Chapter 1: Urbanisation and Epidemiology Intersecting: Context and Setting

For the first time, since time immemorial, most humans resided in urban areas by 2010 (Olsen, 2000; WHO, 2010). The UN (2018) argues that, currently, more than 50% of people globally, live in urban areas and these numbers might rise to above 70% by 2050 with most of urbanisation occurring in African countries. Urbanisation already has an adverse effect on global health and could significantly impact the epidemiology of infectious diseases. Lilienfeld (1978: 87) defines epidemiology as "...a method of reasoning about disease that deals with biological inference derived from observations of disease phenomena in population groups." The contamination of water sources has been found to be one of the major risk factors causing epidemic diseases like cholera in all the regions of Africa; with lower areas being contaminated more through surface water (Griffith *et al.*, 2006).The central argument presented in this research work is that urbanisation in Harare Metropolitan Region has significantly influenced the epidemiological patterns of diseases, particularly communicable diseases, due to poor sanitation, inadequate health infrastructure, and spatial inequalities. The main thrust of the study is to unpack the factors surrounding disease incidences in Harare Metropolitan Region and map the spatial distribution of health facilities in relation to population distribution.

Coexisting with demographic changes, sub-Saharan Africa is experiencing changing epidemiological patterns, particularly a shift towards a dual disease burden. Vearey *et al.* (2019) postulate that non-communicable diseases (NCD) are becoming more prevalent even while infectious diseases remain a considerable source of illness and death, especially among children. NCDs, such as diabetes, obesity and heart disease, are strongly associated with attendant effects of excessive urbanisation. In Harare, Fernandez (2011) argues that bus stops and informal markets, residential housing, water supplies and sewage disposal system were identified as risk factors related to the cholera epidemic that hit Harare in 2008-2009. In some urban areas, as compared to rural areas, higher population density, poor housing and poor sanitation and infrastructure have contributed to increased risks associated

with infectious diseases (Neiderud *et al.*, 2015). By reducing habitats for the vectors, the urban environment may ease the incidence of pathogens and transmission of diseases.

Informal settlements are commonly overcrowded and lack basic services, amenities and facilities, which factors the WHO (2019) has attributed to a higher risk of certain communicable diseases, notably diarrheal illness. During the rainy season, when there is scant sewage disposal or working sewer system, shallow wells get contaminated easily by excrete in run-off of rains as water follows the slopes and get into the lower parts (Zarocostas, 2009). Lack of functional health facilities and poor environmental status closely related to cholera, characterises the situation in developing countries. Zimbabwe as a country has undergone economic downfall especially from the early 90s and this has affected all sectors and the health sector was not spared. The factors surrounding increased incidences of communicable diseases ranges from economic, social and political. For example, Zimbabwe's economic crisis reached peak in 2008 happening concurrently with the cholera epidemic that hit Harare ever in history.

The collapse of Zimbabwe's health system greatly contributed to the severity of the 2008 cholera outbreak. (Jönsson and Guha, 2009). The health care systems had become dysfunctional, water supplies were irregular and sanitation systems had collapsed in Zimbabwe. That greatly affected the poor who are largely located in overcrowded spaces such as Matapi Hostels, Chitungwiza high-density suburbs which are always flooded with sewer. During the 2008 cholera outbreak, health centres in Harare and Chitungwiza registered and cared for 19,422 persons who met the case period's cholera definition. Suburbs with the highest attack rates were located on the south-western area of Harare. Examples of such suburbs include Matapi Hostels and high-density areas in Chitungwiza, which were heavily affected due to poor sanitation and flooding with sewage

Overall, the average elevation is lower and the distance to the epicentre (Chitungwiza) is smaller. These statistics have not been clear whether it is the elevation or the distance from the epicentre that contributed to the spread of the disease or not. Further to this, a study conducted in Hopley suburbs

one of the fast-growing high-density suburbs in Harare revealed that maternal health has greatly been affected by the continuous weakening of the public sector in the country. The gains that had been attained since independence declined sharply from 85% down to maternal deaths accounting to 67% of maternal deaths in 2010. The dying health system coupled with social and economic challenges exacerbate the existing situation. Existing studies have shown that maternal age, age at first marriage, mother's level of education, sanitation, source of drinking water, wealth status, preceding birth interval, birth weight and birth order are significantly associated with the risk of dying during childhood. The high-density and poorly planned suburbs of Harare such as Hopely and Caledonia expose women to diseases related to poor pregnancy management due to lack of primary health care services.

Various questions remain unanswered on the topic of epidemiological patterns in the urban landscape. Whether the threat of disease by suburb is attributed to one simple or multiple factors within a specific suburb due to the ecological fallacy remains unanswered, especially in developing countries, like Zimbabwe. Though lack of water and health facilities are the most known factors involved in the origin and spread of an epidemic (Chadoka and Odimegwu, 2016), the multiplication of more risk factors needs to be highlighted. The relationship between urbanisation and infectious disease is less clear-cut and is moreover impacted by external factors, such as geography and climate. Besides, urban environments are not homogeneous, so risk factors are likely to vary across the continent, across a country and even within a city (Potts, 2012). It is argued that the urban environment may reduce the transmission and incidence of other pathogens, for example, through reducing habitats for some vectors (Hassell, 2006). Basing on this argument, it is not clear whether this tallies with the situation in Harare or not. There has been lack of such studies that brings about the relation between disease outbreaks, facility location and distance /time spend to reach the facility.

The study aims to engage a spatial analysis of the relationship between population and disease occurrences to inform urban public health

management. With specific reference to Harare Metropolitan Region, the specific objectives of the study are to:

1) identify the drivers of communicable disease occurrences in Harare Metropolitan Region;
2) describe selected disease incidences in urban areas;
3) examine the relationship between places of selected disease prevalence and placement of urban health facilities;
4) examine the influence of spatial segregation of the city, population distribution and health facilities and estimate the time used to reach selected health facilities should an emergence happen;
5) relate population distribution to health facilities and the epidemiological patterns; and
6) suggest policy and practical models to inform governance of urban health.

Despite existing knowledge, the study could be the first to make any attempt to try and understand the epidemiological patterns in the urban setting of Harare concerning time use, disease emergencies and location of health facilities. The study highlights the importance of studying epidemiological patterns considering concentrating mainly on factors as time use, disease emergencies and health facilities. The results of the study shall help to plan for some health-related events and also put preventive activities linked with water and sanitation in prevalent suburbs in Harare and Zimbabwe at large.

Following observations made by Rydin *et al.* (2012) and Burdett *et al.* (2011) in their studies, the study shall also help in improving urban health and well-being, recognise and reduce inequalities in health outcomes and in building capacity on national and on regional levels to promote urban health and well-being. The study shall also highlight the behavioural risk factors for infectious diseases in urban settings studies and proffer policy interventions that have specifically been applied to cities. It will also identify current gaps in the literature that may constitute opportunities for future research in this area. The study comes with many benefits at all levels in the societies. Identifying epidemiological patterns guides public health action to orientate further preparedness interventions in Harare. The marginalised shall benefit from reduced inequalities in health outcomes and build capacity on national and

regional levels to promote urban health. The results of this work shall inform public health policy as it relates to capacity building and health systems strengthening in urbanising areas. To researchers, the study highlights knowledge gaps that grounds further research pointers even into rural settlements.

A better understanding of epidemiological patterns and infectious disease risk factors specific to urban settings shall emerge from the study's mixed-methods approach, which includes spatial analysis using GIS, mapping disease outbreaks in relation to health facility locations, and examining factors such as population density, sanitation, and urban infrastructure. By focusing on Harare's urban environment, the study aims to identify key drivers of disease outbreaks, assess spatial inequalities in health access, and propose policy interventions to improve urban public health management. Policy interventions to plan for and act against future urban outbreaks also emerges. The study shall contribute to policy-making, especially in issues to do with urbanisation and epidemiology. The study is also bound to improve their research skills.

Urban areas are complex systems whose characteristics impact the health of people who live in them. The interaction between epidemiology and spatial configuration if becoming more visible. Urban landscape attributes influence various spatial variations in risk of epidemiology. Land changes for instance influence the densities per square meter and the rate at which certain diseases are spread across people. Infectious diseases for instance were contracted by many people if the people are densely populated as compared to the impact on less densely populated environments. Over the years, emergence and re-emergence of vector-borne and zoonotic diseases has been experienced in high-density areas that have inadequate public services mostly in Africa. The linkages between diseases and urban densities go beyond mere densities to include the availability of key services. These services include key services that are needed to reduce the occurrence of diseases and the services needed in events that people get the diseases. The ability for one to get quick medical attention is key in responding to health emergencies. This is also the same when considering the importance of the availability of key services such as WASH infrastructure in preventing diseases.

There are spatial variations in disease risk or incidence. This may lead to some urban landscapes being characterised as having high disease prevalence than others. The disease prevalence is a result of partly local environmental factors. The rapid intensification of agriculture, socioeconomic change and ecological fragmentation can have profound impacts on the epidemiology of infectious disease. Spread and persistence of newly emerged (or re-emerged) pathogens can then be perpetuated by a combination of factors including expanding global human populations and urbanisation especially in poor communities who are less pro-active. Historically, human population density and growth were predictors of infectious diseases. This was so because there were more reactive approaches and less pro-active measures. In that line of argument, human responses to their urban environments in the wake of increased urban population and densities are critical in safeguarding the health of urbanites.

The study is guided by a mixed methods approach. Mixed methods are a methodology for developing better, more context specific instruments that addresses complex scenarios. It provides a more complete understanding of the research problem than either quantitative or qualitative alone. Several philosophical approaches are going to be employed to curtail the shortcomings of one philosophical approach. It allows researcher to tie together several steps in an evaluation process. The approach allows researcher to apply scientific tools using existing data and deduce possible interventions that can be employed to make urban planners to place health facilities in the shortest distance from the populations to be saved. The mixed method approach allows the researcher to inquire about the various types of experiences that include opinions, perception, thought, memory, imagination, embodied action, emotion and social activity (Creswell et al. 2007; Gray *et al.* 2007) and also to gather quantitative data using spatial analytical tools such as GIS.

Case study approach has been adopted as the research design for the study. The study leans heavily on quantitative methodological design and it seeks to map clinical facility locations in relation population locations in Harare, Zimbabwe. The study has sought to investigate and understand why certain urban localities have higher incidences of disease types than others and how planning for facilities can reduce distance travelled by patients to get medical

attention-epidemic response. This is guided by Yin (2017) who argues how the essence of case study is to try and illumine why and how certain decisions and outcomes emerge.

The population of the study comprised clinic facilities in Harare Province. Purposive sampling is the key sampling technique in the study. Purposive sampling was complimented by in depth interviews with health personnel. 11 clinic facilities have been purposively selected in the study: one facility from each of the 11 local districts. Hot spot mapping was employed using GIS to establish incidence of disease outbreaks in each clinic catchment.

The area of focus of the study was Harare Metropole. In the metropole, Harare is Zimbabwe's capital and largest city of Zimbabwe. It comprises 11 local council districts. There are more disease outbreaks in Harare compared to the other cities especially water borne diseases Luque Fernandez (2012). The incidence of disease, especially during the rainy season, has increased coupled with the declining economy and social services system. Since independence Harare has attracted large influx of migrants from the rural areas. This has resulted in straining existing resources that were not further developed to match the growing population.

To address the research, aim and objectives of the study, both primary data collection and secondary data collection methods were adopted. Secondary data were gathered using literature review and archival data from clinical records and geographical. Primary data were gathered using GIS and other mapping tools. The data were complemented with in-depth interviews and focus group discussions.

Literature review is a data collection technique that involves a "systematic identification, location and analysis of documents containing information related to the research problem" (Mills and Gay, 2019: 80). The literature and documents that were reviewed comprise the book, book chapters, journals, health rights and policies, the Zimbabwean constitution and any other related epidemiological, urban planning and spatiality documents.

Interviews were conducted with selected individuals working as health workers, planners and epidemiologists and residents of selected suburbs. Semi-structured interviews with open-ended questions were used to give room for the generation of qualitative data. This will enable the researcher to capture the lived experiences, that will address the location and distribution of health facilities in Harare city concerning disease outbreaks. The interview will use more open-ended questions with residents to invoke discussions (Creswell *et al.*, 2007; Gray *et al.*, 2007). Focus group discussions involve gathering people from similar backgrounds or experiences to discuss a specific topic of interest (Creswell *et al.*, 2007; Gray *et al.*, 2007). Focus group discussions are more like group interviews that comprise several individuals who can contribute to understanding the research problem (Mills and Gay, 2019). Focus group discussions were held with different population groups, middle-aged females and males, mixed groups, the elderly and the adolescents' groups. This will enable the researcher to get a wide range of responses on clinical services availability during disease outbreaks.

Quantitative data collected using GIS and from secondary sources (maps) were analysed using spatial analytical tools. Qualitative data were analysed using NVivo package. NVivo is a qualitative data analysis (QDA) computer software package produced by QSR International. NVivo helps qualitative researchers to organise, analyse and find insights in unstructured or qualitative data like interviews, open-ended survey responses, journal articles, social media and web content.

Triangulation of methods requires to understand ethics and include how they are going to address ethical considerations in their research plans (Mills and Gay, 2019). Against that background, the researcher was highly sensitive to possible ethical issues that may arise during the study. Researchers have the responsibility of maintaining the well-being of research participants (Gray *et al.*, 2007). The researcher neither harmed participants during engaging with them nor force participants to participate in the study. The researcher first sought their informed consent of participants before engaging with them in research. On engaging with each participant, the researcher explicitly highlighted the purpose of the study and notify the participants of their right to refuse participating in the study if they feel they did not want to

participate. To ensure confidentiality, the researcher used anonymity. Where anonymity was not be used, the researcher protected the confidentiality of the identities of study participants. During conducting the research, the researcher were truthful and honest in conducting all research activities.

Certain limitations were encountered during research activities. The first limitation is that the study is relying heavily on technological tools such as drones and geo-mapping. Faulty tools may affect the timely collection of data. The study also relies on clinical staff and currently, the clinics are short staffed and this may affect availability of required respondents. This may stretch the time frame for the study completion. The study is also geographically limited to Harare. There might also be other experiences in other cities and contexts outside Harare. In seeking to improve the validity and reliability of the study, the researcher selected Harare, firstly because it is a city with most of Zimbabweans. Secondly, it is the main city expected to have better medical standards sufficiently aimed at better responding to disease incidences. The other limitation expected are the challenges of data collection during COVID-19. Face-to-face interviews were limited due to COVID-19 protocols. The researcher will therefore utilise virtual tools and applications such as Zoom applications to collect data online.

The chapter introduces the relationship between urbanisation and epidemiological patterns, focusing on Harare, Zimbabwe. It argues that urbanisation, particularly in African cities, has contributed to a dual burden of disease, with both infectious and non-communicable diseases (NCDs) becoming prevalent. The chapter highlights how poor sanitation, overcrowding, and inadequate infrastructure in high-density suburbs have exacerbated health risks, as seen in the 2008 cholera outbreak. It underscores the need for spatial analysis to understand how urban configurations influence disease distribution and access to health facilities. The research aims to identify drivers of communicable diseases, examine the relationship between disease prevalence and health facility placement, and propose policy interventions to improve urban public health management.