UNIVERSITY OF GHANA

DEPARTMENT OF GEOGRAPHY AND RESOURCE DEVELOPMENT

THE STATE OF DISASTER PREPAREDNESS AND RESPONSE TO CHOLERA EPIDEMICS IN THE GREATER ACCRA METROPOLITAN AREA (GAMA): THE CASE OF THE INDIGENOUS COMMUNITIES OF LA AND CHORKOR.

BY

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DEDICATION

This work is dedicated to my Dad, Eric Gyetuah and late Mum, Margret Afua Fofie for their immense contribution towards my education, love and encouragement throughout my life.

DECLARATION

I declare that, I single handedly undertook this study and that all information in this document are as a result of my own studies under supervision. All other secondary sources of information in this work are duly acknowledged. I am hereby responsible for any shortcomings.

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ABSTRACT

Ghana like most developing countries is undergoing a rapid population growth and this affects and limits the effectiveness of environmental structures. Cholera epidemics have been an 'annual ritual' and communities within the Greater Accra Metropolitan Area (GAMA) record the highest number of cases. This study assesses the households', communities and local governments' preparedness and response to cholera epidemics in indigenous communities in La and Chorkor. The research used mixed methodology, namely a rapid assessment tool and a community based-survey through a questionnaire, key informant interviews and direct observation. Person chi-square, binary regression, excel and GIS aided the analyses.

From the findings, sanitation and solid waste are the most severe environmental burdens in La and Chorkor. The socio-environmental conditions in La is better than Chorkor. Comparing results with previous studies, conditions in La have gotten better whiles that of Chorkor have worsened. Based on the secondary data, cholera cases over the years have been higher in La than Chorkor nonetheless, cholera cases in the years 2015 was surprisingly low and this buttress the fact that conditions in the area have improved and that of Chorkor worsened.

The study revealed that, the preparedness and response level in La was better than Chorkor. Although there were efforts in mitigating cholera by stakeholders, these efforts were challenged by general apathy and bad behavioural practices of residents, lack of cholera preparedness and response framework and inadequate material and human resources amongst others. The study concluded that, the household, community and Local government in La and Chorkor were not prepared hence will not respond effectively to mitigate cholera epidemics. To address the situation, this study recommended strict enforcement of byelaws, infrastructural and social improvement in conditions, resourcing of Assemblies and a bottom up approach in household and community education through families and clan heads.

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LIST OF ABBREVIATIONS AND ACRONYMS

AMA	Accra Metropolitan Assembly
ASIP	Accra Sewage Improvement Project
CBS	Community-based Surveillance
CDCP	Centre for Disease Control and Prevention
CDR	Crude Birth Rate
CDR	Crude Death Rate
CERSGIS	Centre for Remote Sensing and Geographic Information System
CFR	Case Fertility Rate
CFSPH	Centre For Food Security And Public Health
CSM	Cerebro-Spinal Meningitis
DRM	Disaster Risk Management
DROP	Disaster Resilience of Place
DRR	Disaster Risk Reduction
FEMA	Federal Emergency Management Agency
GAMA	Greater Accra Metropolitan Area
GHG	Greenhouse Gas
GHS	Ghana Health Service
GIS	Geographic Information Systems
GPS	Global Positioning System
GSS	Ghana Statistical Service
IDNDR	International Decade for Natural Disaster Reduction
LADMA	La Dade-Kotopon Municipal Assembly

LEAP	Livelihood Empowerment Against Poverty
MDG	Millennium Development Goals
MMDA	Metropolitan, Municipal and District Assemblies
NADMO	National Disaster Management Organization
NCCE	National Commission for Civic Education
NDMP	National Disaster Management Plan
NGO	Non-Governmental Organization
NHIS	National Health Insurance Scheme
NPC	Nation Population Council
ORS	Oral Rehydration Solution
SPSS	Statistical Programme for Social Science
SSA	Sub-Saharan Africa
TFR	Total Fertility Rate
TMA	Tema Metropolitan Assembly
UN	United Nations
UNDESA	United Nations Department of Economic and Social Affairs
UNISDR	United Nations International Strategy for Disaster Reduction
WHO	World Health Organization
PHC	Population and Housing Census
GMA	Ghana Meteorological Agency

CHAPTER ONE

GENERAL INTRODUCTION

1.1 Introduction

The growth of cities in recent times has been unprecedented. The urban population, which stood at only 10% of the total global population early in the 20th Century, had reached 50% by 2008 (UNDESA, 2010). Such growth in the urban population in many ways have had series of implications on human health, due to the downward pressure exerted on socio-economic and environmental services most especially in developing countries. These pressures among many include inadequate housing, safe water and electricity supply, sanitation and waste management, and other social provisions (Lead, Nelson & Bennett, 2005). The socio-environmental conditions sometimes worsen when induced by physical factors, which subsequently poses a threat to global health and security (Heyman & Rodier, 2001).

Despite the success of vaccination and other preventive programmes to combat disease epidemics, infectious diseases such as HIV/AIDS, tuberculosis, meningitis, cholera, amongst others they are still out of control in many regions of the globe (Boutaye, 2006). Although, the control and elimination of infectious diseases have enjoyed major success over the past century, it remains the leading cause of death of children, adolescents and adults due to inadequate intervention and practices (Turnock, 2011). According to Goldman (2009), infectious diseases are part of the three top ten causes of death in the world and diseases such as diarrhoea, lower respiratory tract infection, HIV/AIDS, tuberculosis, and malaria are still prevalent in low and middle-income countries. According to Songsore (2013: 30), everyday hazards associated with environmental health account for the greatest burden of diseases, premature death, and injuries in human settlements in developing countries.

Globally, the frequency of disasters and their adverse effects on human population is increasing (Smith et al., 2009). On an individual hazardous basis, epidemics are the major cause of these disasters (Mulugeta et al., 2007). Every year, cholera affects hundreds of thousands of people globally, with a Case Fatality Rate (CFR) of over 2% (Rebaudet et al, 2013). In addition to human suffering and life loss, the epidemic causes panic, disrupting socio-economic structures and subsequently impede growth and development in affected communities (WHO, 2005). According to Kebede et al. (2010) cholera is one of the most reported epidemics in many parts of Africa, specifically Sub-Sharan Africa (SSA). In 2006, the West African coast recorded high cholera cases, particularly between January and June where 1,869 cases and 79 deaths were reported in Ghana alone (Opintan et al., 2008). A report on cholera update by the Ministry of Health to the Parliament of Ghana, also asserts that Ghana recorded 123,222 cholera cases from 1980 to September 2014 (Doztsi, 2014). Most of these cholera cases were from high-density indigenous coastal communities in the Greater Accra Metropolitan Area (GAMA) (Adank et al., 2011).

The core mandate of Disaster Risk Reduction (DRR) is to mitigate and prevent disaster impacts through strategic and systematic approaches. Therefore, to handle cholera epidemics effectively, there is the need for effective mitigation and prevention especially by way of preparedness and response, which subsequently improve resilience. According to United Nations International Strategy for Disaster Reduction (UNISDR) (2005), underlying risks such as poor sanitary infrastructure provisions are the main causes of many epidemic disasters in the world. Therefore, to address problems associated with cholera epidemics, priority must be set to ascertain household, community and local government preparedness and responses to cholera outbreaks as support by the Hyogo framework for action (UNISDR, 2005). This study assesses cholera preparedness and response plans and strategies on

sustainable basis since cholera has become perennial and intractable to deal with, especially during the wet season in the Greater Accra Metropolitan Area (GAMA).

1.2 Problem Statement

Cholera has taken many lives and continues to be a global threat throughout the world. Although, the disease has disappeared from most developed countries, it remains a major public health problem in many developing countries, especially in SSA countries. Africa accounted for about 90% of the one (1) million reported cases between 1999 and 2005 in the world and in Ghana between the same period, over 27,000 cases were officially reported by the Ghana Ministry of Health (WHO, 2006; Osei & Duker, 2008). The number of cholera cases in Ghana have been fluctuating as the country has seen cholera outbreak roughly every five years since 1970 (Opare et al., 2012). The Greater Accra Metropolitan Area (GAMA) records the highest cases in Ghana. Out of the 98.7% cases recorded from the Greater Accra Region in 2014, 59.4% of these cases were from the Accra Metropolis and 15.5% from La Dadekotopon Municipal (Gershon et al., 2014).

Studies have shown that there is a strong relationship between cholera resurgence, climatic conditions and poor environmental services (Magny et al., 2006) and cholera epidemic impacts are severe in poor neighbourhoods with inadequate health infrastructure. According to Osei and Duker (2008), urbanization resulting in overcrowding of neighbourhoods is the most important predictor of cholera. In addition, the environmental factor that predisposes individuals to cholera infection is sanitation, especially when facilities such as toilets and waste dumps are poorly managed (Osei et al., 2010a). Ghana, among other countries in the sub-region, is undergoing rapid urbanization (Songsore, 2003; Yankson, 2006; Owusu, 2005; 2008). As a result, sanitation and solid waste management issues are the major problems facing its cities, especially the city of Accra. This situation, according to Owusu (2010) is

worse in the urban poor indigenous communities such as La and Chorkor, characterized by overcrowding and inadequate sanitary facilities.

Over the years, there has been a paradigm shift in the theory and practice of disaster management from the geo-physical and engineering knowledge to a social and development aspect. Even in recent times, disaster management in the way of proactivism focus on preparedness and response approach, with further emphasis on contingency planning. In other words, the paradigm shift dwells on a more proactive attitude in understanding disaster by focussing on vulnerability in the mix of development (Oteng-Ababio, 2013: 1).

Despite the growing understanding and acceptance of the importance of Disaster Risk Reduction (DRR) through increased capacities, particularly management and risk reduction championed by state institutions like NADMO, international agencies such as the UNISDR, Non-Governmental Organizations (NGOs) and other private sector collaborators, cholera epidemic continues to pose threats and has become an 'annual ritual' in Ghana. Attempts at addressing cholera epidemic impacts by stakeholders over the years have been unsuccessful. This is due to the fact that the needed long term approach such as potable water supply, proper waste disposal and sanitation (Ofori-Adjei & Koram, 2014) as well as fervent implementation of the legislations and principles seems quite challenging (Oteng-Ababio, 2013).

Although there have been several studies on cholera epidemics, (see Glass et al., 1991; Gotuzzo et al., 1994; Piarroux et al., 2011; Thompson et al., 2011) these mostly focus on the epidemiology of the disease, i.e. the biological aspects and spatial concepts (Opintan et al., 2008; Osei, et al., 2010b). Only a few researches have focused on preparedness and response to the epidemics and other related disasters (see Waring & Brown, 2005; Mendelsohn & Dawson, 2008; Bambaiha, 2009) most especially in the local Ghanaian context (see Oteng-

Ababio, 2013). As a result, loss of lives and recurrent cost involved in addressing the cholera epidemic continue to increase at a higher rate.

This study assesses the state of disaster preparedness and response to the cholera epidemic in the Greater Accra Metropolitan Area (GAMA) with specific reference to the indigenous communities of La and Chorkor. According to the UNISDR (2005) disaster impacts and losses could be substantially reduced when authorities, individuals and communities in hazard-prone areas are well prepared and ready to act and are equipped with the knowledge and capacities for effective risk reduction. Hence, there is the need for urgency in planning for and reducing disaster risk in order to be more effective in protecting households and communities. This, according to risk managers is done through livelihood protection, which includes culture, health, socio-economic assets, heritage and ecosystem preservation all strengthening resilience for effective risk reduction (UNISDR, 2015).

Insights gained from this study will assist decision makers in the evaluation of the relative state of preparedness among households, communities, and districts, which would be useful in designing policies, plans and programs to mitigate and prevent future cholera occurrences. It is against this background that this research seeks to bridge the dearth in literature by contributing insights around the assessment of disaster preparedness and response to cholera epidemics. This will assist in designing better mechanisms for reducing future risks and disasters associated with cholera outbreaks in Ghana.

1.3 Literature Review

1.3.1 Urbanization and Risk Accumulation

For the first time in human history, more than half of the world's population (3 billion) has been living in cities since 2007. The share of developing countries is expected to increase to 2 billion in the next 30 years (Cohen, 2006; Madlener & Sunak, 2011). In the past two (2)

decades, many urban areas have experienced dramatic growth due to rapid population growth, technological advancement and political changes.

According to Ravallion et al. (2007), poverty at large is an underlying result of urbanization especially in developing countries. Although the authors acknowledge that about three-quarters of poor people in the developing world still live in rural areas, poverty is clearly becoming more of urban phenomenon. The pattern of increasing total poverty level within the urban population is far more evident in SSA, where the population is urbanizing with little reduction in aggregate poverty. Urbanization is a contributory factor to poverty in urban communities, it does not necessary mean urbanization forms the basis of poverty since there are other contributory factors. In sum, rapid urbanization is associated with overcrowding, environmental degradation, and other impediments to productivity (Bloom et al., 2008).

Cities, if well managed offer varieties of opportunities for development since they have always been the centres for economic growth, innovation, and development (Fox, 2012). Urbanization has traditionally been understood as a by-product of economic development (Fox, 2012). Whiles some writers are of the view that, urbanization has a positive relationship with economic development in Europe and other parts of the world, the situation is not the same on the side of the African continent. In other words, urbanization in Africa is parasitic and does not contribute to economic development (Obeng-Odoom, 2010). Stagnating and retarding economies in Africa have led to a decrease in the quality of urban environments and worsening of both quality and distribution of basic services such as housing, medical facilities and social amenities. Although, urban areas exhibit spatial variation in terms of development most city centres in Africa are surrounded by underdeveloped and inadequately serviced settlements supporting a large fraction of the population (Keiser, et al., 2004: 119). It is estimated that about 72% of the urban population of Africa now live in slum areas (Potts, 2009). Slums are areas of human settlement with inadequate access to safe water, inadequate

access to sanitation and other infrastructure as well as poor quality of housing, overcrowding; and insecure residential status (UN-Habitat, 2003; Riley et al., 2007).

1.3.2 Urbanization and Risk Accumulation in Ghana with Specific Reference to Accra

Ghana is urbanizing with the numbers of urban dwellers exceeding people living in rural areas. This is as a result of rural-urban migration, natural growth and reclassification of rural jurisdiction to urban as they exceed the threshold population of 5,000 (Owusu & Oteng-Ababio 2015). According to the National Population Council (NPC) (2011), the recent movement of people to urban areas reflects the socio-economic changes taking place in Ghana. For instance, The Greater Accra Metropolitan Area (GAMA) which collectively constitute one sprawling urban agglomeration (Songsore et al., 2005:1) in the year 2000 had a population of about 2.7 million (Adank et al., 2011). From the 2010 population census, GAMA had a total population of about 3.7 million out of the 4 million people in the Greater Accra region. According to Songsore (2009), high population growth rate in the area has subsequently resulted in urban sprawl where the majority of the working population commute from the periphery to the business centre.

Urbanization is now an integral part of the socio-economic transformation in Ghana and this has led to massive social changes due to the redistribution of the population. This exerts pressure on the limited resources in its major cities such as Accra. Urban poverty has been one of the main challenges facing the development of urban areas in Ghana and this is due to the inefficiencies of the public sector service delivery agencies and ineffective urban governance (Yankson, 2006). According to Owusu & Oteng-Ababio (2015), Ghana is likely to produce a bipolar urban society marked by world-class infrastructure and services inhabited by upper and middle classes and informal settlement inhabited by the poor. There is a growing level of inequality of social provisions in the city. For example, upper class

residential areas such as East Legon and Roman Ridge in Accra have better social provisions than other medium and low income residential areas like La and Chorkor. This is partly blamed on differences in social capital. Some socio-environmental challenges in Accra include; inadequate supply of clean drinking water, inadequate sewerage facilities, and poor solid waste disposal all because of growth in the urban population. In spite of these challenges, there exist community differentials in supply among the upper, middle, and low-class neighbourhoods as well as other settlements within the urban periphery.

Poverty and marginalisation has been the order of the day as cities in Ghana have increasingly grown in size. The concentration of the wealthy and the poor within urban areas can never be underestimated as supported by various researches (see for instance Songsore & McGranahan, 2007). Although, poverty is prevalent in urban areas in Ghana, it is important to emphasize that, it is still overwhelmingly a rural problem. According to Songsore (2009), poverty is on the rise and concentrated in informal and squatter settlements in almost every major city in Ghana. In Accra, areas such as La, Madina, Nima, Odorkor, Mamprobi, Chorkor and Sabon Zongo just to mention a few, are typical examples and these areas are mostly found along major water courses or lagoon outlets as well as other available uninhabitable spaces (Songsore, 2009). This worrying phenomenon predisposes residents of these vulnerable communities to various forms of disaster such as flood, fire and cholera epidemics among others.

1.3.3 Urbanization and Health Risk

The overall trajectory of urbanization in Africa seems to be in line with Ghana's urbanization process (Songsore, 2009). Urban areas are faced with worsening environmental conditions coupled with weak public sectors and inadequate services. In Ghana, most residential areas are characterised by underlying risk factors (Tipple & Korboe, 1995 cited in Yankson &

Gough, 1999: 89). The worsening environmental problems and health risks in Accra have forcefully been expressed by various writers (see Songsore & McGranahan, 1993). It can be said that, urbanization in Ghana does not necessarily mean economic development since economic development come along with improvements in social provision and other developmental opportunities. Over the years, there has been continuous neglect of the expanding urban slum populations in Ghana and this could inexorably lead to greater economic expenditure on health care. According to Riley et al., (2007), little is known about the range of morbidity in urban slums of the world. This is due to the lack of adequate health care data and resource allocation for effective disease prevention services. Provision of health care services are extended to slum dwellers only when they are at the end-stage of complications of their chronic illnesses and even such complications are battled at a great cost to their health care resources. Therefore, there is the need for urgent attention to health assessment and social intervention strategies for the development of urban slum communities.

According to the WHO (2010), whiles urban living continues to offer many opportunities, including potential access to better health care, today's urban environments constitute health risks and the introduction of new hazards. Risk has various connotations within different disciplines, risk here is defined as "*the combination of the probability of an event and its negative consequences*" (UNISDR, 2009: 25). Usually it is associated with the degree to which humans cannot cope (lack of capacity) with a particular situation. Hazard is also "*a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage*" (UNISDR, 2009: 17). That is to say, a potential damaging physical event, natural phenomenon (i.e. floods), or human activity (open defecation, indiscriminate waste disposal etc.) acts as a hazard within an environment.

Therefore, cholera epidemics may only occur when hazards put vulnerable communities at risk. Health challenges in cities relate to unavailability of water and poor environmental sanitation. This leads to the introduction of communicable and non-communicable diseases, malnutrition, violence, injury, disease outbreaks, and many others. According to Galea and Vlahov (2005), the key factors affecting health in cities can be categorized into three main themes. These are the physical and social environment, access to health and social services.

It is widely known that environmental factors are significant to health and illness in poor countries. Health outcome from these conditions are mostly classified as environmental health. According to Shyamsundar (2002), the two most important ways that the environment has a negative effect on human health is through exposure to water and indoor pollution. "*Exposure occurs when humans encounter pollutants in the environment*" (Corvalan & Kjellstrom, 1976: 7 seen in Songsore et al., 1998). Human exposure to life and health threatening pollutants, pathogens and physical hazards occurs within varieties of situations and through different pathways. This may be through air, water, food and soil (Songsore et al., 1998). According to Shyamsundar (2002), water pollution and sanitation is a key determinant of diseases such diarrhoea, malaria and cholera. Furthermore, air pollution is another major area for concern since it contributes to respiratory tract infections. He noted that, diarrhoea related diseases such as cholera are as much dependent on behavioural practices of household as they centres on quantity of water used. It is therefore, useful to monitor indicators such as faeces disposal practices and hygienic practices amongst others when it is possible to do so.

In Ghana, cholera incidences and outbreaks are predominant in urban and overcrowded communities (Osei & Duker, 2008). Therefore, in recognizing the effect of urbanization on health, it is important for government, international organizations, private sectors, civil societies and pressure groups to have a shared effort to put health at the heart of urban

policies. According to the GSS (2013), Ghana faced challenges in meeting the Millennium Development Goal (MDG) 7 target on sanitation in the area of liquid and soil waste disposal and poor toilet facilities especially in it major cities such as Accra. These conditions were due to ineffective coordination of sanitation delivery services, poor infrastructure and development planning, and inadequate funding for logistics at both the regional and district levels. Therefore, there is the need to improve strategies to expedite action and realise the Sustainable Development Goal (SDG) 6 on clean water and sanitation since it will subsequently help in reducing risk of epidemic diseases such as cholera in low-income communities in Accra such as La and Chorkor.

1.3.4 Epidemiology of Cholera

Epidemiology is a historical overview and investigation to uncover sources of infectious diseases and answer crucial questions of who becomes sick as well as applying modern scientific tools to answer the whereabouts and the trends of diseases. According to Finkelstein (1996), cholera is endemic in areas with poor sanitation. In coastal regions, it exists in shellfish and plankton. Cholera is an acute intestinal infection caused by the waterborne bacteria Vibrio cholerae. Infection is mainly through ingestion of contaminated water or food which has been in contact with faeces from an infected person (WHO, 2000; Kelly, 2001; Codeco, 2001).

1.3.4.1 Historical, Geographic Distribution and Aetiology of Cholera

Cholera has caused widespread morbidity and mortality in the world, predominating in varieties of climate conditions. Its antecedence can be traced as far back as the 16th Century. The first epidemic in 1817 was marked by a worldwide pandemic from Asia, sweeping through the Middle East, Europe, East Africa and America (Briggs, 1961; Glass and Black, 1992). In West Africa, cholera outbreak was first reported in Guinea in 1970 (Stock, 1976)

and in Ghana, the disease was observed during the seventh pandemic (1970's). According to the Centre for Food Security and Public Health (CFSPH) (2004), cholera is endemic in the Middle East, Africa, Central, South America and some parts of Asia and the Gulf Coast of the United States. An outbreak is possible in any country under its prevailing circumstances. Cholera outbreaks occur intermittently in less developed countries whilst outbreaks are mostly localized in developed countries due to the better sanitary conditions as compared to developing countries. Although cholera is preventable, it remains a health hazard in many developing countries where such prevention is challenging (Ali et al., 2012).

The species type, Vibrio Cholerae belongs to the Vibrionaceae family that contains a variety of important organisms and the genus type for the family is Vibrio. The Vibrionaceae family which includes several species that cause intestinal tract infections in both humans and animals are widely distributed in the environment where they contribute to the cycling of organic and inorganic compounds (Farmer III, 2006). Until 1992, the Inaba and Ogawa serotypes, and the classical and El Tor biotypes of 01 Vibrio cholerae group were the main causes of cholera (Finkelstein, 1996). Before 1966, the classical biotype accounted for most epidemics in the Asian continent (Sen and Ghosh, 2005). Vibrio cholerae 01 group continues to be the main causative agent of cholera spread in SSA since the 1970s and has since been noted for its horrendous outbreak on the African continent (Seidlein et al., 2013).

1.3.4.2 Seasonal Pattern and Susceptible Conditions to Cholera

Vibrio cholerae infection numerously occurs during the rainy season due to the poor sanitary conditions that comes with it and the Ogawa serotype is mostly the predominant (CFSPH, 2004; Mala et al., 2014). According to de Magny et al. (2008: 76), "*ocean and climate patterns are useful predictors of cholera epidemics with the dynamics of endemic cholera being related to climate and/or changes in the aquatic ecosystem*". They also revealed that,

there are significant relationships between rainfall, water temperature, depth, and copepod, which produces bacteria strains for Vibrio cholerea.

Although cholera affects only humans, the bacteria can propagate outside the human body and can survive for a long time, most especially in a contaminated environment (WHO, 2003). Vibrio is naturally inhabitable in estuary and sea environments (Sakazaki, 1992). According to the WHO (2003), historical pandemics and epidemics also show a strong link between environmental factors and population growth. Moreover, outbreaks in Africa and Latin America in 1970 and 1991 respectively, were mainly in riverine, estuarine and coastal communities (Lipp et al., 2002; Huq et al., 2005). A spatial statistical modelling by Osei and Duker (2008:1) revealed that, there is a "*direct spatial relationship between cholera prevalence and density of refuse dumps*". In addition, there is "*an inverse spatial relationship between cholera prevalence and distance to refuse dumps*". *A GIS based buffer analysis also showed that the minimum distance within which refuse dumps should not be sited within community centres is 500 m*". The result suggests that proximity and density of open space refuse dumps play a significant role in cholera infection. Therefore, those close to open space refuse dumps are more vulnerable than those further away. Perhaps this explains why, in the aftermath of the Rwandan conflict about 48,000 cholera cases and 23,800 deaths were recorded within a month in a refugee camp in Goma due to poor sanitary conditions (WHO, 2003). In developed countries where good sanitary conditions are mostly predominant, outbreaks of cholera are often limited (CFSPH, 2004).

1.3.4.3 Incubation, Reservoir of Infection, Spectrum of Illness and Treatment of Cholera

The incubation period of the cholera bacteria to manifest itself in the human body is within a few hours to 5 days, however, most infections become apparent within 2 to 3 days. Viable organisms which produce Vibrio cholerae can be found in faeces for up to 50 days, 30 days

on glass, 7 days on a coin, 16 days in soil and dust, and 1 to 2 hours on the fingertips. The bacteria also, survive very well in water and remain viable on plankton in coastal regions (CFSPH, 2004).

Although cholera infection abruptly appears painless, it is marked by watery diarrhoea and sometimes accompanied by vomiting. Infections may be subclinical, mild and self-limiting, or fulminant and severe. However, "*Severe fluid loss can be seen in more serious cases; thirst, oliguria, severe dehydration, acidosis, muscle cramps and shock may result*" (Meade et al, 1998, p. 245). Mortality rate when symptoms are properly treated is less than 1% and a patient may recover within 3 to 7 days. However, mortality rate is above 50% if symptoms remain untreated and death may occur within a few hours if fluid loss is high (CFSPH, 2004).

Cholera is easily treatable using oral rehydration to replace lost fluids. In severe situations, intravenous administration of fluids may be required to replace and restore the electrolyte balance (CFSPH, 2004; Leach, 2014). Ali et al. (2012) also noted that, cholera is preventable through treatment of raw sewage and provision of clean drinking water, and treatable through oral cholera vaccines or rehydration therapy after infection. According to Seidlein et al., 2013, cholera vaccine is also, one known recommended mode for cholera prevention, but they are mostly ignored for public health purposes and are marketed to affluent tourists who perceive themselves at risk to cholera.

1.3.5 The Nexus between Urbanization and Cholera Disaster Risk Reduction

According to Pelling & Wisner (2012), Africa is one of the world's most urbanizing continents. Where most of it urban areas are unplanned, driven by natural growth and in migration of the poor and displaced. In addition, there are clear signs of increasing poverty, lack of basic needs and services and the extension of cities into unsafe lands. Urban centres are also becoming hotspots for disaster risks. These risks among others are associated with

floods, fires, epidemics, and other consequences of crime and urban unrest among urban dwellers. As hazards are growing so are vulnerabilities, with few instances of local or governmental capacity for disaster risk reduction (Action Aid, 2006; as cited by Pelling & Wisner 2012). For the past two decades, Ghana has experienced series of high profile disasters such as floods, cholera epidemics and other commercial fires most especially within the capital cities (Oteng-Ababio & Osman 2012).

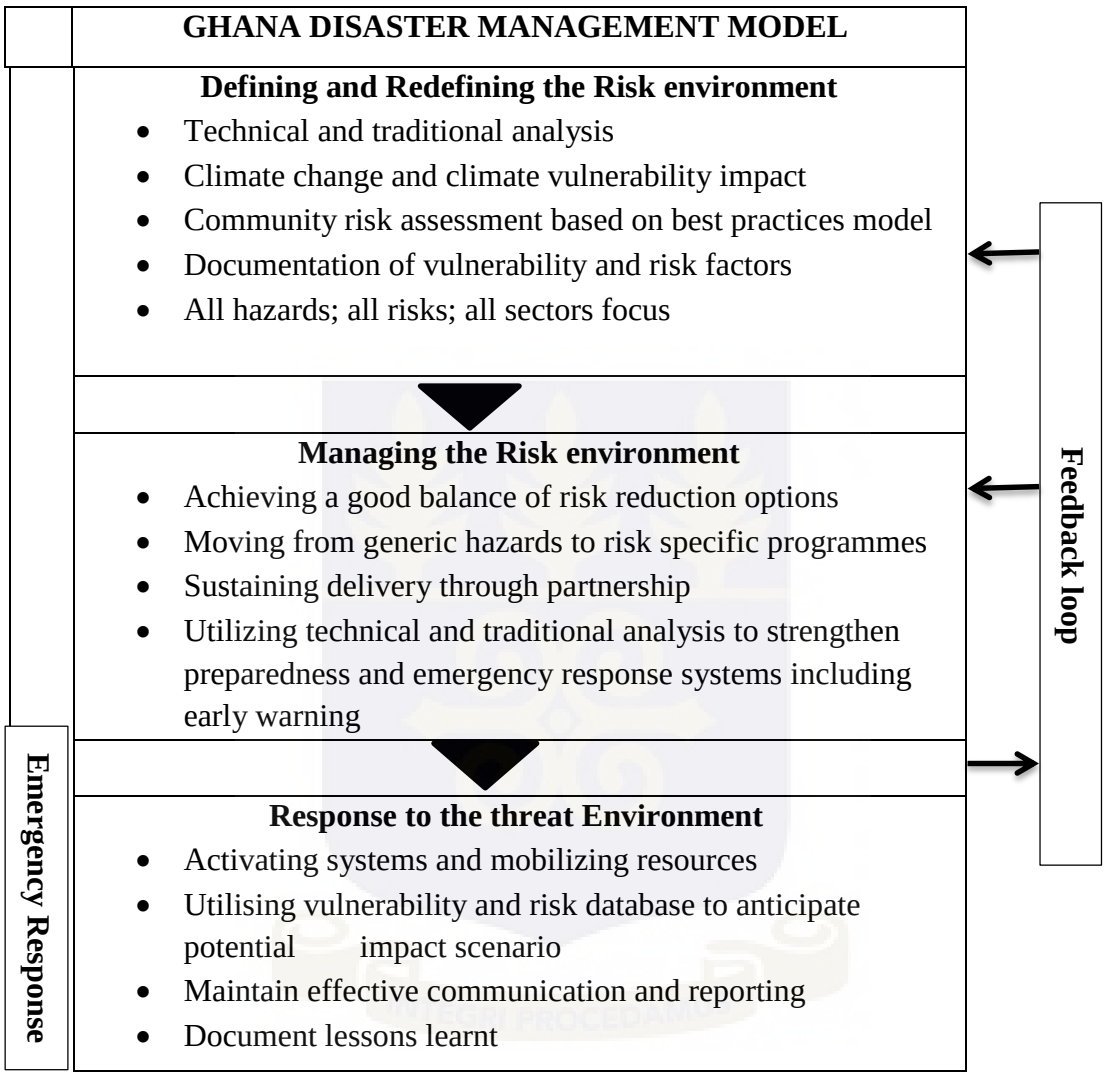
1.3.5.1 Disaster Management and Disease Surveillance in Ghana

In Ghana, NADMO is the sole institution responsible for disaster management. According to UNISDR (2009: 9) disaster is "*a serious disruption of the functioning of a community or a society involving widespread human, material, or environmental losses and impacts which exceeds the ability of the affected community to cope using its own resources*." Disasters that mostly occur in Ghana are categorised into disease epidemics, hydro-meteorological, fire and lightening, pest and insects, geological, and nuclear and radiological disasters (NADMO, 2010). In order for NADMO to carry on its duties effectively, eight technical committees assist in its operation and are under each type of disaster. The National Disaster Management Plan (NDMP) classified disaster management into three themes. These includes, the pre-disaster phase, which focus on disaster mitigation and preparedness, emergency phase (response and relief), and post-disaster phase (rehabilitation, resettlement and reconstruction) (NADMO, 2010). Within NADMO's internal structures, the disease and epidemics department is responsible for the multi-sectorial coordination of preparedness planning and emergency response activities within the public health sector.

The disaster management model in Ghana is based on risk reduction and emergency response. Risk reduction here, centres on defining and redefining the risk environment, and

managing the risk environment. Whiles the emergency response also focuses on timely response to a threatened environment as shown in Figure 1.1.

Figure 1. 1 Ghana Disaster Management Model



Source: NADMO, 2010

Defining and redefining the risk environment provides the use of modern scientific analysis for determining future risk environment to all hazards, sectors, and geographic areas. This creates knowledge of the hazard interaction and elements at risk, which are conducted in a structured and more scientific process. It involves measures such as understanding the social, political and community environment; identifying the hazards and risks; analysing the risks;

evaluating the risks; and identifying risk mitigation strategies. Managing the risk environment also ensures that activities such as prevention, preparedness, response and recovery programmes are multi-hazards focused. This also involves the move from generic hazards to specific risks. All these measures enable communities to understand better the changing risks within their environment, therefore becoming more resilient through proactive risk reduction efforts (NADMO, 2010). Lastly, responding to the disaster environment involves a counter reaction to the actual threat situation. Since not all hazards and risks can be prevented or eliminated, there is the need to respond to the emerging threats or events that have happened. In this sense, response and recovery systems such as warning systems, onset disaster response and post disaster activities that are already developed, are activated (NADMO, 2010).

Cholera has high epidemic potential in Ghana, which causes serious public health impact hence considered a priority for integrated disease surveillance. According to Ghana Health Service (GHS) (2011), the technical guideline to integrated disease surveillance and response plans is based on district risk assessments. This specifies resources available for epidemic preparedness and response, and take into account diseases with epidemic potential in and around neighbouring districts. One of the key sections to preparedness and response is surveillance. In Ghana, Community-Based surveillance (CBS) is one component of the integrated disease surveillance and response system. It is a surveillance system where the community keeps watch for disease occurrences as well as other unusual health events that might indicate the presence of a disease.

1.3.5.2 Disaster Risk Reduction

The increasing rate of urban population can be seen as a risk, as well as an approach in mitigating disaster. Mitigation is "*the lessening or limitation of the adverse impacts of*

hazards and related disasters" which has both direct and indirect impacts on human (UNISDR, 2009: 19). Realizing the potentials in risk reduction requires both technological knowledge and political commitment. Over the years, disaster risk reduction has gone beyond the capacity of governments to handle alone. Local action has also not yet proven itself capable of achieving the scale of change needed to improve resilience of the urban poor (Pelling & Wisner 2012). Therefore, there is the need for public-private partnerships, community and non-governmental organizations to contribute to the provision of infrastructures and services as well as a well-planned effort to reduce risk in urban neighbourhoods (Pelling, 2003).

According to Kouadio et al. (2012), the aftermath of natural disasters such as floods, tsunamis, earthquakes, and tropical cyclones among many also lead to outbreaks of infectious disease. Most especially when disasters result in substantial displacement of the population. This exacerbates predictive risk factors for infectious disease outbreak such as cholera, malaria, typhoid fever, and acute respiratory infections. Therefore, risk assessments are essential in post-disaster situations as well as rapid response and recovery measures and this must be done through a re-established and improved primary health care delivery, especially in pre-disaster surveillance data (Kouadio et al., 2012).

Various literature highlight that, identification of risks is one of the first measures in disaster preparedness and response in order to reduce risk. This intervention can be done through proper engineering by professionals. It is also important to stress that, people at risk in various communities also use different logical inference to recognize and evaluate competing risks. However, it is often noted that, poor people do not take proactive measures in reducing disaster, but they are rather consumed by their immediate demands for survival (UN, Habitat, 2007; cited in Pelling & Wisner, 2012).

According to UNISDR (2009: 10), disaster risk reduction is "*the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reducing exposure to hazards, lessening the vulnerability of people and property, wise management of land and the environment, and improving preparedness for adverse events*". Disaster risk reduction seeks to enhance work in order to reduce hazards, exposures and vulnerabilities. Therefore, effective measures are supposed to be in place to reduce or prevent the creation of new disaster risks and this can be done through a more dedicated way to ensure that underlying risk factors are reduced. In the context of cholera epidemics, underlying risks include; poverty and inequality, climate change and variability, unplanned and rapid urbanization, weak institutions and rule of law, and poor disaster management and coordination, poor sanitation and environmental health and practices, among others. In order to overcome these cancers, it is important to strengthen governance of disaster risk reduction strategies at all level through improving preparedness, response, recovery and reconstruction (UNISDR, 2015).

1.3.5.3 Introspective View of Vulnerability and Resilience towards Disaster Risk Reduction

Measuring vulnerability requires a clear understanding of the definitions and concepts of vulnerability. Vulnerability can also be defined as the "*existence of conditions of defencelessness, and insecurity resulting from physical, social, economic and environmental factors, which expose a community to the impact of hazards*'' (UNISDR, 2004: 9). In the hours of increasing disasters, measuring vulnerability remains a crucial activity if science is to help support the transition to a more sustainable world (Kasperson et al., 2005 cited in Birkmann, 2006). The UNISDR (2004) emphasises that vulnerability assessment serves as a tool and a pre-condition for effective risk assessment. The starting point to disaster risk reduction and promoting the culture of building resilience lies in having knowledge about the hazards, physical, social, economic and environmental conditions. In this context, it is

essential to develop key indicators for vulnerability as stressed by the Hyogo Framework for action (UNISDR, 2005). Although there are no definite guidelines to vulnerability assessment, the Hyogo Framework for Action asserts the fact that, impacts of disasters can be examined on social, economic and environmental conditions since sustainable development of every nation is characterised on such pillars (UNISDR, 2005). Measuring vulnerability combines the susceptibility of people and communities exposed with their social, economic and cultural abilities to cope with the damage that may occur (Bankoff et al., 2004).

According to Cutter et al. (2003), vulnerability should not only be limited to the direct impacts of hazards event. Rather, it should be seen in a wider environment and social situation that enables people and communities to cope with the negative impacts of disasters. Hence, vulnerability can also take into account the coping capacity and resilience of the potentially affected society. For instance, it is important to acknowledge that analysing a damage pattern also serves a contributing factor to identifying vulnerability, as well as the estimation of current and potential vulnerabilities in future.

Increasing attention is now on capacity building of disaster-affected communities to 'bounce back' or recover. This illuminates the need for a modification in the disaster risk reduction approaches, with strong emphasis on resilience rather vulnerability (Manyena, 2006). Individuals, communities and government have used the concept of resilience as an adaptive capacity. Since it helps mitigate disasters and problems of people. Resilience is "*the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including the preservation and restoration of its essential basic structures and functions*" (UNISDR, 2009: 24). The building blocks of resilience forms an integral part of disaster risk reduction activities. Resilience here simply means the ability to "spring back from" a shock. This is

determined by the degree to which the community has the necessary needed resources and is capable of organising itself prior to and during times of need (UNISDR, 2009).

According to Norris et al. (2008), resilience occurs when there are available and sufficient resources to counter the effects of stressors. Whiles, vulnerability works in the opposite direction (insufficient resource), there is the need to induce and suppress stressors through sufficient and effective resources to create resistance or resilience. In building resilience, a broader and more people centred approach is necessary for effective disaster risk reduction. This involves a multi sectorial dimension where government plays the leading role by engaging all relevant stakeholders in the design and implementation of policies, plans, programs and standards for effective and efficient risk reduction through sustainable techniques, financial assistance and technological transfer (UNISDR, 2015).

In establishing the difference between resilience and vulnerability, Miller et al. (2010) emphasised that resilience and vulnerability represent two related yet different approaches to understanding the response of systems and actors to change and shocks. Their respective origins in ecological and social theory largely explain the continuing differences in approach to social ecological dimensions of change. Therefore, resilience and vulnerability need to be used together on common case studies, at multiple spatial scales in order to understand disaster risk reduction.

In order to address existing challenges and preparing for future disasters, it must be done by focusing on monitoring, assessing and understanding of disaster risk governance and coordinating relevant stakeholders at all levels (UNISDR, 2015). It also involves investing in the socio-economic environment, health, culture and education to build resilience for persons and communities and countries at large. Resilience building through technology and research enhances the various phases or functions of disaster risk reduction such as early

warning systems, preparedness, response, recovery, rehabilitation and reconstruction. These measures therefore, calls for international cooperation between states and international organizations.

According to the Sendai framework, whiles indicators show progress in building resilience and reducing risk, a substantial risk reduction approach requires continuous and repetitive process, which is more explicit and focus on people's health and livelihood (UNISDR, 2015). Building on Hyogo-framework for action, the present framework aims to "*achieve substantial reduction of disaster risk and losses in lives, livelihood and health and in economic, physical, social, cultural and environmental assets of persons, communities and countries*" (UNISDR, 2015: 12). This aim should be achieved through four main priorities, which are: "*understanding disaster risks; strengthening disaster risk governance to manage disaster risk; investing in disaster risk reduction for resilience; and enhancing disaster preparedness for effective response and the 'Build Back Better' in recovery, rehabilitation and reconstruction*" (UNIDR, 2015: 14). In order to attain the expected outcome "*there is the need to prevent new and reduce existing disaster risk through the implementation of an integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazards exposure and vulnerability to disaster by increasing preparedness, response and recovery to strengthen resilience*" (UNSIDR, 2015: 12). This requires strong commitment and involvement of political leadership in every country at all levels in the implementation and follow-up processes to create the necessary conducive and enabling environment for effective disaster risk reduction (UNISDR, 2015).

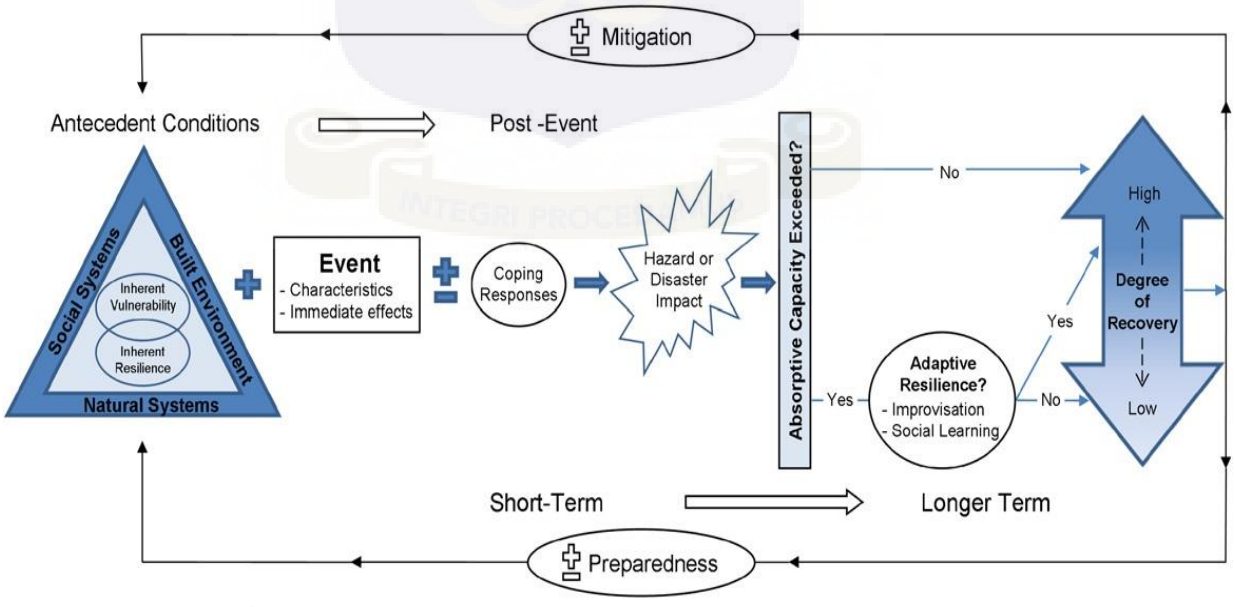
According to Pelling (1999), as cities are pressurized by increased population growth, it results in insufficient capacity to manage water and other resources as well as the production of waste. These events make places socially vulnerable, hence, manifest as an environmental

hazard with time. Cutter et al. (2008) suggest that slow onset hazards which contribute to cholera, give individuals and communities ample time and opportunity to change and modify their existing behaviour and practices to reduce the impact disasters whiles the hazard event is still unfolding. Hence, when appropriate measures are in place, consequences or cholera impact on individuals and the communities in La and Chorkor can substantially reduce or be prevented. In this context, indicators of resilience for effective preparedness and response are considered under the pre-disaster, response and post disaster phases.

1.4 Conceptualizing Preparedness and Response to Cholera Epidemic

According to Cutter et al. (2008), the Disaster Resilience of Place (DROP) model provides steps and understanding in the assessment of disaster resilience of communities. The DROP model integrate global changes, hazards, political ecology, ecosystem and planning as well as other variables for measuring resilience (see Figure. 1.2).

Figure 1. 2 Disaster Resilience of Place (DROP) Model



Source: Cutter et al., 2008

The DROP model is based on the assumption that, natural, social, and the built environment systems are interconnected. It also stresses that human actions affect the environment

negatively and in turn degrade it, which offers less protection against hazards. Furthermore, it presents resilience as both static and dynamic processes. The model, which is place-based, recognizes both communities and state policies and regulations as influencing resilience at the community level (Cutter et al., 2008). According to Cutter et al. (2008), the DROP model is an interwoven recurring process, which begins with antecedent conditions of which the social, natural and the built environmental systems interact. These systems exhibit both resilience and vulnerability characteristics, which operate at the community level.

The antecedent conditions interact with hazard events, which build up within the community. In the case of cholera epidemic, hazard events may include poor sanitary conditions such as indiscriminate waste disposal, open defecation, aftermath of floods and others. These build up hazard events further, produces immediate effects characterized in various forms and magnitude. The immediate effects from the built up hazards may be as a result of the presence or absence of mitigation actions such as preparedness and response actions within the community and these actions, will amplify (plus) or attenuate (minus) the effect of the hazards (Refer to Figure. 1.2).

Further, the presence of coping responses allows the community to act to the immediate impacts from the hazard. These include, emergency response plans such as evacuations, provision of medicine and shelter, information dissemination and many others. It is important to state that, hazard impacts at the next level are determined by the absorptive capacity of the community. The absorptive capacity here, is the ability of the community to absorb the impacts of the disaster using the predetermined preparedness and coping responses. When stakeholders within the community implement these sufficiently, the impacts of disasters can be reduced substantially and even to the possible elimination since risk factors are eliminated. As absorptive capacity of the community is not exceeded, it is considered that there is a higher resilience hence, high degree of recovery. It must be noted that, an absorptive

capacity that exists within the community level can only be exceeded when hazards impacts are too heavy and exceeds the local capacity. In other words, existing preparedness and coping response measures are insufficient to handle impacts. When an absorptive capacity is exceeded, a community can only strengthen its resilience through provision of structures and social learning. Social learning here, is mostly in the form of formalized or well-planned action fused on institutional policies to handle future disasters. When resilience conditions such as infrastructural provisions and social learning takes place, they directly affect the inherent resilience for the next outbreak. This is represented as a feedback loop as shown in Figure 1.2.

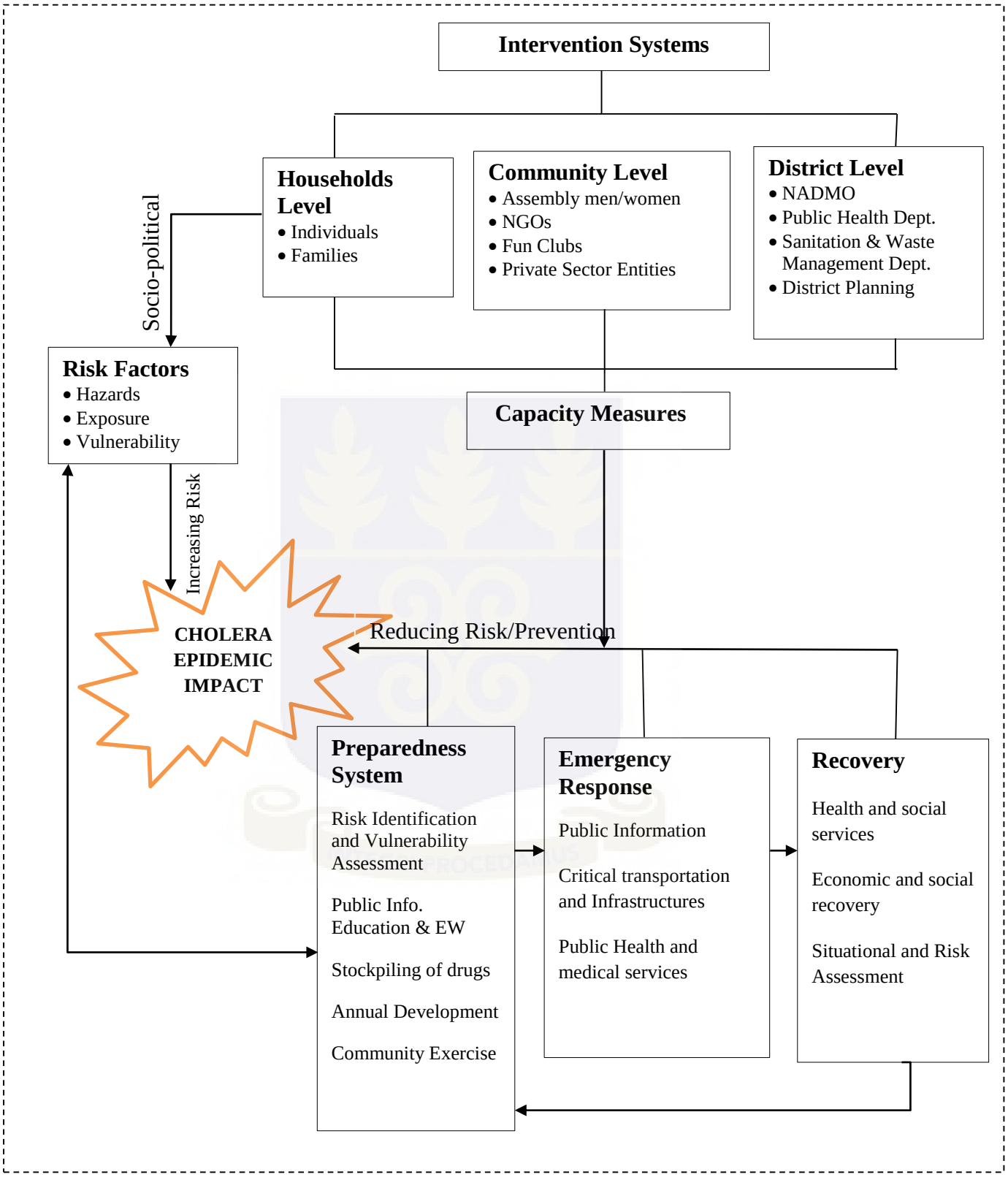
When the disaster impact does not exceed the community's absorptive capacity, the degree of recovery is always high and vice versa (Cutter et al., 2008). It must be noted that, the overall recovery is an on-going process, as potential knowledge gained in the resilience process influences the antecedent conditions through the implementation of new plans and strategies. Therefore, the feedback processes modify both the preparedness measures and response strategies toward mitigation and risk reduction. Although preparedness and response towards mitigation enhances resilience, when social learning is effective and efficient there is a greater likelihood that conditions will be improved and even eliminating hazards in the community. The Drop model recognise the fact that human actions affects the environment hence in order to build resilience it requires active stakeholder participation through strong institutions and policies to prevent disasters. As Norris et al. (2008) noted, to build a collective resilient community there is the need to reduce risks, create resource, encourage local participation, create organizational linkages and coordination, boost and protect social support plans, and above all strengthen legislation and laws. Based on this background, the chorea risk reduction framework demonstrate how capacity measures by

stakeholders influences the various phases of disaster management to reduce risk and possible prevention of cholera.

According to Birkmann (2006), a disaster risk in this case cholera risk emanates from accumulated hazard, exposure, vulnerability, and capacity measures. Hazard here is defined by the level of probability and severity whiles exposure is characterised by structures, population and economy. Vulnerability is measured in four dimension, these include physical, social, economic and environmental. On the other hand, capacity measures which is closely related to coping, adaptation and capability include physical planning, social and economic capacities. Capacity is a "combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals" (UNISDR, 2009: 5).These may include infrastructure, knowledge and skills as well as societal coping abilities. Capacity measures are carried out by various levels of institutions such as the household, community and the local government levels. Capacity measures initiated by these levels of decision-making bodies influence the phases of cholera disaster management which includes the pre-disaster phase (preparedness), disaster response phase (emergency response) and post disaster phase (recovery) (Refer to Figure 1.3). According to the UNISDR (2004) 'framework of disaster risk reduction', vulnerability and hazard influences exposure to risks which are caused by natural and socio-political systems and as such these risk factors increase the rate at which people are affected by cholera.

According to the Federal Emergency Management Agency (FEMA) of the United States Department of Homeland Security, preparedness "*requires the whole community to integrate efforts in order to build, sustain and deliver the core capabilities and also to achieve the desired outcome identified in the National Preparedness Goal*" (2011: 1) *namely* prevention, protection, mitigation, response and recovery.

Figure 1. 3 Cholera Risk Reduction Framework



Source: Authors' Own Construct 2016

Identifying risk and vulnerability assessment remains the first step of the preparedness system. To address problems associated with cholera risks at the preparedness stage there is the need for vulnerability and capacity assessment as well as hazard analysis and monitoring. For this to be effective, it requires capacity measures from the household, community and district levels through community surveillance and monitoring. Since cholera emanates within the environment, community surveillance is always necessary to answer the what, how, when and who factors. Public information, education and early warning systems are also required at this stage as well as stockpiling of drugs, annual developmental and community exercises to ensure effective mitigation efforts. All these capacity measures are carried by levels of decision-making bodies as shown in Figure 1.3. The FEMA categorises response mission into fourteen (14) capability areas that are undertaken by the various levels of decision-making bodies for effective response (FEMA, 2013; 2014). However, to suit the local context of cholera epidemic management in Ghana, only three (3) response capabilities are highlighted. These includes public information, critical transportation and infrastructure systems such as emergency tents, beds and drugs and public health and medical services. The final phase of disaster management i.e. recovery, also involves series of activities which include health and social services such as free health care, economic and social recovery systems such as housing and infrastructure and social provision, and finally a situational and risk assessment. The essence of situational and risk assessments here helps to prepare the community to prevent or lessen the impact of the next outbreak.

The various phases of disaster management influences each other and with strong interventional systems in place will prevent or reduce risks to cholera epidemic (Figure 1.3). The cholera risk reduction approach as emphasized is in line with the 'Sendai Framework for Disaster Risk Reduction' (2015-2030) which stress on understanding disaster risks, strengthening disaster risk governance to manage disaster risk, investing in disaster risk

reduction, and enhancing disaster preparedness for effective response and the 'Build Back Better' in recovery, rehabilitation and reconstruction. The framework also falls within the models of operation of NADMO in the areas of redefining the risks environment, managing it and responding to threats posed by these risks to minimise or prevent the impact of cholera epidemics. The technical guidelines to disease surveillance and response in Ghana also highlight some of the various indicators and procedures towards effective community preparedness and response to cholera epidemics in La and Chorkor.

1.5 Objectives of the Study

1.5.1 Main Objective

The overall objective of this study is to assess sustainable preparedness and response measures towards cholera epidemic mitigation in the GAMA.

1.5.2 Specific Objectives

The specific objectives are to:

i. Analyse the socio-environmental conditions in La and Chorkor that predispose residents to cholera.
ii. Examine the preparedness and response of emergency services during cholera outbreaks.
iii. Evaluate stakeholders' interventions towards the elimination of cholera and other risk factors.
iv. Evaluate the capacity developed towards mitigation of cholera epidemics.
v. Make recommendations for policy consideration towards cholera mitigation and reduction of underlying risk.

1.6 Research Questions

Based on the stated specific objectives, the research seeks to address the following questions.

i. What are the socio-environmental conditions in La and Chorkor that predispose residents to cholera?
ii. What are the preparedness and response of emergency services during outbreaks?
iii. What are stakeholders' efforts towards the elimination of cholera and other risk factors?
iv. What capacities are developed to mitigate cholera epidemic in both communities?

1.7 Hypothesis

i. There is a significant relationship between cholera prevalence and the type of community.
ii. There is no significant relationship between cholera prevalence and the type of community.

1.8 Research Methodology

This research used a case study approach. Berg (2004) defines a case study as "*a method involving systematically gathering enough information about a particular person, social setting, event, or group to permit the researcher to effectively understand how the subject operates or functions*" (Berg, 2004 as quoted by Rutterford, 2012: 118). According to Simon (1996), a case study research is unique and has the capacity to give understanding of complex situations in a particular context since it is often difficult to generalize from a single case. A case study may involve single or multiple cases and this is useful in giving a more detailed description and understanding of the phenomenon (seen in Cavaye, 1996; Rutterford, 2012: 119). Yin (2013) also noted that, a multiple case design in a case study is preferred over a

single case since observation from multiple cases is more compelling. However, data required must be balanced against time and resources from each case. This knowledge therefore, encourages this work to use multiple cases from La and Chorkor to represent low-income indigenous settlements in the GAMA. The research used mixed methods as it serves to integrate both quantitative and qualitative findings at one or more stages of the research process (Creswell et al., 2003; Kroll & Neri, 2009).

1.8.1 Sampling Design for Questionnaire Survey

A total of 150 questionnaires were administered to the various households in both communities (La and Chorkor) with respondents selected based on the 2010 Population Census. A simple random sampling of three (3) indigenous communities each were selected in both La and Chorkor based on cluster of houses. In all, six (6) communities were selected for the study (see Table 1.1). Since houses in the communities exhibit multiple co-habitation, principal homemaker of each house were randomly selected for the questionnaire administration due to their depth of insight in respect of sanitation and housekeeping. A principal homemaker here, means one who manages the household of his/her own family or others especially as a principal occupation. In their absence, any elderly person was chosen. Household according to GSS, (2012b) is defined as a person or a group of persons who lived together in the same house or compound and shared the same housekeeping arrangements. A quantitative sampling approach was used to draw a representative sample of the population so that the result can be generalized or give a cross representation of the total population (Marhall, 1996). With this, the sample size was stratified based on the population of the communities to give an equal representation (See Table 1.1) based on the formula below.

$$n = \frac{P}{TP} \times S$$

Where n = number of Sampled Respondent, P = Population, TP = Total Population of La and Chorkor and S = Sample size. To administer the questionnaire households were simple randomly sampled, since there was some level of homogeneity within the communities.

Table 1. 1 Distribution of Respondents within Some Selected Communities in La and Chorkor

Community	Population	Code	Sample size (Stratified)
LA	**98,683**	**1**	**83**
New Lakpanaa	10,886	11	29
Abafum/Kowe/Abese	5,060	12	13
Adiembra	15,795	13	41
Chorkor	**78,918**	**2**	**67**
Lanteman	15,870	21	26
Chemuana	18,160	22	29
Alhaji	7,200	23	12
Total	**177,601**		**150**

Source: GSS PHC, 2010; LADMA Planning Unit, 2014

Both open and close-ended questions formed the structure of questionnaire survey, whiles proxy variables were used for the rapid assessment. According to Schneiderbauer & Ehrlich (2006), proxy variables are used because it is often difficult to quantify resilience in absolute terms without any external reference to validate the conclusion. Although the indicators approach according to scholars are subjective regarding their mode of selection by the researcher (Luers et al., 2003), they are useful in reducing complexity, measuring progress, mapping and setting other priorities right. This makes them an important assessment tool for decision-making (Cutter et al., 2008).

In carrying out the study, previous studies were consulted. For instance, in choosing of the environmental health indicators, the study largely relied on those used by Songsore et al. (1988) on what they described as environmental problem areas. The proxy indicators were

derived from a number of techniques which included expert opinion in weighting the problem areas (see Songsore et al., 1988). Based on this, the research combines both rapid assessment designed by experts with community based assessment. Unlike the rapid assessment tool used for strategic health planning and management (Leitmann, 1994; McGranahan et al., 1997 cited in Songsore et al., 1998: 4), the participatory community based survey is for focused community action (Israel, et al., 1988; Schulz, 1998) and this gives the community the chance to identify and solve its problems. In so doing, stakeholders and local residents were made active participants in the research in order to tap local knowledge and priorities to improve conditions being studied and establish participation.

1.8.2 Qualitative Research Methods

1.8.2.1 Focus Group Discussion

A focus group discussion which is a method of qualitative data collection of general information from a group of people was undertaken. According to Ho (2006), information from focus group explore insights that would have remain hidden. Typically, the discussions are between a group of five and ten people gathered to share their experiences and ideas. Interactions are based on planned series of discussion topics moderated by the researcher. To ensure maximum participation, a focus group discussion between 5-7 people were conducted to give general information about the problems in the communities and also, compliment data to enrich discussions. The researcher moderated the discussion to ensure maximum participation and effective responses to achieve the research objectives.

1.8.2.2 In-depth Interviews

A semi structured in-depth interview was conducted with some vulnerable households and key stakeholders. The list of stakeholders who were interviewed are officials from the Environmental Health Department, Sanitation and Waste Management Department,

NADMO and Assembly members in the research communities. These stakeholders were selected because they are well informed about policies and practices surrounding cholera epidemics mitigation and play an instrumental role regarding the emerging issues under discussion. According to Marshall (1996), key informant interview supplements the research information since the questionnaire sample are often of small size and to enable participation of the various stakeholders. In the course of the interview with NADMO, an institutional assessment was conducted with some indicators on effective cholera mitigation and underlying disaster risk factors in general. NADMO was chosen because of their constitutional mandate to coordinate all institutions in managing disasters. This institutional assessment tool according to Ramasamy et al. (2008) is a key process in Disaster Risk Management (DRM) systems at the community level.

1.8.2.3 Direct Observation

Direct personal observation was noted during the various data collection stages. These were undertaken as first-hand information concerning the socio-environmental conditions in La and Chorkor. Personal assessments were undertaken on socio-environmental conditions such as water, sullage and drainage, solid waste, medical facilities etc. where pictorial evidence were taken to supplement information to enrich the discussions.

1.8.3 Secondary Source of Data

The secondary data sources were taken from publications, articles, reports, journals and books. Data on cholera cases recorded over the years were taken from the Greater Accra Regional Health Directorate, Accra Metropolitan Health Directorate and La General Hospital. Data from these respective sources helped to know works done in relation to the subject and statistical records to support the discussions to make valid analysis, conclusions and recommendation.

1.9 Analysis of Data

In respect of the data analysis, quantitative data were analysed using the Statistical Programme for Social Science (SPSS) version 20. Chi-square, was used to test the hypothesis of the study. Microsoft Excel was also used for the statistical computations. Nevertheless, the qualitative data (in-depth interviews) were transcribed from the audio version, coded, categorised and analysed according to the themes in relation to the research questions and objectives of the study. ARC/GIS 10.3.1 was also used to project a spatio-temporal variation of cholera cases in the research communities as well as other places of interest and these process used graduation symbols for easy interpretation. Epidemiologist explore the potential of maps to understand the spatial dynamics of diseases (Loslier, 1995). Spatial modelling helps understand the spatial variation in incidence of diseases and measurements with environmental factors and health care system. GIS in health related activities helps us to understand the distribution and diffusion of diseases and its relationship with environmental factors (Loslier, 1995).

1.10 Organization of the Study

This study is organized into seven (7) chapters. The first chapter discusses the general background of the study. This entails introduction, statement of problems, conceptual framework, hypothesis and questions which guided the study and objective. Further to this was the literature review, which highlighted key areas. The second chapter touched on the profile or background of the study areas (La and Chorkor). Chapter three to six sought to analyse results from the rapid assessment and both the quantitative and qualitative data from the household, community and the local government levels. Specifically, chapter three sought to examine the socio-environmental condition of La and Chorkor that predispose residents to cholera. Chapter four also examines the preparedness and response measures in terms of emergencies during outbreak. Whiles the five and six sought to examine the

stakeholders' intervention towards cholera mitigation and analyse the capacities developed to eliminate cholera risk factors within the communities respectively. Finally, chapter seven gave a general summary of the findings, made recommendations and suggested future research area around the topic of discussion.

1.11 Limitation of the Study

The research was limited by finances and time in general. The difficulty in obtaining up to date cholera data from the communities was one of the main challenges encountered in this work. This development to some extent affected the research due to missing data. Again, the difficulty in getting thorough information about the study areas was part of the challenges in the study. The household data collection was very challenging as in some cases respondents demanded money before they responded to questions or interviewed. Interview of some key stakeholders within the community could not take place due to time and resources.

CHAPTER TWO

PROFILE OF LA AND CHORKOR

2.1 Introduction

La and Chorkor are low-income indigenous communities in Accra (Songsore et al., 2001; 2005). La is the administrative capital of the La Dade-Kotopon Municipal Assembly. Until recently, the Municipality used to be La Sub-metro under the Accra Metropolitan Assembly (AMA). It was part of the 46 districts and municipalities created in 2012 by the government of Ghana under the Local Government Act, 1993 (Act 462). This was also to create a pivot of political administration and developmental decision making as a basic unit of government administration (www.ghanadistricts.com). Chorkor on the other hand, is in the Ablekuma South Sub-metro i.e. one of the ten sub-metros of the AMA established by L.I. 2034 (GSS, 2014b).

2.2 Physical Characteristics

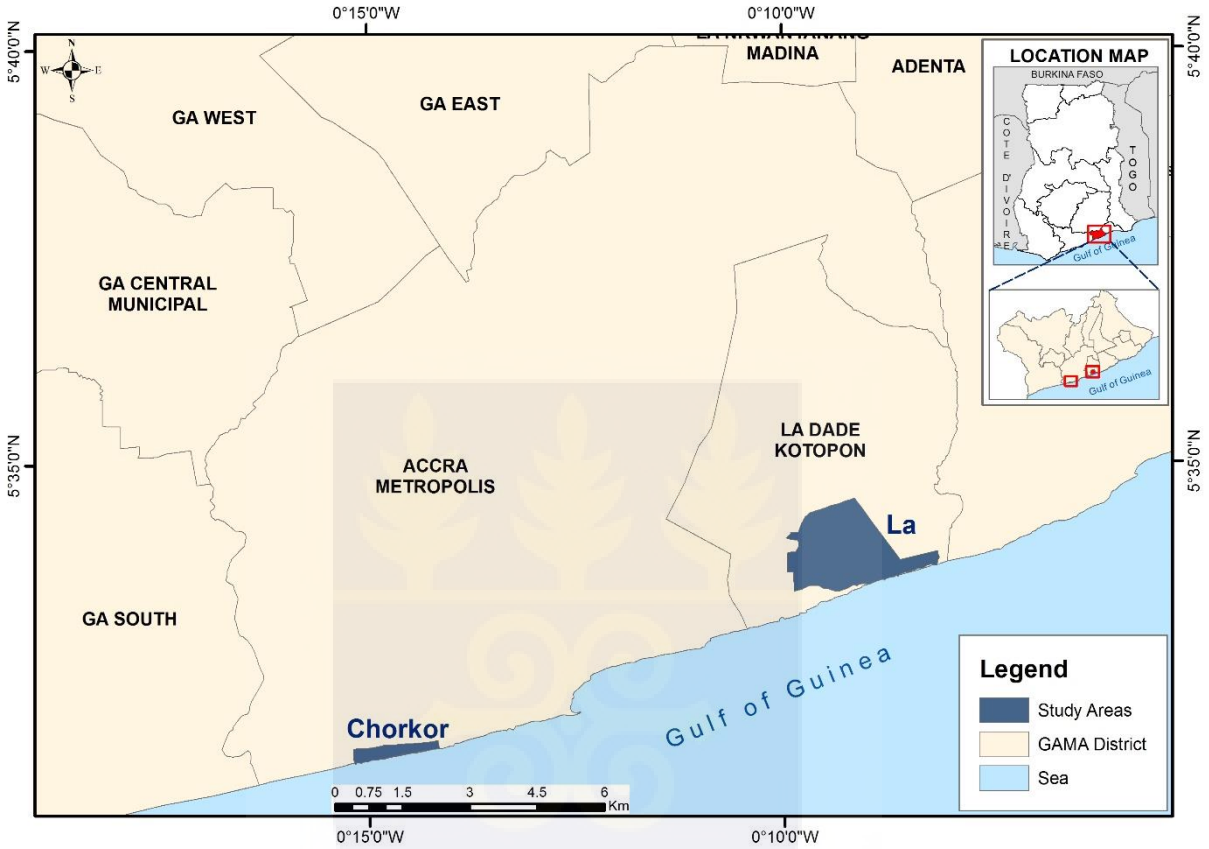
2.2.1 Location of the Study Areas

La lies between longitude 05 35° N and Latitude 00 06° W. Its Municipality share boundaries with La-Nkwantana Medina Municipal and Ayawaso-East and Ayawaso-West Sub-metros of AMA in the north, west with Osu-Klottey Sub-metro also of AMA, east with Ledzokuku-Krowor Municipal Assembly (LEKMA) and bounded south by the Gulf of Guinea (refer to Table 2.1). The Kotoka International Airport, La Pleasure Beach Resort, and the Kpeshie Lagon are some of its landmark areas (Agboklu, 2013).

Chorkor, a fishing village and neighbourhood in Accra lies between longitude 05 31° N and 00° 15 S. The Ablekuma South Sub-metro of the AMA, which serves as an administrative capital of Chorkor, shares boundaries with Ablekuma Central and North Sub-metros.

Chorkor is surrounded by the suburbs of Dansoman, Mamprobi, Korle Gonno and the Atlantic Ocean (www.modernghana.com).

Figure 2. 1 Study Area Map



Source: CERSGIS, 2014

2.2.2 Relief, Drainage and Climate

Both La and Chorkor lie along the coast and have sandy beaches. The Kpeshie Lagoon located within the outskirt of La is less than a kilometre square in surface area. The Chemu Lagoon, in Chorkor has also become one of the most polluted water bodies in Accra (See Plate 2.1). It serves as a principal outlet through which major drainage channels in the city empty its wastes into the sea. According to literature, a large amount of untreated industrial and domestic wastes emptied into surface drains has led to severe pollution in the lagoon which has disrupted its natural ecology (Boadi & Kuitunen, 2002; Oteng-Ababio & Arguello, 2014).

Plate 2. 1 Picture of Chemu Lagoon in Chorkor Surrounded by Domestic Wastes

Source: Field Survey, 2016

La and Chorkor lie within the Coastal Savannah zone with double maxima rainy seasons where the first begins in May and ends in mid-July and the second season begins in mid-August and ends in October. The average annual rainfall is about 735mm, and it occurs primarily during the two rainy seasons. Sometimes both communities experience some showers and thunderstorms in November and December and rains are usually intensive giving rise to flooding where drainage channels are obstructed. There is very little variation in temperature throughout the year. The mean monthly temperature ranges from 24.7°C in August (the coolest) to 28°C in March (the hottest) with annual average of 26.8°C (Dickson & Benneh, 2001). Relative humidity is generally high varying from 65% mid-afternoon to 95% at night (Opoku, & Ansa-Asare, 2007). The relief, drainage and climatic conditions make the research communities susceptible to Vibrio cholerae bacteria. As suggested by

various research works, cholera epidemics are more common under poor environmental conditions and the bacteria is naturally found in estuary and sea environments.

2.3 The Growth of La and Chorkor

Historically, it is believed that the people of La migrated from the Middle East through a town called Bone in Nigeria to the present location. La-mei (the natives) came with and have continued to practice their own religious belief under the deity 'La-Kpa' who they believe fought for them in all the battles with different hostile tribes during their migration. Ga-Adangbe is the main ethnic group of the both La and Chorkor. The dominant indigenous language spoken is Ga and it is a patrilineal society. However, other ethnic groups can be found due to the warm hospitality of the indigenes as well as the extensive economic activities in the area. According to Darko-Gyeke and Kofie (2015), Chorkor, is a slum community and homogenous in structure due to the relatively low educational levels, high levels of unemployment and generally low incomes among residents.

2.3.1 Demographic Dynamics of La and Chorkor

In the years 2000, La had a total population of 81,684 with 39,726 males and 41,958 females whiles Chorkor had a total population of 23,853 with male and female population of 11,495 and 12,358 respectively (GSS, 2005). However, in 2010 the population increased to 98,683 in La and 78,918 in Chorkor. On district basis in the year 2010, the total population of the Accra Metropolis and La Dade-Kotopon Municipal Area were 1,665,086 and 183,528 respectively. The female and male population in Accra constituted 51.9 and 48.1 percent whiles that of La was 52.7% and 47.3% respectively.

The Total Fertility Rate (TFR) of the Accra Metropolis is at 2.2 and 2.0 in La Municipal, which are all lower than the regional average of 2.6 per 1,000 population. Crude Birth Rate

(CBR) for Accra Metropolis is 19.7 whiles La Municipal is 18.9 and these are all lower than the regional average of 22.7 per 1,000 population. CBR is the number of births per 1000 during a specific period. Lower birth rates in these areas are due to contraceptives use, out migrations or increase in mortality of males (GSS, 2014a; 2014b). However, it is noted that teenage pregnancy is high in low income and indigenous communities such as Chorkor and this has resulted in a number of children of school going age roaming in the community (www.modernghana.com). In general, La and Chorkor have a very a youthful population as majority of the population fall within the ages of 15 and 34 years as compared to the LDMA and the AMA demographic data respectively. Although fertility is relatively low, birth rate is still high in low-income communities of La and Chorkor whiles mortality is also high (GSS, 2014a; 2014b).

2.3.2 Housing Stock and Environmental Conditions

In 2000, La and Chorkor had a housing stock of 5,474 and 1,629 respectively (GSS, 2005). On district bases, there are about 19,174 and 149,689 houses in the La Dade-Kotopon Municipality and Accra Metropolis respectively with an average household size of 3.6 (GSS, 2010). Most of these dwelling units constitute compound houses, flats/apartments and tents/huts. Relation between household size and houses available suggests that there exist overcrowding in households (GSS, 2012a). These have severe implications on the insurgence and spread of cholera (Osei & Duker, 2008; Piarroux, et al., 2011; Nair et al., 2014).

Pipe-borne water remains the main source of drinking water in La and Chorkor. In La, pipe-borne water inside houses constituted about 31.9% and those outside houses are 30.5%. Whiles in Accra metro, 31.8% have accesses to pipe borne water in their homes and about 28% rely on pipes outside their homes. Although unprotected springs, rain water, dugout wells, canals and many more exist among communities, sachet water is the second most used

source of drinking water, which constitute about 24% (GSS, 2014a; 2014b). According to Amexo (2014), water in urban areas in Ghana is entangled with low investment and bad management which leads to short supply and low quality in many communities. Even in situations where water is available, its access varies depending on location, infrastructure availability, socio-economic conditions among others and these have led to a mixture of sources in providing water which subsequently has public health implications.

According to GSS (2012), efficient and hygienic ways of human waste disposal available in housing units is a clear and critical indicator to measure sanitation as well as the socio-economic status of households. A significant number of houses share bathrooms in both La and Chorkor especially in compound houses which accommodate large number of people. Public toilets are found in both communities. In La and Chorkor, the public toilet is the main source of toilet facility since many households do not have access to such facilities within their homes. Public toilets are generally regarded as unhygienic due to the many usage as well as improper maintenance (Tanle and Kendie, 2013).

According to Gyan (2013), although Chorkor has electricity, water pipes and schools, it lacks good drainage systems and sanitary conditions. A CHF report also indicates that Chorkor is considered a 'poverty endemic' zone due to the low-income population, overpopulation, poor sanitary condition and above all, lack of basic infrastructures such as adequate toilet facilities, bathhouses, proper waste dumpsites and well-maintained drainage systems (www.basicsinternational.org).

2.4 The Role of La and Chorkor within the Urban Economy of GAMA

The location of La and Chorkor bounded on the south by the Gulf of Guinea provides an avenue for fishing for the indigenes. Therefore, fishing is the main economic activity. In La, the Kpeshie Lagoon which used to serve the same purpose in recent times has declined in

such activities due to the fact that it has been partially choked with debris. Farming activities are mostly limited in both areas due to the infertile nature of the soil for agricultural purposes as well as the limited agricultural lands being used for construction activities and other developmental projects. However, there are pockets of small-scale agricultural activities where vegetables and other fruits are cultivated for both consumption and commercial purposes. The main economic activity for the men is mostly the operation of public transport system popularly known as 'trotro' while majority of the women are into petty trading in small kiosks and containers as well as hawking. In both La and Chorkor about 60% of the population are self-employed and are mostly into fishing, food vending, mechanical works, hairdressing, tailoring and carpentry (GSS, 2014a; 2014b).

On district basis, the La Dade-Kotopon Municipality is considered the richest district assembly in Ghana now, due to the huge funds it gets annually from property rates alone. It contains some of the first class localities in Ghana such as Cantonment and North Labone. The Airport City which is within its boundaries host some of the modern business enclaves with high rise buildings, high valued hotels, offices, shopping malls and the Kotoka International Airport (GSS, 2014a; 2014b).

Plate 2. 2 Airport city Enclave

Source: *LADMA Planning Co-ordinating Unit, 2014*

2.5 Overview of Socio-Environmental Risk Profile in GAMA

Songsore et al. (1998), in their study 'Proxy Indicators for Rapid Assessment of Environmental Health Status of Residential Areas: The Case of the Greater Accra Metropolitan Area (GAMA), Ghana' employed the use of nine environmental problem areas

within a community. “Environmental health indicators can be understood as synthesised information regarding known environment-related diseases or contaminants with known adverse health effects. Once identified, these indicators can be used to establish improved and more cost-effective environmental monitoring and management programmes” (Corvalan and Kjellstrom, 1995: 75 cited in Songsore et al., 1998).

A three-step process was developed to produce a list of proxy environmental health indicators that reflected an informed expert opinion in the GAMA. These steps include; developing a profile of proxy environmental health indicators, developing a method for weighting the indicators in consultation with a statistical expert, and informal consultations with an inter-sectoral network of environmental health experts to discuss and validate the indicators and weighting procedure (see Songsore et al., 1998: 5). The proxy environmental health indicators were developed on three main themes. These are socio-demographic conditions, environmental and major health problems that could be attributed to environmental hazards. The socio-demographic conditions served as a screening device that helped conceptualize the environmental and health problems identified. Within these themes, nine major environmental problems were identified as having strong implication on the health status of residents. These problem areas include; water, sanitation, hygiene, sullage/drainage, pests, housing problems, indoor and outdoor air pollution, food contamination and solid waste. For each of these problem areas, a number of environmental risk factors/hazards were identified and weights were assigned to them (see Songsore et al., 1988: 5). For each of the environmental health problem areas, the total score in the rapid assessment for each residential area was expressed as percentage of the maximum score. The scores were then expressed in quintiles of environmental burden where the first quintile is from 1%-20% and the fifth quintile from 81%-100%. This means the first quintile had the least severe condition while the fifth quintile had the most severe environmental risk or

burden. Afterwards, the aggregated scores were found by adding the individual scores of the nine problem areas expressing the individual area performance as a percentage of the maximum score specified by the model. Results were then expressed as quintiles of aggregate environmental burden for each community. This measured the level of deprivation in communities and level of risk each community is exposed to as far as risk factors are concerned (Songsore et al., 2001: 10).

2.5.1 Quintiles of Aggregate Environmental Burdens within GAMA

Following the method discussed, the rapid assessment tool was applied for environmental health monitoring in 2001, 2005 and 2009. In the year 2001, top of the most deprived communities within the fifth quintile were in AMA. Communities with this quintile included, Nima, Mamobi, La, Gbegbeyige, Accra New Town, Mpoase, Sukura, Sarbon Zongo, Apenkwa, Abeka and Darkuma. In TMA the worst areas were; Ashiaman East and West, and Tema New Town. In the Ga Districts, communities within the fifth quintile were Bortianor, Pokuase, North Ofankor, Mallam, Ofankor Village, Amamoli, North Ashongman and Otenibi. The next cluster of deprived communities within the fourth quintile largely fell within AMA with residential communities such as Chorkor, Korle Gonno, Nungua etc. and newly developing areas of the Ga District and the peri-urban zones of Tema. The first two quintiles in the AMA were areas of West Ridge, Ringway Estate, Airport Residential Area, Dansoman Estate, and North Dorwulu. In Tema, Community 5, 6, 10, 12,13,15,19 and Mortoway North Estate were also within the first two quintiles. While in the Ga District areas within the first two quintiles were Parakou Estate, Atomic Energy Commission and Sport Complex (see Songsore et al., 2001: 26-28).

In 2005, AMA again topped the list of most deprived communities with 12 communities falling within the fifth quintile. These communities include Gbegbeyise, Sabon Zongo,

James Town, Korle Dudor, Kototabi, Nungua, La and North Teshie. In Tema, the only most deprived community was Tema New Town whilst in the Ga District the most affected communities were Oblogo and Ofankor Village. Following the most deprived areas mentioned above are 22 communities in AMA within the fourth quintile. These communities included Chorkor, Mpoase, Korle Gonno, Nima etc. In Tema Municipal, areas within the fourth quintile were Kpone, Kpone Central, Ashiaman East and West, Community 1, Amrahia, and Appolonia in the rural fringes. Whiles in the Ga District, as Mallam, Ngleshie Amanfro and areas in the rural fringes were also within the fourth quintile. On the other hand, residential communities within AMA which were least deprived and fell within the first quintile were Airport Residential Area and East Ridge. In Tema Municipal, 12 communities were found within the least deprived quintile (see Songsore et al., 2005: 28). Reasons for this difference were due to the overall planned nature of these communities in Tema. The most deprived communities in AMA were attributed to increasing population, decaying environmental conditions and inadequate planning whiles areas in Tema and the Ga District were due to the lack of environmental services especially in the rural fringes (Songsore et al., 2001; 2005).

In 2009, results of a similar but limited study along the Korle Lagoon indicated that Old Fadama, South Industrial Areas and James Town were the most deprived communities which fell within the fourth quintile (Songsore et al., 2009: 27). Korle Dudor, Agbogbloshie, Sabon Zongo and Korle Gonno also fell within the third quintile whiles Kole-Bu was the less deprived within the second quintile. This was attributed to the fact that Korle-Bu from the onset was a planned area (Songsore et al., 2009: 27).

Analysis from the rapid assessment tool as discussed above indicated that there were several residential communities in GAMA, which were susceptible to environmental health diseases such as cholera. This was due to the poor environmental conditions and most of these

communities were in the AMA. However, there were some improvements in some of the communities from fifth to the fourth quintile in 2009. To reflect the purpose of this work it can be noted that, the environmental conditions in Chorkor was better than La in 2001 and 2005 since they fell within the fourth and fifth quintile respectively.

2.6 A Retrospective view of Cholera Incidence in GAMA

In the epidemiological history of Ghana, cholera remains one of the deadliest infectious diseases the country has ever known (Oteng-Ababio, 2014). In 2014 for instance, Ghana recorded the worst case in 123 out of the 216 districts with a cumulative total of 26,286 cases and 211 deaths at a Cases Fatality Rate of 0.8% and the Greater Accra Region alone accounted for about 72% of the cases (WHO, 2014). Case Fatality Rate here, is defined as the proportion of reported cases of cholera which are fatal within a specific time.

The Greater Accra Region (GRA) as at 1988 to November 2015 had recorded 49,860 cholera cases with 438 deaths from the various districts in the region. The year 2004, 2007 and 2010 recorded the lowest number of cases within the region representing 8; 7 and 7 cases respectively with no death. However, there was a sharp rise in the number of cholera cases in 2011, 2012 and 2014 recording 9,174, 6,882 and 20,199 cases respectively, where the highest number of deaths were recorded within this period (refer to Table 2.1). From Table 2.1, Case Fatality Rate over the years is below 5% and this according to the Centre for Disease Control and Prevention (CDCP) can be explained by the fact that most deaths are as a results of delays in reaching health facilities by severely ill patients. Therefore, education is one of the recommended ways to minimise the number of deaths within a particular community.

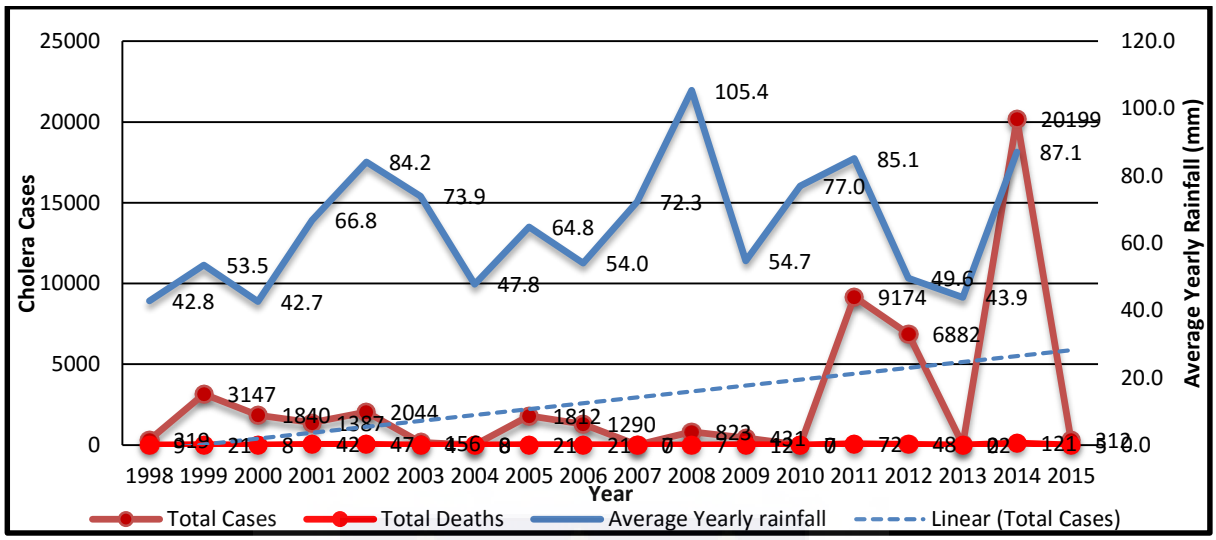
Table 2. 1 Cholera Reported and Investigated Cases within the Greater Accra Region

Years	Reported Cases		Case Fatality Rate
	Total Cases	Total Deaths	Percentage (%)
1998	319	9	2.8
1999	3,147	21	0.7
2000	1,840	8	0.4
2001	1,387	42	3.0
2002	2,044	47	2.3
2003	156	4	2.6
2004	8	0	0.0
2005	1,812	21	1.2
2006	1,290	21	1.6
2007	7	0	0.0
2008	823	7	0.9
2009	431	12	2.8
2010	7	0	0.0
2011	9,174	72	0.8
2012	6,882	48	0.7
2013	22	0	0.0
2014	2,0199	121	0.6
2015	312	5	1.6
Total	**49,860**	**438**	**0.9**

Source: GAHD, 2015

As represented in Figure 2.2, a trend analysis for the 15 years' period (1998-2015) show that reported cases are increasing and this can be simply explained as due to population increase over the years, coupled with a rise in risk factors to cholera epidemics. Since cholera emanates from natural and environmental events, a trend analysis of cholera cases and rainfall in the Greater Accra Region revealed that, as average annual rainfall increases, cholera cases also increased. As shown in Figure 2.2, cholera cases increased from 319 cases in 1998 to 3,147 cases in 1999 when average rainfall had also increased from 42.8mm to 53.5mm respectively. Other instances could be seen in the year 2002; 2005; 2008; 2011 and 2014. However, there were some exceptional years, which did not experience any significant outcome and these could be better explained by other factors. High-rise of cholera cases in Accra in 2014 could be partly attributed the heavy floods in June and July. Areas that were worst affected were Adabraka, Awoshie, Kwame Nkrumah Circle, Mallam, North Kaneshie, Abeka, Dansoman, Odorkor, Anyaa, Nii Boi Town and Taifa (www.graphic.com).

Figure 2.2 Trend of Reported Cholera Cases and Average Yearly Rainfall in the Greater Accra Region (1988- 2015)



Source: *GAHD, 2015; GMA, 2016*

Within the last five years in the Greater Accra Metropolitan Area (GAMA) the Accra Metropolis has recorded the highest number of cases with 22,333. Taking Greater Accra Region as a whole, Ada West has the least with just a single case. It should be noted that, until 2012 when new districts were born, most areas exist as parts of older districts therefore, this accounted for no prior data records for the new districts. In the five years' period, 2013 recorded the least with 22 Cholera cases and these were all coming from the GAMA (refer to Table 2.2). From Table 2.2, it is evident that cholera incidences are predominant in urban and overcrowded communities as noted in other works (see for instance Osei & Duker, 2008). Results from previous studies (Songsore et al. 2001; 2005) shows that the AMA always tops the list of most deprived communities. This possibly explains why it always records the highest number of cholera cases.

Table 2.2 Cholera Reported and Investigated Cases by Districts in the Greater Accra Region (2011-2015)

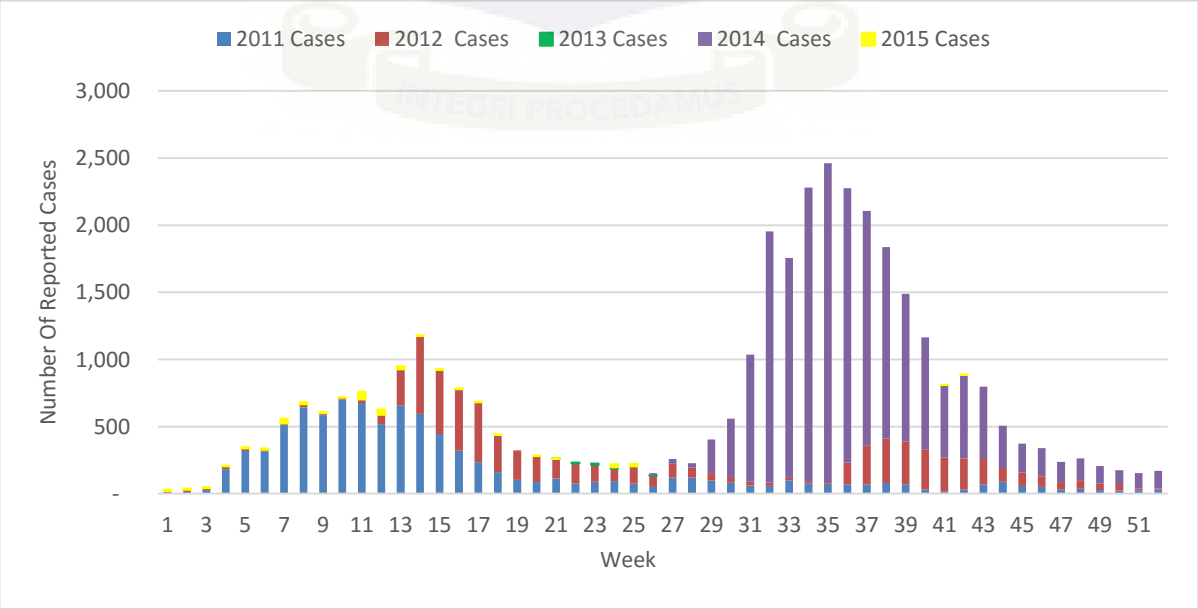
	2011			2012			2013			2014			2015		
	Cases	**Deaths**	**CFR**	**Cases**	**Deaths**	**CFR**	**Cases**	**Deaths**	**CFR**	**Cases**	**Deaths**	**CFR**	**Cases**	**Deaths**	**CFR**
Accra Metropolis	6,960	62	0.9	4,623	39	0.8	14	0	0	10,504	65	0.6	232	5	2.2
Ada East	1	0	0.0	0	0	0	0	0	0	103	1	1.0	0	0	0
Ada West **							0	0	0	1	0	0.0	0	0	0
Adenta Municipal	42	0	0.0	84	0	0	0	0	0	19	0	0.0	0	0	0
Ashiaman Municipal	17	0	0.0	7	0	0	0	0	0	68	1	1.5	1	0	0
Ga Central **							7	0	0	152	1	0.7	0	0	0
Ga East	758	1	0.1	754	3	0.4	0	0	0	190	0	0.0	5	0	0
Ga South	420	3	0.7	765	2	0.3	1	0	0	2,082	5	0.2	19	0	0
Ga West	621	3	0.5	356	3	0.8	0	0	0	1,286	2	0.2	5	0	0
Kopne Katamanso **							0	0	0	280	0	0.0	9	0	0
La Dadekotopon **							0	0	0	1,907	15	0.8	7	0	0
la Nkwantanang **							0	0	0	770	6	0.8	8	0	0
Ledzokuku Krowor	276	0	0	269	0	0	0	0	0	1,398	14	1.0	18	0	0
Ningo prampram * **							0	0	0	32	0	0.0	0	0	0
Shai Osudoku *	8	1	12.5	11	0	0	0	0	0	315	1	0.3	5	0	0
Tema Metropolis	71	2	2.8	13	1	7.7	0	0	0	1,092	10	0.9	3	0	0
Total	**9,174**	**72**	**0.8**	**6,882**	**48**	**0.7**	**22**	**0**	**0**	**20,199**	**121**	**0.6**	**312**	**5**	**1.6**

* Areas outside GAMA
** Until 2012 were part of other Metropolis and Districts
Source: GARHD, 2015

Reported Cholera cases in the GAMA region shows a fluctuating trend. For instance, in 2011 a total number of 19,165 cases were recorded and this reduced to 6,871 in the subsequent year which further reduced to 22 in 2013. However, there was sharp rise of cholera cases in 2014 with 19,748 cases and as at November, 2015 a total number of 307 cases had been reported. The year 2014 recorded the highest death within the Greater Accra Region with 121 deaths and 119 deaths in the GAMA. However, in the year 2013, out of the 22 cholera cases reported no death occurred. Overall, it can be emphasized that deaths increase with increasing number of cholera cases.

On monthly basis, cholera occurs throughout the year (see Figure 2.3). However, it is most severe during week 6 to week 22 (February to June) and week 27 to week 47 (July to November) and these months fall within the two main rainy seasons in Ghana. This therefore implies that, cholera incidence has a significant relationship with climatic conditions as asserted by de Magny et al. (2008), that the causative factor of vibrio cholerae has a significant relationship with climatic factors

Figure 2.3 Cumulative Weekly Cholera Epidemiological Graph in the Greater Accra Region (2011-2015)



Source: GARHD, 2015

2.7 Summary

The GAMA is a labour seeking urban residential area, which attracts people all over Ghana with a youthful population. La and Chorkor are indigenous communities where fishing, petty trading and commercial driving are some of the main economic activities of the people. Aside the attractiveness and the contributions to the economic development of Ghana, both communities are threatened by poverty. Overcrowding, inadequate planning and poor environmental conditions such as lack of toilet, solid and liquid waste, water supply facilities and lack of other social amenities are some of the characteristics of the present state of both communities. These poor environmental conditions expose the residents of the communities to a variety of infectious diseases. Cholera remains one of these diseases and the AMA as a whole records the highest number of cases each year there is an outbreak. Cholera outbreak mostly occurs throughout the year however, it is most severe during the raining season. Environmental risk profile in GAMA also suggest that, most communities in AMA are deprived hence are at risk to environmental related diseases.

CHAPTER THREE

SOCIO-ENVIRONMENTAL CONDITION AND CHOLERA INCIDENCE/ PREVALENCE IN LA AND CHORKOR

3.1 Introduction

This chapter provides analysis of the empirical data collected from the rapid assessment and household survey from the two communities (La and Chorkor). In order to address each of the objectives under social and environmental conditions of the communities the results were captured under four main sub-headings. The first section discusses the demographic characteristics of the sampled households using frequencies and percentages. The second and third sections analysed the socio-environmental conditions that are likely to predispose people to cholera infections and spatio-temporal analysis of cholera incidence in the communities respectively. Lastly, a predictor model was generated between cholera prevalence and the social conditions.

3.2 The Demographic Characteristics of the Respondents

This section provides the demographic characteristics of La and Chorkor. Again, it highlights the socio-economic characteristics of the respondents. These include, gender, marital status, ethnic groupings, education, household size and income. These are important in elaborating the socio-environmental conditions at the household and community level.

The gender distribution as represented in Table 3.1 shows that 77% of the respondents were females in La whiles 76% of females were in Chorkor. This is attributed to the fact that, majority of women in the community were engaged in informal activities which are mainly homebased hence they are mostly at home while majority of men were engaged in other activities outside home. This is also partly due to the fact that per the 2010 population census, the female populations in both communities are higher than males (GSS, 2012a).

Table 3. 1 Cross Tabulation of Respondents' Demographic Characteristics by Community

Demographic Characteristics	Community [n (%)]	
	La (n=83)	Chorkor (n=67)
Gender		
Male	19 (22.9)	18 (23.9)
Female	64 (77.1)	51 (76.1)
Age Range		
18-29	14 (16.9)	20 (29.9)
30-39	22 (26.5)	22 (32.8)
40-49	18 (21.7)	15 (22.4)
50-64	24 (28.9)	8 (11.9)
65+	5 (6.0)	2 (3.0)
Marital Status		
Single	21 (25.3)	23 (34.3)
Married	35 (42.2)	34 (50.7)
Divorced	15 (18.1)	7 (10.4)
Widow	7 (8.4)	1 (1.5)
Separated	5 (6.0)	2 (3.0)
Religious Conviction		
Christian	72 (86.7)	60 (89.6)
Muslim	7 (8.4)	5 (7.5)
Traditionalist	2 (2.4)	1 (1.5)
No Religion	2 (2.4)	1 (1.5)
Ethnic Group		
Akan	10 (12.0)	9 (13.4)
Ewe	10 (12.0)	3 (4.5)
Ga/Ga-Adangbe	57 (68.7)	50 (74.6)
Northerner	6 (7.2)	3 (4.5)
Others	0 (0.0)	2 (3.0)
Educational Level		
No Formal Education	10 (12.0)	15 (22.4)
Primary/Junior High	49 (59.0)	33 (49.3)
Senior High/Voc./Tech.	24 (28.9)	19 (19.4)
Household Size		
1-5	43 (51.8)	35 (52.2)
6-10	21 (25.3)	16 (23.9)
11 and Above	19 (22.9)	16 (23.9)
Monthly Income Range (GHC)		
≤ 399	52 (62.7)	34 (50.7)
400-799	23 (27.7)	30 (44.8)
800 and Above	8 (9.6)	13 (4.5)

Source: Field Survey, 2016

In assessing socio-environmental conditions, marital status is very important since there is a probability of creating higher household size and enhancing vulnerability to poverty

(Adesanoye & Okunmadewa 2007). Again, marriage is beneficial to individual's health because many spouses monitor and attempt to control their family's health behaviour (Umberson, 1992). From the results, 42% of the respondents were married in La whiles 51% were married in Chorkor. Again, 25% of the respondents in La were single whereas in Chorkor they were 34% (see Table 3.1). Results of age distribution show that majority of the respondents from La were between the age range of 30-39, which represents 27% whiles 6% were persons at age 65 and above. In Chorkor the same trend was recorded as it represents 33% and 3% for ages ranging from 30-39, and 65 and above respectively. This reveals that the communities have a youthful population and this is a characteristic of every developing country (GSS, 2012a).

The religious diversity of La and Chorkor is well represented by the various religious groups. As shown in Table 3.1, 87% of the respondents were Christians in La whiles 90% were Christians in Chorkor. The Christian population is more dominant with influx of both orthodox and charismatic churches as people appear more vulnerable hence attribute almost everything in their daily lives to spiritualism. This supports the reports by the GSS that the Christian population is more dominant followed by Muslim and Traditionalist in Accra (GSS, 2012a:2012b). Again, Ga/Ga-Adangbe representing 69% and 75% in La and Chorkor respectively, dominates the communities (see Table 3.1). This is not surprising because, both communities serve as the main traditional settlements of the people of Accra. The Akan ethnic group is next in dominance in La and Chorkor as they represent 12% and 13% respectively. In all, various ethnic groups within the communities are well represented. In effect, most people migrated from other places to these communities. Among these reasons are job related issues, marital purposes and high cost of rent (Awumbilla & Agyei-Mensah, 2009). Consequently, this has adverse effect on rapid urbanization resulting in overcrowding,

environmental degradation and inadequate supply of basic social services (Bloom et al., 2008).

Education plays an important role in cholera prevention since there is a relationship between poor literacy skills and health status of an individual (Nutbeam, 2008). As shown in Table 3.1, about 22% of the respondent in Chorkor had no formal education against 12% in La. Most of the people in both communities had primary/junior high education, representing 59% and 49% in La and Chorkor respectively. It can be said that many people have smaller household sizes, within the range of 1-5. This represents about 52% in both communities (refer to Table 3.1). The extended family system is still common in these communities. As there were households with larger family sizes above 11 this represents 23% and 24% in La and Chorkor respectively. Reasons for these results suggest that, societies are undergoing several changes in indigenous African communities and this has resulted in the dominance of the nuclear family type. Factors accounting for these changes include increased urbanization, intercultural marriages, political and economic transformation (Ardayfio-Schandorf, 2006). Having said that, there exists households with larger family sizes. Both communities have an average household size of four (4) persons and an average of seven (7) households per each dwelling unit (house). Overcrowding therefore exists within both communities, as it is assumed that four (4) people live in a room.

As noted already urban poverty contributes to cholera epidemics as the disease targets vulnerable settlements. Since poverty assessment is both an economic and a social issue, assessing income distribution of a community helps understand their socio-economic vulnerability. On income distribution, 63% and 51% of the respondents in La and Chorkor respectively said they earned an average monthly income of less than GH ₵399. Whiles a few residents earn above GH ₵799, representing 10% and 5% in La and Chorkor respectively (see Table 3.1). Average monthly income per household in both communities was GH ₵300,

which is below the average per capita income of GH ₵400 a month in Ghana (GSS, 2014c: 9). It is deduced that, 21% of the respondents in each of the communities are poor since they live below the upper poverty rate of GH ₵1,314 per adult per year as identified by the Ghana Living Standard Survey round 6 (GLSS 6) (GSS, 2014c: 9).

3.3 Socio-Environmental Conditions (Environmental Proxy Indicators)

According to the UNISDR (2005), to enable decision makers to assess the impacts of disasters, there is the need to develop indicators of disaster risk and vulnerability at the national and sub-national level. Here indicators mean "*quantifiable constructs that provide information either on matters of wider significance than that which is actually measured, or on a process or trend that otherwise might not be apparent*" (Hammond et al., 1995 cited in Yiran, 2014; 13). The indicators approach is useful for decision-making. This helped reduce the complex reality of variables that contribute to environmental health into simple terms necessary for comparison and monitoring across space and time. According to McGranahan et al. (2001), understanding neighbourhood conditions plays an important role in urban environmental management most especially when environmental services are lacking. To understand inter and intra neighbourhood conditions, participatory rapid assessment is one of the research methods in assessing environmental problems facing low-income communities.

According to Shyamsundar (2002), core environmental health indicators should relate to the three major health problems (diarrhoea, respiratory infection and malaria) that affect the poor. In relation to the above, this section employed the proxy indicators for assessment of environmental health status of residential areas (see Songsore et al., 1998). The environmental health indicators within problem areas were used to measure the socio-environmental conditions since it provides routine monitoring of environmental health

situation within a community and again to systematically quantify environmental risk factors (Songsore et al., 1988) to cholera. The indicators helped plan and manage the communities towards cholera prevention programmes. Again, this approach was used to validate whether the socio-environmental conditions in La and Chorkor have improved or gotten worse over the years, since the socio-environmental conditions of an area have implication for continued endurance or the persistence of cholera risk. In applying the environmental indicators as a rapid assessment tool, La and Chorkor were divided into four blocks each, based on the environmental conditions to reflect indigenous communities. These indigenous communities were; New Lapkana, Abafum/Kowe/Abese, Adiembra and Lakpakpa whiles that of Chorkor include; Lanteman, Chemuana, Alhaji and T-Gardens. The results from each block were combined to create a community average (refer to Appendix 7). Since the rapid assessment also contained both community and household level indicators, structured observation as well as interview with environmental health officers and assembly members were made respectfully.

According to Shyamsundar (2002), access to safe water is a commonly used indicator to assess health outcome of diarrhoeal diseases such as cholera since it influences the behavioural practices of households. From the rapid assessment on water (refer Appendix 7), there were evidence of pipelines on ground surface and in drains that expose residents to infectious diseases. Plate 3.1 and 3.2 are evident of this situation in both communities with residents health at risk especially when pipelines are burst.

Plate 3. 1 Pipelines found in drains in Chorkor

Source: Field Survey, 2016

Plate 3. 2 Pipelines found in drains in La

Source: Field Survey, 2016

Frequent water interruption was a common phenomenon in both communities most especially during power outages and this affect water accessibility and quality in the communities. Again the principal source of portable water supply within both communities were outside house compound and most portable water used within households were stored in open containers. This situation was very common in Chorkor as compared to La and this renders residents very vulnerable to infectious diseases such as cholera as most households do not treat water before usage. This supports the assertion made by Songsore that "*given the widespread practice of unhygienic water handling and storage in deprived low-income areas, it is not enough to focus on bringing water to the tap, what happens between the tap and the mouth is also critical in determining health outcomes*" (Songsore, 2008: 8).

Access to good quality water is a challenge to most towns and cities in Ghana and this has forced households to supplement their activities with sachet water. Even though such supplement is laudable, it is still a route of disease transmission due to inadequate treatment (Addo et al., 2009). From the findings, water has been a major challenge facing La and Chorkor and this puts both communities in the third and fourth quintiles representing 53% and 71% respectively (refer to Table 3.2). This therefore, affects its quality hence expose residents to the danger of cholera.

Table 3. 2 Environmental Health Indicators and Total Weighted Environmental Health Index for La and Chorkor, 2016

Indicators	Max Score	La			Chorkor		
		Means Score	Percentage (%)	Quintile	Mean Score	Percentage (%)	Quintile
A. Water	**37.0**	19.78	53.4	3	26.30	71.1	4
B. Sanitation	**29.9**	24.00	80.3	4	27.15	90.8	5
C. Pests	**24.6**	12.48	50.7	3	21.30	86.6	5
D. Sullage/Drainage	**23.4**	13.20	56.4	3	20.30	86.8	5
E. Food Contamination	**21.0**	10.35	49.3	3	16.95	80.7	5
F. Hygiene	**19.6**	12.08	61.6	4	17.40	88.8	5
G. Solid Waste	**19.2**	12.90	67.2	4	17.45	90.9	5
H. Housing Problems	**13.6**	8.53	62.7	4	11.45	84.2	5
I. Indoor/Outdoor Air Pollution	**11.8**	4.92	41.7	3	9.69	82.2	5
Grand Total	**200**	**118.22**	**59.1**	**3**	**167.99**	**84.0**	**5**

Source: Field Survey, 2016

The findings support the assertion made by Amexo (2014) that, urban water in Ghana is challenged by poor management and this affects its supply and quality. To compliment the results from the rapid assessment, a tenant in La, noted that:

> *Access to water has been a major problem in the community. Although the situation has improved over the years. I fetch water right from my next house neighbour, however, frequent interruption of water has been very challenging to my house chores duties (Household 2- personal interview, February 26, 2016, Adiembra-La).*

Another tenant also said, that:

> *Although we have pipe water in our house, it is only accessible to the Landlord. Therefore, we fetch water from the neighbourhood of which we pay 50 pesewas per bucket. Also, due to the frequent water interruption we are forced to store water in barrels for weeks which as a result affects it quality and taste so we mostly depend on sachet water for drinking (Household 1-personal Interview, February 27, 2016, New Lakpanaa-La).*

In Chorkor, an interview with a 42 year old woman also revealed that:

> *We access water from a nearby house at a fee. However due to the poor quality of the water they depend on sachet water as a principal source of drinking water (Household, 3- personal interview, February 19, 2016, Chemuana, Chorkor).*

From the interviews, it was noted that, most households depend on their neighbours in order to have access to water. In addition, since they do not have access to good quality water they are forced to depend on other means. Again even when water is available in their houses its accessibility depends on other social factors.

In summary, access and quality water still remains a critical problem within the communities that needs urgent attention from stakeholders to mitigate the outcome of environmental health challenges associated with water. Although the problem has improved in La and gotten worse in Chorkor over the years, the current situation in both communities still exposes residents to the dangers of environment related diseases since water scarcity and pollution, expose vulnerable households to cholera.

Sanitation related diseases such as diarrhoea is much dependent on behavioural practices of households therefore it is useful to monitor disposal practices of faecal matter and hand washing practices when possible (Shyamsundar, 2002). As shown in Appendix 7, open defecation and littering of polythene with faecal matter is very common within both communities. Again, communal toilets remains the principal source of toilet facilities within the communities as most households do not have access to toilets hence rely on those provided by government and private entities. These services are provided at a fee. In an interview with respondents from both communities, they attested to the fact that *"we depend on both private and public toilet facilities as a place of convenience and fees charged ranges from 30 to 50 pesewas for public and private toilets respectively"* (Household-personal

interview, February, 2016 La and Chorkor). It can be deduced that, since these services are provided at a cost, residents find other alternative means of convenience provided he or she cannot meet the required fees charged and during rush hours when there are queues to use the facilities. This leave most people defecating at unauthorised places especially along the beaches as captured in Plate 3.3.

Plate 3. 3 Open Defecation along the Beach in Chorkor

Source: Field Survey, 2016

Since most public toilets are sited in the midst of human dwellings it leaves some odour nuisance which has a direct effect on the health status of residents especially those close to these facilities. From the analysis, sanitation condition in both communities remains a serious problem as both La and Chorkor fall within the fourth and the fifth quintiles representing 80% and 91% respectively (refer to Table 3.2). Previous studies suggest that, sanitation in respect of access to toilet facilities remains a serious problem within the communities,

although, conditions in La have improved somewhat whiles those in Chorkor have gotten worse (see Table 3.3).

Table 3. 3 Quintile of Environmental Burden in La and Chorkor (2001, 2005 & 2016)

Indicators	**2001**		**2005**		**2016**	
	LA	Chorkor	La	Chorkor	La	Chorkor
A. Water	4	2	4	3	3	4
B. Sanitation	5	4	5	4	4	5
C. Pests	5	5	5	5	3	5
D. Sullage/Drainage	5	5	5	4	3	5
E. Food Contamination	5	2	5	4	3	5
F. Hygiene	4	3	4	4	4	5
G. Solid Waste	5	5	5	5	4	5
H. Housing Problems	4	3	5	4	4	5
I. Indoor/Outdoor Air Pollution	4	4	5	5	3	5
Quintile of Aggregated environmental burden	**5**	**4**	**5**	**4**	**3**	**5**

Source: Songsore et al. 2001; 2005; Field Survey, 2016

Due to the poor socio-environmental conditions within the two communities, the issue of pest it very severe hence help spread environmental diseases such as cholera within the community. The presence of houseflies, mice and cockroaches were found within the communities since there was evidence of indiscriminate dumping of garbage and wastes, drains filled with garbage, choked drains amongst others. Out of the maximum score of 24.6 on pest, La and Chorkor recorded 12.5 and 21.3 representing 51% and 87% respectively. These categorizes both communities into the third and fifth quintile respectively (refer to Table 3.2). It can also be said that on the issues of pest, the case of Chorkor has not seen any improvement (refer to Table 3.3).

According to Gretsch (2015), rapid urbanization adds up to the already existing pressure on water and sanitation. These are critical to the health status of communities in low-income countries. Drainage networks designed for storm water are commonly used for disposing waste. These at the long run pose health threats to residents. A research by Sasaki et al.

(2009) concluded that although increased precipitation is associated with the occurrence of cholera outbreaks, insufficient drainage networks statistically elevate the risk of cholera incidences. From the rapid assessment (see Appendix 7), there were pieces of evidence of drains with choked garbage, weeds and silts, pool of stagnant water in drains among other unsanitary conditions within the community (see Plate 3.4). These in general contribute to the poor sullage and drainage within La and Chorkor. Out of the 23.4 maximum score on sullage and drainage, La scored 13.2 against 20.3 at Chorkor representing 56% and 87% putting them into the third and fifth quintiles respectively (refer to Table 3.2). Comparing with previous studies there has been an improvement on sullage and drainage in La whiles the condition in Chorkor has deteriorated (see Table 3.3).

Plate 3. 4 Uncovered Choked Drains within the Communities

Source: Field Survey, 2016

Aside water, food is recognised as another vehicle of cholera transmission. Foods are likely to be contaminated with faecal matter through the hand during preparation or handling especially within an unhygienic environment (Rabbani & Greenough, 1999: 1). These practices make consumers vulnerable to cholera and diarrhoeal infections. There was

evidence of uncovered foods, food sold near drains, eating-places without running water, dusty eating areas among many others within both research communities. From the analysis (refer to Appendix 7), out of the 21 maximum score of 21.0 on food contamination, La scored 10.4 whiles Chorkor scored 16.9 representing 49% and 81% respectively. This categorised La and Chorkor in the third and fourth quintiles respectively (refer to Table 3.2). It can also be deduced that food contamination over the years has improved in La from the fifth quintile in 2001 and 2005 to the third quintile in 2016 whiles that of Chorkor has aggravated (see Table 3.3). According to Rabbani & Greenough (1999), to reduce the risk to food borne transmission of cholera, foods should be prepared, served and reheated before eating as well as handwashing with soap in safe water before eating and after defecation. Therefore, there is the need to improve the way food is being handled through education in both communities most especially in Chorkor to eliminate any possible risk of cholera infections.

According to Shyamsunder (2002), diarrhoeal diseases such a cholera are mostly dependent on behavioural practices of households. Hence, hygienic practices such as handwashing with soap should be a normal practice. Scheelbeek et al. (2009) also asserted that, in food preparation, hygiene is a risk factor to cholera. Therefore, it is important to focus on hygienic practices because without proper washing of hands with soap households are at risk to cholera infections. Results from the rapid assessment revealed that, poor hygiene persists as a challenge within the research communities. La and Chorkor scored 12.1 and 17.4 representing 62% and 89% respectively out of the 19.6 maximum score (refer to Table 3.2). Risk factors within this category include, unwashed hands in food preparation, unwashed dishes within households, inadequate public bathhouse facilities amidst others. Hence the need to intensify public education to improve hygienic conditions within the communities. However, compared with previous studies (Songsore et. al., 2001;2005), it can be seen that

hygiene conditions in La has not improved or worsened whiles that of Chorkor has gotten worse (refer to Table 3.3).

As stated earlier, proximity to and density of open refuse dumps plays a contributory role in cholera infection (Osei & Duker, 2008). Managing the quantum of waste in Accra has been very challenging for city authorities especially ensuring that wastes are collected for proper disposal. The Accra waste department is capable of collecting only 60% of the waste generated daily. The remaining 40% subsequently ends up in open space, surface drains and water bodies (Boadi & Kuitunen, 2002). The 2014 cholera outbreak, which claimed a number of lives, was largely blamed on inability of Metropolitan, Municipal and District Assemblies (MMDAs) to collect the generated waste within their jurisdiction. On solid waste, there was evidence of poor solid waste management within both study communities. These are mainly, mounds of uncollected garbage, indiscriminate dumping of waste etc. within the communities. Plate 3.5 is evidence of the current situation in Chorkor where solid wastes are dump along the shoreline. Indiscriminate dumping of wastes as well as other solid waste problems can be seen in Plate 3.6. In general, solid waste remains one of the major problems facing both communities. During the survey, two hotspots were identified as areas where wastes are accumulated without control. These were backyard dumping which comes as a result of the long distance of dumpsites, absence of skip containers or other socio-economic reasons. Again, sanitary landfill/waste dumpsites are left unattended to, which have turned into illegal dumpsites. As stated earlier most of the illegal dumpsites were found along the beaches as depicted in Plate 3.5 and 3.6. This makes residents especially those who live close to the beaches very vulnerable to infectious diseases. Results from the rapid assessment shows that, out of the 19.2 maximum score for solid waste, La and Chorkor scored 12.9 and 17.5 representing 67% and 91% respectively (refer to Table 3.2). Table 3.3 also shows that

there has not been improvement in solid waste management in Chorkor over the years as it remains in the fifth quintile.

Plate 3. 5 Uncollected Waste Dumpsite in Chorkor

Source Filed Survey. 2016

Plate 3. 6 Indiscriminate Dumping of Solid Waste and Children Scavenging on them in Chorkor

Source: Field Survey, 2016

Notwithstanding the above conditions, housing problems also contribute to the socio-environmental burden within the urban space of Accra. As most people, especially migrants, do not have comfortable and appropriate place of settlement they are compelled to live in

squatter and slum settlements. La and Chorkor cannot be left out of the conversation, as current conditions there exhibit over population as an effect of urban growth. Assessment for the rapid survey (Appendix 7) shows that, there was evidence of overcrowding and unplanned layout of houses amongst other inadequate and inappropriate housing conditions (see Plate 3.7). From the assessment, housing problems within La and Chorkor scored 8.53 and 11.45 out of the maximum score of 13.6 representing 63% and 84% respectively (see Table 3.2). Comparing with previous studies, it can be been seen that, housing problems in La have improved from the fourth and fifth quintiles in 2001 and 2005 to the third quintile in 2016 whiles that of Chorkor has worsened from the fourth quintile to the fifth quintile (refer to Table 3.3). Worsening housing conditions in Chorkor is not surprising due to the highly dense population and as such many people do not have a convenient place of residence but reside in illegal and substandard structures (see Plate 3.8).

Plate 3. 7 Unplanned Layout of Houses in Chorkor

Source: Field Survey, 2016

Plate 3. 8 Illegal Dump Site in Close Proximity to Houses in Chorkor

Source: Field Survey, 2016

From the above discussions, it is obvious that residents in the research areas of La and Chorkor are prone to both indoor and outdoor pollution due to the unsanitary conditions of the communities especially that of Chorkor. From the rapid assessment, there was evidence of households cooking with wood/charcoal in kitchens, use of mosquito coil as repellents, smoke pollution from corn mills/fish smoking/rubbish burning and odour from sanitary and solid waste facilities. Out of the 11.8 maximum score on indoor/outdoor pollution in the model, La and Chorkor scored 8.5 and 9.7 representing 42% and 82% respectively (refer Table 3.2). From Table 3.3, it can be seen that conditions in La has improved form the previous fifth quintile to the third quintile whiles conditions in Chorkor has deteriorated and shifted from the fourth to the fifth quintile.

Overall results from Table 3.2 indicate that, out of the maximum score of 200 as specified in the model, La and Chorkor scored 118 and 168 representing 59% and 84% respectively. This means the socio-environmental conditions in La is slightly better than Chorkor. Aggregate of the nine environmental burdens or risks put La and Chorkor in the third and fifth quintiles respectively. This indicates that, Chorkor is one of the most deprived communities in GAMA

hence most vulnerable to environmental health diseases. Based on various indicators, it can be said that sanitation in respect of toilet facility remains one of the most serious environmental burdens in La as it recorded a mean score of 24 out of the maximum score of 30 representing 80% and falls within the fourth quintile. However, almost all the environmental indicators in Chorkor had severe burdens on environmental health since they fell within the fourth and fifth quintiles (For details of the results see Appendix 7).

To show whether conditions in both areas have improved or gotten worse, previous environment risk profiles in 2001 and 2005 of the study areas (see Songsore et al., 2001; 2005) were compared to the field results from 2016 assessment (see Table 3.3). From Table 3.3, it can be seen that almost all the environmental problem areas in Chorkor have gotten worse as they fell within the fifth quintile. The aggregated environmental burden in Chorkor also fell within the fifth quintile. This increasing risk may be due to population growth and overcrowding amongst other things, hence there is excessive pressure on the limited services of the community. In La, conditions are said to have improved as almost all the indicators with the exception of hygiene fell to lower quintile values than previously. This improvement can be attributed to a number of factors. This includes creation of La Dade-Kotopon Municipal Assembly as an administrative area hence communities in La are better managed than in previous years when they were directly under the AMA. Even though poor socio-environmental condition is synonymous to indigenous low-income communities, socio-environmental conditions in Chorkor seems to have grown worse because of densification and overcrowding. The socio-environmental conditions in the research areas do not appear good which predisposes residents to diseases infections such as malaria, cholera amongst others. During the interview, officials from both communities noted that:

> *The communities record high number of cholera cases during outbreak and this is because of the indigenous nature of the community characterised by low education*

level, poor drainage and toilet facilities, open defecation, indiscriminate dumping of waste and other socioeconomic and environmental problems. Although work goes on daily and periodic basis, the situation remains the same without any significant changes and this is due to bad attitudes/behaviour of residents.

The Environmental Health Officer in the Ablekuma South Sub-metro further lamented that:

Ablekuma over the years records high rate of cholera cases within the Greater Accra Region and this is a worrying phenomenon to the Assembly especially during the raining season. He attributed the worrying situation aside the socioeconomic and environmental conditions to the presence of the sewage disposal site 'Lavender Hill' as one of the causative agents of the disease since liquid wastes are not treated before discharge into the sea. Again, the inefficiency of work by waste contractors has been a contributory factor towards cholera epidemics in the community sub metro.

The overall results from the rapid assessment was not surprising as the Assemblyman of Chorkor reaffirmed present socio-environmental conditions. He noted that, *"The socio environmental condition in the area is very bad due to the highly dense population. This has affected water supply and sanitation provision coupled with teenage pregnancy and other social vices" (Assemblyman –Personal Interview, Chorkor, 23/2/16).*

3.4 Spatio-temporal Analysis of Cholera Incidence

In assessing the distribution of cholera cases within the Accra Metropolitan Assembly over the past 5 years. It can be seen that the Ablekuma Sub Metro recorded the highest cases in the years 2011 and 2012, 2013 with 1126, 1253 and 8 cases respectively whiles Okaikoi and the Osu Clottey Sub Metro also recorded the highest in the 2014 and 2015 with 3678 and 87 cases respectively (refer to Table 3.4). Within the Metropolis, the year 2013 recorded the least number of cholera cases, this sharply rose in the subsequent year in 2014 and fell back

in 2015. This sharp rise was as a result of several factors which included limited government funding to Assemblies, stakeholders apathy, environmental factors and lack political will to enforce bye laws. As shown in Table 3.4, males were more affected with cholera than females within the various Sub Metros in the AMA. This could be explained by the fact that most of the male population eat outside home hence are more exposed to the environmental contaminants of cholera.

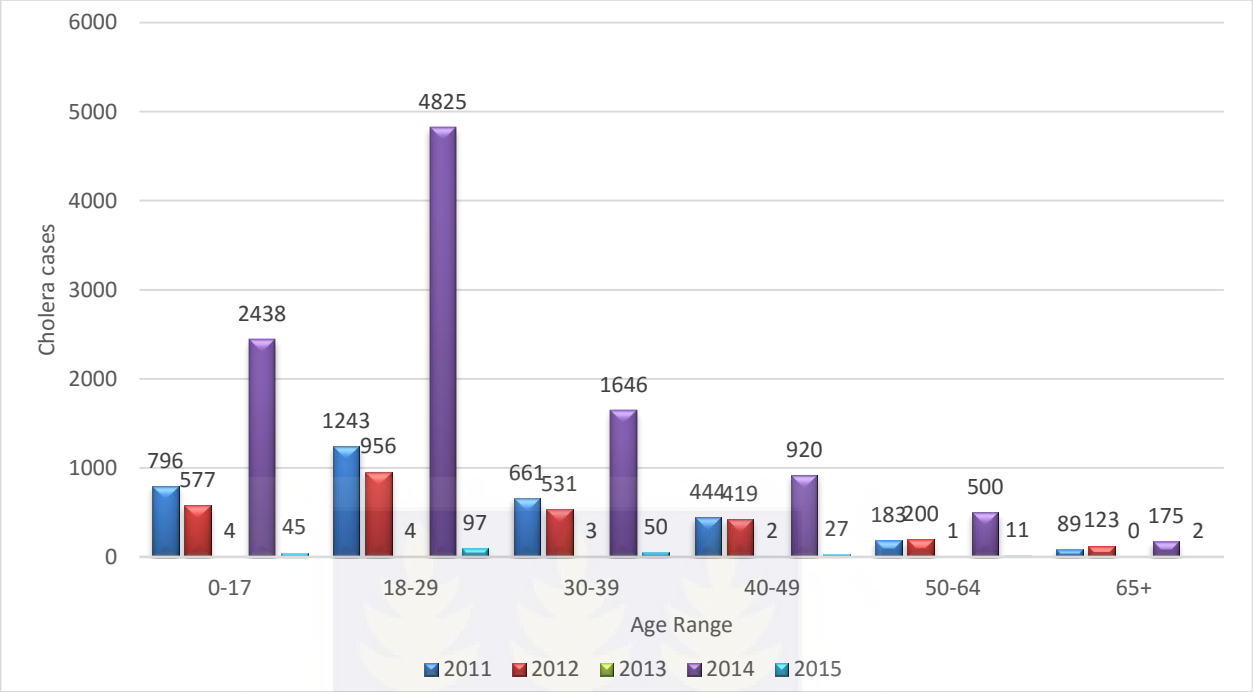
Table 3. 4 Distribution of Cholera Cases by Gender within the Accra Metropolitan Assembly

Sub Metro	2011			2012			2013			2014			2015		
	Male	Female	Total Cases	Male	Female	Total Cases	Male	Female	Total Cases	Male	Female	Total Cases	Male	Female	Total Cases
Ablekuma	592	534	1,126	598	655	1,253	3	5	8	2,011	1,443	3,454	41	36	77
Chorkor*	14	19	33	41	28	69	2	1	3	81	65	146	13	13	26
Ashiedu Keteke	298	156	454	221	185	406		1	1	480	436	916	16	10	26
Ayawaso	145	89	234	74	55	129	1	1	2	518	306	824	17	11	28
Okaikoi	542	437	979	545	424	969	2	0	2	2,083	1,595	3,678	9	5	14
Osu Clottey	351	272	623	25	24	49		1	1	941	691	1,632	49	38	87
Total Cases	**1,928**	**1,488**	**3,416**	**1,463**	**1,343**	**2,806**	**6**	**8**	**14**	**6,033**	**4,471**	**10,504**	**132**	**100**	**232**

*Chorkor is within the Ablekuma Sub Metro

Source: GARHD, 2015

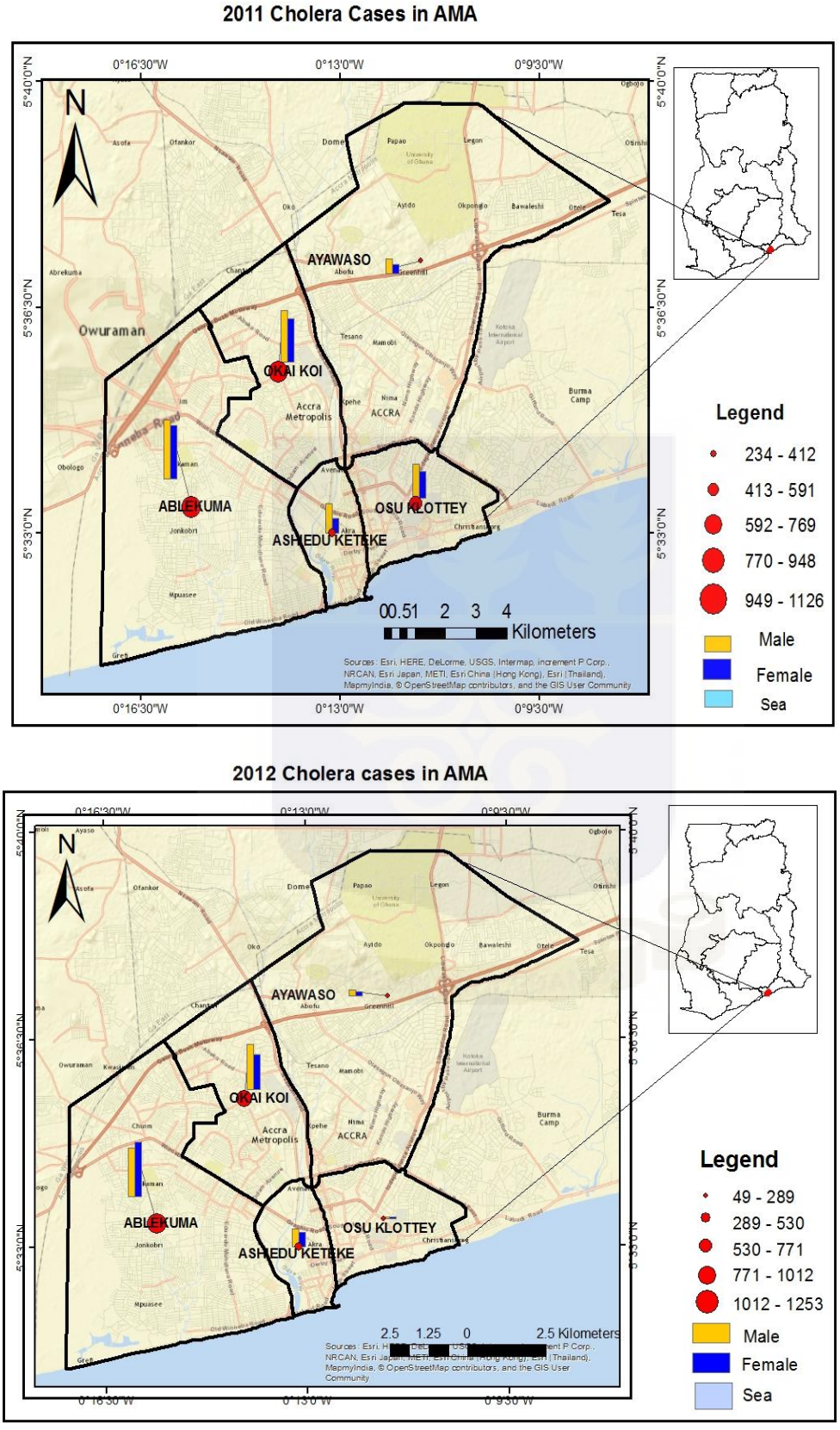
Figure 3. 1 Age Distribution of Cholera Incidence in the Accra Metropolitan Assembly (AMA)



Source: GARHD, 2015

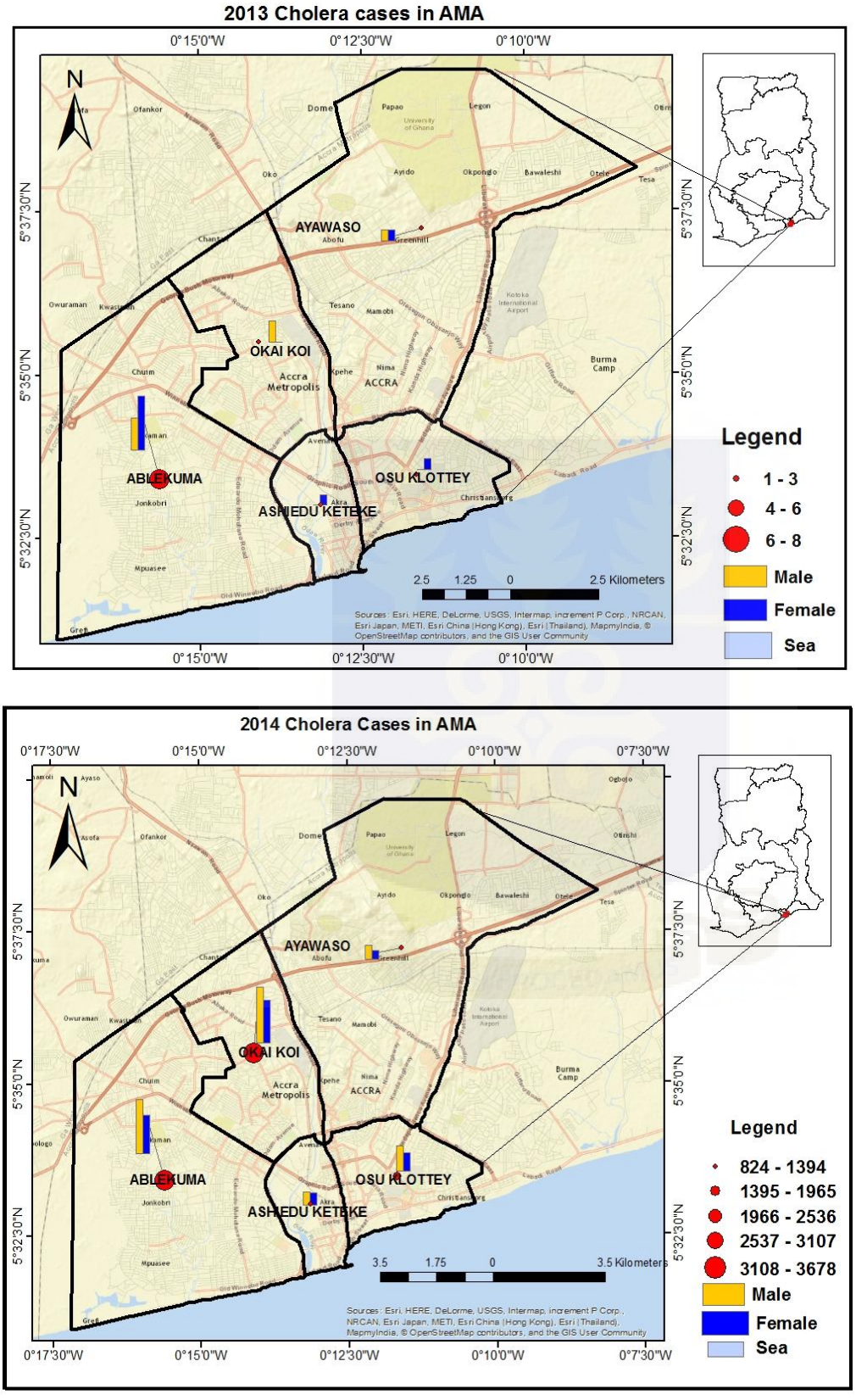
On age distribution of cholera incidences within the Accra Metropolitan Assembly, most people affected by cholera from 2011 and 2015 were within the age range of 18 to 29 years followed by age 17 years and below. This could be explained by the fact that, most people at these ages are unmarried hence depends on street foods. Age 65 and above had the least recorded cases of cholera infections since they form the least population (refer to Figure 3.1). As shown in Figure 3.1, the active working population within the age range of 18 to 49 years are mostly infected with cholera. In general, these figures support the evidence that the AMA has a youthful population. The maps below (see to Figure 3.2, 3.3, 3.4) shows a spatio temporal variation of cholera incidence within the Accra Metropolitan Area as represented and explained in Table 3.4.

Figure 3. 2 Distribution of Cholera Cases within the Accra Metropolitan Assembly (2011 and 2012)



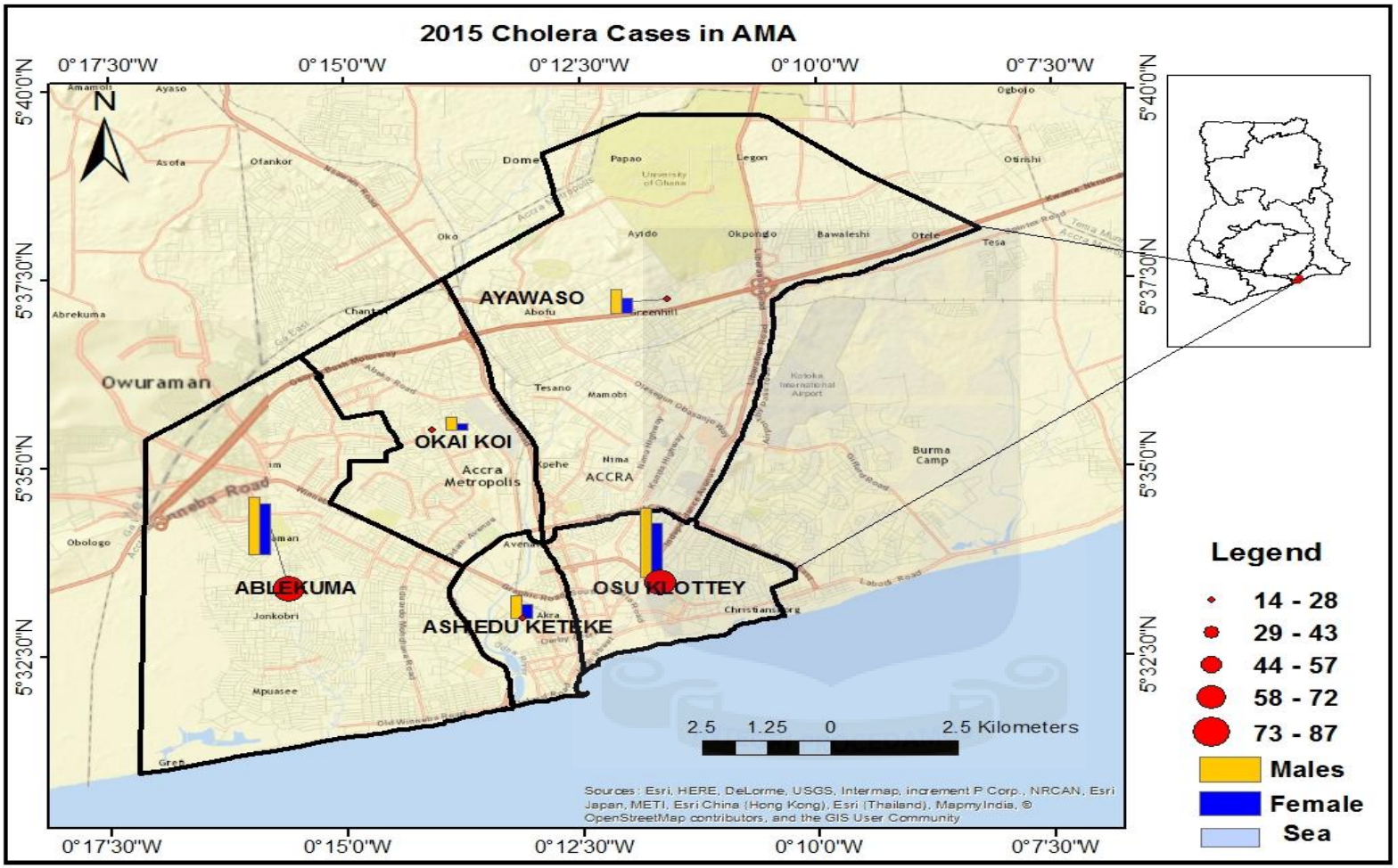
Source: Author's Own Construct 2016

Figure 3. 3 Distribution of Cholera Cases within the Accra Metropolitan Assembly (2013 and 2014)



Source: Author's Own Construct 2016

Figure 3. 4 Distribution of Cholera Cases within the Accra Metropolitan Assembly (2015)



Source: Author's Own Construct 2016

As depicted in Table 3.5, cholera cases in La in 2012 increased from 34 in the previous year to 82 cases whiles that of Chorkor also increased from 33 to 69 cases. However, there was a sharp decline of cases in 2013 to 3 and 5 cases in Chorkor and La respectively. Again in 2014, there was high reported cholera cases in both communities as compared to the previous years and this high rise of cases could similarly be due to limited government funding to the assemblies, stakeholders apathy, high rains and flood, poor sanitation and lack of political will to enforce bye laws. Based on the secondary information, cholera cases have been predominantly high in La than Chorkor (see Table 3.5). However, in 2015, La experienced a sharp decline of cholera cases and this could be explained by the improvement in socio-environmental conditions in the community as compared to Chorkor as depicted in Table 3.3. This support the results from the rapid assessment which suggest that, the socio-environmental conditions in Chorkor have worsened over the years. Weighting cholera cases in the two communities by population indicate that cholera cases in Chorkor with the exception of year 2014 have been higher than La over the study period, since La has a greater population (refer to Table 1.1). Table 3.6 also shows age distribution of cholera reported cases within La and Chorkor. From this, it is noted that for the past five years cholera affect the youthful population hence cholera incidence decreases as age grows. Figure 3.5 shows a spatio-temporal variation of cholera cases within La and Chorkor over the last five years.

Table 3. 5 Distribution of Cholera Cases by Gender in La and Chorkor

Community	2011			2012			2013			2014			2015		
	Male	Female	Total Cases	Male	Female	Total cases	Male	Female	Total cases	Male	Female	Total cases	Male	Female	Total cases
Chorkor	14	19	33	41	28	69	2	1	3	81	65	146	13	13	26
La	14	20	34	52	30	82	2	3	5	653	428	1081	3	1	4

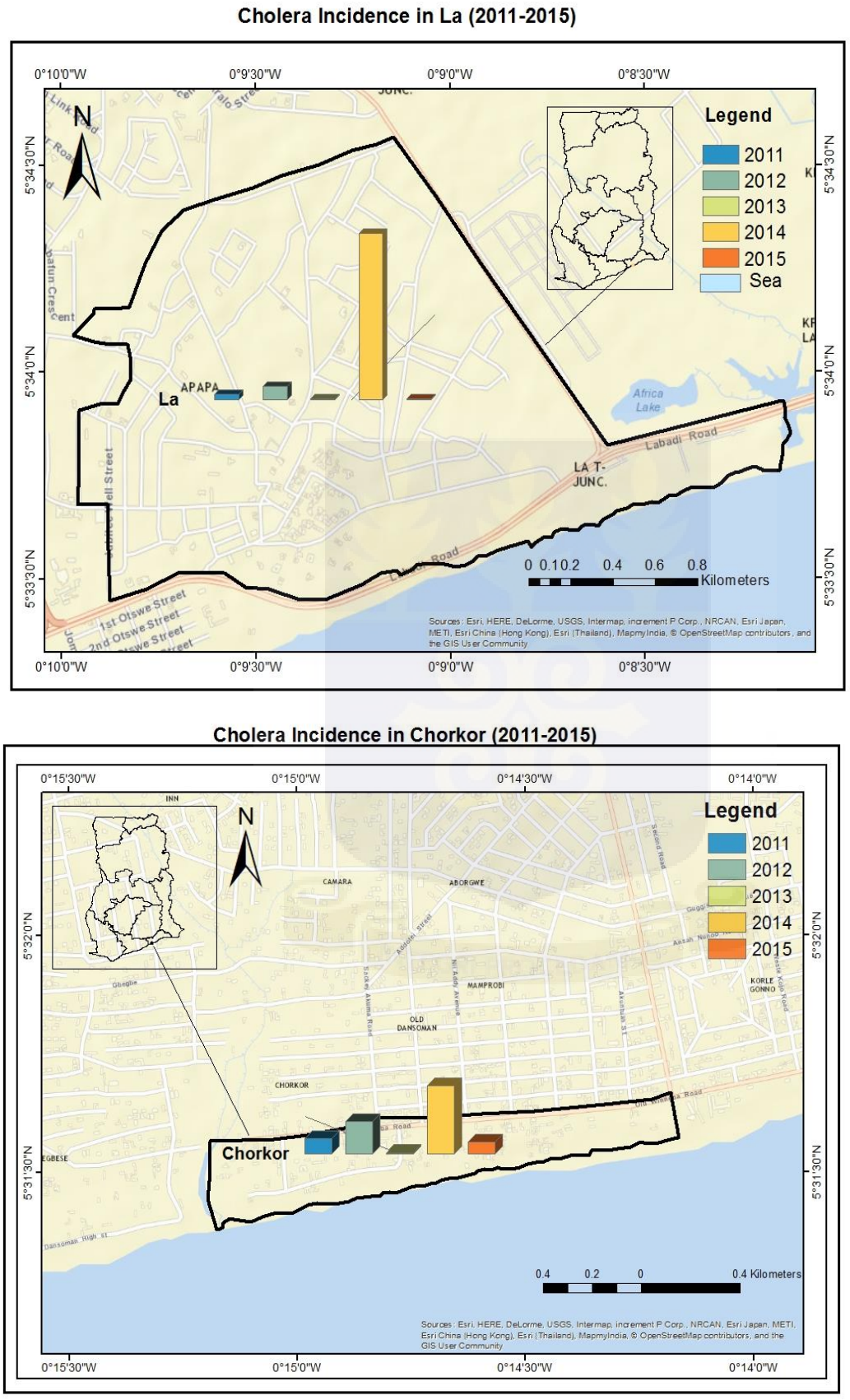
Source: GARHD, 2015; LGH, 2016

Table 3. 6 Distribution of Cholera Cases by Age in La and Chorkor

Community	Years	Age range					
		0-17	18-29	30-39	40-49	50-64	65+
	2011						
Chorkor		13	10	4	3	1	2
La		9	15	5	2	3	
	2012						
Chorkor		29	17	11	9	3	
La		15	33	16	14	2	2
	2013						
Chorkor			2	1			
La		2	2	1			
	2014						
Chorkor		19	63	27	16	14	7
La		217	472	254	84	45	9
	2015						
Chorkor		4	10	6	5	1	
La			4				

Source: GARHD, 2015; LGH, 2016

Figure 3. 5 Distribution of Cholera Cases in La and Chorkor (2011- 2015)



Source: Author's Own Construct 2016

3.5 Predicting Cholera Prevalence: A Chi-square and Binary Logistic Regression Model

A chi-square and binary logistics regression was conducted to find out the relationship between demographic characteristics and cholera prevalence. According to Shields & Twycross (2003), unlike incidence that measures the number of people becoming ill during a given period in a specified population or community, prevalence measures the number of people who are ill at a point in time. In this analysis, prevalence was used as whether a household has been a victim to cholera in the last 5 years. A binary logistics regression was used because the dependent variable (cholera prevalence) is a categorical variable and has two categories whiles the independent variables thus, demographic characteristics were categorical.

On cholera infection within the study areas, 18% and 27% of the respondents in La and Chorkor respectively said they or their household have been affected with cholera in the last 5 years (see Table 3.7). The Chi-square test revealed that there is no significant relationship (*p*=.236) between cholera prevalence and community. This may be because both communities exhibit some similarities in terms of demographic such as ethnic, household size etc. and socio-environmental characteristics. Hence, the alternate hypothesis was rejected. Almost all respondents who noted that their household have been affected with cholera emphasized that they contracted it through food. This scenario suggests why there is a close link between cholera infection and food contamination.

Table 3. 7 Cholera Prevalence by Community

Community		Have you or any of your household been affected by cholera in the last 5 years [n (%)]		Chi-square Value	Significance p=Value
		Yes	No		
La	**(n=83)**	15 (18.1)	68 (81.9)	1.671	.236
Chorkor	**(n=67)**	18 (26.9)	49 (73.1)		

Source: Field Survey, 2016

A cross tabulation analysis between cholera prevalence and gender revealed that most of the cholera infection within the communities were females in both communities. With this 13 and 16 of the female respondents in La and Chorkor respectively noted that they or their household have been affected with cholera in the last 5 years. This represent 87% and 89% of the people who said they or their household have been affected with cholera in both La and Chorkor respectively (see Table 3.8). This revelation shows a sharp contrast with the previous results derived from secondary sources (cholera incidence) (refer to Table 3.5) as it suggested males were most affected than females in the two communities. This could be a result of the fact that the research targeted principal homemakers and were mostly females hence the likelihood of females responding more than males.

Table 3. 8 Cross Tabulation between Cholera Prevalence, Gender and Age Distribution

Community		Have you or any of your family been affected with cholera in the last 5 years [n (%)]		Chi-square value	Significance *p*=value
		Yes	No		
La	**Gender**				
	Male	2 (10.5%)	17 (89.5%)	0.948	.502
	Female	13 (20.3%)	51 (79.7%)		
Chorkor	Male	2 (12.5%)	14 (87.5%)	2.208	.200
	Female	16 (31.4%)	35 (68.6%)		
La	**Age Range**				
	18-29	3 (21.4%)	11 (78.6%)	1.384	.501
	30-59	9 (15.3%)	50 (84.7%)		
	60+	3 (30.0%)	7 (70.0%)		
Chorkor	18-29	10 (47.6%)	11 (52.4%)	8.164	.013*
	30-59	6 (14.6%)	35 (85.4%)		
	60 +	2 (40.0%)	3 (60.0%)		

La (n = 83) Chorkor (n =67) *p value is significant if $p<0.05$

Source: Field Survey, 2016

With respect to cholera prevalence and age, 9 respondents between the age of 30 and 59 years in La noted that they or their household have been affected with cholera in the last 5 years. This represented 60% of the respondents in all age ranges who said they or their

household have been affected with cholera in the last 5 years (see Table 3.8). In Chorkor, most of the cholera infection were within age 18 to 29 years. Here, 10 respondents representing 56% of the respondents in all the age ranges in Chorkor said they or their household have been affected with cholera in the last 5 years. From Table 3.8, there is a statistical significant relationship (p = .013) between cholera prevalence and age range distribution in Chorkor. This buttresses the earlier results of cholera incidence that, cholera mostly affected the youth within the community.

In analysing the relationship between demographic characteristics (ethnic group, educational level, household size and income) and cholera prevalence within the communities, the Exponentiated Beta (Exp (B)) was used because it was comparing the reference categories to the other categories. The logistic model was statistically significant (p = .000) in both communities. This means there was a significant relationship between demographic characteristics and cholera prevalence. The model explained 18.5% and 26.6% (Nagelkerke R^2) of the variances in cholera incidences in La and Chorkor respectively. From Table 3.9, there was a significant relationship between ethnic group and cholera prevalence in Chorkor. Meaning when you compare Ga/Ga-Adangbe to the reference category (other ethnic groups), the Ga/Ga-Adangbe group has less chance of saying that their household have not been affected by cholera in the last 5 years. In other words, a unit increase of other ethnic groups leads to a .191 decrease in a chance of a Ga/Ga-Adangbe saying that his household has not been affected by cholera in the last 5 years. This might be as a result of the fact that, the Ga/Ga-Adangbe group were the highest respondents since the research was conducted in an indigenous Ga community hence the highest responds in cholera victims as well as other biases. With the other demographic characteristics, there were no significant relationship with cholera prevalence.

Table 3. 9 Binary Logistic Model of Demographic Characteristics and Cholera Prevalence

Demographic Characteristics		Cholera Prevalence in the Community					
		La			Chorkor		
		B	Sig.	Exp (B)	B	Sig.	Exp (B)
Ethnic Group	Ga/Ga-Adangbe	-.643	.366	.526	-1.658	.053*	.191
Educational Level			.471			.464	
	Non-Formal (1)	1.459	.239	4.301	.206	.824	1.229
	Primary (2)	.543	.436	1.721	-.730	.358	.482
Household Size			.184			.146	
	1-5 (1)	.355	.623	1.426	-2.164	.057	.115
	6-10 (2)	2.185	.069	8.895	-2.182	.072	.113
Income Range (GH cedis)			.868			.989	
	0-399 (1)	-19.93	.999	.000	-20.562	.999	.000
	400-799 (2)	-20.309	.999	.000	-20.469	.999	.000

La (n = 83) Chorkor (n =67
*p value is significant if p<0.05
Source: Field Survey, 2016

3.6 Summary

This chapter examined the social, economic and environmental conditions that predispose residents to the cholera infections. Even though there are similarities in social-environmental condition in terms of population, housing and family systems, social provisions etc. differences between them are influenced by the socio-economic structure of the communities. From the rapid assessment, the socio-environmental conditions in La was better than Chorkor and comparison with previous studies (see Songsore et al., 2001; 2005) also indicated that conditions in La have gotten better whiles that of Chorkor have worsened. Data on cholera incidence within the AMA also revealed that, the Ablekuma Sub Metro recorded the highest cases of cholera reported cases from 2011 to 2013 whiles Okaikoi and Osu Clottey had the highest cases in 2014 and 2015 respectively. Nevertheless, most of these cases were predominated by males. According to the secondary data, cholera mostly affected the young and economic active age from age 49 and below. However, ages of 18 to 29 formed

the highest age group with the most reported cases across the five years of study. There was similar results in comparing La and Chorkor where cholera affected the youthful population. On cholera prevalence, there was evidence of cholera infection in the two research communities as some respondents stated that their household has been affected with cholera in the last 5 years and this was mainly transmitted through food. There was a significant relationship between cholera prevalence and age range in Chorkor. That is, cholera was prevalent within the age of 18 to 29 years. Cholera cases in La over the years have been higher than that of Chorkor, however 2014 recorded lower cases than Chorkor. Comparing cholera reported cases in terms of population in the two communities it could be said that cholera cases in Chorkor is higher than La (see Table 3.5). The maps also showed an inter and intra community variation of cholera cases over the last 5 years (refer to Figure 3.5).

CHAPTER FOUR

PREPAREDNESS AND RESPONSE OF EMERGENCY SERVICES DURING CHOLERA OUTBREAK

4.1 Introduction

This chapter discusses the main subject of the research thus, preparedness and response of emergency services during cholera outbreak. To arrive at this objective, the chapter touches on three main sections. These include; preparedness and response at the household level; the community level; and the local government level. Each section examines the role and responsibility of stakeholders in preparedness as well as emergency services during cholera outbreak. Here, the major actors apart from the household respondents were the Assembly members, officials from NADMO, and officials from Environmental Health and Sanitation Departments.

4.2 Household Preparedness and Response of Emergency Services

The purpose of disaster preparedness and response helps stakeholders to respond promptly in disaster situations. Preparedness and response measures help assess people's vulnerability and resilience to combat the occurrences of disasters (see Oteng-Ababio, 2013).

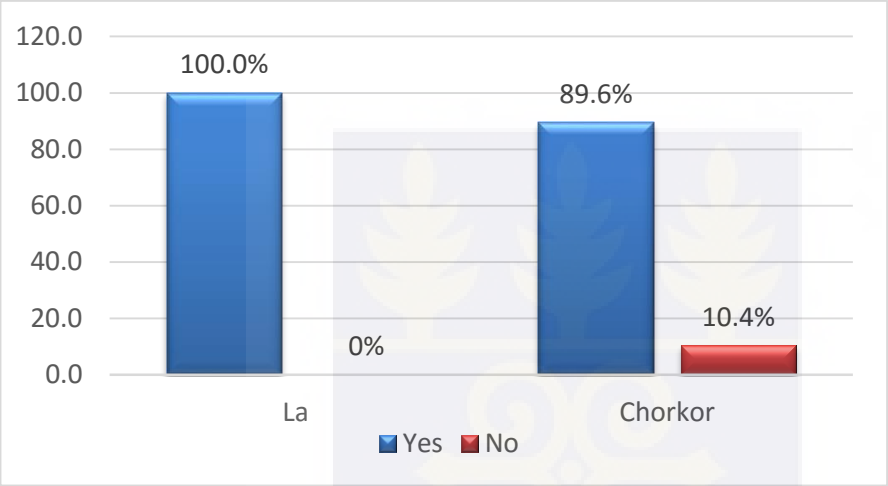
4.2.1 Preparedness

4.2.1.1 Knowledge/Experience on Cholera

From Figure 4.1, it can be interpreted that cholera in nothing new to both communities as 100% and 90% of the respondents in La and Chorkor said that they have heard of the disease. This means cholera is nothing new to the residents in the community. Further interrogations revealed that knowledge and information about cholera and its prevention were mostly heard through electronic media such as TV or radio or both devices. A very few people also said

they heard of the disease through local announcement. On the root causes of cholera, majority of respondents who said there have heard of the disease also had fair idea of how one can contract cholera. The means of contracting cholera according to the respondents were mostly through drinking and eating of contaminated water and food respectively while others asserted that it is through filth and unhygienic practises.

Figure 4. 1 Knowledge about Cholera

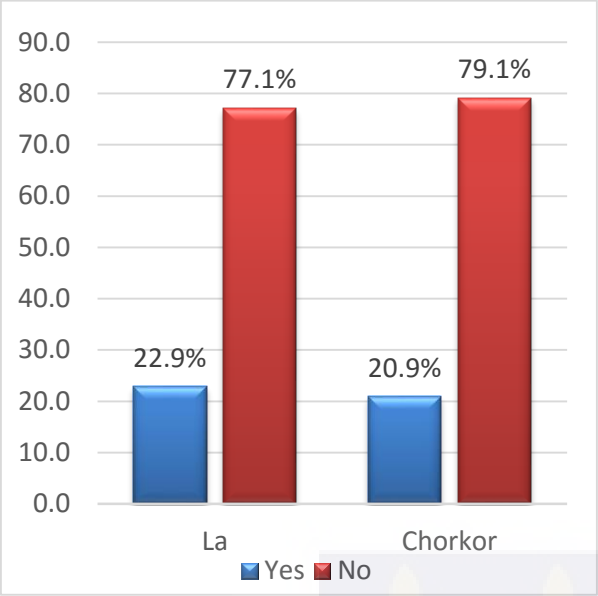


Source: Field Survey, 2016

4.2.1.2 Household Capacity Requirements

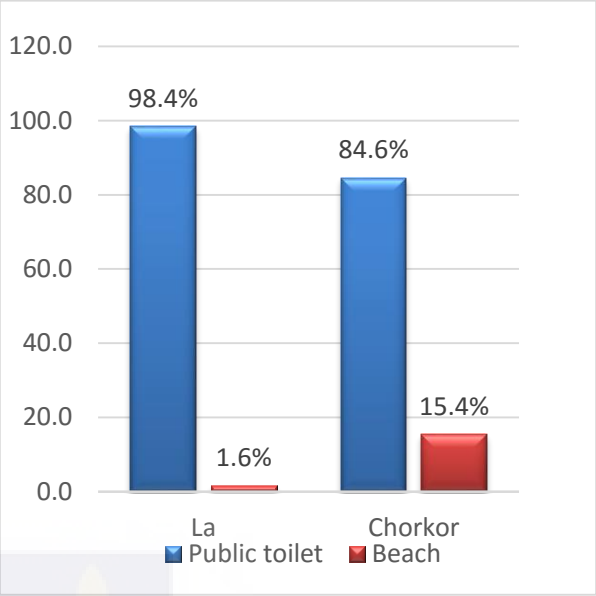
Most households are vulnerable to cholera infection due to inadequate basic household amenities such as water and toilet facilities. Results from Figure 4.2 suggest that 77% and 79% of the respondents in La and Chorkor respectively have no access to toilet facility in their houses. Hence, they depend on other means such as public toilets and open defecation (Figure 4.3). As represented in Figure 4.3 out of the respondents who said they do not have toilet facility in their homes, majority of them representing 98% and 85% in La and Chorkor respectively said they rely on the public toilets as a place of convenience whiles the others said they defecate openly along the beaches.

Figure 4. 2 Toilet Facility in Houses



Source: Field Survey, 2016

Figure 4. 3 Place of Convenience



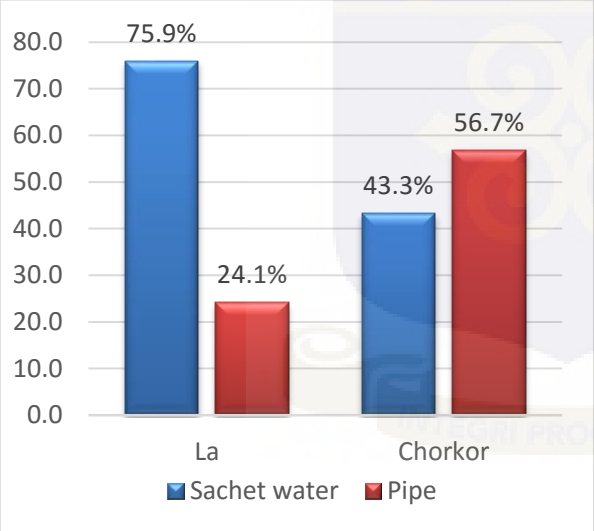
Source: Field Survey, 2016

On principal source of drinking water among households, 76% of the respondents in La said they depend on sachet water whiles 57% of the respondents also depend on pipe borne water as their principal source of drinking water in Chorkor (refer to Figure 4.4). This inverse relationship between both communities may be as a result of economic differences where most people in Chorkor cannot afford the use of sachet water because of economic reasons hence they depend on pipe water supplied by Government. However, according to Addo et al. (2009), one of the main reasons why people have switched to the use of sachet water as a source of drinking water is to supplement their water use. Even though the introduction of sachet water was to provide consumers safe, hygienic and affordable source of drinking water, over the years it has been known to be a route source of diarrhoeal infections and this is due to inadequate treatment, improper filtering and post production contamination. According to Stoler (2014), there is a substantial progress in sachet water regulation and control which has improved water quality in low-income urban communities. This maybe the reason why most households now prefer the use of sachet water as their principal source

of drinking water. Therefore, law enforcement that govern their operation and education of consumers must be strictly adhered to in order to reduce cholera epidemics and other disease infections in general.

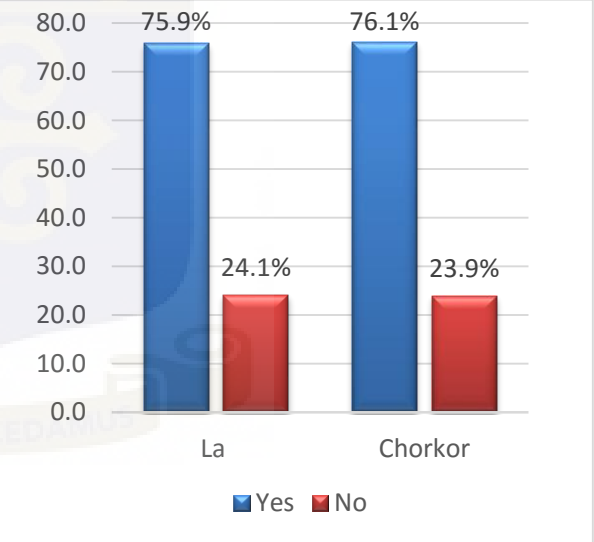
With food safety and consumption, 76% of the respondents in both communities said they consume roadside foods everyday, which in a way is considered less hygienic as compared to homemade foods (see Figure 4.5). As households frequently buy roadside food, it exposes them to cholera infections since most of these foods are sold cold and are contaminated by unclean hands whilst serving as well as dust particles settling on foods that are not properly covered.

Figure 4. 4 Source of Drinking Water



Source: Field Survey, 2016

Figure 4. 5 Consumption of Roadside Foods



Source: Field Survey, 2016

A cross tabulation between demographic characteristics (education, household size and income) and cholera preparedness (household toilet and consumption of roadside food) indicate some level of relationship among the variables in La. From Table 4.1, there is a significant relationship between education and provision of household toilet facility, income and household toilet facility, and household size and consumption of roadside food. Most

households with lower level of education do not have access to toilet facility in the house. Again, an individual's income in a particular household influences his/her access to toilet facility. Thus, the higher his/her income there is the possibility that he/she has access to toilet facility at home. As most residents of La are low-income earners this analysis supports the view that public toilets are one of the alternatives to open defecation for a significant number of people in low income urban communities where there are issues of space and unaffordability of private sanitation facilities (Peprah et al, 2015). Lastly, with household size, the larger the size of a particular household there is the possibility that they often consume foods outside home hence are exposed to cholera infections.

Table 4.1 Cross Tabulation between Demographic Characteristics and Preparedness

Community	Demographic characteristics	Do you have toilet facility in your house? N (%)			Do your household often buy roadside food? N (%)		
		Yes	No	*P*-value	Yes	No	*P*-value
La	**Education**			.028*			.482
	No Formal Education	3 (30.0)	7 (70.0)		9 (90)	1 (10)	
	Primary/Junior High	7 (14.3)	42 (85.7)		38 (77.6)	11 (22.4)	
	Senior High/Voc./Tech.	6 (30.0)	14 (70.0)		13 (65.0)	7 (35.0)	
	Tertiary	3 (22.9)	1 (25.0)		3 (75.0)	1 (25.0)	
	Household Size			.410			.000*
	1-5	8 (18.6)	35 (81.4)		38 (88.4)	5 (11.6)	
	6-10	7 (33.3)	14 (66.7)		9 (42.9)	12 (57.1)	
	11 and Above	4 (21.1)	15 (78.9)		16 (84.2)	3 (15.8)	
	Income Range			.020*			.582
	0-339	7 (13.5)	45 (86.5)		41 (78.8)	11 (21.2)	
	400-799	8 (34.8)	15 (65.2)		17 (73.9)	6 (26.1)	
	800 and Above	4 (50.0)	4 (50.0)		5 (62.5)	3 (37.5)	
Chorkor	**Education**			.907			.104
	No Formal Education	4 (26.9)	11 (73.3)		14 (93.3)	1 (6.7)	
	Primary/Junior High	6 (23.1)	27 (81.8)		25 (75.8)	8 (24.2)	
	Senior High/Voc./Tech.	3 (23.1)	10 (76.9)		7 (53.8)	6 (46.2)	
	Tertiary	1 (16.7)	5 (83.3)		5 (83.3)	1 (16.7)	
	Household Size			.894			.086
	1-5	7 (20.0)	28 (80.0)		28 (80.0)	7 (20.0)	
	6-10	4 (20.0)	12 (75.0)		14 (87.5)	2 (12.5)	
	11 and Above	3 (18.8)	13 (81.2)		9 (56.2)	7 (43.8)	
	Income Range			.174			.199
	0-339	4 (11.8)	30 (88.2)		27 (79.4)	7 (20.6)	
	400-799	9 (30.0)	21 (70.0)		23 (76.7)	7 (23.3)	
	800 and Above	1 (33.3)	2 (66.7)		1 (33.3)	2 (66.7)	

*p value is significant if p<0.05

Source: Field Survey, 2016

4.2.1.3 Education, Training and Community Services

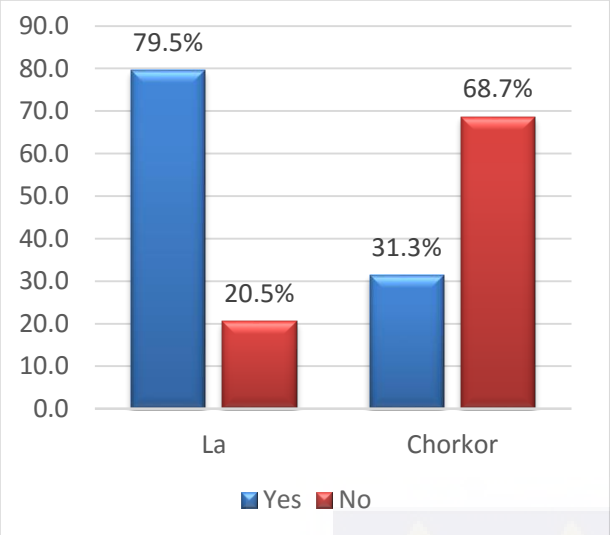
There is a relationship between education and health (see Ross & Wu, 1995: Cutler & Lleras-Muney, 2006). Educational attainment is a well-established social determinant of health (Cohen & Syme, 2013). As already established, education is an important factor to disease prevention and to have active representative plans on cholera preparedness the issue of education on personal hygiene is key at the household and the community levels. It is therefore always advisable for households to educate themselves in order to be prepared and prevent cholera and other diseases.

Asked whether there is some form of education or training on personal hygiene at the household and community level, 80% of the respondents in La said such mechanism exist whiles only 31% confirmed that it exist in Chorkor (see Figure 4.6). This may be due to the educational differences between the two communities per the response on education above as well as other social differences. The response was not surprising since during the interview with the Environmental Health Officer of LADMA, he indicated that:

> *In order to mitigate last year epidemic, their outfit worked closely with community leaders, families and clan heads who made sure they advise and educate their members on the need of personal hygiene and also to abide by the laws on sanitation." (Institutional Interview, La).*

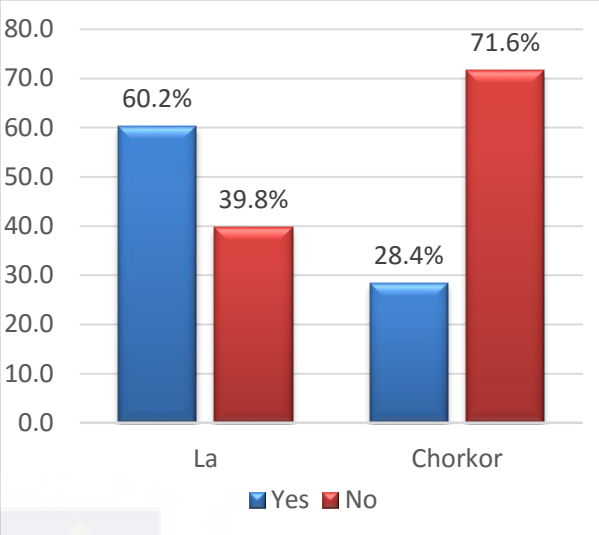
This practice is an important contributory factor towards cholera preparedness in La, due to the indigenous nature of the community.

Figure 4. 6 Education on Personal Hygiene



Source: Field Survey, 2016

Figure 4. 7 Early Warning on Cholera



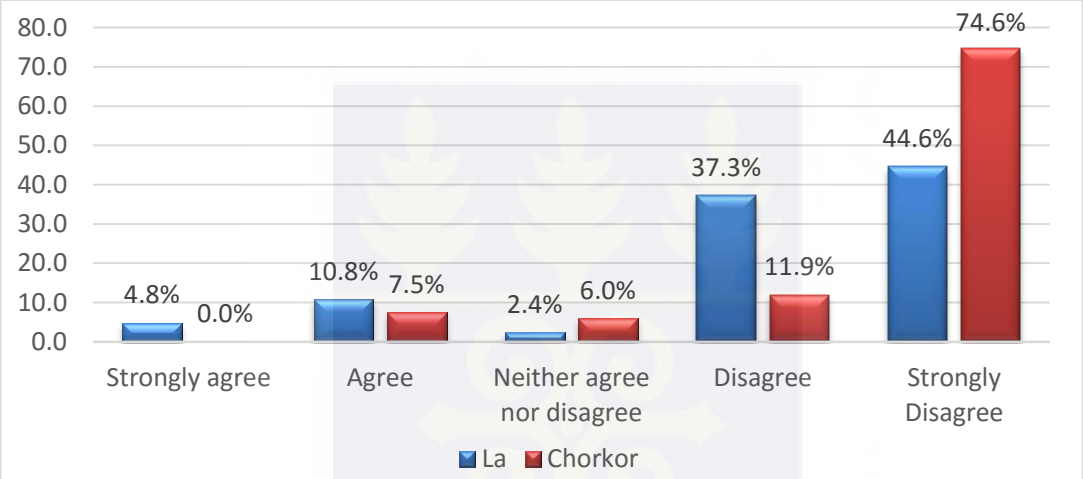
Source: Field Survey, 2016

Since cholera epidemics are mostly associated with, climatic factors (see de Magny et al., 2008) early warning is a key measure to prepare and respond to all emergencies. This measure according to literature must be properly adhered to in order to prevent and mitigate cholera epidemics. From Figure 4.7, 60% and 28% of the respondents said there was periodic warning on cholera prevention in La and Chorkor respectively. Early warning, per further interrogation are done before and during the raining season.

To further the discussions on the role of key stakeholders on education of cholera prevention, respondents were asked if NADMO and the Public Health Department embark on such programmes. Results from Figure 4.8, shows that NADMO does not educate community members on cholera prevention in both communities. This represents 45% and 75% in La and Chorkor respectively as they strongly agreed to that effect. Only 11% and 8% of the respondents in La and Chorkor respectively agreed that NADMO educate them on cholera preventive measures. With the Department of Public Health, 17% and 3% strongly agreed whiles 41% and 22% also agreed that the department educate them on cholera preventive

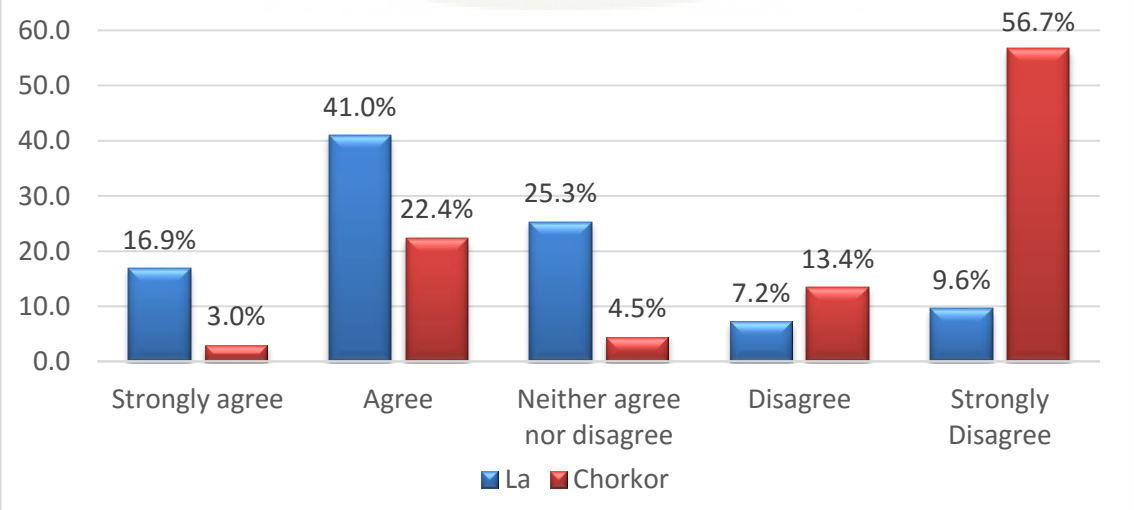
measures in both La and Chorkor respectively. However, about 10% and 57% strongly disagreed to that assertion (refer to Figure 4.9). From the findings, it shows that the Public Health Departments of the respective assemblies carry most of the education on cholera prevention in the communities rather than NADMO. On the other hand, it can be interpreted that cholera education is generally low, as majority of the respondents seem to know very little about such development.

Figure 4. 8 Education by NADMO



Source: Field Survey, 2016

Figure 4. 9 Education by Public Health

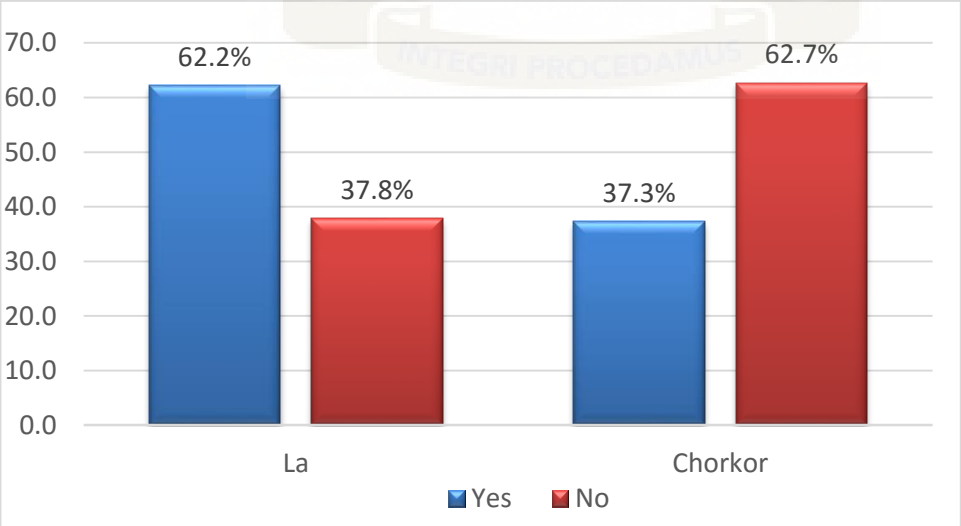


Source: Field Survey, 2016

In response to the 2014 cholera outbreak in Ghana, the Ministry of Local Government of Ghana declared a National Sanitation Day on November 1st, 2014. The main aim of this directive was to address the country's poor sanitation and its related health implications. However, it is unclear if Ghana's National Sanitation Day has legal basis (Fordjour, 2015). This problem leaves people in a dilemma whether or not it is compulsory to observe that day as such and if there are sanctions when individuals go astray.

On the issue of communal services within the community, 62% of the respondents said they participate in community clean up exercises in La whiles 37% of the respondents acknowledged same in Chorkor (see Figure 4.10). For those who indicated non-compliance argued that time for such activities were not favourable due to economic and social reasons. As suggested by some residents from both communities, *Saturdays are among their busy schedules during which they go to the market to sell hence using that day for clean-up services will affect them and their families. They further added that such activity was a matter of choice since they have never been sanctioned for not taking part.*

Figure 4. 10 Community Participation in Clean-up Activities

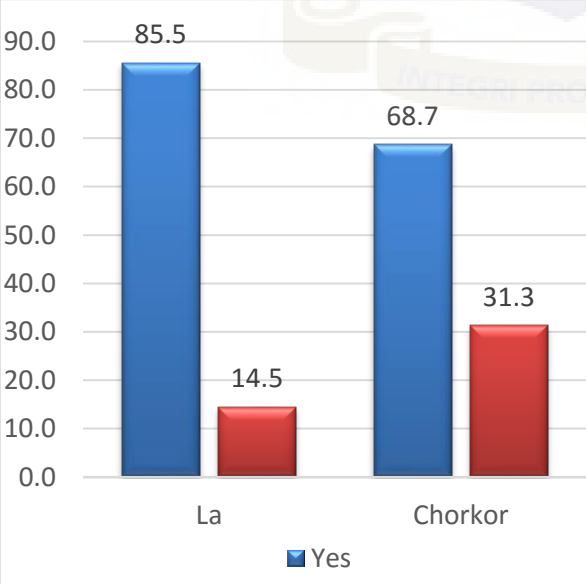


Source: Field Survey, 2016

4.2.2 Response and Recovery

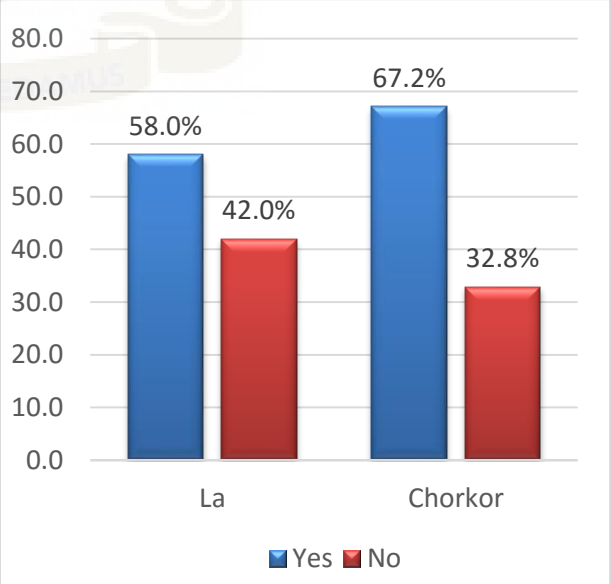
From Figure 4.11, 86% and 69% of the respondents in La and Chorkor respectively said they are duly informed when there is a cholera outbreak and this is mostly through the radio, television and public announcement by the information service departments of the Municipal and Metropolitan Assemblies. Asked whether respondents have idea on immediate remedies or intervention when one shows symptoms of cholera, respondents from both communities seems to have a fair idea. Such responses included, rushing patients to hospital, giving patient Oral Rehydration Solution (ORS) as well as other local measure such as giving patients coconut water, warm water with a pinch of salt amongst others. Again, the respondents further said the Public Health Department mostly comes around during an outbreak. Others discounted it that nothing of that sort was done in both communities. From this, it is noted that in order to strengthen cholera preventive measures, all stakeholders responsible for educational campaigns as well as response activities must be proactive to help mitigate outbreaks.

Figure 4. 11 Information during Outbreak



Source: Field Survey, 2016

Figure 4. 12 NHIS to Access Health Care



Source: Field Survey, 2016

In the midst of high cost of health care, the National Health Insurance was introduced in the year 2001 to replace out-of-pocket fees (Agyepong & Adjei, 2008). Over the years, this has served as a viable alternative to access health care. On the use of the National Health Insurance, 58% against 67% of the respondents in La and Chorkor respectively said they have registered for the national health insurance which they use to access health care (see Figure 4.12). Having said that some of the respondents also acknowledged the fact that the use of the national health insurance to access health care was not effective and efficient. Amongst these challenges are medical services delivery, shortage of drugs etc. This supports the argument that, there are some challenges facing the scheme in Ghana (see, Gobah & Liang, 2011). Monitoring of outbreak is one of the preventive health delivery services in managing epidemics and this measure is carried out at all levels. Asked whether there are follow-up services of cholera victims during and after the outbreak, majority of the respondents said they do not have any idea about such activities whiles others also stated emphatically that such activities or measures do not exist in both communities.

4.3 Community Preparedness and Response to Emergencies during Outbreak

4.3.1 The Role of Assembly Members in Preparedness and Response

Community based preparedness and response is one of the main components to mitigate cholera epidemics. Assembly Members act as mediators between the community members and the local government and they all come into play to realise the goal of cholera mitigation. As noted earlier Community-Based Surveillance (CBS) is another component of the integrated disease surveillance and response system in Ghana (GHS, 2011). This mechanism encourages a community to watch for disease occurrences and as this happens, the Assemblyman/woman with the support of his/her members plays an important role in fighting disease outbreaks.

Narratives from the interview with two (2) Assemblymen in La indicates that their outfit works closely with the Municipal Assembly especially in cleaning and enforcing sanitary laws and practices as well as relaying information to residents. They indicated that clean up exercises as well as community education are the main activities in preparing against cholera emergencies. Furthermore, there are free distribution of aqua tabs for water treatment to households during rainy seasons. In emergencies, they also work in close contact with NADMO, Public and Environmental Health, hospitals and other stakeholders to ensure there is provision of timely treatment to prevent casualties.

These measures are almost the same as that in Chorkor as the Assemblyman noted that:

> *Previously there was high cholera cases recorded in the community but last year it wasn't heard loud because of some measures and plans the assembly has put in place. These include distribution of bins, communal education on hygienic practices and clean-up activities. He further said that, during outbreak AMA provides mobile vans to educate community members (Interview, Assemblyman Chorkor).*

All these measures helped reduce the incidence of the disease and these were all done in close collaboration with the Member of Parliament, churches and other stakeholders.

4.4 Local Government Preparedness and Response to Emergencies during Outbreak

4.4.1 Role of NADMO in Preparedness and Response

The role of NADMO in disaster management as already stated in Ghana is in three (3) stages thus, pre-disaster, disaster and post-disaster stages. Preparedness and response to emergencies which falls under these three components helps determine whether a community is prepared towards cholera outbreak and these goals are guided by a model

(Ghana Disaster Management Model) (NADMO, 2010). From the words of the Deputy NADMO Coordinator in the Ablekuma South Sub-metro, *the only activities his outfit embarks on in the fight against cholera within communities under his jurisdiction is education on handwashing and good sanitary practices. He further stated that the district does not have an accurate framework or action plan but these activities are instructed from the national level, however it mostly centres on education and this is carried out mainly in schools and through public forums. He however acknowledged that such education was not done at the household level.* From the narratives, this might actually explain why households responded that there is no education on cholera prevention.

In La, the core activities of NADMO in someway, go beyond education. The organization aside education is involved in provision of material support to cholera victims such as blankets, mosquito nets, cups and other materials to ease conditions at the hospitals during emergencies. Again, the organization embarks on door-to-door educational exercises, clean-up activities, vulnerability assessment and makes recommendation to the assembly. They do all these activities in collaboration with the Environmental Health and Sanitation Department and with the support of the assembly, NGO's and other stakeholders. From the interview, the Zonal Coordinator of NADMO for Abafum/Kowe/Abese noted that *"Last year Global Solution provided the community with mobile toilets in homes and households were given some time to pay"* (Institutional Interview-NADMO February, 2016).

From the analysis it can be said that NADMO's model in managing disaster as mentioned earlier exists on paper but are not fully implemented or practised on field. That is, defining and redefining the risk environment, managing the risk environment and response to the threat environment are not fully adhered to at the local government level. The common activity the organization embarks on in both communities is education on cholera prevention. Having said this, the role of NADMO in cholera preparedness and response to emergencies

during cholera outbreak are far advanced in LADMA hence helps mitigate the disease impact than that of Ablekuma South Sub Metro.

4.4.2 The Role of Environmental Health and Public Health Department in Preparedness and Response

One of the active players in ensuring good sanitary environment is the Department of Environmental Health. Their main responsibility is to enforce regulations and standards of the environment and to ensure the biophysical environment is safe for human existence. On the role of the Environmental Health Department in preparedness and response to cholera emergencies during the outbreak, the District Environmental Health Officer in the Ablekuma South Sub Metro stated that their outfit plays a major role in ensuring good sanitary practices within the environment. This is done through strict enforcement of the byelaws of the assembly. During the interview the officer narrated the following as a preparedness and response plan within the Sub Metro (see Box 4.1). This scenario is not different from the case of La.

Box 4. 1 Chorkor: Environmental Health Department in Preparedness and Response

There is an action plan by the Environmental Health Service in preparing and responding to cholera epidemics in the Sub Metro. This has to do with education and awareness creation as well as open forums with market women and residents of the community in general. This action plan commences each year before the beginning of the rains. During the rainy season, aqua tabs and soaps are distributed to households to treat water and washing of hands respectively. They collaborate with the National Commission for Civic Education (NCCE) to create awareness of cholera within the community. Such education is mostly done in local dialect (Ga-Adangme and Twi). They also teach them how to apply first aid to affected patients before taking them to hospital.

During outbreaks, the Environmental Health and Public Health Departments monitor cholera cases within the households. This is done by collaborating with health institutions such as Korle-Bu Hospital and Mamprobi polyclinic so that affected patients can be followed up and subsequently fumigate their houses. However, in cases of death the head office is contacted to disinfect the corpse for burial. After the outbreak, they ensure basic standards of sanitation and hygiene are maintained and improved. Training, sensitization, and desilting drains within the community are some of the practices undertaken by the department.
He further noted that in the discharge of their duties, before, during and after the epidemic, they work closely with NCCE, NADMO, Waste Managers (Zoomlion) etc. Transportation of officers to undertake field work has been one of their main challenges as it hinders prosecuting measures toward preparedness and response to epidemics as well as monitoring communities and households on sanitary practices

Source: Ablekuma South Sub Metro, 2016

4.4.3 The Role of Sanitation and Waste Management Department in Preparedness and Response

The Sanitation and Waste Management Department also plays a major role in cholera preparedness and response to emergencies because earlier in this research it was recognised that exposure to both solid and liquid waste serves as a contributory factor to cholera epidemics.

Interview with the officials from the Sanitation and Waste Management Departments of the two Assemblies revealed that;

> *The department undertakes daily waste collection and dispose them at Nsumiah and Tema (final disposal site) through the use of compaction trucks.* They stated that, *at first there were central containers placed at vantage points for people to dump their waste at a fee (50 pesewas). However, since many households were refusing to pay it has been replaced by the polluter-pay-system where households register with recognized and unrecognized waste contractors who go for waste on daily and weekly basis at a fee. In managing of these wastes, the department encounters several challenges. Amongst them are inadequate vehicles and break down of vehicles for waste disposal, poor community participation and shortage of staff.*

In suggesting the way forward in addressing sanitation problems within the community, the District Cleansing Officer in Chorkor, emphasised that, "*the issue of sanitation is a collective responsibility. Sanitation problem in Chorkor cannot be solved unless residents are ready to help. Since there is a general apathy on the side of community members in realising the goal of cholera eradication*" (Institutional Interview-Sanitation and Waste Management Department, Ablekuma South Sub-metro, 2016).

4.5 Summary

On household preparedness and response to emergency services, residents in the research communities have knowledge and information about cholera infection. The institutional interviews reaffirmed the case that, there were evidence of cholera infection in the communities and these were largely blamed on inadequate basic household facilities such as water supply and toilet facilities. There is statistical significant relationship between education, income and household toilet facility in La whiles in Chorkor there is a significant relationship between household size and consumption of roadside foods. There is evidence of community education in La and Chorkor however, both communities are not on the same

scale. Again, commitment to community clean-up services is better in La than Chorkor. At the community and Local Government levels, the various officials acknowledged that their outfits provide mitigation measures towards cholera risk reduction. However, in the discharge of such duties they encounter several challenges that hinder their activities for effective preparedness and response to emergency services.

CHAPTER FIVE

STAKEHOLDERS' INTERVENTION TOWARDS THE ELIMINATION OF CHOLERA AND OTHER RISK FACTORS

5.1 Introduction

This section evaluates stakeholders' intervention towards the elimination of cholera and other risk factors in La and Chorkor. Firstly, it touches on stakeholders' effort in ensuring a clean and safe environment. It further, evaluates the socio-environmental changes that have taken place within the community and finally seeks to identify the difficulties in prosecuting sanitary and developmental efforts. Analysing these factors will help identify and strengthen interventions in eliminating cholera as well as other propagating factors.

5.2 Stakeholders Effort in Sanitizing the Community

The fight against cholera is a shared responsibility hence the need for all stakeholders to get on board to eliminate risk factors. One of such ways is ensuring good socio-environmental conditions within the community involves, desilting of gutters, regular clean up exercises and above all effective and efficient communication to maintain a healthy environment. In La, a large section of the participants responded that the La Dade-Kotopon Municipal Assembly (LADMA) mostly helps in undertaking clean up exercises in the community aside the normal role of waste collection by waste managers. Effort in maintaining a healthy environment include regular waste collection and disposal, community clean-up exercises and public information on sanitation activities. A respondent revealed that:

> *Clean up exercises are organized on first Saturday of every month to mark the National Sanitation Day and this is mainly championed by LADMA who mostly inform residents on such activities. Concerns on such activities were the gradual low*

participation of residents and left over of debris from desilted drains, which eventually return to the drains over time.

Respondents also noted that there were avenues in addressing community challenges through the Assembly Members and that they spearhead most of the clean-up exercises that take place in the community.

This situation is not the same in Chorkor, as majority of the respondents said that AMA does not fully participate in clean-up exercises. Again, they acknowledged that clean-up exercises were conducted occasionally with the help of the Assemblyman and some few community members and such exercises were mostly done during election seasons. They further asserted that there is no effective community information system as the Assemblyman does not avail himself to address community problems. In maintaining a healthy environment in Chorkor, the Assemblyman during the interview emphasised that, "*the assembly has outlined some programmes with 'Clean Ga', a private sector organization to help clean the community. Their main activities include spraying of gutters, schools, public toilets, drains, and other fumigation exercises within the community*." He acknowledged that there are some problems they encounter in cleaning up the community and this includes, low participation. Therefore, the Clean Ga initiative will help address the problem of apathy since their services would be rendered at a cost of GH ₵100 to spray a house.

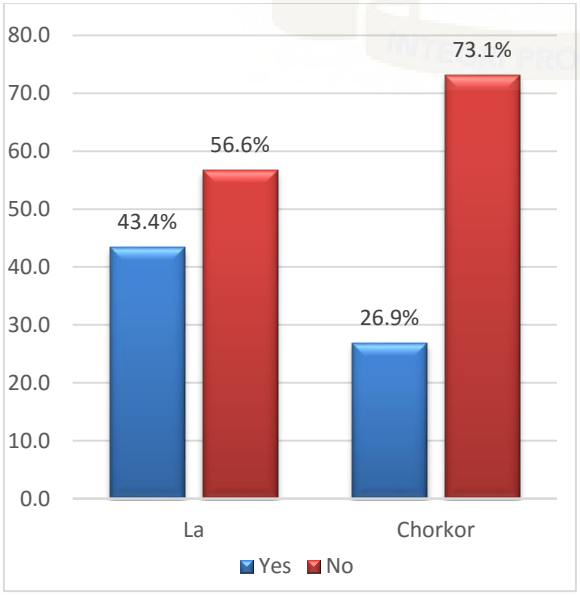
The above scenarios suggest that although there are difficulties in respect of cleaning activities the case of La is better off than Chorkor, since the community (La) appears to be more structured and organised with all stakeholders actively involved in eliminating cholera propagating factors.

5.3 Socio-Environmental Improvement

From the various literature, it is clear that to reduce environmental health burden of households and community at large an improvement in their socio-environmental condition is one of the surest ways. Cholera risk factors can be eliminated if hazards that trigger the disease are well understood and eliminated with all the necessary human and technical knowledge.

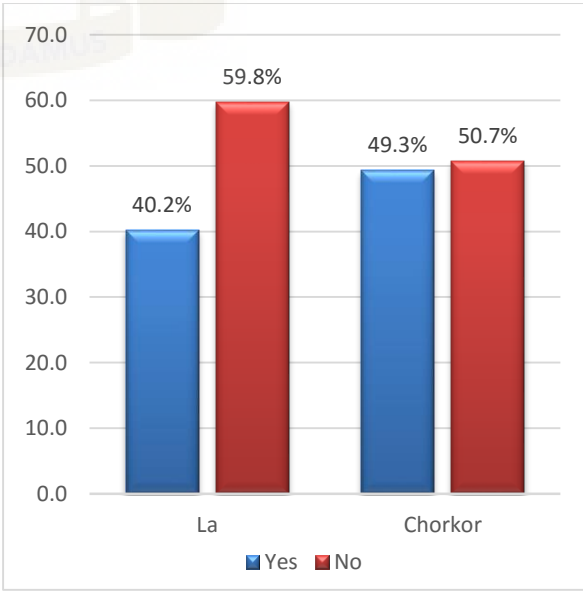
On infrastructural development, 57% and 73% of the respondents in La and Chorkor respectively said there have not been any significant changes infrastructural services within the communities (see Figure 5.1). Out of respondents who said otherwise in La, they noted that there has been improvement in public standpipes within the community. Whiles those in Chorkor said, there have been improvement in public toilet facilities. Results from Figure 5.2 shows that, 40% of the respondents said there has been improvement in environmental conditions in La while 49% also responded same in Chorkor. Amongst some environmental conditions improved in La and Chorkor was water supply.

Figure 5. 1 Infrastructural Development



Source: Field Survey, 2016

Figure 5. 2 Improvement in Environment Condition



Source: Field Survey, 2016

This was reaffirmed by the Assembly Members of the research communities who acknowledged that, there have been improvement in the environmental service provision in the area of sanitation and water. For instance in waste collection, they said the introduction of the polluter pay system in some way has helped ease the waste problems in the communities. They also said they have been aided with some tricycles and other equipment, which are used to collect waste from communal waste bins as well as waste from households at a low cost. Asked whether there were plans to collect waste along the beaches especially in Chorkor, the Assemblyman of the area stated that "*there is* no *access route for vehicles to collect such waste. However, in the interim, residents are discouraged from dumping more waste there whiles the Assembly devises ways to get rid of the heaped waste."*

The Environmental Health Officer in the Ablekuma South Sub-metro who earlier noted that cholera risk in the community is because of the presence of 'Lavenda Hill' further stated that to help eliminate risk factors of cholera:

> *The AMA is building a central sewage system for treatment of sewage. Upgrade of the 'Lavenda Hill', which is currently ongoing, through the Mudor Treatment Plant (Conti project) would help to improve the situation. The 'Conti project' also includes the dredging of all lagoons within the Metropolis and this will help reduce floods and other risk factors to cholera. Again, there are plans to increase public toilet facilities within the community as well as increase the landfill site for waste disposal. As it stands there are six (6) toilet facilities in the community two of which were built by the Accra Sewage Improvement Project (ASIP). The Sub Metro over the years has seen such improvement as there has been six (6) new facilities in the Ablekuma South Sub Metro. Further to this, the GAMA Sanitation and Water Project is initiating a plan to build low-cost toilet facilities for households, with the cost spread over a long period for households to pay.*

From the survey findings, it can be said that there has not been significant improvement in infrastructure and environmental conditions within both communities especially in Chorkor, as Figure 5.2 does not clearly show improvement in the environmental conditions.

5.4 Summary

In the fight against cholera epidemics in the research communities, there is evidence of stakeholders' effort in sanitizing the community through clean up exercises and sensitization of community members on cleanliness to maintain a healthy environment. Clean-up activities are regularly observed in La according to the National Sanitation calendar. However, in Chorkor it is done occasionally, especially during election seasons with few residents participating. Again, there is a gap in communication in Chorkor since the Assemblyman does not avail himself in listening and addressing problems in the community. On socio-environmental development, both communities stated that there has not been tremendous improvement in socio-environmental conditions and infrastructure development. However, some little improvement in these services were water, public toilets, and waste collection and disposal. Some officials also acknowledged that, the completion of some ongoing projects in the district will also contribute to eliminate cholera risk factors. For instance, the 'Mudor treatment Plant' will help treat human waste before disposing it into the sea and this will help reduce cholera propagating factors.

CHAPTER SIX

CAPACITY DEVELOPED TOWARDS MITIGATION OF CHOLERA EPIDEMICS

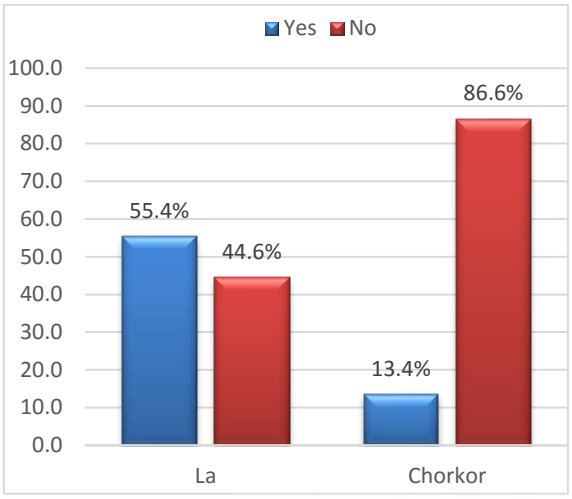
6.1 Introduction

This chapter evaluates capacities developed towards mitigation of Cholera epidemics at the various levels of decision-making. It evaluates the capacity developed by stakeholders to mitigate cholera at the household, community and the local government level. It again examines the challenges within each level that hinders the successful execution of the capacity developed.

6.2 Households Capacity towards Cholera Mitigation

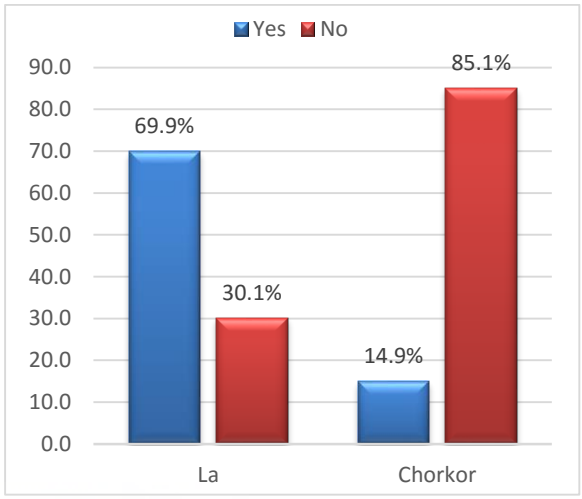
As shown in Figure 6.1, 55% percent of the respondents in La said clean up exercises in the community are well organised. Respondents who said such activities are not well organized attributed their reasons to a number of factors. These include, poor information and communication and low turnout of residents during such activities. In Chorkor, about 87% of the respondents said clean up exercises in the community are not well organised. Reasons to this outcome included poor communication, low turnout, and poor participation by the local assembly and beside uncollected refuse from such activities finally returns to drains. This possibly explains the poor socio-environmental conditions in Chorkor as compared to La, as communal activities are not practiced leaving the community unhealthy for human habitation.

Figure 6. 1 Clean-ups Well Organised



Source: Field Survey, 2016

Figure 6. 2 Public Information on Cholera



Source: Field Survey, 2016

As already stated, public information and education on cholera prevention is one of the best and surest means to mitigate cholera at the household and community level. Asked whether public information and education on cholera are well communicated hence can help prevent cholera, 70% of the respondents in La affirmed that information and education were well communicated and understood. However, there is an inverse relation in Chorkor as about 85% of the respondents said information and education were not properly done within households and community. The respondents then suggested public information or education should be conducted frequently on door-to-door basis (house-to-house) and such information should be carried out in the local dialect.

From the findings capacity developed in the area of clean-up exercises and public information on cholera epidemics are not well adhered to hence cannot effectively mitigate cholera epidemics in the research communities especially in Chorkor. Therefore, there is the need to strengthen mitigation capacities such as regular and well organized clean up services and information dissemination in order to help mitigate cholera epidemics at the household level. In evaluating the capacity of cholera mitigation at the household and the community

level, majority of the respondents said, not much has been done on issues of addressing socio-environmental conditions such as sanitation, water and waste collection. The household interviews suggested that, to fight cholera effectively it is a shared responsibility of all stakeholders. The activities or things to consider to address all the issues raised include, regular clean up services on the part of the local assembly, community members and households. They again suggested the need to strengthen education on cholera, provision of basic infrastructural services and strengthening of bylaws governing sanitation in general in the communities.

6.3 Community Capacity towards Cholera Mitigation

Evaluating capacity towards cholera mitigation at the community level is also another important effort towards cholera prevention. At the community level, the Assemblymen of the various electoral areas in the research community acknowledged that communal exercises within the community are largely faced with low participation of community members. From the interview the various Assembly members noted that:

> E*ven though there has been some effort in improving social services such as water supply, toilet facilities and solid waste collection, they are still inadequate due to high population densities as a result of natural growth and in migration.*

Assembly members in both communities also acknowledged that contracts on waste collection and disposal must be reviewed since most waste contractors do not perform tasks properly. For instance, in the Ablekuma South Sub-metro, there was evidence of non-performance of 'Platinum Waste Contractors' and this has mainly contributed to bad socio-environmental conditions in Chorkor with regards to waste collection and disposal. Finally, they also stressed that to mitigate the high prevalence of cholera efficiently and effectively

the by-laws governing sanitation must be strictly enforced especially in the households and the community in general.

6.4 Local Government Capacity towards Cholera Mitigation

The Local Assembly as the main administrative institution in the various districts directly contributes towards the welfare of members within its jurisdiction. The assembly executes a lot of projects and interventions toward cholera mitigation including education, training, clean up exercises and service provision.

In manging waste and good sanitary practices in the communities as noted during the interview with officials, they noted that the Assembly is doing its work concerning sanitation but due to the bad behaviour and attitude of residents, it makes work very difficult thereby affecting cholera mitigation effort. Officials from both districts also indicated that shortage of staff is one of the challenges they face in the fight against cholera. During the interview they made mention of a series of challenges they encounter in the discharge of their duties. These include, apathy and poor attitude towards sanitation activities by community members, break down of trucks and inadequate logistics for waste works, long distance from waste disposal sites, shortage of labour force, non-performance of waste contractors and poor community participation in general. As they said, to ensure community preparedness and response against cholera epidemics, the Assembly should ensure strict enforcement of by-laws, continuous sensitization on proper sanitary behaviour, increased logistics and trucks, and an increase in labour force. For instance, the Environmental Health Officers in the Ablekuma South Sub Metro acknowledged that; *"there are several challenges encountered by the various departments in charge of sanitation and diseases prevention. These include lack of transportation for health officers to undertake exercises and understaffing of labour force".* They however, suggested that improvement in infrastructure, awarding of contracts

to effective waste management contractors, increasing of staff strength, provision of transport, tools and equipment to departments and continuous public education are the surest ways to build capacities in mitigating cholera epidemics in the community and the sub metro at large.

According to the NADMO officials in both research areas (La and Chorkor), the organization coordinated activities of all stakeholders in preparedness and response to cholera epidemics. The NADMO officials interviewed were asked a series of questions on capacity building framework they adopt towards cholera mitigation efforts. On cholera risk assessment with officials of NADMO in La, they acknowledged that the local community has been involved in assessing the socio-environmental condition of the community and the municipal coordinator plays the leading role supported by the municipality. There was also a community hazard and vulnerability map which is updated periodically. On cholera risk preparedness, there exist cholera prevention volunteers in the community instituted by the Public Health Department and the La Municipal Assembly together. There is also in place community cholera prevention plans addressing sanitation, drains, housing as well as other hazards championed by Environmental Health and Sanitation Department. Again, the municipal assembly uses local media to disseminate informative programs on cholera prevention and sanitation outreach. The La Tenu radio is one of such mediums in information dissemination. The municipal coordinator mainly spearheads these activities with the support of the zonal coordinators of NADMO. NADMO also helps in the provision of shelter and other hospital equipment when there are emergencies to save lives. There is also a disaster volunteer group trained to provide support in emergencies. On providing immediate response relief and assistance, there are in place search and rescue teams in the community and emergency relief items are targeted to the most vulnerable. Finally, on reconstruction of

settlements and services they again acknowledged that such activities are undertaken with the support of private sector organizations, NGOs and the national coordinating body.

In Chorkor, the cholera reduction framework that exits involves the supply of shelter and other hospital equipment to cholera victims. Again, emergency reliefs are targeted to the most vulnerable households in the community and it is mainly spearheaded by NADMO and supported by AMA.

The above scenarios on the mode of operations of NADMO in both districts i.e. the La Dade-Kotopon Municipal Assembly and the Ablekuma South Sub Metro in cholera mitigation are very distinctive. NADMO operations in La seems to tackle most of the issues raised under the reduction framework. This is why the socio-environmental conditions in La are better off than Chorkor.

6.5 Summary

Findings from the discussions in this chapter shows that clean up exercises are not well organised especially in Chorkor due to apathy on the side of residents as well as poor communication. Information on cholera prevention are also not well communicated to residents as most of them are done on radio and public forums. Hence, the need for door-to-door campaign on cholera prevention at the household level through other appropriate modes of communication. Again, the non-performance of waste contractors are some of the issues affecting cholera mitigation efforts. Other factors affecting cholera mitigation in both communities include; administrative challenges, inadequate equipment and tools, and long distance of final disposal sites. Administration process of NADMO in both research communities also varies as that of the Ablekuma South Sub Metro mostly concentrates on education leaving other priorities in cholera mitigation unattended to.

CHAPTER SEVEN

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This chapter presents the results of the study. These include summary of the findings in respect of socio-environmental conditions, preparedness and response, intervention towards cholera mitigation as well as capacity evaluation in mitigating cholera. In general, this section draws conclusions and makes recommendations of the research. Attempt at suggesting future research areas was also considered.

7.2 Summary of Finding

7.2.1 Socio-Environmental Conditions and Cholera in La and Chorkor

The findings from both rapid assessment and household survey revealed that the socio-environmental conditions in both La and Chorkor were poor which predispose residents to cholera infections and other communicable diseases. However, comparison with previous studies in 2001 and 2005 revealed that the conditions in La have improved whiles that of Chorkor has gotten worse as the results put both La and Chorkor in the third and fifth quintiles of environmental burden respectively. These changes can be attributed to a number of factors. Since La is now an administrative region (LDMA), communities under its administration are better managed and coordinated in terms of policies, programmes and projects than previously when it was under the AMA. Worsening conditions in Chorkor were attributed to densification and overcrowding. Records of cholera reported cases also revealed that the Accra Metropolitan Assembly over the years record the highest number of cases. Specifically, the Ablekuma and Okaikoi Sub Metros recorded the highest cases in the last five years. On gender differences, it could be noted that males were more affected than

females in the Metropolis. Again a trend analysis of cholera epidemics showed an increasing number of cholera cases within the Greater Accra Region where factors such as rainfall could be said to be some of the propagating factors to cholera epidemics in the region as suggested by other research works. Furthermore, cholera reported cases were mostly the youthful population. Comparing cholera incidence in La and Chorkor, it could be seen that La over the years record the highest number of cases and this could be as result of the high population difference than Chorkor. However, it could similarly be viewed that case in La in the last year of the study (2015) was lower than Chorkor and this could be explained by the fact that, conditions in La have improved whiles that of Chorkor has worsened. From the findings, there is evidence of high cholera prevalence in both communities and most affected households revealed that it was caused through food contamination.

7.2.2 Preparedness and Response of Emergency Services during Cholera Outbreak

The findings revealed that residents in the research communities have some level of knowledge and information about cholera and information to this effect are mostly carried through electronic media. Again, households are vulnerable to cholera epidemics because of inadequate basic household and community facilities and infrastructure due to overcrowding. For instance, the results revealed that most households do not have access to toilets in-house hence they rely on public toilets as a place of convenience, which in a way does not promote good sanitary practices. Poor environmental health behaviour and unhygienic practices are some of the pathways to cholera infection in the communities. A Chi-square test of demographic characteristics and preparedness also revealed that there was a significant relationship between educational level, income and provision of household toilet facility in La. There was also a significant relationship between household size and the consumption of roadside foods. Educational activities to cholera prevention are poorly organized however the case of La is better than Chorkor. Again, commitment to community clean-up services

are more poorly organised in Chorkor. There is evidence of efforts towards preparedness and response to emergency services in the area of education, clean-up activities and early warning. However, these activities are confronted with many challenges that hinder their success.

7.2.3 Stakeholders' Intervention towards the Elimination of Cholera and Underlying Risk

There is evidence of stakeholders' effort in ensuring a healthy environment through community clean up exercises and sensitization. Although clean up exercises are organized every first Saturday of the month per the National Sanitation calendar, this activity is losing its purpose overtime as participation is low. In the case of Chorkor, community sensitization programmes are only done during election seasons with few people participating. The study also revealed that, there has been improvement in infrastructural and social involvement projects hence has helped reduced cholera risk factors as well as future mitigations in the communities. These projects include; water delivery, toilet facility and waste management. For instance, the completion of the ongoing 'Conti Project' in the Metropolis in a way will help eliminate some risk factors to cholera.

7.2.2 Capacity Development towards Mitigation of Cholera Epidemic

Even though there is evidence of capacities and measures developed towards cholera mitigation through sensitization and clean up exercises, these activities are mostly limited in their impact by poor information dissemination and apathy on the side of residents. Information on cholera prevention are not well communicated as they are mostly done on radio and public forums, which are only privy to very few people. The non-performance of waste contractors are again some of the problems facing cholera mitigation efforts in the communities. This situation largely affects the poor environmental condition in Chorkor.

Other factors negatively affecting cholera mitigation efforts in both communities include, administrative challenges, inadequate equipment and tools and inadequate waste disposal sites. For instance, the activities of NADMO in both communities vary as that of the Ablekuma South Sub-metro mostly concentrates on education leaving other priorities in cholera mitigation.

7.3 Conclusions

Cholera remains one of the most feared diseases in La and Chorkor and the Greater Accra Metropolitan Area (GAMA) at large because measures that exist for its mitigation and prevention are not available where they are most needed. The social, economic and environmental predicaments that exist in these communities outweigh cholera control, mitigation and prevention efforts. Hence, mitigation efforts of the epidemics within the Greater Accra Region and Ghana at large should be looked at holistically. Even though La and Chorkor are homogenous in nature, it is evident that socio-environmental conditions in indigenous low-income communities vary as all indicators used gear towards that direction. The analysis also revealed that within the same community, there are neighbourhood variations in socio-environmental conditions. The spatio-temporal map also showed evidence of inter community and Sub-Metro variation of cholera cases since they had different conditions.

Education, clean-up services, early warning and distribution of water treatment tabs have been the main preparedness and response plans towards addressing cholera emergencies in the two communities. The mode of operation of these activities varies with better performance outcomes in La than in Chorkor. The findings also revealed that most of the measures to prepare and respond to cholera emergencies exist on paper and do not entirely reflect what is actually being practised. Poor attitude and behaviour, apathy, inadequate

human and material resources, low educational level, lack of access routes hinder preparedness and response measures.

There is again evidence of plans, initiatives and developmental projects that seek to eliminate risk factors. These include improvement in water and sanitation facilities. These services are carried out through public-private partnerships with the local Assembly. In evaluating capacities developed to mitigate future epidemics, education and sensitization, clean-up activities and other developmental projects are the main strategies undertaken in both communities. However, they are faced with several difficulties in the process of executing these activities, which need special attention. Activities by special organizations such as NADMO in the fight against disease epidemics do not clearly have an action plan on which their activities are coordinated. However, the case of La is again better than Chorkor as the organization there goes beyond education in cholera epidemic mitigation to prevention.

The study however concludes that the household, community and local government levels in both communities were not well prepared and therefore will not respond effectively during future cholera epidemics until risk factors and other preventive efforts are well executed. In addition, there is the need for urgent improvement in environmental conditions through proper planning and social provision to ease the current vulnerable condition in the communities. This in a way would help reduce risk factors towards the occurrence of cholera. In all, the fight against cholera epidemics needs collaborative efforts from all stakeholders from the household, community, local government and the central government, since cholera prevention is a shared responsibility.

7.4 Policy Recommendation

Based on the findings the following recommendations were made for policy guidance.

7.4.1 Improvement in Infrastructural, Economic and Social Services

There is the need for infrastructural and economic development as well as improvement in social services to boost the social, economic and environmental conditions of the communities to help ease the current poor socio-environmental conditions. This can be done through public-private partnership and corporate social responsibility to help improve the socio-environmental well-being of residents. Social services such as the National Health Insurance Scheme and the Livelihood Empowerment Against Poverty (LEAP) should be effective and efficient to empower the poor and the vulnerable in the communities.

7.4.2 Proper Waste Management System

The award of contracts to waste contractors is another considerable aspect the District Assemblies should consider. This will promote the effective and efficient waste management system within the communities. Clean-up exercises should also be a regular activity at homes and community through a properly organized activity with the involvement of all stakeholders.

7.4.3 Enforcement of By-laws on Sanitation

There is also the need for the Assembly to strictly enforce by-laws within the communities under their jurisdiction. This in a way would enhance and promote good sanitary practices within the community and will deter people from going contrary to the law. For instance, the law and policy for providing a toilet within each dwelling unit must be strictly enforced to punish landlords who violate the laws.

7.4.4 Improvement in Human and Material Resources

Improvement in human and material resources should also be given an equal attention. This involves increasing staff strength and education at all levels of institutions in charge of

sanitation and disaster management to maintain a healthy biophysical environment. In addition to such development, recruitment process should in a way consider the background of people in order to suite the cultural characteristics of the communities in order for them to work effectively. Increase in budgetary resources is also an important measure to address the socio-environmental challenges within the community. This in a way would equip staff in both field and administrative duties for effective cholera mitigation.

7.4.5 Education and Sensitization

Effective and efficient community education and sensitization on proper sanitary practices has the potential to mitigate cholera epidemics in the community. This should be done through public forums, schools, community announcement and on door-to-door basis at the household level through the most effective means of communication. Education should take the bottom up approach by engaging chiefs, clans and family heads to educate their member on the need for good hygienic practices and the maintenance of a healthy environment.

7.5 Future Research Suggestion

This research was conducted between two low-income indigenous communities (La and Chorkor) in GAMA. This actually affected the generalization of cholera preparedness and response in GAMA. Hence, future research should look at more than two communities to give a better generalization of the situation since communities in GAMA annually record the highest number of cholera cases in the country.

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APPENDICES

Appendix 1: Household Survey: Questionnaire for Preparedness and Response to Cholera Epidemics

QUESTIONNAIRE FOR A STUDY ON "THE STATE OF DISASTER PREPAREDNESS AND RESPONSE TO CHOLERA EPIDEMICS IN THE GREATER ACCRA METROPOLITAN AREA (GAMA). THE CASE OF THE INDIGENOUS COMMUNITIES OF LA AND CHORKOR".

This research is carried out for an award of MPhil degree in Geography and Resource Development in the University of Ghana. Information required in the process of administering this survey is purely for academic research purpose as stated herein and confidentiality will be strictly observed.

Please tick or write where applicable. Thank you for your anticipated participation.

NAME OF COMMUNITY_____ Date _____

House No _____ Questionnaire No_____

Background Information

1. The respondent for this survey is: a) Head of household b) Spouse c) relative d) Partner e) Tenant
2. Gender? a) Male b) Female
3. Age? _____
4. Marital status? a) Single b) Married c) Divorced d) Widow(er)
5. Religious conviction? a) Christian b) Muslim c) Traditionalist d) No religion
6. Ethnic Groupings a) Akan b) Ewe c) Ga-Adangme d) Northerner e) Other, specify _____
7. Educational Level a) No Formal Education b) Primary/Junior High c) Senior High/Vocational/Tech d) Tertiarye) Other, specify_____
8. How many households/families are in this house? _____
9. What is the social structure of your family? a) Nuclear family b) Extended family
10. What is the size of your household (no. of persons)? _____
11. Were you born in La/Chorkor? a) Yes b) No If Yes, jump to question 15
12. If No, where were you born? Hometown _____Region _____

13. If No, what is the reason for your migration to La/Chorkor? a) In search of a job b) On a job transfer c) Marital Purpose d) Health Reasons e) Conflict/ Violence f) Family issues g) High rent h) Other, please specify_____
14. What is the main occupation of the household head? _____
15. What is the average monthly income of your household (Ghana cedis)?
    a) 0-200 b) 201-400 c) 401-600 d) 601-800 e) 801-1000 f) 1001+
16. Where do you access health facility? (specify)_____

Section A: Preparedness and Response of Emergency Services

Knowledge/Experience on Cholera

17. Have you heard of cholera? a) Yes b) No
18. If yes, which medium did you hear it from?
    a) Radio b) TV c) Local Announcement d) Friend/Family e) other_____
19. What is the root causes of cholera? a) Eating contaminated food
    b) Drinking contaminated water c) other _____
20. Have you or any of your houshold been infected with cholera in the last 5 years? a) Yes b) No
21. If yes, how did you/he/she/ contract it? _____

Getting Ready (Preparedness)

22. Do you have toilet facility in your house? a) Yes b) No
23. If No, where do you use as a place of continence? a) Public Toilet b) beaches
    c) gutter d) other, specify _____
24. What is the principal source of drinking water in your household? a) Sachet water
    b) Pipe borne water
25. Do you or your household often buy roadside foods? a) Yes b) No
26. If yes, how often? _____
27. Do you inform/teaches your family about personal hygiene? a) Yes b No
28. How do you rate sanitation situation in your community?
    a) Very good b) Good c) Bad d) Very bad
29. Do you participate in public clean up exercises in your community? a) Yes b) No
30. If Yes, how often

    _____

31. If No, state your reasons_____

32. Are there any sanction when you refuse to participate in clean up exercises? a) Yes b) No

33. Are you timely educated and warned on cholera? a) Yes b) No

34. If yes, when was the last time? a) Always b) Less than 3 month c) 6 month ago d) 1 year ago e) above a year

Education on Cholera prevention please tick where appropriate

1 Strong Disagree 2 Disagree 3 Neither Agree nor Disagree 4 Agree 5 Strongly Agree

	1	2	3	4	5
35. NADMO have been educating us on how to prevent cholera.					
36. The department of Public Health have been educating us on how to prevent cholera.					
37. Community Fun Clubs/ Social groups have been educating us on how to prevent cholera.					
38. NGOs/ Private entities have been educating us on how to prevent cholera. (Specify….....)					

Moving into action (Response)

39. Are you duly informed when there is cholera outbreak incidence? a) **Yes** b) No

40. If yes, by who_____ and through which medium_____

41. Is your style of living different when there is an outbreak? a) Yes b) No

42. If yes, how? _____

43. What are the immediate measures when one shows symptoms of cholera?

_____

44. What has been the official intervention during outbreak?

NADMO_____

Public Health _____

Other ( )_____

Recovery

45. Have you registered for the National Health Insurance? a) Yes b) No

46. If yes, does the use of the National Health Insurance help you access health services effectively?
    a) Yes b) No
47. Are there follow-ups services for cholera victims during and after outbreak? a) Yes b) No c) No idea
48. If Yes, by who and which institution (s)? _____

Section B: Stakeholders Intervention towards Elimination of Cholera and Other Risk Factors

49. What has been the Local government's effort in sanitizing the community?

_____

_____

50. Are there social support systems available for aged and disabled people in the community? a) Yes b) No c) No idea
51. If Yes, by which institution(s) _____
52. Has there been improvement in infrastructure services such as water supply/toilet facility/waste dumps site etc. services within the community?
    a) Yes b) No
53. If yes, which of them? _____
54. Has there been improvement in environmental conditions within the community over the years? a) Yes b) No
55. If Yes, which of these services? a) Water b) Solid waste collection c) Toilet d) Sullage and drainage e) Other Specify_____
56. How effective are communication systems for easy relay of information on sanitation and other problems facing community? _____

Section C: Capacity Developed Towards Mitigation of Cholera Epidemics

57. Do you think behavioural change can help prevent cholera? a) Yes b) No
58. Do you think clean up exercises in the community are well organized? a) Yes b) No
59. If no, why _____

_____

60. Do you think public information/education on cholera are well communicated hence can help prevent cholera? a) Yes b) No

61. If No, how do you think it can be done best? _____

_____

62. Do you think a lot has been done in addressing sanitation, water, toilet facilities by the local assembly? a) Yes b) No

63. In your view, what do you think should be done to address these challenges?

_____

Appendix 2: Household Interview Guide

Background Information

1. Sex

Section A: Socio-Environmental Conditions

2. What do you think about the social environmental condition such as sanitation, water, solid waste dumps etc.) in the community?
3. What are the factors that account for the poor condition in the area?

Section B: Preparedness and Response of Emergency Services during Cholera Outbreaks

4. Do the assembly collect waste in dumpsite on time?
5. What role do you play to ensure that wastes are not dump indiscriminately within your surrounding as well as keeping of proper sanitary condition?
6. Does the community have adequate toilet facilities?
7. What are some of the reasons behind open defecation along the beaches and other indiscriminate places?
8. Do you or any external body play special role during cholera outbreak?
9. What is been done different within the community during cholera outbreak?

Section C: Intervention towards the Elimination of Cholera and Other Risk Factors

10. What do you/community members do to eliminate cholera and other risk factors?
11. What has been done by the assembly to improve sanitation, waste management, water problems in the community?

Section D: Capacity Developed Towards Mitigation of Cholera Epidemics

12. How prepared are you to mitigate cholera epidemics in the community?
13. What are the challenges you face in the discharge of your duties in cholera prevention?

Appendix 3: Institutional Interview Guide-Assembly Members

INSTITUTIONAL INTERVIEW DATE

1. Role of Respondent
2. Electoral Area
3. How long have serve as assemblyman/women in your electoral area?

Section A: Socio-Environmental Factors

4. What do you think about socio environmental condition in La/Chorkor?

Section B: Preparedness and Response of Emergency Services during Cholera Outbreak

Getting Ready (Preparedness)

5. Do your locality suffer from cholera epidemics?
6. What do you think are the risk factors causing cholera within your community?
7. Which institutions help in dealing with cholera incidences within your area?
8. What measures do you/community members put in place to ensure that community do not suffer cholera incidences?
9. What are the challenges impeding the prosecution of these measures.

Moving into Action (Response)

10. How is information handled when there is cholera outbreak?
11. What critical role do you play during cholera outbreak?

Section C: Stakeholder Intervention towards Cholera Mitigation and Reduction of Underlying Risk Factors

12. What are the developmental changes within the locality over the years?
13. Are there developmental plans and projects to improve sanitation, water and toilets facilities in the community?
14. What measures are in place to improve environmental conditions?

Section D: Capacity Develop Towards Cholera Mitigation and Underlying Risks

14. Do you think measures put in place can help mitigate cholera and other risk factors?
15. In your view, what can be done different to mitigate cholera and the underlying risks in your locality?

Appendix 4: Institutional Interview Guide-Environmental/Public Health Department

INSTITUTIONAL INTERVIEW DATE

Background Information

1. Role of Respondent
2. Sex
3. District/SubMetro

Section A: Socio-Environmental

4. How do you describe the socio-environmental conditions in La/Chorkor?

Section B: Preparedness and Response of Emergency Services during Cholera Outbreak

5. Is there cholera risk reduction framework for effective mitigation?
6. What measures are put in place before, during and after cholera epidemic?
7. What are the challenges faced in the prosecution of these measures?
8. Which state actors or community structures do you collaborate with in preventing cholera within the community?

Section C: Stakeholders' Intervention towards the Elimination of Cholera and Other Risk Factors

9. Are there plans in place to increase sanitation facilities within the community?
10. What is been done by your outfit to eliminate cholera in the community?
11. What is been done eliminate risk factors which causes cholera in the community?

Section D: Capacity Developed Towards Mitigation of Cholera Epidemics

12. What are the challenges encountered in cholera prevention as well as the alternative solutions?
13. What are the shortfalls by your institution in fighting cholera and underlying risk factors?

Thank You

Appendix 5: Institutional Interview Guide-Sanitation and Waste Management

INSTITUTIONAL INTERVIEW DATE

Background Information

1. Role of Respondent
2. Sex
3. District/Sub Metro

Section A: Socio-Environmental

4. How do you describe the socio-environmental conditions in La/Chorkor?

Section B: Preparedness and Response of Emergency Services during Cholera Outbreak

5. How is sanitation and waste managed within the community?
6. What are the challenges faced in the prosecution of these measures?

Section C: Stakeholders' Intervention towards the Elimination of Cholera and Other Risk Factors

7. What is been done by your outfit to eliminate cholera in the community
8. Are there plans in place to increase sanitation facilities within the community?
9. What is been done to eliminate risk factors which causes cholera in the community?

Section D: Capacity Developed Towards Mitigation of Cholera Epidemics

10. What are the challenges encountered in controlling or providing good sanitary condition in the area as well as an alternative solution?
11. What are the shortfalls by your institution in fighting cholera and underlying risk factors (solid waste and sanitation, floods etc)?

Appendix 6: Institutional Interview Guide-NADMO (Disease Epidemic Department)

INSTITUTIONAL INTERVIEW DATE

Background Information

1. Role of Respondent
2. Sex
3. District
4. What is the main responsibility of your organization in cholera prevention?

Section A: Socio-Environmental

5. How do you assess the socio-environmental conditions in La/Chorkor?
6. What has been the reason for frequent cholera outbreak within the community?

Section B: Preparedness and Response of Emergency Services during Cholera Outbreaks

7. What is the role of NADMO in managing cholera?
8. Is there cholera risk reduction framework for effective mitigation?
9. What measures are in place before Cholera Outbreak within the community?
10. What measures are in place during and after cholera outbreak?
11. What are the challenges faced in the prosecution of these measures?
12. How is institutional coordination before, during and after cholera outbreak?
13. Which state actors or community structures do you collaborate with in preventing cholera within the community?

Section C: Intervention towards the Elimination of Cholera and Other Risk Factors

14. What measures are in place to reduce cholera outbreak as well as eliminate risk factors in the community?
15. What are the challenges in the prosecution of these measures?

Section D: Evaluate the Capacity Developed Towards Mitigation of Cholera Epidemics

16. How do you assess the performance of your organization in mitigating cholera?
19. What are the shortfalls by your institution in fighting cholera and underlying risk factors as well as alternative solutions?
20. Sheet of key processes in Cholera risk reduction and DRR systems at the community level. (Institutional vulnerability).

Key processes and instrument (Cholera reduction framework)	Indicators	Status	Name of Institution involve with		Remarks
		YES/ NO	Lead Role	Supporting Role	
Cholera risk assessment	Local communities have been involved in assessing sanitation and garbage collection, water availability and quality, toilet facility availability, drains and floods etc.				
	Community hazard and vulnerability maps are prepared and regularly updated				
	Livelihood profiles of vulnerable groups are identified				
Cholera risk preparedness	Community cholera prevention and other disaster committees and volunteers exist				
	Community cholera prevention plan addressing sanitation, water, drains, housing and other hazards exists				
	Hazards monitoring technology is available				
	Local media Local information programmes are targeted to cholera prevention and general sanitation outreach				
	Roles and responsibilities allocated and directory of the names and inventories of equipment for use during emergencies are available				
	Shelters, drugs and other hospital equipment are available to save lives and livelihoods				
	Volunteers trained to provide support in case of emergency				
	Evacuation routes identified and local people informed				
Providing immediate response and/or relief assistance/rehabilitation	Social capital networks to support neighbours and relatives exist				
	Search and rescue teams available at the community level				
	Emergency relief are targeted to the most vulnerable households				
Reconstruction of settlements, infrastructure and services	Private sector participation in rehabilitation and economic recovery exist				

Appendix 7: Results of Proxy Indicators for Rapid Assessment of Environmental Health Status of La and Chorkor.

Indicators		New Lakp.	Aba./Kow./Abe.	Adie.	Lakp.	All of La
	Maximum Score	Mean Score				
A. Water						
1. Ponds/streams as principal source of water supply within community	6.7	-	-	-	-	-
2. Pipelines on ground surface and in drains (cross contamination)	4.8	-	4.8	4.8	-	2.4
3. Frequent water supply interruptions within community	4.0	4.0	4.0	4.0	4.0	4
4. Principal source of potable water supply outside house compound	3.6	3.6	3.6	3.6	3.6	3.6
5. Vendors as principal source of potable water supply within community	3.4	3.4	3.4	3.4	3.4	3.4
6. Potable water stored in open containers	3.1	-	3.1	-	-	0.775
7. Use of common dip cup for drinking water	2.8	2.8	2.8		2.8	2.1
*8. Distance above 200 metres from water collection points	2.7	-	-	-	-	-
*9. Queuing time of 20+ minutes at water collection points	2.4	-	-	-	-	-
*10. Pay as you use for water	2.4	2.4	2.4	2.4	2.4	2.4
*11. Community self-assessment of water quality using own indicators	1.1	1.1	1.1	1.1	1.1	1.1
Sub-Total for Water	**37.0**	**17.3**	**25.2**	**19.3**	**17.3**	**19.775**
B. Sanitation						
1. Open defecation by neighbourhood children and/or adults	5.9	5.9	5.9	5.9	5.9	5.9
2. Littering of polythene/paper bags of faecal matter within community	4.1	4.1	4.1	4.1	4.1	4.1
3. Presence of overflowing septic tanks and aqua-privy systems in the community	3.3	-	-	-	-	-
4. Use of chamber pots for storing faecal matter/urine in-house	3.1	3.1	3.1	3.1	3.1	3.1
5. Communal toilets as principal toilet facility within community	3.1	3.1	3.1	3.1	3.1	3.1
*6. Queuing time above 10 minutes at selected toilets within community	2.7	-	-	-	-	-
7. Presence of public toilets in the midst of human dwellings	2.5	2.5	2.5	2.5	2.5	2.5
8. Toilet sharing between households within house compound	1.9	1.9	1.9	1.9	1.9	1.9
*9. Toilet user fee payment for toilet use	1.7	1.7	1.7	1.7	1.7	1.7
10. Odour nuisance around toilets/garbage dumps/drains etc.	1.7	1.7	1.7	1.7	1.7	1.7
Sub-Total for Sanitation	**30.0**	**24**	**24**	**24**	**24**	**24**
C. Pests						
Indicators	**Maximum Score**	**New Lakp.**	**Aba./Kow./Abe.**	**Adie.**	**Lakp.**	**All of La**
1. Presence of many flies within kitchen/chop bar (cooking area)	5.3	-	5.3	-	-	1.325

2. Presence of mosquito larvae in water storage containers (Entomologists?)	5.2	5.2	5.2	-	5.2	3.9
3. Presence of many flies within toilet	4.4	-	4.4	4.4	4.4	3.3
4. Presence of many cockroaches in cooking area and house compound	2.8	-	2.8	-	-	0.7
5. Presence of mice within house	2.7	2.7	2.7	2.7	2.7	2.7
6. Complaints about bed bugs in sleeping area	2.2	-	2.2	-	-	0.55
7. Evidence of lice in children's hair within community	2.0	-	-	-	-	-
Sub-Total for Pests	**24.6**	**7.9**	**22.6**	**7.1**	**12.3**	**12.475**
D. Sullage/Drainage						
1. Evidence of mosquito and other larvae within stagnant water bodies	4.2	4.2	4.2	4.2	4.2	4.2
2. Pools of stagnant water (cesspools)	3.9	-	-	-	-	-
3. Drains choked with garbage, weeds and silt	3.7	-	3.7	3.7	3.7	2.775
4. Pools of stagnant water in drains	3.5	3.5	3.5	3.5	3.5	3.5
5. Evidence of children playing in and around stagnant water	3.0	-	3	-	-	0.75
6. Absence of narrow drains in the community	2.9	2.9	-	2.9	-	1.45
7. Evidence of flood risks within community	2.1	-	-	2.1	-	0.525
Sub-Total for Sullage/Drainage	**23.4**	**10.6**	**14.4**	**16.4**	**11.4**	**13.2**
E. Food Contamination						
1. Evidence of defecating children around food vending area/ cooking area with the home	3.2	-	-	-	-	-
2. Uncovered vendor prepared food/uncovered prepared food left-overs within the house	2.6	2.6	2.6	2.6	2.6	2.6
3. Food sold near public toilets	2.5	-	2.5	-	-	0.625
4. Food sold near drains	2.1	2.1	2.1	2.1	2.1	2.1
5. Use of unwashed or rotten vegetables for cooking/raw eating	1.8	-	1.8	-	-	0.45
6. Using (naked) hand as means of serving food.	1.7	-	-	-	-	-
7. Food sold in eating places without running water	1.6	1.6	1.6	1.6	1.6	1.6
8. Dusty eating areas or eating areas along main transportation arteries with vehicular smoke pollution	1.6	1.6	1.6	1.6	1.6	1.6
9. Serving food in leaves/paper	1.5	-	1.5	-	-	0.375
10. Lack of medical certification of food vendors (from health inspectors)	1.5	-	-	-	-	-
11. Food cooked in the open for sale	1.0	1	1	1	1	1
Sub-Total for Food Contamination	**21.0**	**8.9**	**14.7**	**8.9**	**8.9**	**10.35**
Indicators	**Maximum Score**	**New Lakp.**	**Aba./Kow./Abe.**	**Adie.**	**Lakp.**	**All of La**
F. Hygiene						
1. Hands not washed after toilet	3.5	-	3.5	-	-	0.875
2. Hands not washed before food preparation/eating	3.3	3.3	3.3	3.3	3.3	3.3
3. Evidence of spitting around in community	2.2	2.2	2.2	2.2	2.2	2.2

4. Evidence of unwashed plates/dishes in house compound	1.8	1.8	1.8	1.8	1.8	1.8
5. No facility for hand washing attached to toilet, chopbars, etc.	1.8	-	-	-	1.8	0.45
6. Presence of children/adults with open sores/running noses	1.6	-	-	-	-	-
7. Communal handwashing practices within home	1.5	1.5	1.5	1.5	1.5	1.5
8. Absence of household bathhouse facility	1.3	-	-	-	-	-
9. Presence of barefooted children in community	1.3	1.3	1.3	-	-	0.65
10. Inadequate public bath-house facilities	1.3	1.3	1.3	1.3	1.3	1.3
Sub-Total for Hygiene	**19.6**	**11.4**	**14.9**	**10.1**	**11.9**	**12.075**
G. Solid Waste						
1. Mounds of uncollected garbage within community	4.1	4.1	4.1	4.1	4.1	4.1
2. Indiscriminate dumping of garbage in community	4.0	-	4	4	-	2
3. Evidence of uncovered solid waste within house compound	3.6	3.6	3.6	3.6	3.6	3.6
4. Evidence of children playing around waste dumps and/or scavenging in them	3.4	-	-	-	-	-
5. Paper and plastic litter within community	2.2	2.2	2.2	2.2	2.2	2.2
6. Evidence of animals scavenging on waste dumps and spreading the litter	2.0	-	2	-	2	1
Sub-Total for Solid Waste	**19.2**	**9.9**	**15.9**	**13.9**	**11.9**	**12.9**
H. Housing Problems						
1. Evidence of crowding in sleeping places	2.4	-	2.4	-	2.4	1.2
2. Absence of mosquito/insect screens in building	2.0	2	2	-	2	1.5
3 .Evidence of domestic animals sharing dwelling places with humans	1.8	-	-	-	-	-
4. Droppings of domestic animals in and around house compound	1.3	1.3	1.3	1.3	1.3	1.3
5. Evidence of crowding and unplanned layout of houses	1.1	1.1	1.1	1.1	1.1	1.1
6. Evidence of people sleeping outside of rooms in community	1.1	-	-	-	1.1	0.275
7. Evidence of leaking roofs during rains	1.1	1.1	1.1	1.1	1.1	1.1
8. Evidence of damp walls	1.0	-	-	1	-	0.25

Indicators	**Maximum Score**	**New Lakp.**	**Aba./Kow./Abe.**	**Adie.**	**Lakp.**	**All of La**
9. Presence of noise pollution from artisanal works/micro-enterprises etc.	0.7	0.7	0.7	0.7	0.7	0.7
10. Evidence of dirty floors	0.6	0.6	0.6	0.6	0.6	0.6
11. Evidence of cracks in walls	0.5	0.5	0.5	0.5	0.5	0.5
Sub-Total for Housing Problems	**13.6**	**7.3**	**9.7**	**6.3**	**10.8**	**8.525**
I. Indoor/Outdoor Air Pollution						
1. Smoke pollution from corn mills and micro-enterprise/vehicle (e.g.	1.9	-	1.9	-	-	0.475

garages, fish smoking, rubbish burning etc.) in community						
2. Wood as principal cooking fuel in community	1.8	-	1.8	-	1.8	0.9
3. Evidence of widespread cigarette/pipe smoking within home	1.8	-	-	-	-	-
4. Evidence of cooking done indoors (in sleeping rooms)	1.7	-	-	-	-	-
5. Evidence of cooking with wood/charcoal in kitchens	1.5	1.5	1.5	1.5	1.5	1.5
6. Charcoal as principal cooking fuel in community	1.5	1.5	1.5	1.5	1.5	1.5
7. Use of pump-spray insecticide	1.0	-	-	-	-	-
8. Use of mosquito coil/burning of leaves as repellent	0.7	0.7	0.7	0.07	0.7	0.5425
Sub-Total for Indoor/Outdoor Air Pollution	**11.8**	**3.7**	**7.4**	**3.07**	**5.5**	**4.9175**
Grand Total	**200.0**	**101**	**148.8**	**109.07**	**114**	**118.2175**

Indicators		**Lanteman.**	**Chemuana**	**Alhaji**	**T Gard.**	**All of Chorkor**
	Maximum Score	**Mean Score**				
A. Water						
1. Ponds/streams as principal source of water supply within community	6.7	-	-	-	-	-
2. Pipelines on ground surface and in drains (cross contamination)	4.8	4.8	4.8	4.8	4.8	4.8
3. Frequent water supply interruptions within community	4.0	4.0	4.0	4.0	4.0	4.0
4. Principal source of potable water supply outside house compound	3.6	3.6	3.6	3.6	3.6	3.6
5. Vendors as principal source of potable water supply within community	3.4	3.4	3.4	3.4	3.4	3.4
6. Potable water stored in open containers	3.1	3.1	3.1	3.1	3.1	3.1
7. Use of common dip cup for drinking water	2.8	2.8	2.8	-	2.8	2.1
*8. Distance above 200 metres from water collection points	2.7	-	-	-	-	-
Indicators	**Maximum score**	**Lanteman**	**Chemuana**	**Alhaji**	**T Gard.**	**All of Chorkor**
*9. Queuing time of 20+ minutes at water collection points	2.4	2.4	2.4	-	2.4	1.8
*10. Pay as you use for water	2.4	2.4	2.4	2.4	2.4	2.4
*11. Community self-assessment of water quality using own indicators	1.1	1.1	1.1	1.1	1.1	1.1
Sub-Total for Water	**37.0**	**27.6**	**27.6**	**22.4**	**27.6**	**26.3**
B. Sanitation						
1. Open defecation by neighbourhood children and/or adults	5.9	5.9	5.9	5.9	5.9	5.9
2. Littering of polythene/paper bags of faecal matter within community	4.1	4.1	4.1	4.1	4.1	4.1

3. Presence of overflowing septic tanks and aqua-privy systems in the community	3.3	3.3	3.3	-	3.3	2.475
4. Use of chamber pots for storing faecal matter/urine in-house	3.1	3.1	3.1	3.1	3.1	3.1
5. Communal toilets as principal toilet facility within community	3.1	3.1	3.1	3.1	3.1	3.1
*6. Queuing time above 10 minutes at selected toilets within community	2.7	-	2.7	-	-	0.675
7. Presence of public toilets in the midst of human dwellings	2.5	2.5	2.5	2.5	2.5	2.5
8. Toilet sharing between households within house compound	1.9	1.9	1.9	1.9	1.9	1.9
*9. Toilet user fee payment for toilet use	1.7	1.7	1.7	1.7	1.7	1.7
10. Odour nuisance around toilets/garbage dumps/drains etc.	1.7	1.7	1.7	1.7	1.7	1.7
Sub-Total for Sanitation	**30.0**	**27.3**	**30**	**24**	**27.3**	**27.15**
C. Pests						
1. Presence of many flies within kitchen/chop bar (cooking area)	5.3	5.3	5.3	5.3	5.3	5.3
2. Presence of mosquito larvae in water storage containers (Entomologists?)	5.2	5.2	5.2	-	5.2	3.9
3. Presence of many flies within toilet	4.4	4.4	4.4	4.4	4.4	4.4
4. Presence of many cockroaches in cooking area and house compound	2.8	2.8	2.8	2.8	2.8	2.8
5. Presence of mice within house	2.7	2.7	2.7	2.7	2.7	2.7
6. Complaints about bed bugs in sleeping area	2.2	2.2	2.2	2.2	2.2	2.2
7. Evidence of lice in children's hair within community	2.0	-	-	-	-	-
Sub-Total for Pests	**24.6**	**22.6**	**22.6**	**17.4**	**22.6**	**21.3**
D. Sullage/Drainage						
1. Evidence of mosquito and other larvae within stagnant water bodies	4.2	4.2	4.2	4.2	4.2	4.2
2. Pools of stagnant water (cesspools)	3.9	3.9	3.9	-	-	1.95
3. Drains choked with garbage, weeds and silt	3.7	3.7	3.7	3.7	3.7	3.7
4. Pools of stagnant water in drains	3.5	3.5	3.5	3.5	3.5	3.5
Indicators	**Maximum score**	**Lanteman**	**Chemuana**	**Alhaji**	**T Gard.**	**All of Chorkor**
5. Evidence of children playing in and around stagnant water	3.0	3	3	3	3	3
6. Absence of narrow drains in the community	2.9	2.9	2.9	2.9	2.9	2.9
7. Evidence of flood risks within community	2.1	2.1	2.1	-	-	1.05
Sub-Total for Sullage/Drainage	**23.4**	**23.3**	**23.3**	**17.3**	**17.3**	**20.3**
E. Food Contamination						
1. Evidence of defecating children around food vending area/ cooking area with the home	3.2	3.2	3.2	-	-	1.6

2. Uncovered vendor prepared food/uncovered prepared food left-overs within the house	2.6	2.6	2.6	-	2.6	1.95
3. Food sold near public toilets	2.5	2.5	2.5	-	2.5	1.875
4. Food sold near drains	2.1	2.1	2.1	2.1	2.1	2.1
5. Use of unwashed or rotten vegetables for cooking/raw eating	1.8	1.8	1.8	-	-	0.9
6. Using (naked) hand as means of serving food.	1.7	1.7	1.7	1.7	1.7	1.7
7. Food sold in eating places without running water	1.6	1.6	1.6	1.6	1.6	1.6
8. Dusty eating areas or eating areas along main transportation arteries with vehicular smoke pollution	1.6	1.6	1.6	1.6	1.6	1.6
9. Serving food in leaves/paper	1.5	1.5	1.5	-	1.5	1.125
10. Lack of medical certification of food vendors (from health inspectors)	1.5	1.5	1.5	1.5	1.5	1.5
11. Food cooked in the open for sale	1.0	1	1	1	1	1
Sub-Total for Food Contamination	**21.0**	**21.1**	**21.1**	**9.5**	**16.1**	**16.95**
F. Hygiene						
1. Hands not washed after toilet	3.5	3.5	3.5	3.5	3.5	3.5
2. Hands not washed before food preparation/eating	3.3	3.3	3.3	3.3	3.3	3.3
3. Evidence of spitting around in community	2.2	2.2	2.2	2.2	2.2	2.2
4. Evidence of unwashed plates/dishes in house compound	1.8	1.8	1.8	1.8	1.8	1.8
5. No facility for hand washing attached to toilet, chop bars, etc.	1.8	1.8	1.8	-	-	0.9
6. Presence of children/adults with open sores/running noses	1.6	1.6	1.6	1.6	1.6	1.6
7. Communal handwashing practices within home	1.5	1.5	1.5	1.5	1.5	1.5
8. Absence of household bathhouse facility	1.3	-	-	-	-	-
9. Presence of barefooted children in community	1.3	1.3	1.3	1.3	1.3	1.3
10. Inadequate public bath-house facilities	1.3	1.3	1.3	1.3	1.3	1.3
Sub-Total for Hygiene	**19.6**	**18.3**	**18.3**	**16.5**	**16.5**	**17.4**
G. Solid Waste						
Indicators	**Maximum score**	**Lanteman**	**Chemuana**	**Alhaji**	**T Gard.**	**All of Chorkor**
1. Mounds of uncollected garbage within community	4.1	4.1	4.1	4.1	4.1	4.1
2. Indiscriminate dumping of garbage in community	4.0	4	4	-	4	3
3. Evidence of uncovered solid waste within house compound	3.6	3.6	3.6	3.6	3.6	3.6
4. Evidence of children playing around waste dumps and/or scavenging in them	3.4	3.4	3.4	-	3.4	2.55
5. Paper and plastic litter within community	2.2	2.2	2.2	2.2	2.2	2.2

6. Evidence of animals scavenging on waste dumps and spreading the litter	2.0	2	2	2	2	2
Sub-Total for Solid Waste	**19.2**	**19.3**	**19.3**	**11.9**	**19.3**	**17.45**
H. Housing Problems						
1. Evidence of crowding in sleeping places	2.4	2.4	2.4	2.4	2.4	2.4
2. Absence of mosquito/insect screens in building	2.0	2	2	2	2	2
3 .Evidence of domestic animals sharing dwelling places with humans	1.8	-	-	-	-	-
4. Droppings of domestic animals in and around house compound	1.3	1.3	1.3	1.3	1.3	1.3
5. Evidence of crowding and unplanned layout of houses	1.1	1.1	1.1	1.1	1.1	1.1
6. Evidence of people sleeping outside of rooms in community	1.1	1.1	1.1	1.1	1.1	1.1
7. Evidence of leaking roofs during rains	1.1	1.1	1.1	1.1	1.1	1.1
8. Evidence of damp walls	1.0	1	1	1	1	1
9. Presence of noise pollution from artisanal works/micro-enterprises etc.	0.7	-	-	0.7	0.7	0.35
10. Evidence of dirty floors	0.6	0.6	0.6	0.6	0.6	0.6
11. Evidence of cracks in walls	0.5	0.5	0.5	0.5	0.5	0.5
Sub-Total for Housing Problems	**13.6**	**11.1**	**11.1**	**11.8**	**11.8**	**11.45**
I. Indoor/Outdoor Air Pollution						
1. Smoke pollution from corn mills and micro-enterprise/vehicle (e.g. garages, fish smoking, rubbish burning etc.) in community	1.9	1.9	1.9	1.9	1.9	1.9
2. Wood as principal cooking fuel in community	1.8	1.8	1.8	1.8	1.8	1.8
3. Evidence of widespread cigarette/pipe smoking within home	1.8		1.8		1.8	0.9
4. Evidence of cooking done indoors (in sleeping rooms)	1.7	1.7	1.7		1.7	1.275
5. Evidence of cooking with wood/charcoal in kitchens	1.5	1.5	1.5	1.5	1.5	1.5
6. Charcoal as principal cooking fuel in community	1.5	1.5	1.5	1.5	1.5	1.5
7. Use of pump-spray insecticide	1.0					0
8. Use of mosquito coil/burning of leaves as repellent	0.7	0.7	0.7	0.7	0.7	0.7
Indicators	**Maximum score**	**Lanteman**	**Chemuana**	**Alhaji**	**T Gard.**	**All of Chorkor**
Sub-Total for Indoor/Outdoor Air Pollution	**11.8**	**10.9**	**7.4**	**10.9**	**9.575**	**9.69375**
Grand Total	**200.0**	**181.5**	**180.7**	**141.7**	**168.075**	**167.99375**

*data was obtain through a focus group discussion.