to ensure that the risk of residents polluting the environment and its effect on their health is reduced. Residents also need to be educated by stakeholders about the importance of living in a clean environment and finding better ways to dispose waste and preserve the water bodies of Ledzokuku-Krowor. This would go a long way to augment the development of stakeholders to improve the health and wellbeing of the residents of Ledzokuku-Krowor.

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