University of Ghana http://ugspace.ug.edu.gh

UNIVERSITY OF GHANA

Sanitation and Incidence of Malaria in Urban Areas: A Case Study in Gbawe, Accra

BY

Worlanyo Bernice Nyadzi

(10241802)

THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MA DEVELOPMENT STUDIES DEGREE.

JULY 2013

University of Ghana http://ugspace.ug.edu.gh

DECLARATION

I, **Worlanyo Bernice Nyadzi**, hereby declare that except for references to other people's work which have been duly acknowledged, this thesis is the result of my own research carried out at the Institute of Statistical, Social and Economic Research (ISSER), University of Ghana under the supervision of Professor Kwabena Asomanin Anaman.

This thesis has neither in whole nor in part been presented for another degree.

…… DATE …….

WORLANYO BERNICE NYADZI

STUDENT

…….. DATE ……..……

PROF. KWABENA ASOMANIN ANAMAN

SUPERVISOR

University of Ghana http://ugspace.ug.edu.gh

DEDICATION

This work is dedicated to the Almighty God for making it possible for me to successfully complete this study and then to my parents, Mr. and Mrs. Nyadzi for their support and encouragement throughout this period. I further dedicate this to the Legon Interdenominational Church.

University of Ghana http://ugspace.ug.edu.gh

ACKNOWLEDGEMENTS

The most difficult tasks of any grateful person is finding the most appropriate way and words to express his/her candid appreciation and feeling about persons who have made him/her what he/she is. This is exactly what l feel about the people who have contributed to the completion of this research. First, I am highly thankful to God for giving me wisdom, good health, favour and guidance to develop and complete this dissertation.

I wish to take this opportunity to express my sincere appreciation to my supervisor, Prof. Kwabena Asomanin Anaman for his encouragement, guidance and constructive criticisms throughout the study. May God bless him. I am also grateful to my family, friends and the Legon Interdenominational Church for their financial, material and words of encouragement throughout my studies. I further acknowledge the advice of other lecturers at the Institute of Statistical, Social and Economic Research (ISSER) and the supporting staff for typing various introductory letters needed for data collection.

I would also like to acknowledge the support and cooperation of Madam Cynthia Lamptey and Delia Yayra Kwame at the Public Health Nurses School Demonstration Clinic at Mallam and Abukari Abdul- Wahab at the Waste Management Department at Ga South Municipal Assembly.

To you all I say thank you and may God bless you all.

University of Ghana http://ugspace.ug.edu.gh

ABSTRACT

Rapid urbanization in Accra over the years has come with its attendant sanitation and health problems. It is said that the major health problems in urban centers are preventable and communicable diseases attributed to poor environmental sanitation. This study examined the perceived causes of poor sanitary condition and their links with the incidence of malaria in Gbawe. The study also identified the major factors influencing the disposal of household wastes and established the factors which influenced households' method of disposal of waste. This was undertaken through elicitation of data and information from residents of the area directly with additional information derived from interviews with personnel of Public Health Nurses School Demonstration Clinic and the Waste Management Department in the Ga South Municipality.

The survey data collected was analyzed using simple statistical analysis to derive frequencies and means of important variables. Chi-square test was also employed to analyze relationships among variables. Logistic regression analysis was the third method of statistical analysis used in the study and it identified the statistically significant factors that influenced the likelihood of respondents using improved methods of disposal of solid wastes generated in their homes.

The results of the study showed that householders perceived attitude problem due to lack of care in proper disposal of wastes, high fees charged at the public dump site and by private waste collection service providers, and weak enforcement of sanitation bylaws by authorities as the major factors responsible for improper disposal of wastes. The majority of the residents did not have toilet facilities in their homes and hence relied on public toilet

University of Ghana http://ugspace.ug.edu.gh

facilities and the bush or field for disposal of human excreta. With regards to method of solid waste disposal, householders disposed wastes in the public dump and containers, burned them, threw them in the bush or patronized the services of private firms involved in waste collection and disposal.

Other results indicated that the probability of using an improved method of disposing solid wastes increased with increasing household income but it decreased with increasing number of household members. The main cause of malaria as perceived by respondents was improper disposal of wastes which served as breeding grounds for mosquitoes which transmitted malaria to humans.

University of Ghana http://ugspace.ug.edu.gh

TABLE OF CONTENTS

Content **Page**

DECLARATION i

DEDICATION ii

ACKNOWLEDGEMENTS iii

ABSTRACT…. iv

TABLE OF CONTENTS vi

LIST OF FIGURES ix

LIST OF TABLES x

LIST OF ACRONYMS xii

CHAPTER 1…. 1

INTRODUCTION AND PROBLEM STATEMENT 1

1.1 Introduction and Background of the Study 1

1.2 Problem Statement 2

1.3 Objectives of the Study 5

1.4 Research Questions 5

1.5 Hypotheses of the Study 6

1.6 Significance of the Study 6

1.7. Limitations of the Study 7

1.8 Organization of Study Report 7

CHAPTER 2 8

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK 8

2.1 Introduction 8

2.2 Definition of Sanitation 8

2.3. Solid Waste Disposal Methods 10

University of Ghana http://ugspace.ug.edu.gh

2.4 Human Excreta Disposal Methods 11

2.5 Causes of Improper Disposal of Wastes 12

2.6. Sanitation Condition in Urban Centers 13

2.7 Poor Sanitation and Incidence of Malaria 14

2. 8. Regulatory Framework and Institutions in Charge of Environmental Sanitation 16

2.9 Conceptual Framework of the Study 18

CHAPTER 3 20

THE PROFILE OF THE STUDY AREA 20

AND RESEARCH METHODOLOGY 20

3.1 Introduction 20

3.2 Summary Profile Description of Gbawe. 20

3.3 Research Design 24

3.4 Sources of Data 24

3.5 Unit of Analysis 25

3.6 Sampling Size 25

3.7 Survey Sampling and Administration Procedures 25

3.8 Methods of Analysis of Survey Data 27

3.9 Logistic Regression Analysis 29

CHAPTER 4 31

RESULTS OF THE STUDY 31

4.1 Socio-economic Characteristics of Survey Respondents 31

4.2 Households' General Attitudes Concerning Environmental Sanitation 36

4.3 Methods of Waste Disposal 44

4.3.1 Human Excreta 44

4.3.2 Household Solid Wastes 45

4.4. Chi-Square Analysis of Factors Influencing Methods of Wastes Disposal. 50

University of Ghana http://ugspace.ug.edu.gh

4.5: Logistic Regression Analysis of Factors Influencing Householders' Choice of Methods for Collection and Disposal of Solid Wastes. 52

4 7: Linkage Between the Quality of Environmental Sanitation and Incidence of Malaria..... 58

CHAPTER 5 61

CONCLUSIONS AND RECOMMENDATIONS..... 61

5.1 Conclusions..... 61

5.2 Policy Recommendations..... 62

APPENDIX 1: SURVEY QUESTIONNAIRE..... 65

APPENDIX 2:..... 74

INTERVIEW GUIDE FOR WASTE MANAGEMENT..... 74

APPENDIX 3: INTERVIEW GUIDE FOR PUBLIC HEALTH NURSES SCHOOL DEMONSTRATION CLINIC, MALLAM 76

APPENDIX 4: THE DETERMINATION OF THE 77

OPTIMAL SAMPLE SIZE OF SURVEY RESPONDENTS..... 77

APPENDIX 5: THE POPULATION OF HOUSEHOLDS AND THE RANDOMLY SELECTED NUMBER OF HOUSEHOLDS FOR EACH OF THE 20 DIVISION IN GBAWE BASED ON THE MULTI-STAGE SAMPLING METHOD. 78

APPENDIX 6: STATISTICAL ANALYSIS PROGRAMME USED TO ANALYSE THE SURVEY DATA INCLUDING CHI-SQUARE AND LOGISTIC REGRESSION PROCEDURES. 79

REFERENCES..... 81

University of Ghana http://ugspace.ug.edu.gh

LIST OF FIGURES

Figure 2.1: Causes of poor sanitation which leads to incidence of malaria … …. … ... 19

Figure 2.2: Map of Ga South Municipality … … … … …. … … ... .22

University of Ghana http://ugspace.ug.edu.gh

LIST OF TABLES

Table 3.1 Top reported disease at the OPD of PHNSDC, Mallam from 2010-2011 … …...23

Table 4. 1: Summary of socioeconomic characteristics of survey respondents based on frequency analysis ... …. … …. …. . …... …. …. …. …. …. …. …. …. …. …. …. …. 33

Table 4.2: Summary of socioeconomic characteristics of survey respondents based on averages .... ……. …… …… …… …… …… ……. …… ……. .. … …… …...35

Table 4.3 Summary of households views on the general sanitary condition in Gbawe ……39

Table 4.4: Summary of survey respondents views on the causes malaria based on frequency analysis … … … …. … …… … … …….. … ….40

Table 4.5: Households perceptions of the important of the causes of improper disposal of wastes ……... …… …… . ……. ... 41

Table 4.6: Respondents suggested measures to be undertaken by WMD and PHNSDC to tackle the market failure arising from improper disposal of wastes … … … 42

Table 4.7: Respondents suggested measures to be undertaken by all residents in Gbawe to tackle the market failure resulting from improper disposal of waste … … … 43

Table 4.8: Summary of method of waste disposal by respondents … … ……46

Table 4.9: Summary of amount paid by households on waste disposal and distance to a sanitation facility based on averages ... …… ……. ….. 48

Table 4.10: Reasons why respondents opt for specific methods of solid waste disposal based on frequency analysis …… … … … …… …….. … ….. …..49

University of Ghana http://ugspace.ug.edu.gh

Table 4.11: Results of chi-square analysis of association between method of waste disposal (solid and human excreta) and for socioeconomic, condition of facilities and the amount paid for disposal of solid wastes …… …… …… ……51

Table 4.12: Results of the logistic regression analysis of householders' choice of method for the collection and disposal of solid wastes … … … … … ……..54

Table 4.13: Summary of availability and condition of household and public toilet based on averages……. …….. …… ……. ……. …….56

Table 4.14: Frequency of clean of public toilet facility and the pressure on the facilities as assessed by respondents based on frequency analysis ….. …..... ……. ….. …57

Table 4.15: Perceived suffering due to the quality of environmental sanitation in Gbawe and incidence of malaria based on frequency and averages … ……. …….. ……59

Table 4.16: Summary of householders' perceptions and causes of malaria…… …….. 60

University of Ghana http://ugspace.ug.edu.gh

LIST OF ACRONYMS

CSV	Chi-square value
GSMA	Ga South Municipal Assembly
GSS	Ghana Statistical Service
JMP	Joint Monitoring Programme
KVIP	Kumasi Ventilated Improved Pit
MDG	Millennium Development Goal
MLGRD	Ministry of Local Government and Rural Development
MMDAS	Metropolitan Municipal and Districts Assemblies
MTDP	Medium Term Development Plan
NADMO	National Disaster Management Organisation
NESSA	National Environmental Sanitation Strategy and Action Plan
OPD	Out- Patients Department
PHNSDC	Public Health Nurse's School Demonstration Clinic
SPSS	Statistical Package for Social Sciences
UNDP	United Nations Development programmme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
KVIP	Kumasi Ventilated Improved Pit
WMD	Waste Management Department
WHO	World Health Organisation

University of Ghana http://ugspace.ug.edu.gh

CHAPTER 1

INTRODUCTION AND PROBLEM STATEMENT

1.1 Introduction and Background of the Study

The health status and productivity level of people are greatly influenced by the state of the environmental sanitation condition in which they live. This view has raised so many concerns on issues of sanitation at both the national and international levels. A report by World Health Organisation (WHO) and United Nations International Children's Education Fund (UNICEF, 2012) indicated that it was unlikely for the world to meet the United Nations Millennium Development Goal (MDG) 7 target on sanitation by the end of 2015 even though a lot of progress had been made. The report projected that 67% of the world population would have improved sanitation by 2015 which was below the 75% threshold level needed to reach the MDG 7 target.

Sanitation is not only a big issue in the world today but a growing one in most urban centers; this is as a result of increases in the number of people living in urban centers coupled with rising per capita incomes which have led to rising per capita generation of wastes and increasing levels of improperly-disposed wastes. Authorities in urban centers of developing countries such as Ghana often lack resources needed to effectively manage waste generated; improper disposal of waste can lead to the spread of diseases such as malaria, diarrhea, typhoid and acute eye infections (Government of Ghana, 2010a). Urbanisation in Accra over the years has come with its attendant sanitation and health problems including those related to the spread of malaria due to increased levels of mosquitoes. For example, a study conducted by Opoku *et al*. (2007) to access the occurrences and habitat characteristics of mosquitoes in Gbawe shows that Gambiae and Decens mosquito species are the most

University of Ghana http://ugspace.ug.edu.gh

common species in Gbawe. The presence of these species is attributed to the improper disposal of wastes in the area. The need to ensure hygienic sanitary condition cannot be overemphasized as it has a significant effect on the health and development of a society.

1.2 Problem Statement

Despite a lot of efforts to reduce cases of malaria, it is still one of the biggest challenges facing many developing countries especially those in Africa. The 2011 World Malaria report indicated that 261 million cases of malaria were recorded in 2010 of which 81% were in Africa. An estimated 655,000 people die of malaria each year and about 91% of these deaths occur in Africa (World Health Organization, 2011). A major reason for the high prevalence of malaria in Africa including Ghana is the poor environmental sanitation quality which is underpinned by rapid unplanned urbanisation and lack of policy on how to effectively manage wastes.

Accra has been experiencing rapid urbanisation. Data from the Ghana Statistical Service (GSS) show that the population of Ghana was growing at a pace of 2.5 per cent per annum and the urban population accounted for about 50.9 per cent in 2010. Greater Accra region recorded the highest proportion of urban population of 90.5% (GSS, 2013 p.53). Urbanisation provides a lot of opportunities and benefits but it also results in some negative impacts. These negative impacts include declining quality of health of people due to the poor sanitary conditions, pressure on social amenities, and scarcity of land for constructing sanitation facilities. As noted by Chaplin (1999) and Songsore, (2003a), the key challenge facing many developing countries undergoing urbanisation is the issue of sanitation and waste management. Whenever there is an increase in the number of people living in a

University of Ghana http://ugspace.ug.edu.gh

particular place, wastes accumulate and improper disposal of wastes can lead to an increase in infectious diseases such as cholera, hepatitis, malaria and typhoid.

Schertenleib *et al.* (2002) define proper sanitation management as interventions to reduce people's exposure to diseases by providing a clean environment in which they live and with measures to break the cycle of disease. These usually include hygienic management of human and animal excreta, refuse and waste water. Other interventions are control of disease vectors and the provision of washing facilities for personal and domestic hygiene.

Ghana is said to be confronted with a number of serious environmental challenges of which poor waste management, pollution of water bodies and improper disposal of waste are among the top ten challenges (Government of Ghana, 2010a). These environmental challenges are associated with health problems such as malaria, diarrhoea and skin diseases. Songsore and McGranahan (1993) indicate that the major health problems in urban centers are preventable and communicable diseases attributable to poor environmental sanitation, ignorance and poverty.

Addressing the sanitation-linked malaria challenge in Ghana is critical to achieving some of the MDGs established by the United Nations in 2000. It was in line with this objective that the United Nations General Assembly declared 2008 as the International Year of Sanitation. The goal was to raise awareness and to accelerate progress towards achieving the MDG 7 target to reduce by half the proportion of the 2.6 billion people without access to basic sanitation by 2015 (UNICEF, 2007). Achieving the first, fourth and fifth MDGs (eradicate poverty, reduce child mortality and improve maternal health) also largely depends on how

University of Ghana http://ugspace.ug.edu.gh

we ensure a clean environment, access to improved sanitation and reduces incidence of malaria.

The study area Gbawe, is an urban centre located in Ga South Municipality of Greater Accra Region is the most populous locality in the municipality. The total population of Gbawe was estimated as 40,498 in 2010 Ga South Municipal Assembly (GSMA 2010- 2013). Gbawe is confronted with a number of serious environmental challenges of which indiscriminate disposal of solid and liquid wastes especially in open places; poor drainage system and burning of garbage are paramount. The choked drainage systems of Gbawe have become a breeding site for mosquitoes. The Municipality recorded 24,276 cases of malaria in 2010. Malaria is also the number one disease seen at the outpatient departments (OPD) in health facilities of the area (GSMA 2010-2013).

There have been efforts by the District Assembly in improving sanitation condition over the years. Yet still the sanitary condition continues to deteriorate. Gbawe has limited access to both public and domestic toilet facilities. There are about four (4) public toilets in the area. The operators of this facility used to charge 20 Ghana pesewas but due to the current water and power crises facing the country, the fee was increased to 30 Ghana pesewas per person in 2013 leading to some households to resort to unhygienic practices such as the use of polythene bags and bushes as their final place for disposing excreta. According to Beede and Bloom (1995) the perceptions and attitudes of people towards waste disposal can affect the way it is effectively managed; hence it is important to examine and ascertain the perceived links between the quality of environmental sanitation and the incidence of malaria as a way of reducing the societal disease burden imposed by malaria.

University of Ghana http://ugspace.ug.edu.gh

1.3 Objectives of the Study

In light of the above discussion, the main objective of this study is to analyze the perceived causes of poor sanitary conditions and their links with the incidence of malaria in Gbawe. This is undertaken through elicitation of data and information from residents of the area directly with additional information derived from interviews with personnel of clinics and the Waste Management Department in the area.

The specific objectives of the study are as follows:

1. To identify the major factors which are perceived by respondents as the causes of the improper disposal of wastes and low sanitary condition in Gbawe.

2. To ascertain the various methods of disposal of wastes in Gbawe.

3. To identify the factors that influence method of disposal of wastes by households.

4. To examine the perceptions of people with regards to the link between poor sanitary condition and incidence of malaria in Gbawe.

1.4 Research Questions

Based on the aforementioned objectives, four (4) research questions were formulated to analyze the sanitation condition that prevails in the study area and its effects on malaria. The specific research questions are as follows:

a. What are the major factors responsible for the low sanitary condition in Gbawe?

b. What are the various methods of waste disposal in the community?

University of Ghana http://ugspace.ug.edu.gh

c. What factors influence household choice of method of collection and disposal of wastes?

d. What do residents perceive as the major causes of malaria in the community?

1.5 Hypotheses of the Study

Several hypotheses were formulated based on the research questions and objectives. These hypotheses are listed below:

1. Weak enforcement of laws, high fees for disposing wastes and poor attitudes towards the disposal of wastes are some of the major causes of improper disposal of wastes in Gbawe.

2. Householders prefer burning household wastes rather than disposing them in approved public containers.

3. Householders' choice of disposal of solid wastes is related to the level of education, their total income, distance of home to the dumping site and the number of people in a house.

4. Residents perceive that a major cause of incidence of malaria in the area is mosquitoes bite due to poor sanitary conditions which serve as a breeding ground for mosquitoes.

1.6 Significance of the Study

There are a lot of problems associated with improper disposal of waste. These include prevalence of diseases such as malaria, cholera and diarrhoea. The topic is worth researching as improved sanitation in a community creates direct health benefits and ensure proper socioeconomic development of the area. Therefore the findings of this study can help policy

University of Ghana http://ugspace.ug.edu.gh

makers and health workers to know what residents in Gbawe perceive as the major causes of malaria. The study also seeks to give a true picture of the current sanitary condition in Gbawe and provide more accurate information to health workers and policy makers so that malaria incidence can be contained or reduced.

1.7. Limitations of the Study

In every human endeavor limitation are bound to exist including availability of time. The most important constraint that the researcher faced in undertaking this study was inadequate time. The time available for the research study was short. Hence it limited the sample size of respondents that could be covered in relation to the population of residents in Gbawe.

1.8 Organization of Study Report

The report is organised into five chapters. Chapter one provides a general introduction to the study, the background of the study, a statement of the problem, research objectives, research questions, hypotheses, significance and organisation of the study. Chapter two focuses on the review of relevant literature on the topic and the conceptual framework while chapter three focuses on the methodology adopted as well as the profile of the study area. The results of the study are discussed in Chapter 4. The conclusions and recommendations are summarised in chapter five. The appendices and references form the last part of the report.

University of Ghana http://ugspace.ug.edu.gh

CHAPTER 2

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Introduction

Over the years a number of research works have been carried out to examine the sanitation problem confronting developing countries and its effect on the economy, social, psychological and human health among others. The United Nations (UN) in 2000 adopted the MDG 6 target to halt and begin to reverse the incidence of malaria and other major diseases. This chapter reviews previous studies by researchers on sanitation and its effect on social, economic and incidence of malaria.

2.2 Definition of Sanitation

Mensah (2002) defines sanitation as the state of cleanliness of a place, community or people. He relates it to those aspects of human health including the quality of life determined by physical, biological, social and psychological factors in the environment. Schertenleib *et al.* (2002) define sanitation as measures put in place to reduce people's exposure to diseases by providing a clean environment in which to live and with measures to break the cycle of disease. Diseases arise due to improper disposal of wastes by household, business and industries. Improper disposal of waste is when people dispose of waste indiscriminately. Usage of improved sanitation facility by households is likely to reduce incidence of malaria and other sanitation-related diseases.

Improved toilet facility is one such improved sanitation facility since it can hygienically separate human excreta from human contact (WHO/UNICEF, 2012). Users of improved

University of Ghana http://ugspace.ug.edu.gh

toilet facilities are considered to have access to improved sanitation. But this based on the condition that the improved toilet facility is not shared by multiple households and other members in the community. Improved types of toilet facilities include (1) flush or pour-flush to piped sewer system, (2) flush or pour-flush to septic tank, (3) ventilated improved pit latrine (VIP), (4) pit latrine with slab and (5) composting toilet. About 63 per cent of the world's population has access to improved sanitation facilities (WHO/UNICEF, 2012). Access to improved toilet facility improves the health status of people and the quality of the environment they live in.

Unimproved toilet facilities include (1) flush or pour–flush to elsewhere, (2) pit latrine without slab, (3) open pit, bucket, (4) hanging latrine, (5) public or shared toilet facilities, and (6) open defecation in the bush, field or beach. A shared toilet facility is defined as a facility of an otherwise acceptable type that is shared between two or more households. In this context, public toilet facilities are considered to be shared and hence unimproved. An estimated 2.5 billion people are still without access to improved toilet facility as at 2010, 425 million of the world population use public toilet facilities while 1.1 billion people still practise open defecation (WHO/UNCIEF, 2012). Even though the proportion of people practising open defecation is decreasing in the world, many countries are off track in achieving the MDG sanitation target.

The proportion of people who practise open defecation; bushes, fields, beaches and water bodies in Ghana decreased slightly from 20.2% in 2000 to 19.3% in 2010. However the proportion of households using public toilet facilities, considered to be unimproved facilities, increased from 31.4% in 2000 to 34.6% in 2010 (Ghana Statistical Service (GSS), 2013, p.391). This GSS report also indicated that 15.4% of Ghanaian households have

University of Ghana http://ugspace.ug.edu.gh

access to water closet toilet facility (improved facility), 19.0% have access to pit latrine (with or without slab) and 10.5% have access to Kumasi Ventilated Improved Pit (KVIP) (GSS, 2013, p.391).

2.3. Solid Waste Disposal Methods

Solid wastes consist of solid material such as plastics and papers generated by households and other actors in the economy (Government of Ghana, 2010). Miller (1988) defines solid waste as any useless, unwanted or discarded material that is not liquid or gas. In Ghana such wastes are disposed off either by burning, or disposed off into public dumps either into containers or open dump sites, or are buried indiscriminately or are routinely collected from homes by private operators (GSS, 2012).

Solid waste constitutes a major source of environmental hazard. Environmental hazards accounts for an estimated 25 % of the total burden of disease worldwide. Nearly 35% of ill health in Sub-Saharan Africa is caused by environmental hazards (WHO, 2009). Disposal of solid waste was not a major problem at the beginning of civilization because the human population was small, lands were available in abundance for absorption of waste and most wastes were biodegradable (Tchobanoglous *et al.,* 1993). However in this modern era of urbanisation and globalisation, solid waste disposal and collection are the common practice in urban centers. Anomanyo (2004) observes that about 60 to 75 percent of solid waste generated in Accra is collected. Uncollected wastes often find their way into open drains and create a breeding ground for mosquitoes and insects (Fobil, 2007).

Improper disposal of wastes is a common practice in other African countries. Ayotamuno and Gobo (2004) in their study on sanitation in Nigerian cities pointed out that

University of Ghana http://ugspace.ug.edu.gh

indiscriminate disposal of waste had become a common practice in many cities in the country. Most of the solid wastes were located close to markets and public places. Improper disposal or collection of wastes promotes the breeding of mosquitoes, rodents and pathogens that can cause and transmit diseases such as malaria, cholera and diarrhea. Uncollected wastes also produce foul odor which constitute a source of environmental nuisance (Ofomata and Eze, 2001). The most popular means of disposal of solid wastes in Ghana is by public dump, either dumping in a container (23.8%) or dumping into open dump site (37.7%) (GSS, 2013 p. 392). Another method includes collection of waste from houses 14.4%, 9.1% of the population dump waste indiscriminately while 10.7% burn their solid waste (GSS 2013 p.392).

2.4 Human Excreta Disposal Methods

People dispose of their human wastes into water closet toilet containers, pit latrine, KVIP, public toilet facilities while many people practise open defecation. Access to improved sanitation facility by households is important for promoting good health and quality of life. Access to improved toilet facility such as the used of water closets, pit with slab, KVIP is very limited in Ghana. About 34.6% of Ghanaians use public/shared toilet facility, 19.3% practice open defecation, pit latrine is used by 19% of the population, only 15.4% used water closet facilities and 10.5% used KVIP (GSS, 2013).

Public toilet facilities are allowed in densely-populated areas in Ghana (Tettey-Lowor, 2009). Such facilities are built either by the District Assembly or private operators. The use of public toilet facility for human waste disposal is considered as an unimproved method of excreta disposal (WHO/UNICEF, 2012). This is based on the fact that public toilet facility

University of Ghana http://ugspace.ug.edu.gh

does not hygienically separate human excreta from human contact; it is often dirty and inaccessible at nights especially for females and children.

The use of public toilet and open places for disposal of human excreta is attributed to inadequate access to improved toilet facilities in houses and the willingness of many landlords to abide by the sanitation byelaws that require the construction and/or availability of an improved toilet facility in every house. The exact numbers of people who visit or use public toilet facilities each day vary. OCIN (2005) estimated that about 1,500 people visited the public toilet per day while Van der Geest and Obirih- Opereh (2002) estimated the number to be 1,000 people per day on the average. The sanitary condition in most public toilets is poor. Solomon Davids (2010) in an article on Ghanaweb Internet site, describes the condition of public toilet facilities in Ghana as a place not worth calling places of convenience but rather a place of inconvenience. He indicated that about 90% of public toilets especially in Accra are not good for human use and are a major source of diseases in Ghana.

2.5 Causes of Improper Disposal of Wastes

Improper disposal of waste is caused by social, economic, behavioral (attitude) and political circumstances and expectation. Household's economic status influences their method of disposal of wastes. People with high incomes are likely to use improved methods of waste disposal. Weak enforcement of sanitation byelaws and pressure on existing sanitation facility can lead to improper disposal of wastes. Sule (1981) indicated that the major factors responsible for the poor sanitary condition of Nigerian cities are improper management of solid wastes and weak enforcement of solid waste disposal laws. The situation is similar to

University of Ghana http://ugspace.ug.edu.gh

Ghana where authorities in charge of enforcing sanitation byelaws are not effectively enforcing these laws.

Bad attitudes towards matters relating to environmental cleanliness are also a major cause of improper disposal of wastes which cannot be ignored (Nze, 1978). Other factors identified by Nze are inadequate sanitation facility, inadequate infrastructure for environmental administration, disregard for industrial and commercial growth and other human factors**.**

2.6. Sanitation Condition in Urban Centers

Sanitary condition in an urban center is critical in promoting quality of life, good health and tourism for economic growth and development. The driving forces behind the rapid urbanisation in Africa today are a combination of rural-urban migration and natural increase within towns and cities themselves (Songsore, 2000). Improper disposal of waste is one of the critical challenges facing rapid urban development in most of the developing world including Ghana. As noted by Chaplin (1999) and Potter and Lloyd Evans (1998) the issue of sanitation and waste management is a key challenge facing many countries in the developing world that are undergoing rapid urbanisation.

According to United Nations Development Programme (UNDP) survey report, solid waste disposal is the second most pressing problem facing urban city dwellers after unemployment (Da Zhu *et al*., 2008). Uguwh (2009) observes that an average Nigerian household generates about 0.49 kg of solid waste per day and commercial companies generate almost 90% of the total urban wastes. In Ghana, the rapid urban change in Accra, Kumasi and Takoradi is

University of Ghana http://ugspace.ug.edu.gh

accompanied by increasing density and intense pressure on sanitation facilities (Konadu-Agyemang, 2001a).

2.7 Poor Sanitation and Incidence of Malaria

Poor sanitation condition is seen as a critical environmental health problem in terms of deaths and illnesses worldwide (Songsore, 2000). The spread of vector-borne diseases like malaria and dengue fever is associated with poor disposal of solid wastes (McKenzie *et al*., 2004). According to McMichael (2000) many researchers have attributed the occurrences of parasites, cholera, malaria and diarrhea in African cities to poor sanitary conditions as a result of the indiscriminate disposal of waste.

Malaria is an infectious disease caused by protozoan parasites from the Plasmodium family, which is transmitted via the bites of female Anopheles mosquitoes or by a contaminated needle or transfusion (WHO, 2011). Four species of malaria parasites exist: Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale and Plasmodium Malariae. A research conducted by the Ministry of Health, (MOH) Ghana shows that only three species of the Plasmodium are present in the country, Plasmodium falciparum, Plasmodium malariae and Plasmodium ovale. Plasmodium falciparum is the predominant parasite species carried by a combination of vectors in Ghana (MOH, 1991). The Plasmodium falciparum develops resistance to certain anti–malarial drugs (WHO/UNICEF, 2003). A vector common in Africa is the anopheles Gambia and is one of the most efficient species for the transmission of the disease malaria (Snow *et al.*, 2003).

University of Ghana http://ugspace.ug.edu.gh

Indiscriminate disposal of waste into the environment serves as a breeding ground for mosquitoes (Ofamata and Eze, 2001). Common symptoms of malaria include severe headaches, fever, profuse sweating, muscle aches and drowsiness. Other factors also contribute to the incidence of malaria apart from poor sanitary conditions. These include economic, perceptions, socio-economic and social circumstances. Mensah and Kumaranayake (2004) conducted a study in Benin to establish the perceived importance of factors that contributed to the incidence of malaria. The researchers established that characteristics of household heads such age, knowledge of malaria, education and size of household significantly affected the incidence of malaria.

Asenso-Okyere (1994) conducted a study on malaria in four districts in the Greater Accra region of Ghana namely Kojo Ashong, Barekese, Barekuma and Oyereko. The results of the study revealed that residents in these districts perceived malnutrition, mosquitoes, excessive heat, excessive drinking, flies, fatigue, dirty surroundings, unsafe water, bad air and poor hygiene as factors causing malaria. The study found that all the adolescents at the time of the study had no knowledge on how the disease was spread from person to person. Some of the symptoms considered to be linked to malaria by respondents were chills and shivering, a bitter taste, body weakness, yellowish urine, headaches and yellowing of the eyeballs.

Nkuo-Akenjii *et al.* (2006) indicated that malaria is prevalent throughout Cameroon with the transmission being affected by climate and geography and lack of adequate vector control measures. The story is not different in Zambia; available information shows that increases in malaria cases and deaths have not yet been reversed (WHO, 2011).

University of Ghana http://ugspace.ug.edu.gh

Sharma *et al.* (2001) in their study in Sundargarh to examine the socio-economic factors and human behavior towards the incidence of malaria argue that poor socio-economic status and socio-cultural factors play an important role in increasing the incidence of malaria. They show that human behaviour such as sleeping habits and outdoor activities after dusk, poor knowledge about the disease and treatment-seeking behaviour are of great significance as determinants of malaria transmission or incidence of malaria.

Less attention has been paid in the literature to the social implications of poor sanitary condition in Ghana. Owusu (2010) however conducted a study to examine the social effects of poor sanitation in a poor neighborhood (Sabon Zongo). He established that residents of Sabon Zongo package their excreta and solid wastes in plastic bags and disposed them indiscriminately in the community due to their inability to pay for disposal of wastes. He also observed that insecurity, contestation for open space, violence and general indiscipline characterize the behavior of the youth of the area partly due to their deprivation of improved sanitary conditions.

2. 8. Regulatory Framework and Institutions in Charge of Environmental Sanitation

In Ghana four ministries are involved in environmental sanitation. The Ministry of Local Government and Rural Development and the Ministry of Water Resource Works and Housing formulate policy for sanitation and water respectively. The Ministry of Environment, Science Technology and Innovation and Ministry of Health are in charge of educating the public on hygienic practices and they also contribute to policy formulation. The Ministry of Local Government and Rural Development has the overall responsibility for formulating environmental sanitation policies. The Environmental Sanitation Strategy and

University of Ghana http://ugspace.ug.edu.gh

Action Plan of Ghana touches on all aspects of environmental health management including solid waste management and human excreta disposal. The policy gives full backing to departments and agencies for management of waste, public health management, environmental monitoring and planning. The responsibility of constructing appropriate domestic and communal toilet facilities is the duty of communities working with their District Assemblies.

The current National Environmental Sanitation Strategy and Action Plan was revised in 2009. The policy focus on solid and liquid waste, industrial and hazardous waste, storm water drainage, environmental and hygienic education and vector diseases (Government of Ghana, 2010). The policy aims at maintaining a safe, hygienic environment in all human settlements to promote the social, economic and physical well-being of all sections of the population. The policy specifies clearly the various roles of individuals, communities, institutions and other agencies in ensuring a clean and safe environment.

The Metropolitan, Municipal and District Assemblies (MMDAs) are responsible for implementing sanitation policy and byelaws. The Waste Management Department, Public Health and the National Disaster Management Organisation (NADMO) are responsible for educating the public about hygienic environmental practices among community members. They are to ensure that people abide by sanitation bye laws. The District Assemblies are also in charge of providing public facilities and refuse dump container in central business districts, major commercial and light industrial areas, local markets and public transport.

University of Ghana http://ugspace.ug.edu.gh

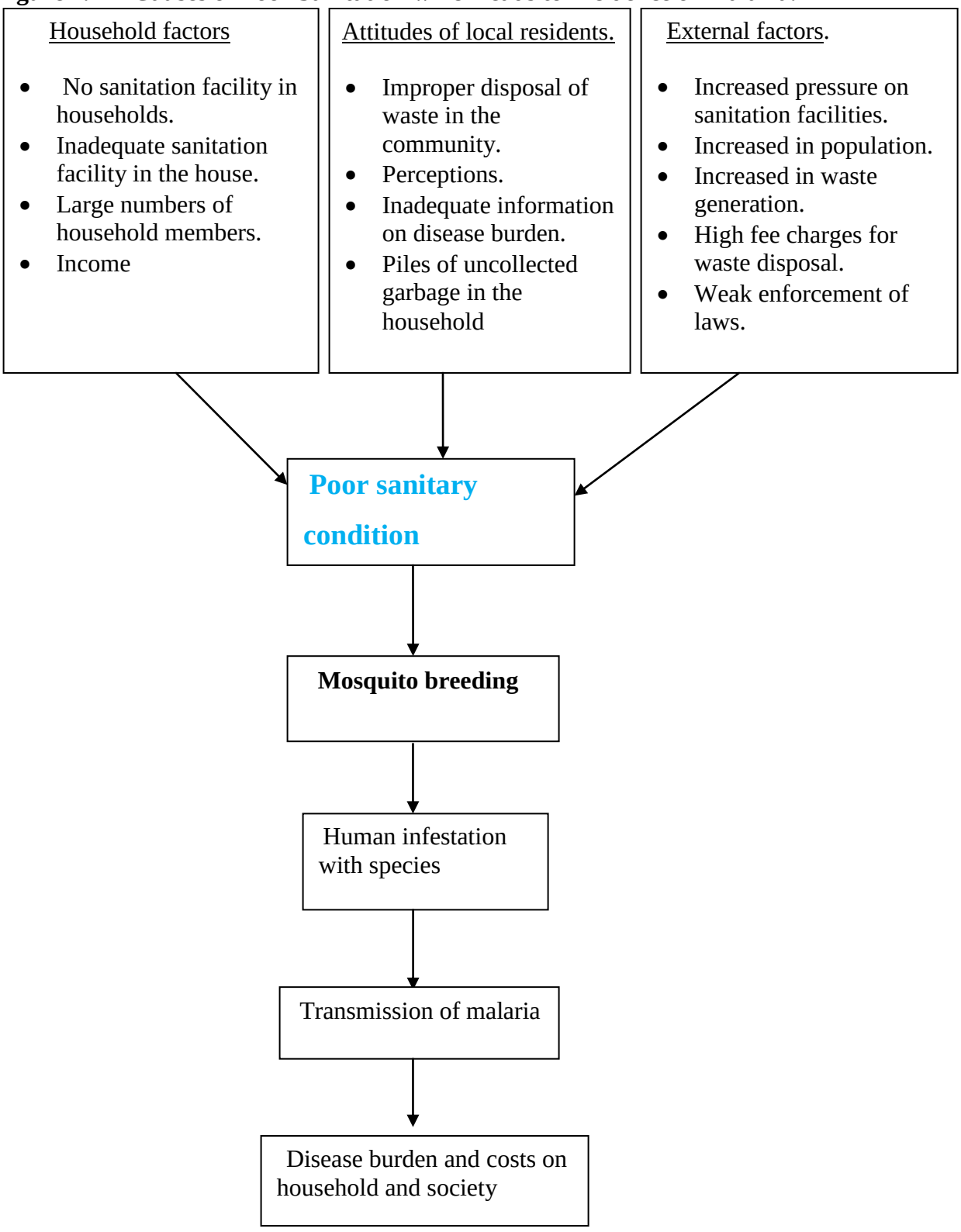
2.9 Conceptual Framework of the Study

The conceptual framework gives a diagrammatic representation of the causes of poor sanitation which leads to incidence of malaria and this is illustrated in Figure 2.1. It depicts the interrelationships among variables in the framework. From the conceptual framework, poor sanitation is as a result of bad attitudes of residents such as indiscriminate disposal of wastes in the community, inadequate sanitation facilities and high fees charged for waste disposal which discourage householders with low incomes from using improved sanitation facilities. Weak enforcement of sanitation bye laws, increase in the number of people in a household and increase in the number of people living in the community also contribute to poor sanitation.

Improper disposal of wastes serves as a breeding ground for mosquitoes. When an infected mosquito bites a human being, it leads to the transmission of malaria. Incidence of malaria affects the quality of life and allocation of resources within the household, community and the nation as a whole. This is because in addition to human suffering, it also puts stress on health facilities and increase government and household costs arising from the purchase of drugs and time spent for treatment at clinics and hospitals.

University of Ghana http://ugspace.ug.edu.gh

Figure 2.1 Causes of Poor Sanitation which leads to Incidence of Malaria.



Source: Author, February 2013

University of Ghana http://ugspace.ug.edu.gh

CHAPTER 3

THE PROFILE OF THE STUDY AREA AND RESEARCH METHODOLOGY

3.1 Introduction

This chapter is broadly divided into two main sections. The first part looks at the general profile of the study area. The second part examines the methodology employed in the study such as the research design and how the data were analyzed. It also explains the instrument used for data collection and data analysis procedures.

3.2 Summary Profile Description of Gbawe.

Gbawe was founded more that 100 years ago. The town is located within the Ga South Municipal Assembly and shares boundaries with Mallam and Weija. It also shares boundaries with the Accra Metropolitan Assembly in the South-East, Akwapim South to the North-East, Ga West to the East, West Akim to the North, Awutu-Effutu Senya to the West, Gomoa to the South-West and the Gulf of Guinea to the South (GSMA, 2010). The Gbawe Chief is considered as the traditional leader with autonomy over Gbawe. His duties include settling disputes, making traditional laws, sanctioning the sale of lands and providing security.

The 2000 Population and Housing Census indicated that the population of the entire Gbawe area was 40,498. The projected population for the year 2013 was 44,771 (GSMA, 2010). Presently, statistics are not available with regards to the occupational distribution in the

University of Ghana http://ugspace.ug.edu.gh

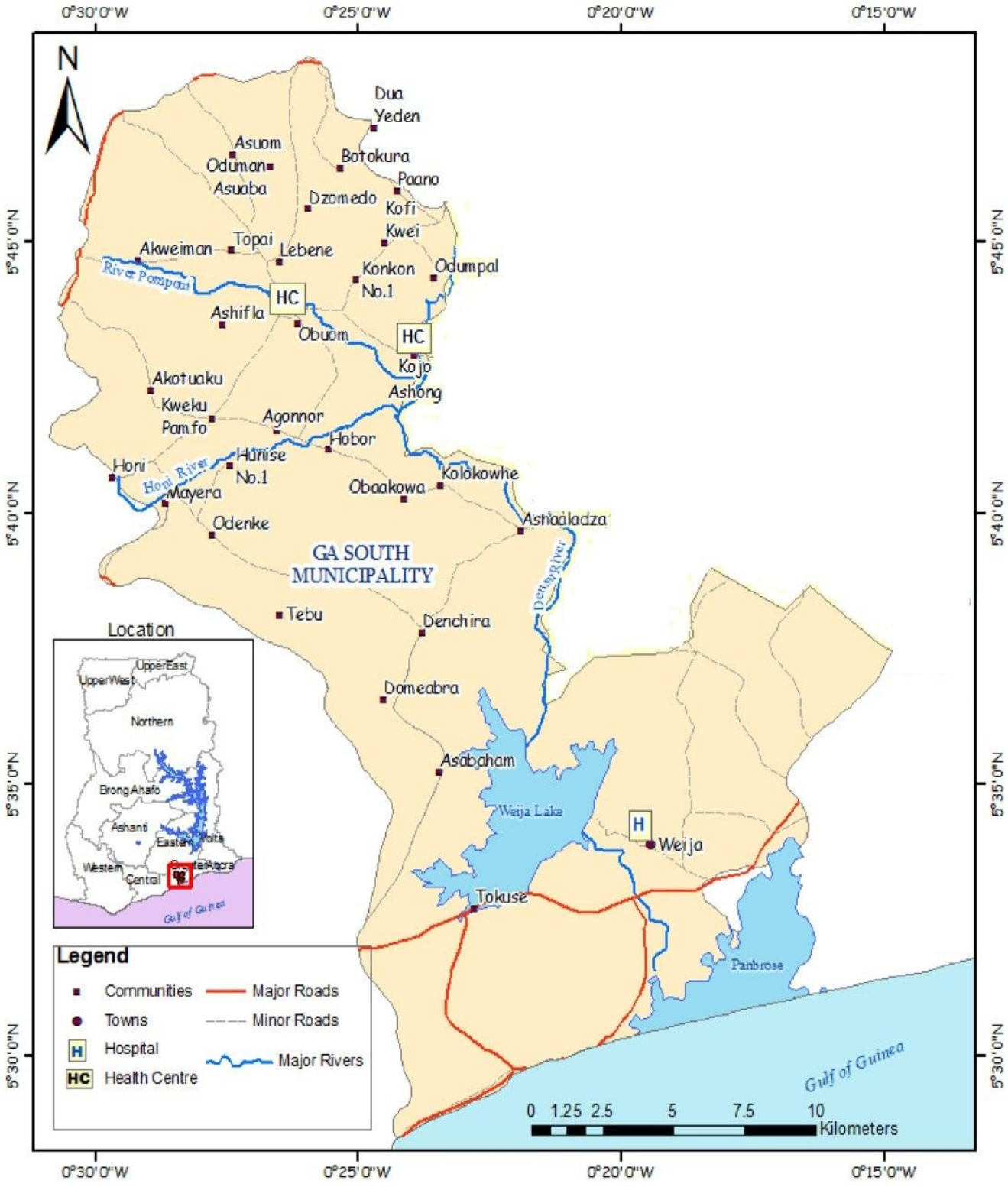
Municipality. However residents are engaged in small and medium scale enterprise, others are working in the government sector while others are in the informal sector.

As is the case of most areas of Ghana, the government is the major provider of health care delivery in the municipality. Residents attend the PHNSDC at Mallam for treatment of diseases. The clinic apart from providing health care services to residents also trains community health workers who often embark on weekly health outreach to schools, homes and selected communities in order to make health care more accessible. Malaria is the top recorded disease at the outpatient department (OPD) of the clinic in both 2010 and 2011 (refer to Table 3.1). The clinic also registers and renews residents who have the National Insurance Scheme card.

There are a few government basic schools in Gbawe. The town has no government senior high school. The municipal assembly is currently building a three classroom block and office unit (GSMA, 2010) in the area. The public schools are managed by the Municipal Education Directorate. Some of the challenges confronting schools in Gbawe include limited resources to carry out monitoring and evaluation of students and inadequate infrastructure facility. Access to potable water is limited in Gbawe not withstanding the fact that the Weija water reserviour and treatment plant which supply almost half of Accra with water is located not far from Gbawe. Many households in Gbawe do not have improved sanitation facility in their houses. Majority of people used the public toilet in the disposal of human excreta. Users of public toilet paid 30 pessewas per visit to the facility.

University of Ghana http://ugspace.ug.edu.gh

Figure 3.1: Map of Ga South Municipality



Source: Ackumey *et al.* (2012)

University of Ghana http://ugspace.ug.edu.gh

Table 3.1: Top reported diseases at the OPD of PHNSDC, Mallam in 2010 and 2011.

Year	**2010**	**2010**	**2011**	**2011**
Disease	**No.**	**Percent**	**No.**	**Percent**
Malaria	495	30	599	40
Skin infection	152	10	110	0
URTI	39	0	208	10
Diarrhoea	77	0	103	0
Eye infection	15	0	39	0
Home accidents	18	0	34	0
ARI	16	0	8	0
Worm infestation	16	0	-	-
Mumps	15	0	6	0
Mild hypertension	-	0	-	-
Other animal bites	-		8	0
All other diseases	-	-	255	10

Source: Annual Report of PHNSDC, Mallam, 2010/2011.

There are a number of internet cafes at Gbawe and several mobile phone companies provide services in the town including MTN, Tigo, Glo, Vodafone and Airtel. The area also has a number of micro finance institutions. There are a number of restaurants and bars which provide hospitality services in the town and its surroundings.

University of Ghana http://ugspace.ug.edu.gh

3.3 Research Design

There are three types of data that can be used for empirical analysis, namely time series, cross- sectional and pooled data. The research design used in this study was a cross-sectional descriptive survey where data collection occurred at a single point in time for each household. Time series data were also used. These data were obtained from the Mallam Public Health Nursing School Demonstration Clinic (PHNSDC).

Research design is simply the framework outlining the various research activities required in order to effectively address the research question (Ahiadeke, 2008). A scientific survey was undertaken in this study. Surveys are often used for studies that involve individual people as the unit of analysis due to the need to communicate with them directly (Anaman, 2003). Surveys are used by researchers for descriptive, explanatory and exploratory purposes. This research design based on scientific survey used in this study was helpful because it allowed for the generalisation of findings from a sample to reflect the views of the target population.

3.4 Sources of Data

Primary and secondary data were sourced by employing both qualitative and quantitative methodologies. Secondary data were obtained from relevant books, journals, articles, internet, published and unpublished materials. The researcher also obtained data from existing documents of related institutions and departments. Primary data were collected through interviews. The researcher administered the survey questionnaires through face-to-face interviews. All the 120 home interviews were conducted by the author of this report. The interviews were done with household heads or in their absence the most senior persons in the household who were able to answer the questions contained in the questionnaires.

University of Ghana http://ugspace.ug.edu.gh

3.5 Unit of Analysis

The units of analysis for the research study were households in Gbawe; and two institutions, Waste Management Department and the PHNSDC all located in the Ga South Municipality.

3.6 Sampling Size

The survey of householders involved a random sample with a minimum optimal size of 91 householders out of the total 1034 houses in Gbawe as at the time of the survey. The desired maximum sampling error was 10%. The minimum optimal size (n) of 91 was chosen based on the Yamane formula (1973). This formula is given as $n = N/1+N (e)^2$ where N is the total number of households and e is the margin of error (assumed to be 10% for this study). The researcher anticipated that some householders would refuse to participate or might not be available for the survey. Therefore an oversampling of about 30% was employed. The optimal sample size was then increased to 120. The details of the determination of the optimal sample size are provided in Appendix 4.

3.7 Survey Sampling and Administration Procedures

A scientific survey based on the multi-stage cluster sampling method of households was undertaken using home-based face-to-face interviews involving a questionnaire reported in Appendix 1. The survey examined poor sanitary conditions and the incidence of malaria and covered a period of five (5) months from mid-December 2012 to mid-May 2013.

Cluster sampling was a principal mode of sampling used in the study. It is a probability sampling procedure in which elements of the population are randomly selected in naturally-occurring clusters. There are three types of cluster sampling as follows: (1) single-stage (2)

University of Ghana http://ugspace.ug.edu.gh

two-stage and (3) multi-stage cluster sampling. The researcher used the multi-stage cluster sampling.

Multi-stage cluster sampling involves listing and selecting of a sample of subjects from the primary sampling units (Anaman, 2003). The researcher used major road intersections to group houses in Gbawe town into clusters. The process of clustering houses around each major road intersection was done till all the areas of the town were covered. Through this process, the researcher artificially created 20 clusters in the entire town. The houses in each of the 20 clusters were numbered. The population of numbered houses in Gbawe at the time of the survey was 1034. The optimal sample size for each cluster was based on the number of houses in each cluster as a proportion of the total number of houses in the entire town, Gbawe (1034) multiplied by the optimal sample size (120).

Appendix 5 shows the details of the sampling procedures applied to the 20 clusters in the determination of the optimal size for each cluster and the entire town (Gbawe). The households in each cluster were selected randomly to ensure that each household stood an equal chance of being selected. This was done through the use of a random number generator programme available from a standard scientific calculator. In all 120 households were randomly selected.

A small pilot survey was initiated in January 2013 involving ten (10) respondents. The purpose of the pilot survey was to assess the suitability of the questions in order to capture the required information. The results of the pilot survey were used to improve the final version of the questionnaire. Prior to the household face-to-face interviews, the Municipal

University of Ghana http://ugspace.ug.edu.gh

Assembly was informed and permission to interview respondents was sought and approval received. Permission to interview was also sought from the district health directorate and approval was given to interview three health workers at the PHNSDC at Mallam.

The final questionnaire was developed after the pilot survey. It consisted of five main sections. A copy of the questionnaire used for the study is presented in Appendix 1. Section A of the questionnaire assessed the attitude of householders towards sanitation and general information on the sanitary condition in Gbawe. This section identified the causes of improper disposal of wastes. Section B dealt with the disposal of wastes by householders (both solid and liquid wastes). Section C sought information from householders on the availability and conditions of facilities in their houses and in the community. Section D requested information from households with regards to the link between the quality of sanitation and the incidence of malaria. The last section E was designed to solicit information on selected socio-economic characteristics of all respondents.

3.8 Methods of Analysis of Survey Data

Using the Statistical Package for Social Sciences (SPSS), the survey data were analyzed using simple statistical analysis to derive frequencies and means of important variables. Chi-square test was also employed to analyze relationships among variables using SPSS. Chi-square test is used in social science research to test hypothesis concerning frequency distribution or the independence of two variables. The chi-square test is a test of statistical significance for categorical data (Gaur *et al.*, 2006). It is a test of association between variables.

University of Ghana http://ugspace.ug.edu.gh

Babbie (2001, p. 459) points out that chi-square test is based on the null hypothesis that there is no association between two variables based on grouped data. A chi-square test is undertaken by first computing cells in a contingency table of two variables, for example, the method of disposal of solid wastes and household monthly income. The chi-square value (CSV) is calculated by squaring the difference between the observed cell frequency and expected cell frequency (E) and then dividing this squared difference by the expected cell frequency. The CSV is the sum arrived by repeating these steps for all the cells in the contingency table. It is shown below

$$\mathbf{CSV} = \sum \mathbf{((O-E)^2/E)}$$ **where** $\sum$ is the summation symbol.

The chi-square test used in the study involved tests of association between method of disposal of solid wastes and some factors identified through the literature review reported in Chapter 2 and others identified through the researcher's observations on the field. These factors were total monthly income of working respondents, level of education, monthly amount paid for disposal of waste and professional occupation. Chi-square test was also used to test the association between method of disposal of human excreta and pressure on sanitation facility, level of education, number of people in a household and total monthly income.

Logistic regression analysis was the third method of statistical analysis used in this study. It was used to determine the factors that influenced householders' choice of method of disposal of solid wastes. The logistic regression analysis was also carried out using SPSS and the details of this analysis are provided in the next section.

University of Ghana http://ugspace.ug.edu.gh

3.9 Logistic Regression Analysis

In Chapter 1, it was hypothesized that using a specific method of disposal of solid wastes would depend on some socio-economic characteristics of a householder and distance to the disposal site. Therefore the probability of a householder using the public dump container or private waste collection services or unapproved waste disposal methods would be related to some socio-economic characteristics. This probability P_i was a latent variable which was not directly observed. However, householders either used public dump container or patronize private waste collection services or used unimproved methods of disposal of wastes. This observation could be represented by a dummy variable (Y_i) which had a value of 1 if the householder disposed wastes in public dump containers or through private waste collection firms and zero if the householder used unimproved methods of waste disposal. This relationship is indicated below in Equation 1.

$$P_i = B_0 + B_j \sum_{j=1}^{k} X_{ij} + U_i \qquad \textbf{EQUATION 1}$$

where B_j was the coefficient of the jth socioeconomic characteristic

X_{ij} was the jth socio-economic characteristic of the ith householder and

U_i was the error term.

Assuming that the error term in equation 1 (U_i) is symmetric and its cumulative distribution is logistic, then logistic regression equation is described as follows in Equation 2 (Gujarati, 2003).

University of Ghana http://ugspace.ug.edu.gh

$$(\log(P_i/(1-P_i)) = B_0 + B_j \sum_{j=1}^{K} X_{ij} + U_i \qquad \text{EQUATION 2}$$

Equation 2 is estimated using maximum likelihood procedures available in SPSS. The left hand side of Equation 2 is the log odds ratio and is a linear function of the explanatory variables. The log odds ratio describes the odds favouring the use of the public dump/private waste collection service. The right hand side of this equation are the socio-economic characteristics that are expected to influence the choice of using the public dump/private waste collection services.

University of Ghana http://ugspace.ug.edu.gh

CHAPTER 4

RESULTS OF THE STUDY

4.1 Socio-economic Characteristics of Survey Respondents

Table 4.1 provides a summary of the socio-economic characteristics of the respondents who participated in the survey. Based on frequency analysis, 40.8% of the respondents were males and 59.2% were females. About 46% of respondents were married, 29% were single or not married while the remaining 25% were in informal unions**.** About seven in 10 respondents were Christians; however about 11.7% of the respondents declared themselves as both Christians and followers of African traditional religions. About 10.8% of the respondents were Muslims.

With regards to ethnicity, about 39.2% of the respondents were Gas, 17.5% were Ewes while 12.5% were Fantes. About 8.3% of the respondents were Guans. The Mole-Dagbani group accounted for about 6.7% of the respondents. About 5% of respondents were Asantes, 4.2% were Kwahus. Nzemas and Ga-Adangbes were 1.7% of the respondents each respectively.

Considering age, 33.3% of the respondents were in 30-39 age category while 32.4% were in the 40-49 age category. About 21.6% of respondents were in 20-29 age category while 10.8% were in 50-59 age category. About 1.75% of the respondents were between 60 and 69 years.

Another important socio-economic characteristic was the level of education attained. About 28.3% of the respondents had completed junior high school or its equivalent, 16.7% had completed senior high school level while 13.3% of respondents had some senior high school

University of Ghana http://ugspace.ug.edu.gh

qualification. About 11.7% of the respondents had a primary school qualification, 7.5% had diploma and 6.7% had completed technical school. About 4.2% of the respondents did not attend any formal school while 4.2% and 2.5% respectively had received bachelors and postgraduate degree. Finally 4.2% of the respondents never attended school. In terms of occupation 60% of the respondents were self- employed, about 18.3% were government sector employees, 15% were artisan and 2.5% were employed in the private sector. About 2.5% are farmers and 1.7% of the respondents were unemployed.

Table 4.2 reports average figures of selected socio-economic characteristics of respondents. The mean age for the whole group was 38.1. Respondents worked as petty traders, food vendors, hairdressers, tailors and seamstress. Most of the workers used electricity in their daily work, during the survey; they complained bitterly about the erratic supply of electricity which had affected their businesses. The average total monthly income of working respondents was about GHS 266.2 (refer to Table 4.2).

The mean number of people living in homes was 8.9. The number of people living in a house was a likely variable to influence a household mode of disposing both human excreta and solid wastes. A household with many people generate a lot of wastes and are likely to pay more for the use of sanitation facility and vice versa. Another variable that often influences a household's method of waste disposal is the distance or time from a household to a proper sanitation facility. The average time from a house to the nearest public toilet facility and public container dump site was two minutes and 13 minutes respectively.

University of Ghana http://ugspace.ug.edu.gh

Table 4.1: Summary of socio-economic characteristics of survey respondents based on frequency analysis.

Item	Percent Frequency
Gender	
➢ Female	59.2
➢ Male	40.8
Marital Status	
➢ Married	45.8
➢ Single	29.2
➢ Informal unions	25.0
Religion	
➢ Christian	70.8
➢ Christian and Traditionalist	11.7
➢ Muslim	10.8
➢ Traditionalist	5.0
➢ Muslim and Traditionalist	0.8
➢ Atheists	0.8
Ethnicity	
➢ Ga	39.2
➢ Ewe	17.5
➢ Fante	12.5
➢ Guan	8.3
➢ Mole- Dagbani	6.7
➢ Asante	5.0
➢ Kwahu	4.2
➢ Akuapim	3.3
➢ Ga-Adangbe	1.7
➢ Nzema	1.7

University of Ghana http://ugspace.ug.edu.gh

Age	
➢ 20-29	21.6
➢ 30-39	33.3
➢ 40-49	32.4
➢ 50-59	10.8
➢ 60-69	1.7
Educational attainment	
➢ Junior high school	28.3
➢ Senior high graduate	16.7
➢ Some senior high school	13.3
➢ Primary school	11.7
➢ Diploma	7.5
➢ Technical school	6.7
➢ HND	5.0
➢ No formal education	4.2
➢ Bachelors degree	4.2
➢ Postgraduate degree	2.5
Occupation	
➢ Self employed/own business	60.0
➢ Government sector employee	18.3
➢ Artisan	15.0
➢ Private sector employee	2.5
➢ Farmers	2.5
➢ Unemployed	1.7

Source: Field survey, 2013.

University of Ghana http://ugspace.ug.edu.gh

Table 4.2: Summary of socio-economic characteristics of survey respondents based on averages.

Items	Mean	Standard deviation
Age for the whole Group	38.1	8.8
Total income of working respondents per month	266.2	173.7
Number of people in the house	8.9	3.0
Minutes through walking from house to the nearest public toilet facility	2.2	1.1
Minutes through walking from house to public waste disposal facility	13.2	7.0

Source: Field survey, 2013

University of Ghana http://ugspace.ug.edu.gh

4.2 Households' General Attitudes Concerning Environmental Sanitation

Table 4.3 provides a summary of the perceived general sanitary condition and seriousness of improper disposal of waste in Gbawe. Good sanitary conditions have a significant effect on the health status and quality of life of residents. Respondents were therefore asked to assess the general sanitary condition in the area. They were asked to quantify the sanitary condition by indicating 1 as very poor, 2 as poor, and 3 as fair, 4 as very good and 5 as excellent. Respondents viewed the sanitary condition of the area as between poor and fair based on the average elicited score of 2.9.

Respondents were also asked to quantify the level of seriousness of improper disposal of waste in Gbawe by indicating 5 as very serious, 4 for being serious, 3 for moderately serious, 2 as low and 1 for being not serious at all. Respondents viewed the problem as serious to very serious based on the average score of 4.5. The low coefficient of variation of the score reflected the near unanimity with regards to the generally poor sanitary condition and seriousness of the environmental sanitation problem of Gbawe.

People had perceptions about the causes of malaria, respondents were therefore asked to indicate what they considered as the causes of malaria in Gbawe. All the 120 respondents agreed that improper disposal of wastes served as a breeding ground for mosquitoes and people got malaria from a bite from an infected mosquito. Table 4.4 is a summary of what respondents considered as the causes of malaria. About 65% of respondents considered bites from infected mosquitoes due to improper disposal as the cause of malaria, 15.8% of the respondents also considered breeding of mosquitoes in gutters and tins, while 15% considered improper disposal of waste as the cause of malaria in Gbawe. The poor drainage system in the area is considered by 2.5% of the respondents as the cause of malaria.

University of Ghana http://ugspace.ug.edu.gh

These findings suggested that knowledge of transmission and cause of malaria was very high among respondents. People knew what caused malaria and that poor sanitary conditions of the area was one of the important causes of malaria. Therefore the market failure arising from lack of information on the causes of malaria was not an important issue. Rather the situation reflected a clear case of community failure and government failure in dealing with the poor environmental sanitation problem of Gbawe given the externalities imposed by individual behavior which could not be solved by market forces.

Table 4.5 summarizes respondents' views on the causes of improper disposal of wastes in public places like roads, quarry pit, gutters, bushes and other areas in Gbawe. Based on the average score of importance of 4.8 (out of a maximum score of 5.0), the most important cause of improper disposal of waste in public places was considered to be the attitude problem of people due to lack of care in proper disposal of wastes by householders. Attitude problem here refers to the behaviour of people who throw household wastes and excreta at improper places in Gbawe without thinking about the consequences of their actions. This result also confirms the finding of the study by Nze (1978) that bad attitudes of people lead to improper disposal of waste and attitudes of people should not be ignored when policies are being formulated for environmental programmes. Bad attitudes of people towards sanitation and disposal of waste can be changed through education.

The second most important cause of improper disposal of wastes in public places and other inappropriate places in Gbawe was the high fees charged by private waste collection service providers and managers of the public dump containers. This was assessed with a high mean score of 4.6. The managers of the public waste dump containers were appointed by the

University of Ghana http://ugspace.ug.edu.gh

District Assembly. Householders who could not afford paying for these services end up disposing wastes indiscriminately in the community.

The third most important cause identified by respondents was the weak enforcement of sanitation byelaws by the Waste Management Department of the Ga South Municipality. The average score was 4.4. This finding corroborates the observation by Sule (1991) that weak enforcement of sanitation laws is a factor responsible for improper disposal of wastes. Another major cause of improper disposal of waste was the inability of the Municipal Assembly to provide adequate facilities for disposal of wastes. The average score was 3.4. Other causes identified were lack of adequate information on the disease burden of improper and unhygienic disposal of wastes, increase in the number of people currently residing in Gbawe and the distances of houses to the public wastes collection centers (refer to Table 4.5).

Table 4.6 summarizes respondents' suggested measures to be undertaken by householders to tackle the market failure arising from improper disposal of wastes in public places in Gbawe. About 37.5% of respondents suggested that all households must dispose their wastes at the public dump container and appropriate places designated by the District Assembly. Residents also needed to change their attitude towards disposal of waste at improper places. This view was suggested by about 35% of respondents. About 10% of respondents suggested that all households must obey sanitation byelaws requiring the need for the government through the District Assembly to enforce existing sanitation laws.

Table 4.7 summarizes respondents' suggested measures to be undertaken by the Waste Management Department of the District Assembly and the Public Health School at Mallam

University of Ghana http://ugspace.ug.edu.gh

to tackle the market failure arising from improper disposal of wastes. About 16.7% of respondents suggested that the sanitation and waste management unit must provide more public containers for the disposal of waste. Further, more public toilet facilities were required. Other suggestions included the two units to embark on educational outreach to educate residents on risks associated with poor sanitation and the need to organize regular clean-up exercises (refer to Table 4.7).

Table 4.3: Summary of householders views on the general sanitary condition in Gbawe based on averages.

Items	Average score of importance	Standard deviation of score	Coefficient of variation of score ***
Assessment of general sanitary conditions	2.9*	0.9	0.31
Level of seriousness of the problem	4.5**	1.0	0.22

Source: Field survey, 2013

Notes

***The scoring of general sanitary condition is based on 5 denoting that the sanitary condition is excellent, 4 very good, 3 fair, 2 poor, 1 very poor.**

****The scoring of the level of seriousness of improper disposal is based on 5 denoting that it is very serious , 4 serious, 3 moderately serious, 2 low and 1 not serious at all.**

***** The coefficient of variation is defined as the standard deviation divided by the mean score and expresses the degree of unanimity of the householders with respect to the views expressed by them**

University of Ghana http://ugspace.ug.edu.gh

Table 4.4: Summary of survey respondents views on the causes of malaria in Gbawe based on frequency analysis.

Causes	Percent frequency
Bite from infected mosquitoes due to improper disposal of wastes	65.0
Breeding of mosquitoes in gutters and tins of Milk	15.8
Improper disposal of waste	15.0
Poor drainage systems	2.5
Improper disposal of wastes and poor drainage Systems	1.7

Source: Field survey, 2013

University of Ghana http://ugspace.ug.edu.gh

Table 4.5: Householders' perceptions of the importance of the causes of improper disposal of wastes in public and open places like drains, quarry pit, gutters, bushes and uncompleted building in their area.

Cause	Average score of importance	Standard deviation of score	Coefficient of variation of score
Attitude problem due to lack of care in proper disposal of household wastes by householders	4.8	0.6	0.13
High costs or fees charged by private/public companies to collect and dispose of household solid wastes	4.6	0.8	0.17
Weak enforcement of existing byelaws on sanitation.	4.4	0.5	0.11
Inadequate collection and disposal of wastes by municipal authorities	3.8	0.9	0.24
Lack of adequate information on the human costs of improper and unhygienic disposal of wastes	3.4	0.9	0.26
Increased in the number of people currently living in the area.	2.8	0.8	0.29
Long distances of houses to roadside community waste collection centers	2.6	0.8	0.31

Source: Field survey, 2013

Note: **The scoring is based on 5 denoting that item is extremely important, 4 very important, 3 moderately important, 2 of low importance and 1 not important.**

University of Ghana http://ugspace.ug.edu.gh

Table 4.6: Respondents suggested measures to be undertaken by the waste management department and public health clinic to tackle the market failure arising from improper disposal of wastes

Suggested measures	Percent Frequency
Provide more sanitation facilities at appropriate places.	16.7
Provide more sanitation facilities and educate residents on risks associated with poor sanitation.	15.0
Organize regular clean up exercises.	15.0
Enforce existing laws dealing with improper disposal of wastes	13.3
Punish residents who disobey byelaws on proper disposal of waste.	11.7
Enforce byelaws and provide more sanitation facilities.	10.0
Provide more sanitation facilities and reduce the fee charged for waste disposal.	5.8
Provide more sanitation facilities and educate residents to change their attitude.	5.8
Reduce the fee charge for disposal of wastes	6.7

Source: Field survey, 2013

University of Ghana http://ugspace.ug.edu.gh

Table 4.7: Respondents suggested measures to be undertaken by all residents in Gbawe to tackle the market failure resulting from improper disposal wastes in open places.

Suggested measures	Percent Frequency
Resident should dispose waste at appropriate places in the area	37.8
Resident should change their poor attitude towards disposal of wastes	35.3
Residents must obey byelaws on disposal of wastes.	10.1
Resident should check each other and the chief should also punish those who disobey sanitation laws	6.7
Resident must organize regular clean up exercise	5.9
Resident must educate each other about the effect of poor sanitary condition.	4.2

Source: Field survey, 2013

University of Ghana http://ugspace.ug.edu.gh

4.3 Methods of Waste Disposal

4.3.1 Human Excreta

As shown in Table 4.8, 69.2% of respondents did not have toilet facilities in their houses. Only 30.8% of respondents had toilet facilities in their houses. These findings suggested that most landlords in Gbawe were not abiding by the sanitation byelaw dealing with the provision of toilet facilities in residential houses and homes. This also confirms the general observation finding from the 2010 Population and Housing Census of the low level of availability of toilet facility in houses (GSS, 2013, p. 391).

About 48.6% of the respondents who had toilet facilities in their houses used water closet facilities (considered to be improved). About 29.7% of respondents used Kumasi Ventilated Improved Pit (KVIP) latrines developed by Albert Wright in the early 1970s. 18.9% of respondents also used pit latrines without slab and 2.7% used pan latrine which are both considered to be unimproved facilities.

About 63.5% of respondents who did not have toilet facilities in their houses used the public toilet and bushes for disposal of human excreta (unimproved facilities). Further, about 28.2% of these respondents disposed their human excreta only at the public toilet facilities, 4.5% of respondents disposed them in the public toilet facilities and gutters while 3.5% disposed them in the bushes and fields. About 65% of respondents paid for usage of public toilet; 35% did not pay for usage of a public toilet facility. Users of public toilet facilities paid 6. 84 Ghana cedis per week (refer to Table 4.7).

University of Ghana http://ugspace.ug.edu.gh

4.3.2 Household Solid Wastes

Table 4.8 provides information on the various means used by householders for the disposal of their solid wastes. About 30.8% of respondents burned and/or dumped their solid wastes in the public dump and containers; 18.5% burned and/or threw their wastes into the bush while 17.5% of respondents disposed their solid wastes into public dump and containers without burning them. About 10.8% of respondents only burned their wastes. Another 10% of respondents hired private waste collection firms to collect and dispose of their household solid wastes.

The percentage frequency showed that about 58.3% of respondents paid some money for disposal of solid wastes from their homes. The remaining 41.7% did not pay any money for disposal of wastes choosing to use unimproved methods such as burning and dumping the wastes into the bush. Those who pay money to dispose of their solid wastes used either the public dump and containers or hired private firms to collect their solid wastes from their homes. The minimum amount paid by respondents for disposal of waste was 2 Ghana cedis (GHS) per month and the maximum amount paid was GHS15 a month. The average amount paid by respondents was GHS5.92 per month (refer Table 4.9). About 78.4% of respondents who paid money to dispose of their solid wastes stated that charges for waste disposal were too high. This result suggested that there could be a relationship between method of waste disposal and income.

Respondents also stated their reasons for choosing a specific method of disposal of solid waste. Table 4.10 summarizes these reasons. These included the lack of money to pay for hiring private firms to collect households wastes necessitating dumping the wastes in the

University of Ghana http://ugspace.ug.edu.gh

bushes, the relatively small amounts of wastes generated by those with relatively small household sizes and the use of bushes to dump wastes for those living close to the bushes.

Table 4.8: Methods of waste disposal by respondents based on frequency analysis.

Item	Percent
Access to toilet facility in a house	
Have access	30.8
Do not have access	69.2
Facility type used by respondents with toilet facility in the house.	
Water closet	48.6
KVIP	29.7
Pit latrine (without slab)	18.9
Pan latrine	2.7
Facility type used by respondents without toilet facility in house.	
Bushes and Fields	63.5
Public toilet	28.2
Public and bushes	3.5
Public toilet and gutters	4.7
Paid for usage of toilet facility.	
Percentage of respondents who paid	65.0
Percentage of respondents who did not pay	35.0

University of Ghana http://ugspace.ug.edu.gh

Method of solid waste disposal.	
Burned and/or used public dumps or containers	30.8
Burned and threw them into the bush	18.3
Disposed of wastes in public dumps or containers	17.5
Burned the wastes only	10.8
Hired private firms to collect wastes from houses	10.0
Threw into the bush.	
Bush and public dump	5.0
Bush and buried	4.2
Buried	2.5
	0.8

Source: Field survey, 2013

University of Ghana http://ugspace.ug.edu.gh

Table 4.9: Summary of the amounts paid by households on wastes disposal and distance to a sanitation facility based on averages.

Item	Average	Standard deviation
Weekly amount paid by household for use of public toilet facilities (GHS)	6.8	2.6
Monthly amount paid by household for solid waste disposal (GHS)	5.9	3.9
Distance to the nearest public toilet facility based on walking (minutes of walking)	2.2	1.1
Distance to the nearest public dump container site based on walking (minutes)	13.2	7.0

Source: Field survey, 2013

University of Ghana http://ugspace.ug.edu.gh

Table 4.10: Reasons why respondents opt for specific methods of solid waste disposal based on frequency analysis

Reason	Percent Frequency
I dump it in a public container if l have money otherwise I threw it in the bush	25.8
I do not have money to pay at the public dump container site.	17.5
Household waste is relatively small so l burned it	10.8
To prevent breeding of mosquitoes and protect the environment	8.3
The public dump site is the best place for disposal of wastes.	8.3
Have money to pay private to collect household wastes.	7.5
My waste contains a lot of papers and dry leaves	7 .5
I live close to the bush	5 .8
I live far from the public dump site	4.2

Source: Field survey, 2013

University of Ghana http://ugspace.ug.edu.gh

4.4. Chi-Square Analysis of Factors Influencing Methods of Wastes Disposal.

The results of the chi-square analysis of the association between the method of disposing solid waste and several socio-economic characteristics are reported in Table 4.11. The results showed that the following socioeconomic characteristics were statistically associated with significant methods of solid waste disposal: (1) monthly income of working respondents (income), (2) level of education (leveledu), (3) amount paid monthly for disposal of solid waste (Mamount) and (4) Occupation (Occup). The number of people living in a household (Phouse) was not statistically associated with choice of method of waste disposal based on lack of significance of the result.

Table 4.11 reports the results of analysis of the degree of association between methods of human excreta disposal (Hexcreta) and some socio-economic characteristics. The following variables were statistically significantly associated with the method of excreta disposal: (1) number of household members and (2) pressure on existing facilities in the community. Household income and level of education were not statistically significant with method of human excreta disposal.

University of Ghana http://ugspace.ug.edu.gh

Table 4.11: Statistical significance of the association between method of waste disposal (solid and human excreta) and socioeconomic characteristics condition, of facilities and the amount paid for disposal of solid wastes based on chi-square analysis of all respondents.

No.	Items of Comparison	Chi-square Test Significance Level
1	Solid wastes disposal versus household monthly income	0.001*
2	Solid wastes disposal versus level of education	0.08*
3	Solid wastes disposal versus amount paid monthly for disposal of waste	0.000*
4	Solid wastes disposal versus occupation	0.000*
5	Human excreta disposal versus perceived pressure on public toilet facilities	0.05*
6	Human excreta disposal versus number of people in a house.	0.05*
7	Human excreta disposal versus household monthly income	0.94*
8	Human excreta disposal versus level of education	0.83*

Source: Field survey, 2013

Notes

*** Significant at the 10% level used in this study.**

University of Ghana http://ugspace.ug.edu.gh

4.5: Logistic Regression Analysis of Factors Influencing Householders' Choice of Methods for Collection and Disposal of Solid Wastes.

A logistic regression analysis was undertaken to determine socio-economic characteristics that significantly influenced the choice of householders using approved public dump containers/private waste collection services to dispose of their solid wastes. The logistic regression model for the study was as follows.

CHOICE= ßo + ß$_1$ HINCOME + ß2 DISTANCE + ß$_3$ EDUCATION + ß4 PHOUSE +U$_i$

where

CHOICE was a dummy variable with 1 representing householders using public dump containers and hiring private firms to collect wastes from houses and zero otherwise.

DISTANCE was the minutes from the household to the nearest public dump container.

HINCOME was total monthly household income of working respondent**.**

EDUCATION was the level of formal education acquired by the respondent

PHOUSE was the number of people living in the household

U$_i$ was the error term assumed to have a zero mean and constant variance.

The results of the logistic regression analysis are summarized in Table 4.13. The model performed well with correct classification of about 80.7% of the observations as measured by the Count R^2. The degree of misclassification index was therefore 19.3%. Two independent variables were statistically significant in influencing the odds in favour of householder using public dump container/private waste collection services. These were

University of Ghana http://ugspace.ug.edu.gh

HINCOME and PHOUSE. HINCOME was positively related to the dependent variable. PHOUSE was negatively related to the dependent variable.

As expected from economic theory, total household income was a highly significant variable in influencing the choice of improved disposal of solid wastes. Households with high total monthly income were more likely to dispose their solid wastes using improved means based on using approved public dump/containers and/or hire private waste collection firms to collect wastes from their homes. This result corroborated the finding by Anaman and Jair (2000) that wealthier households were more likely to hire private waste collection services.

The number of people living in a household would reduce the probability that the household would dispose wastes at the public dump/hire private waste collection service assuming all other things equal. This was because an increase in the number of people living in a household would lead to an increase in the generation of wastes which would imply greater costs for the collection and proper disposal of these wastes. Therefore householders who could not afford to pay for the disposal of their wastes were likely to resort to the use of unimproved collection methods. This result points to an important policy intervention that may be required to assist households with many people with incentives to encourage them to properly dispose of their solid wastes generated within their homes.

As shown in Table 4.12, the other two independent variables, LEVELEDU (level of formal education attained by respondent) and DISTANCE (distance from the house to a public waste collection dump or centre) were not statistically significant.

University of Ghana http://ugspace.ug.edu.gh

Table 4.12: Results of the logistic regression analysis of householders' choice of method for collection and disposal of household solid wastes.

Explanatory Variable	Parameter Estimate	Standard Error	Probability level of significance
INTERCEPT	0 .393	1.076	0 .715
HINCOME	0 .007	0.002	0.000*
PHOUSE	-0.154	0 .091	0 .090*
LEVELEDU	-0 .133	0 .138	0.336
DISTANCE	-0 .051	0 .037	0 .175

Source: Field survey, 2013

Notes

Sample size was 120

***Parameter was statistically significant at the 10% confidence level used for the study**

The proportion of correct classification (Count R^2) was 80.7%.

University of Ghana http://ugspace.ug.edu.gh

4.6. Availability and Conditions of Household and Public Toilet Facilities at Gbawe

Table 4.13 provides a summary of the conditions and availability of household and public toilet facilities in Gbawe as rated by respondents on a scale of 1 to 5, with 1 being very poor, 2 for unsatisfactory, 3 for being fair, 4 for good and 5 for excellent. On average, the respondents viewed the condition of facility as good to excellent (mean score 4.5) and this rating was highly unanimous given the low standard deviation of 0.9 and related coefficient of variation of 0.2. The coefficient of variation is defined as the standard deviation divided by the mean score. With regards to availability of public toilet facilities at Gbawe, respondents gave an average rating score of fair (means score of 3.0) suggesting some improvement would be necessary given the relatively high standard deviation of 0.9 and related coefficient of variation of score of 0.30.

As shown in Table 4.14 the vast majority of the respondents (88.2%) indicated that the toilet facilities were cleaned every day. With regards to whether there was pressure on the existing sanitation facilities in the area, 53.4% of respondents said there was pressure on the existing public toilet facilities while 46.6% however said there was no pressure on existing facilities. However it was clear that the majority of respondents indicated that there was pressure on the existing public toilet facilities.

University of Ghana http://ugspace.ug.edu.gh

Table 4.13: Summary of availability and condition of household and public toilet facilities based on average scores.

Items	Average score of importance	Standard deviation of score
Condition of household toilet facilities.	4.5	0.9
Availability of public toilet facilities at Gbawe.	3.0	0.9

Source: Field survey, 2013

The scoring of general sanitary condition is based on 5 denoting that the sanitary condition is excellent, 4 very good, 3 is fair, 2 unsatisfactory, 1 very poor

University of Ghana http://ugspace.ug.edu.gh

Table 4.14: Frequency of cleaning of public toilet facilities and the pressure on these facilities as assessed by respondents based on frequency analysis.

Item	Percent Frequency
Frequency of cleaning public toilet facilities	
Every day	88.2
Three times	3.6
Once a week	3.6
Two times a week	2.7
Four times	1.8
Pressure on existing public toilet facilities	
Yes	53.4
No	46.6

Source: Field survey, 2013

University of Ghana http://ugspace.ug.edu.gh

4 7: Linkage Between the Quality of Environmental Sanitation and Incidence of Malaria.

As indicated in the literature review and the conceptual framework in Chapter 2, the nature of environmental sanitation quality in a community determines the quality of life of those who live in that community. As shown in Table 4.15, 98.3% of respondents reported that the environmental sanitation quality of the area had affected their lives adversely based on ill-health over the previous two years. Further, almost five out of every six respondents (81.7%) had suffered from malaria or the symptoms of malaria over the previous two years. The minimum number of times a household member experienced malaria was one and the maximum was 30. The average number of times respondent's household members experienced malaria over the last two years was 4.5. These results corroborated the findings of the work of Ofomata and Eze (2001) who established that poor sanitary conditions served as breeding grounds for mosquitoes which transmitted malaria to humans through bites.

Table 4.16 provides a summary of households' perceptions of the causes of malaria or symptoms related to malaria. The most important cause of malaria as perceived by 77% of respondents was poor sanitary condition which led to bites from mosquitoes. About 14% of respondents indicated that general body tiredness and/or bites from infected mosquitoes were the causes of malaria. Five percent of respondents indicated that malaria was caused by not sleeping under mosquito nets. Four percent of respondents reported that poor and choked drainage system was the cause of malaria. Poor and choked drainage system was a direct output of a poor environmental system in the area. Therefore about 95% (or 19 out of 20) of the respondents laid blame on poor environmental sanitary condition as the cause of malaria (77% +14% + 4%).

University of Ghana http://ugspace.ug.edu.gh

Table 4.15: Perceived suffering due to the quality of environmental sanitation in Gbawe and the incidence of malaria based of frequency percentage and averages.

Item	Percent frequency and average
Suffered from environmental sanitation quality of area based on ill-health over the last two years Yes No	 98.3% 1.7%
Suffered from malaria over the last two years before the survey Yes No	 81.7% 18.3%
Number of times a household member had malaria over the last two years.	4.5

Source: Field survey, 2013

Note: Number without % represent mean score.

University of Ghana http://ugspace.ug.edu.gh

Table 4.16: Summary of householders' perceptions of the causes of malaria.

No.	Causes	Percent frequency
1	Poor sanitary conditions in the area	77.0
2	General tiredness and/or bites from infected mosquitoes	14.0
3	Not sleeping under treated mosquito nets	5.0
4	Poor and choked drainage systems in the area	4.0

Source: Field survey, 2013

University of Ghana http://ugspace.ug.edu.gh

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study involved an analysis of poor sanitary condition and incidence of malaria in Gbawe. This chapter outlines a summary of the main findings and policy recommendations. In order to address the three main objectives outlined in chapter one, a multi-stage cluster sampling was used to randomly select 120 householders from Gbawe. About 59.2% of respondents were females whiles 40.8 % were males. A conceptual framework developed by the researcher was used to guide the analysis of factors that led to poor sanitary condition and the link between poor sanitary condition and malaria.

Concerning the first objective of establishing the factors perceived by householders as being responsible for the improper disposal of wastes, the results indicated that householders perceived attitude problem due to lack of care in proper disposal of wastes, high fees charged at the public dump sites and by private waste collection service providers and weak enforcement of sanitation byelaws by government authorities as the major factors. Poor sanitary condition often led to incidence of malaria and other sanitation-related diseases as the surrounding served as a breeding ground for mosquitoes.

The second objective of the study was to ascertain the various methods of waste disposal and human excreta by householders. Householders used various means to dispose of their solid wastes. About 30.8% of respondents burned and/or dumped their solid wastes in the public dump and containers; 18.5% burned and/or threw their wastes into the bush while 17.5% of respondents disposed their solid wastes into public dump and containers without

University of Ghana http://ugspace.ug.edu.gh

burning them. About 10.8% of respondents only burned their wastes and 10% of respondents hired private waste collection firms to collect and dispose of their household solid wastes.

The third objective of the study was to determine the factors that influenced the household's choice of the method of collection and disposal of solid wastes. Logistic regression analysis was used to identify variables which influence the householder's choice of solid waste disposal method. The significant factors that influenced solid waste disposal method were total household income and the number of people in a household. The probability of using an improved method of disposing solid wastes increased with increasing household income but it decreased with increasing number of household members.

The fourth objective was to determine the perceptions of households with regards to the link between the quality of sanitary condition and malaria. About 98.3% of respondents indicated that the existing environmental sanitary condition had adversely affected their health over the previous two years. Further, 81.3% of respondents reported that one or more of household members had suffered malaria over the previous two years. The main cause of malaria as perceived by respondents was the poor environmental sanitation quality exemplified by the improper disposal of wastes which served as a breeding ground for mosquitoes which then transmitted malaria to humans. This factor was indicated by about 95% of the respondents.

5.2 Policy Recommendations

The study established a clear linkage between the poor quality of environmental sanitation and the incidence of malaria at Gbawe based on the perceptions of residents in the area. The

University of Ghana http://ugspace.ug.edu.gh

poor environmental sanitation quality of the area was largely attributed to improper disposal of wastes. The four most important causes of improper disposal of wastes at Gbawe were bad attitude towards disposal of waste, high fee charged for disposal of waste, weak enforcement of laws and inadequate sanitation facilities. As asserted by Agbola (1993) attitudes are learned by people and can therefore be changed or modified. People with bad attitudes towards wastes disposal can be changed for the betterment of society and a clean environment. This can be done through education. Hence the Waste Management Department and PHNSDC must embark on an educational campaign to educate residents on risks associated with improper disposal of wastes including the increased incidence of malaria and its attendant societal cost burden. Also, in order to reduce incidence of malaria among households, the Chief of Gbawe, and religious leaders of various faiths must educate and persuade their followers on the proper disposal of wastes.

High fees charged by both public dump managers and private waste collection firms were cited as an important cause of the use of unimproved methods of waste disposal by respondents. Further the logistic regression analysis clearly indicated that households with high number of people are less likely to use improved methods of waste collection and disposal. This result illustrated the market failure problem of poor people and those with low incomes who are unable to pay for proper disposal of wastes and resort to use of unimproved methods such as dumping into open spaces which contributes to increased incidence of malaria.

Therefore the District Assembly should as a matter of urgency increase the number of available public dumps and containers in the area and abolish the payment of fees and charges for use of these public dumps and containers. This will encourage low-income

University of Ghana http://ugspace.ug.edu.gh

households to properly dispose of their solid wastes. Financing and maintaining these public waste dumps and containers can be done through the payment of household property taxes and stricter enforcement of these payments. The increase in the number of public waste dumps and containers and regular maintenance of these public assets will encourage the proper disposal of household solid wastes as the distances from homes to these centres will be reduced. The District Assembly should also encourage a recycling programme at public waste dump centres to separate bottles and other useful products from household solid wastes which can be sold to private commercial entities such as breweries and soft drinks manufacturers in Accra to raise money to manage the recycling programme and create jobs for the youth in the area.

Residents must also organize regular clean-up exercises to improve upon the sanitary condition. Household participation in cleaning or keeping the sanitary condition neat will reduce indiscriminate dumping of waste and lead to ownership and sustainability of clean surrounding. This organization of regular clean-up exercises can be facilitated through the Chief of Gbawe to make the programme non-partisan.

The study also established that many households in Gbawe do not have access to toilet facilities in their houses. This market failure can be solved by ensuring that every landlord/landlady provides improved toilet facility in their house. Those who disobey this rule must be prosecuted to deter other landlords/ladies. The number of public toilet facilities at Gbawe should be increased by the Assembly with emphasis on the modernization of toilet facilities that ensure good privacy especially for women.

University of Ghana http://ugspace.ug.edu.gh

APPENDIX 1: SURVEY QUESTIONNAIRE

CONFIDENTIAL

SURVEY OF SANITATION AND INCIDENCE OF MALARIA IN URBAN AREAS: A CASE STUDY IN GBAWE.

This study is being conducted in partial fulfilment for the award of a Masters Degree in Development Studies by University of Ghana Legon. I would be grateful if you could participate in the study by completing this questionnaire. You will be assisting the researcher in purely academic work. Please be assured that all information provided will be treated with utmost confidentially.

RESPONDENT (MEMBER OF HOUSEHOLD)

SURVEY CODE NUMBER: ******** **

SECTION A: GENERAL INFORMATION AND ATTITUDES TOWARDS SANITATAION

1. How long have you been in the community?

2. On a scale of 1 to 5 with 1 being very poor and 5 being excellent, how will you assess the general sanitary condition in your area?

5	4	3	2	1
Excellent	Very Good	Fair	Poor	Very poor

3. Do you think that improper collection and disposal of solid wastes in gutters, quarry pits, roads and bushes is a problem in Gbawe and Ga South Municipality? Please indicate the level of seriousness of the problem.

5 - Very serious 4 - serious 3 - moderately serious 2 - low 1 - not serious at all.

University of Ghana http://ugspace.ug.edu.gh

4. Could you please indicate what you consider as the cause of malaria in Gbawe?

5. Could you also please indicate specifically what you think can be done by the public health and sanitation unit of Ga South Municipality to reduce the problem of improper disposal of waste in Gbawe?

6. Please indicate **in terms of importance the causes** of improper disposal of wastes in public and open places like drains, quarry pit, gutters, bushes, water bodies and uncompleted buildings in your area. Please circle the number most closely representing your opinion noting that a score of 5 is "extremely important", 4 is "very important", 3 is "modestly important", 2 is "less important" and 1 "not important")

	Extremely	**Important**			**Not important**
Weak enforcement of laws	5	4	3	2	1
Inadequate disposal site and facilities for disposing of wastes by municipal authorities	5	4	3	2	1
Attitude problem due to lack of care in proper disposal of household wastes in the area	5	4	3	2	1
Lack of adequate information on the d diseases burden of improper and unhygienic disposal of wastes	5	4	3	2	1
Long distances of houses to the disposal site	5	4	3	2	1
High fees charged by private companies or at the public dump site to collect and dispose of household solid wastes	5	4	3	2	1
Increased in the number of people currently living in the area.	5	4	3	2	1

Others (please explain)

7. Could you please indicate what you think could be done by resident of Gbawe to tackle the improper disposal of wastes in open and public places.

University of Ghana http://ugspace.ug.edu.gh

SECTION B: WASTE DISPOSAL METHODS

LIQUID WASTE

8. Do you have a toilet facility in your house? 1) Yes ☐ 0) No ☐

9. If yes, which type of toilet facility do members of your household use?

1. Water closet ☐
2. KVIP ☐
3 Pit latrines (without slab) ☐
4. Pan latrine ☐
5. Others (specify)…….

10. A) Do you pay for usage of the toilet facility? 1) Yes ☐ 0) No ☐

B) If yes, how much does your household pay weekly on average on toilet facilities?

11. If no, to (question 8) how do you dispose of your human excreta?

1) Public toilet ☐ 2) Gutters ☐ 3) Bushes ☐ 4. Public toilet and gutters ☐

5 Public toilet and bushes ☐ 6) others (specify)…….

12. i) Do you have a public toilet facility in your community?

1) Yes ☐ (0) No ☐

ii) How long does it take you to access a public toilet facility?

1) Less than 5mins ☐ 2) Less than 10mins ☐ 3) Less than 15mins ☐

University of Ghana http://ugspace.ug.edu.gh

4) Less than 20min ☐ 5) Less than 25mins ☐ 6) Less than 30mins ☐

g) Others (Specify)…….

SOLID WASTE

13. How does your household dispose its solid wastes? Please tick one or more

1) Burning garbage around your house …….

2) Throwing the wastes in the bush ……..

3) Throwing the wastes around your neighbourhood ….……

4) Sweep or put solid wastes in the gutters and drains……

5) Burying the wastes in the ground around your house……..

6) Putting the wastes into the Zoom lion container ……...

7) Dumping the waste at the public dump {Container) …….

8) Others (please specify)

14. Why do you opt for the method(s) above?

Explain……

……

15. i) Do you pay for disposal of solid waste? 1) Yes ☐ (0) No ☐

ii) If yes, how much do you pay monthly to dispose of your waste?

16. I) Do you think the amount spent/charge on solid waste disposal is high?

1) Yes ☐ 0) No ☐

ii) Please give reason …….

University of Ghana http://ugspace.ug.edu.gh

……

17. Could you please indicate how long it takes to and from a dumping site in your community?

18. i) In your opinion, do you consider the time spent in disposing wastes (both solid and liquid) as being too much?

1) Yes ☐ 0) No ☐

ii) Give reason? .....

……

SECTION C AVAILABILITY AND CONDITIONS OF FACILITIES

19. On a scale of 1 to 5 with 1 being very poor and 5 being excellent, how would you rate the condition of the toilet facility in your household?

5	4	3	2	1
Excellent	Good	Fair	Unsatisfactory	Very poor

20. How will you rate the availability of sanitation facilities in your community?

5	4	3	2	1
Very Good	Good	Fair	Poor	Very Poor

21. How often is the toilet facility cleaned in your community?

University of Ghana http://ugspace.ug.edu.gh

22. i) Do you think there is pressure on the existing toilet facility in your area?

1) Yes ☐ 0) No ☐

ii) If yes which of the following best describes why? 1) Long queues ☐ 2) leaking roofs ☐

3) Always unsanitary ☐ 4) often broken down ☐ 5. Others please specify…….

iii) What do you think can be done to reduce the pressure?

23. Indicate the name of the waste company which disposes your household wastes?

24. How often does this company collect your waste/garbage? Please tick

1. Every day ☐ 4. Once a fortnight ☐

2. Two times a week ☐ 5. Once times a week ☐

3. Four times a week ☐ 6. Three times a week ☐

7. Others (please specify).....

25. On a scale of 1 to 5 with 1 being very poor and 5 being excellent, how would you rate the quality of service provided by the company?

5	4	3	2	1
Excellent	Good	Fair	Unsatisfactory	Very poor

26. In what ways do you think the company can improve its service?

University of Ghana http://ugspace.ug.edu.gh

SECTION D: PERCEPTIONS AND INCIDENCE OF DISEASES

27. Does the poor sanitary condition in the community affect you in any way?

1) Yes ☐ 0) No ☐

If no to question 27 please skip to question 29

28. If yes to (question 27) could you please indicate how it affects you?

29. i) Has any member in your household experienced severe headaches, high fever, profuse sweating, muscle aches and drowsiness which are related to malaria within the last 2 years?

1) Yes ☐ 0) No ☐

(If no to question 29 please skip to question 31)

ii) If yes, how many times did they experience this within the last two years?

30. In your opinion, what do you consider/perceive as the cause of the above (question 29)?

.....

.....

31. If no to question 29 what sanitation related disease do they often complain about and what are the symptoms?

32. Do you think the breeding of mosquitoes in choked gutters, pools, tin of tomatoes, milo and milk leads to increase in incidence of malaria in your area? 1) Yes ☐ 0) No ☐

33. Assume the sanitary condition in the area is unhygienic and some of the residents are feeling sick. What do you think would be the common sickness among the residents?

University of Ghana http://ugspace.ug.edu.gh

SECTION E: DETAILS OF RESPONDENTS

34. Are you: 1) Male ☐ (0) Female ☐

35. Marital status: 1) Single ☐ 2) Married ☐

3) Divorced ☐ 4) Widowed ☐ 5) Informal unions ☐

36. What is your age?

37. What is your highest educational level? (Please tick the appropriate)

1. No school at all ☐
2. Primary school ☐
3. Junior high school ☐
4. Some senior high school ☐
5. Senior high school graduate ☐
6. Technical college/school ☐
7. HND ☐
8. Diploma ☐
9. Bachelor degree ☐
10. Postgraduate degree ☐
11. Others.....

38. Please indicate your religious affiliation.

39. Please indicate your ethnic background?

40. Please state the number of people in your house? _____people

41. What is your major occupational activity? Please tick the appropriate occupation

1) Government sector employee ☐ 2) Private sector employee ☐ 3) Artisan ☐

University of Ghana http://ugspace.ug.edu.gh

4) Self employed/ own business ☐ 5) Farmer ☐ 6) Unemployed ☐ 7) others (please specify)……

42. Your approximate total income per month (please tick the appropriate box).

1. Less than GH₵100	☐	6. GH₵501-GH₵600	☐
2. GH₵100-GH₵200	☐	7. GH₵601-GH₵700	☐
3. GH₵201- GH₵300	☐	8.GH₵701-GH₵800	☐
4. GH₵301-GH₵400	☐	9.GH₵801- GH₵900	☐
5. GH₵401-GH₵500	☐	10.GH₵901-GH₵1000	☐

11. Others please specify the range……...

42. Any additional information provided by the respondent.

THANK YOU FOR YOUR RESPONSE.

END OF SURVEY.

University of Ghana http://ugspace.ug.edu.gh

APPENDIX 2:

INTERVIEW GUIDE FOR WASTE MANAGEMENT

DEPARTMENT --- GA SOUTH MUNICIPALITY

NOTE: This questionnaire is to solicit information on sanitation and incidence of malaria in Gbawe. Any information provided here is purely for academic exercise and will be treated with the much needed confidentiality.

Basic information:

1) Name of Respondent _____
2) Position _____
3) Department _____
4) Date _____

WASTE MANAGEMENT DEPARTMENT

1. What are the main responsibilities of your Department?

2. What roles does your unit play in ensuring proper sanitary condition in Gbawe?

3. How many public dump containers do you have in Gbawe and do you have plans to increase them?

4. How many public toilet facilities do you have in Gbawe?

5. What percentage of the population has access to toilet facilities in their homes?

University of Ghana http://ugspace.ug.edu.gh

6. What are the approved methods for disposing solid and liquid wastes? Do residents in Gbawe adhere to the approved methods?

7. How will you describe the public attitude towards waste disposal in Gbawe?

8. What is your general assessment of the sanitary condition in Gbawe?

9. i) Do residents pay for using both public toilets and communal waste disposal sites?

I). If yes how much do they pay?

II). If No, how is the management and maintenance of the facilities carried out?

10. How many private waste collection companies operate in Gbawe?

11. Which specific intervention has been implemented by your department over the past 3 years to improve sanitation in Gbawe?

12. What is the main sanitation- related disease in Gbawe?

University of Ghana http://ugspace.ug.edu.gh

APPENDIX 3: INTERVIEW GUIDE FOR PUBLIC HEALTH NURSES SCHOOL DEMONSTRATION CLINIC, MALLAM

This questionnaire is to solicit information on poor sanitation and the incidence of malaria in Gbawe. Any information provided here is purely for academic work and will be treated with utmost confidentiality.

Basic information:

1) Name of Respondent_____
2) Position_____
3) Institution _____
4) Number of staff in the institution_____

1. What are the sanitation - related diseases in Gbawe?

2. What do you consider as the main cause of malaria in Gbawe?

3. What is the most common infection recorded by the OPD in Gbawe in the last 5 years?

4. What has been the trend of malaria in Gbawe in the last 3 years?

5. a) Does your outfit have health officers who visit Gbawe? ……....

   b) How many times in a week do health officers visit the area?

6. What are some of the roles that your unit plays in the control and prevention of diseases in Gbawe?

7. What suggestions will be useful in reducing the incidence of malaria in Gbawe.

University of Ghana http://ugspace.ug.edu.gh

APPENDIX 4: THE DETERMINATION OF THE OPTIMAL SAMPLE SIZE OF SURVEY RESPONDENTS

The formula for calculating the optimal sample size is based on the work done by Yamane (1973). This formula is widely used for it simplicity and given as

$\{n = N/1+N (e)^2\}$ where;

n = desired sample size,

N = total number of houses in Gbawe as at the time of the survey and

e = margin of error (10%).

For this study the desired maximum sampling error of the estimate of the proportion of

The optimal sample size (n) is therefore calculated from the equation as follows;

$\{n = N/1+N (e)^2\}$

$$n = \frac{1034}{1+ 1034(0.1)^2}$$

$$n = \frac{1034}{1+ 10.34}$$

$$n = \frac{1034}{11.34}$$

$$n = 91.2$$

Therefore the desired sample size was 91

But since some householders may refuse to participate in the survey, one can oversample. So the optimal sample size was increased to 120(about 30%).

University of Ghana http://ugspace.ug.edu.gh

APPENDIX 5: THE POPULATION OF HOUSEHOLDS AND THE RANDOMLY SELECTED NUMBER OF HOUSEHOLDS FOR EACH OF THE 20 DIVISION IN GBAWE BASED ON THE MULTI-STAGE SAMPLING METHOD.

Division	Number of houses	Number of houses selected based on minimum optimal sample size of 91	Number of houses selected based on maximum optimal size of 120	Actual number of houses where interviews were conducted based on the actual sample size of 120
1.	50	50/1034*91=4	50/1034*120=6	6
2.	57	57/1034*91=5	57/1034*120=7	7
3.	50	50/1034*91=4	50/1034*120=6	6
4.	60	60/1034*91=5	60/1034*120=7	7
5.	50	50/1034*91=4	50/1034*120=6	6
6.	64	64/1034*91=6	64/1034*120=7	7
7.	55	55/1034*91=5	55/1034*120=6	6
8.	40	40/1034*91=4	40/1034*120=5	5
9.	54	54/1034*91=5	54/1034*120=6	6
10.	55	55/1034*91=5	55/1034*120=6	6
11.	65	65/1034*91=6	65/1034*120=6	6
12.	35	35/1034*91=3	35/1034*120=7	7
13.	50	50/1034*91=4	50/1034*120=4	4
14.	65	65/1034*91=6	65/1034*120=6	6
15.	40	40/1034*91=4	40/1034*120=8	8
16.	35	35/1034*91=3	35/1034*120=5	5
17	50	50/1034*91=4	50/1034*120=4	4
18	54	54/1034*91=5	54/1034*120=6	6
19	58	58/1034*91=5	58/1034*120=7	7
20	47	47/1034*91=4	47/1034*120=5	5
Total	**1034**	**91**	**120**	**120**

University of Ghana http://ugspace.ug.edu.gh

APPENDIX 6: STATISTICAL ANALYSIS PROGRAMME USED TO ANALYSE THE SURVEY DATA INCLUDING CHI-SQUARE AND LOGISTIC REGRESSION PROCEDURES.

```
GET DATA
/TYPE=XLS
/FILE='D:\WORLANYO\SURVEY01.XLS'
/READNAMES=ON.
frequencies variables=v3 to v5 v6 to v16 v17 to v20 v22 v23 v24 v25 v26 v27 v29  v30 v32
v34 v33 v35 v36 v37 v38 v39 v43 v42 v44 v45 v46 v48 v49 v50 v51 v52 v53 v55 v56 v57 v59
v60 v61.
descriptives variables=v2 v6 to v16 v21 v28 v31  v40 v41 v42 v46 v47 v54 v58.
compute age=v54.
compute gender=v52.
if v22=1 excretadis=1.
if v22=2 excretadis=0.
if v22=3 excretadis=0.
if v22=4 excretadis=0.
if v22=5 excretadis=0.
if v25=1 wastedis=0.
if v25=2 wastedis=0.
if v25=3 wastedis=0.
if v25=4 wastedis=0.
if v25=5 wastedis=0.
if v25=6 wastedis=1.
if v25=7 wastedis=1.
if v25=8 wastedis=0.
if v25=9 wastedis=0.
if v25=10 wastedis=0.
if v46=1 malaria=1.
if v46=0 malaria=0.
if v56=1 christ=1.
if v56 gt 1 christ=0.
if v56=1 muslim=0.
if v56=2 muslim=1.
if v56=3 muslim=0.
if v56=4 muslim=0.
if v56=5 muslim=0.
if v56=6 muslim=0.
if v56=7 muslim=0.
if v56=2 muslim=1.
if v56=1 trad=0.
if v56=2 trad=0.
if v56=3 trad=1.
```

University of Ghana http://ugspace.ug.edu.gh

```
if v56=4 trad=1.
if v56 gt 4 trad=0.
if v60=1 hincome=50.
if v60=2 hincome=150.
if v60=3 hincome=250.
if v60=4 hincome=350.
if v60=5 hincome=450.
if v60=6 hincome=550.
if v60=7 hincome=650.
if v60=8 hincome=750.
if v60=9 hincome=850.
if v60=10 hincome=950.
if hincome le 300 mclass=0.
if hincome ge 300 mclass=1.
if v18=1 toiletf=1.
if v18=0 toiletf=0.
if v19=1 mtoiletf=1.
if v19 gt 1 mtoiletf=0.
crosstabs tables=v60 by v25/cells=row column/statistics=chisq corr.
crosstabs tables=v60 by v26/cells=row column/statistics=chisq corr.
crosstabs tables=v60 by v55/cells=row column/statistics=chisq corr.
crosstabs tables=v60 by v6/cells=row column/statistics=chisq corr.
logistic wastedis with hincome v58 v55 v31.
frequencies variables=v54.
descriptives variables=v60.
descriptives variables=v24 v31.
descriptives variables=v3 v7 to v13 v60.
frequencies variables=v4.
frequencies variables=v40.
frequencies variables=v41.
logistic excretadis with hincome v55 v58 v31.
crosstabs tables=v25 by v60 v55 v57 v28 v29 v59 v58/cells=row column/statistics= chisq corr.
crosstabs tables=v22 by v60 v55 v57 v59 v37 v21 v58/cells=row column/statistics= chisq corr.
descriptives variables v3 v6 v34 v35 v42.
descriptives variables=v60 v48 v47.
frequencies variables=v47 v48 v46.
descriptives variables=v54 v58 v31 v24 hincome.
```

University of Ghana http://ugspace.ug.edu.gh

REFERENCES

Ackumey, M. M., Gyapong, M., Pappoe, M., Maclean, C. K., & Weiss M. G. (2012). Socio-Cultural Determinants of Timely and Delayed Treatment of Bruli: Implication for Disease Control *Infectious Disease of Poverty Journal,* htt://www.idpjournal.com/content/1/1/6 accessed on 15th June 2013

Agbola, T.(1993). Environmental Education in Nigerian Schools, as quoted in Kendie, 1999. *Do attitudes matter? Waste Disposal and Wetlands Degradation in the Cape Coast Municipality of Ghana. DPPC,* University of Bradford.

Ahiadeke, C. (2008). *Research Methodology, Theory and Practice in the Social Sciences.* Sundel Services Accra.

Anaman, K. A. (2003). *Research Methods in Applied Economics and Other Social Sciences.* Brunei Press Sendirian Berhad .

Anaman, A. K. & Jair, R. M. (2000). Contingent Valuation of Solid Waste Collection Services for Rural Households in Brunei Darussalam *The Singapore Economic Review*, 45 (2), 223-240.

Anomanyo, D. E. (2004). *Integration of Municipal Solid Wastes Management in Accra Ghana Bioreactor Treatment Technology as an Integral Part of the Management Process*. A thesis submitted to the Lund University in partial fulfillment of the requirements for the award of the Master of Science (MSc) degree in International Environmental science November 2004, htpp://www.lumes.lu.se/database/alumni/03.04/theses/ anomanyo-edward.pdf, accessed on March 15th, 2013.

Asenso-Okyere, W. K. (1994). Socioeconomic Factors in Malaria Control, *World Health Organization Forum,* pp. 265-8.

Ayotamuno, J. M. & Gobo, A. E. (2004). Municipal Solid Waste Management in Port Harcourt Nigeria: Obstacles and Prospect, *Management of Environmental Quality*: *An international Journa*l, 15 (4) pp. 389- 398.

Babbie, E. (2001). The *Practice of Social Research 9th Edition,* Belmont, California: Wadsworth Publishing Company.

Beede, D. N. & Bloom, D. E. (1995). *The* Economics of Municipal Solid Waste, *The World Bank Research Observer* 10(2) August pp. 113-150.

University of Ghana http://ugspace.ug.edu.gh

Chaplin, S. E. (1999). Cities, Sewers and Poverty: India's Politics of Sanitation, *Environment and Urbanization,* 11 (1), 145–158.

Davids, S. (2010). Accra's *Public Places of Inconvenience*, Feature article on http://www.ghanaweb.com/GhanaHomePage/features/artikel.php?ID=183943 accessed on 22nd June, 2013.

Da Zhu, P., H. Asnani, C. Zurbrugg, S. Anapolsky & S.Mani. (2008). *Improving Municipal Solid Waste Management in India, A Source Book for Policy Makers and Practitioners.* World Bank, Washington D.C.

Fobil, J.N.*et al.* (2007). The Influence of Institutions and Organizations on Urban Waste Collection Systems: An Analysis of Waste Collection System in Accra, Ghana. *Journal of Environmental Management, 86(1), 262–271.*

Ga South Municipal Assembly, (2010). *Medium Term Development Plan* 2010-2015: Ghana Shared Growth and Development Agenda. Accra.

Gaur, A. S. & Gaur, S.S. (2001). *Statistical Methods for Practices and Research; A Guide to Data Analysis using SPSS.* Response books Saga Publications.

Ghana Statistical Service. (2013). *2010 Population and Housing Census: National Analytical Report.* Accra, GSS

Government of Ghana. (2010a). *National Environmental Sanitation Strategy and Action Plan.* Accra: Environmental Health and Sanitation Directorate, Ministry of Local Government and Rural Development.

Gujarati, D. N. (2003). *Basic Econometrics, Fourth Edition*, London: McGraw-Hill.

Konadu-Agyemang, K. (2001a). *The Political Economy of Housing and Urban Development in Africa: Ghana's Experience from Colonial Times to* 1998. London: Praeger.

McKenzie, D., Gedalof, Z. E., Peterson, D. L., & Mote, P. (2004). Climatic Change, Wildfire, and Conservation *Conservation Biology, 18(4), 890-902.*

McMicheal, A. J. (2000). The Urban Environment and Health in a World of Increasing Globalization: Issues for Developing Countries. *Bulletin of the World Health Organization,* 200(78) Geneva, Switzerland.

University of Ghana http://ugspace.ug.edu.gh

Mensah, M. (2002). *The State of Environmental Sanitation in Accra Metropolitan* Area. Pentecost Press. Accra, Ghana.

Mensah, O. & Kumaranyake, L. (2004). Malaria Incidence in Rural Benin: Does Economic Matter *In Benin Health Policy*. pp.92-101.

Miller, J.G. (1988). Perspective of Wastes Management in Ghana, Recycling Option, Seminar on Abfall, Borse .Stock Exchange for Industrial Waste Geoth Institute Accra, 30 (3): 134-139.

Ministry of Health (1991). *Annual report,* Ministry of Health, Accra.

Nkuo-Akenji, T. Ntonifor, N. N. Maze, B. Kimbi, H. K. Abongwa, E. L. Armand,N. Anong. ,D.N. Songmbe, M . Boyo, G . M .Ndamukong , N. K .& Titanji, P. K. (2006). Environmental Factors Affecting Malaria Parasite Prevalence in Rural Bolifamba South West Cameron, *African Journal of Health Sciences,* 13 (1-2) January-June 2006.

Nze, F.C. (1978). Managing Urban Waste in Nigeria for Social and Economic Development *Journal of Management Studies,* Lagos 5, Nigeria.

OCIN (2005). *Accra Sewerage Improvement Project (ASIP), Appraisal* Report, African Development Fund.

Ofomata, G.E.K. & Eze, P.O. (2001). *Geographical Perspectives on Environmental Problems and Management in Nigeria, Jamoe Publishers Enterprise Enugu Nigeria.*

Opoku, A.A., Ansa-Asara O.D. & Amoako,J (2007). "The Occurrences and Habitat Characteristic of Mosquitoes in Accra", *West African Journal of Applied Ecology* 11, pp 99- 107.

Owusu, G (2010). Social Effects of Poor Sanitation and Waste Management on Poor Urban Communities: A Neighborhood-Specific Study of Sabon Zongo, Accra,. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability,* 3:2, 145-160. http://www.tandfonline.com/loi/rjou20,assessed on 5th July, 2012.

Public Health Nurses School Demonstration Clinic Mallam (2011) Annual report.

University of Ghana http://ugspace.ug.edu.gh

Potter, R.B. & Lloyd-Evans, S. (1998). *The City in the Developing World.* London, Longman.

Schertenleib, R & Dionys, F (2002). *An Integrated Approach to Environmental Sanitation an Urban Agriculture.* Deubendof, Switerland.

Sharma, S. K., Pradham, P. & Pradhi, D. M., (2001). "Socioeconomic Factors Associated with Malaria in a Tribal Area of Orissa, India", Indian *Journal of Public Health*, pp93-98.

Songsore, J. & McGranahan, G. (1993). "Environment, Wealth and Health: Towards an Analysis of Intra-Urban Differentials within the Greater Accra Metropolitan Area" *Ghana Environment and Urbanization,* 5, 10–34.

Songsore, J. (2000). *Urbanization and Health in Africa: Exploring the Interconnections Between Poverty, Inequality and the Burden of Disease*, IWSG Working Papers 12-2000.

Songsore, J. (2003a). Towards a Better Understanding of Urban Change: *Urbanization, National Development and Inequality in Ghana*, Accra: Ghana Universities Press.

Snow, R., Craig, M.H., Newton, C.R. & Steketee, R.W. (2003). The Public Health Burden of Plasmodium Falciparum Malaria in Africa: Deriving the Number. *Working Paper No. 11, Disease Control Priorities Project.* Bethesda, Maryland: Fogarty International Center, National Institutes of Health.

Sule, O R.A. (1981). Management of Solid Wastes in Nigerian towards a Sanitary Urban Environment. *Quarterly journal of administration*, Lagos vol. 15, Nigeria, http://www.kon.org/urc/u6/george.html, accessed on 17th July 2013

Tchobanoglous, G., Theisen, H. & Vigil, S. A. (1993). *Integrated Solid Waste Management*. New York, McGraw Hill.

Tettey-Lowor, F. (2009). *Closing the Loop between Sanitation and Agriculture in Accra, Ghana: Improving Yields in Urban Agriculture by Using Urine as a Fertilizer and Drivers & Barriers for Scaling-up*, Unpublished MSc Thesis Report, Wageningen University, The Netherlands.

Uguwh, (2009).cited in Solid Wastes Effects at Human Development and Health, http://www.ukessays.co.uk/essays/health/solid-wastes-effects-at-human-development-and-health.php accessed on December 29th 2012.

University of Ghana http://ugspace.ug.edu.gh

United Nations News Center, (2010). *General Assembly Declares Access to Clean Water and Sanitation is a Human Right*, http://www.un.org/waterforlifedecade/human, accessed February 15th 2013.

UNICEF (2007).The International Year of Sanitation 2008 http://www.unicef.org/media/media-39547html accessed on December 27th 2012.

Van Der Geest, S & Obirih-Opare, N. (2002). *Getting Out of the Shit: Toilets and the Daily Failure of Governance in Ghana*, Euro-African Association for the Anthropology of Social Change and Development. Accessed at: http://apad.revues.org/pdf/150. May 12th 2013.

WHO (2009). World Malaria report Geneva, Switzerland.

WHO (2011). WHO Global Malaria Programme: *World Malaria report (2011)*. Geneva, Switzerland.

WHO/UNICEF (2012). *Progress on Drinking Water and Sanitation update* WHO, Geneva/ New York: WHO/UNICEF.

WHO/ UNICEF. (2003). The Africa Malaria report 2003. Geneva

Yamane, T. (1973). *Statistics: A Introductory Analysis, 3rd edition* Harper and *Row, New* York.