

**UNIVERSITY OF GHANA**

**THE PREVALENCE OF BURULI ULCER AND  
ITS EFFECT ON HUMAN DEVELOPMENT IN  
NSAWAM ADOAGYIRI MUNICIPALITY,  
EASTERN REGION**

**BY**

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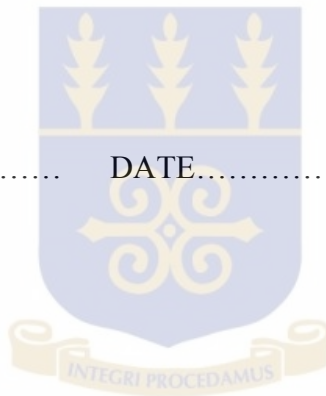
**THIS DISSERTATION IS SUBMITTED TO THE  
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## DECLARATION

I, **Ama Agyaa Aboagye**, 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 (ISSER). This thesis has neither in whole nor in part been presented for another degree.

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## DEDICATION

This work is dedicated to the Almighty God for His guidance and protection throughout the course of this study and for a successful completion and then, to all my guardians for continually supporting me in diverse ways. May God bless you. Amen.



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## ABSTRACT

The objectives of the study were to determine the perceived causes of Buruli ulcer disease from both sufferers and non-sufferers in Nsawam Adoagyiri municipality, to analyse how the disease affected human health in the area, and to elicit responses, from both sufferers and non-sufferers, on measures that could be taken to reduce human suffering and impacts from the disease. A simple random sampling method of data collection was used to select 193 respondents from the area, consisting of sufferers and non-sufferers of the disease, as well as medical personnel offering care to patients at the government health centres.

Sufferers indicated that drinking and using contaminated water for domestic household activities was the most important cause of the disease. Non-sufferers, who were not medical personnel, suggested that the most important cause of the disease was through contraction from the environment due to swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease. However, non-sufferers, who were medical personnel, asserted that the most important cause of the disease was poor personal hygienic practices. In terms of health and welfare effects, the majority of sufferers indicated that the disease had limited their ability to perform tasks in their community. The main factor influencing treatment expenditures was the income of the sufferer with richer sufferers spending more on expenditures to treat the disease. Another significant factor was the unemployment status of the sufferer with unemployed people spending less than employed people to treat the disease. Several suggestions were provided by the three groups of respondents to government to deal with the disease. The most important suggestions to the government included the provision of medicine to treat the disease, information to prevent people from acquiring the disease, and encouragement of early reporting of symptoms of the disease at medical centres for treatment.

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Background

Human development is concerned with giving everyone – women and men – power over their own lives and opportunities to live the way they want (Sen and Sudhir, 1994). As much as human development is responsible for enhancing the lives of people, it is also dependent on a myriad of things for its sustainability. The concept of human development is related to the empowerment people to put their choices for a better life.

Several scholars such as Mahbub ul Haq, founder of the Human Development Report (HDR), have influenced the human development aspect of economic development over the years. The UNDP HDR was greatly influenced by Professor Amartya Sen where he pointed out that increases or decreases in national incomes were just part of the process of economic growth and did not offer the complete picture of economic development thereby the processes leading to the development of the Human Development Index (HDI).

The Human Development Index (HDI) adopted by the UNDP places emphasis on the growth of national incomes but also on other aspects of economic development such as the overall health and educational attainment of the population. The HDI concept acknowledges that in order to consider how developed a nation is, several indexes need to be considered. These indexes include life expectancy, literacy, standard of living, education and GDP per capita.

Economic growth, measured by changes in the gross domestic product (GDP), is a useful starting point to measure human development but does not represent the entire picture of development which must include development measures in health and education. Human development is dependent on the physical, emotional spiritual and mental health of the people of any nation. The sustainability of development is dependent on many things including human health, physical and mental, spiritual and emotional wellbeing components.

As indicated earlier, the quality of health is an important aspect of economic development that is now explicitly included in the derivation and use of HDI. In the world today, we are plagued with all kinds of diseases, which affect us both socially and economically. We continue to battle these diseases daily through personal interventions and medical discoveries to find lasting solutions to completely eradicate these diseases from our environment. Diseases such as tuberculosis and AIDS (Acute Immune Deficiency Syndrome) are a few diseases that have plagued our world fiercely and which have been a hindrance to the progress of human development at one point in time or the other. For these diseases, there were hardly any medical interventions for years. However, after over a century later, cures were developed for leprosy and tuberculosis, which were discovered in 1887 and 1882 respectively (Lankinen *et al.*, 1994). In the case of AIDS, anti-retroviral drugs, which reduce the pressure on the immune system and control the disease, have been developed and now the disease is under much control and its symptoms may be suppressed for years without killing the sufferer. There is still no scientifically proven cure for AIDS.

The diseases mentioned above are important to the introduction of the Buruli Ulcer disease because of the similarity they share, they are alike yet so different. The similarities include but are not restricted to, the devastating effects of these diseases on humanity and the differences

include but are also not limited to, the accessibility to comprehensive information and knowledge about the diseases. There are several other diseases that are not well known but have devastating effects on their sufferers and some which including Buruli ulcer, have even been gathered under the heading of 'Neglected Tropical Diseases' commonly used in scientific medical literature to refer to diseases that have gone unnoticed or have been given very little attention due to its incidence amongst the poor and under privileged in the society. Buruli Ulcer is one of about 17 other diseases that have been termed as Neglected Tropical Diseases, which hereafter will be known as NTDs. These diseases have even been termed as NTDs because they occur mainly in poverty-stricken tropical and sub-tropical areas, and often at times there are no known cures. The people who are mostly affected by these diseases are often the poorest of the population, living in remote, rural areas, urban slums or conflict zones. Neglected tropical diseases persist under conditions of poverty and are concentrated almost exclusively in impoverished populations in the developing world(WHO, 2013).

Buruli Ulcer, also known as Bairnsdale disease, Searles and Kumasi disease, is a disease that affects the skin and is caused by an organism called 'mycobacterium ulcerans'. The mycobacterium ulcerans is an environmental pathogen that is commonly associated with water and soil (Ross *et al.*, 1997; Hayman, 1991). Buruli Ulcer disease has been described as the third most common mycobacterium infection in humans after tuberculosis and leprosy.

The disease has been noticed to affect mostly the limbs and the trunk, starting as a painless swelling, known as a nodule, in the skin and causing severe deforming and debilitating ulcers if it is not detected and treated on time (WHO, 2000). Speculations suggest that the causative organism enters the skin through abrasion or a cut on the human body. This is just one of the perceived causes of the transmission and spread of this horrific, disfiguring and maiming

disease. However, the exact mode of transmission of the disease has still not been proven and is not fully established by scientists that have spent several years researching about the disease.

Earlier reports suggested the most effective treatment to be through excision but the WHO (World Health Organization) has reported that a combination of antibiotics have been known to suppress the disease and halt it at a pre-ulcerative stage if reported to the health facilities for prompt treatment. There has not been any development related to the introduction of immunization against the disease. However, prompt reporting and treatment at an early stage may help to reduce the suffering and socio economic burden of the disease on the individual and their family.

Buruli Ulcer disease evolves in three stages. A firm, non-tender nodule and sometimes plaques or oedema characterizes the pre-ulcerative phase. In the second phase the skin ulcerates, causing osteomyelitis as a possible complication. In the third phase of the disease, a granulomatous healing response takes place followed by fibrosis, scarring, calcification and contractures, with the possibility of permanent disabilities (Stienstra *et al.*, 2001, 2002).

## **1.2 Problem Statement**

Buruli Ulcer disease, caused by an environmental pathogen called mycobacterium ulcerans, has been identified as one of the most neglected tropical diseases that are treatable. The mode of transmission is still unknown for this disease leading to several speculations by medical experts, research experts and the ordinary individual, as to the cause of this disease that can cause a total malfunction in the tissues of the human skin. Currently, early reporting and treatment of the disease is the only way to stop the disease from developing to an ulcer, which

can go on to destroy the bone formation and disrupt the free movement of the limbs of the affected person.

The total Buruli Ulcer cases recorded globally in 2012 including that of Ghana was 5,076. Africa is the worst affected region and Ghana was ranked as the second most endemic country after Cote d'Ivoire, (WHO, 2012). According to a case search for Buruli Ulcer in the country conducted by Amofah *et al.*(2002), the overall crude national prevalence rate of active lesions was 22.7 per 100,000 persons, with cases being reported in each region of the country at a rate of incidence of 150.8 per 100,000 in the most disease-endemic districts of the country.

The incidence of Buruli Ulcer in Ghana has been described as relatively high (Asiedu *et al.*, 2000). It is the perception of most people in the endemic areas that, the disease is as a result of poor hygiene, drinking contaminated water from the rivers, contact with other sufferers, sexually transmitted or a general disease from the environment where they are in contact with the swamps and other insects or worms from the rivers or marshes. Others have linked the disease to magical and religious factors like witchcraft (Stientra *et al.*, 2002). Scientific studies have shown that mycobacterium ulcerans which is a suspect for being the carrier of the disease is found living free in the environment and so therefore, the disease is believed to be contracted from the environment.

Infection leads to extensive destruction of skin and soft tissues with the formation of large ulcers usually on body extremities. Patients who are not treated early suffer long-term functional disabilities such as restriction of joint movement as well as the obvious cosmetic problem of ugly scarring that may need extensive skin grafting to bring the body even a little bit closer to normal. In most cases skin grafting may be too expensive to undertake (Raymond,

2009) thereby resulting in permanent scars for life. Early diagnosis and treatment are vital in preventing such disabilities or, the uneventful case of death.

The WHO fact sheet 119 on Buruli Ulcer reported that more than half of the infected persons in Africa, with Ghana recorded as the second most endemic country, were children (WHO, 2001). This provides a cause for concern considering the treatment processes for caring for Buruli Ulcer sufferers and the imminent social cost and burden it places on the individual and their family. Children may have to spend long hours getting treatment in the hospital for the disease and may lose valuable learning and playing time which is most important in their transformative years. In some cases, children had discontinued their education all together due to the extent of the deformity developed from the disease. Children disfigured by this disease fall short of a normal life and become dependent on family for support, not being able to get decent jobs or work in the fields to support themselves in the future.

The effects on children are similar to those on men and women. The disease limits the movement of the sufferer and incapacitates him/her in its advanced stage. The ulcer has a terrible smell, which causes the sufferer to shy away from the public to avoid being ostracized or being accused as being cursed. For women, especially those in rural and impoverished communities, the effects may be much greater since women are known to undertake many more economic and social activities. Women generally undertake many household activities, like cooking, cleaning and fetching of water from communal sources whiles pursuing income-generating activities, like farming and trading. Women sufferers who develop disabilities from the disease could be limited in their role to perform household tasks and undertake income-generating activities thereby providing very little support in the home which may go on to destroy marriages and cause broken homes.

The study area is the Nsawam Adoagyiri Municipality (district) located in the eastern region

of Ghana, one of the major endemic areas of the disease in Ghana where efforts are geared towards the treatment of the diseases that are reported at the health centres (refer to Figure 2.3). Notable effort has gone into educating and sensitizing the residents about the disease and its symptoms yet still there is a problem of underreporting, resulting in people turning up to the health centres with the severest of ulcers that are far advanced due to their ignorance and the perception they hold about the disease. A national case search identified 5,619 patients with 6,332 Buruli ulcer lesions at various stages of development with 48.5% of the lesions recorded in the ulcerative stage (Amofah *et al.*, 2002). The perceptions held locally about the causes and spread of the disease also usually tend to inform the choice of treatment.

Scientists and medical experts in this field have been unable to fully establish the exact mode of spread or diagnosis of the disease and in effect have been unable to develop any form of vaccine or counter drug to solve the problems of this disease. The perception of people about the disease has influenced the health seeking behaviour of sufferers and also affected the rate of prevalence of the disease.

Inadequate information on the root causes of the disease are identified as some of the reasons for late detection and reporting of the earliest symptoms of the disease. Education on preventive measures have not been intensive enough to foster sensitivity amongst people living in the endemic areas to enable early, rather than late detection and reporting of any of the early symptoms. Late reporting to the appropriate health centres aggravates the effects of the disease. In Africa most cases are still diagnosed late. There is a low level of development among people living with the ulcers and scars, resulting from treatment of the ulcers. Human development should be encouraged among these people and they should be accepted in the community to live normal lives. From previous studies, public medical attention is now

available in some of the disease-stricken areas; however, the full socioeconomic impact on individuals has not been completely ascertained.

This study seeks to learn from sufferers and non-sufferers living within the study area including those working as government health personnel, the perceived causes of the Buruli Ulcer disease and possible measures that can be undertaken to reduce the effects of the disease on sufferers. The study also attempts to understand the factors influencing the treatment costs of the disease with a view of finding ways that can be used to assist sufferers to reduce their treatment costs.

There is inadequate relevant information on the causes of the disease and the sufferers are looking for treatment in all sorts of places according to what they perceive as the cause of the illness. The disease has to be detected early, reported on time to the appropriate health centre and treated with quick response so as not to aggravate the suffering of the individual. The prevalence of the disease among the poor in the endemic areas raises a cause for concern since poverty-stricken people are always at the mercy of disease and suffering and do not always have access to the best treatment and medical care but are often the ones who suffer the most from this horrible disease.

### **1.3 Objectives of the Study**

In the light of the previous discussion, the main objective of this survey-based study is to establish the perceived causes of Buruli Ulcer disease in the Nsawam Adoagyiri municipality and ascertain the measures that can be employed by society to reduce the effects of the disease on sufferers. The specific objectives are as follows:

- a. To establish the perceived causes of Buruli Ulcer disease from both the perspective of sufferers and non-sufferers.

- b. To ascertain the effects of the disease on human welfare from sufferers.
- c. To analyse the factors influencing the treatment costs of the disease.
- d. To establish societal intervention measures to reduce human suffering from the disease from the perspective of both sufferers and non-sufferers of the disease.

#### **1.4 Hypotheses of the Study**

Several hypotheses were derived based on the objectives of the study. These are as follows:

- a. The perceived causes of the disease vary among the different groups of people: (a) sufferers (b) non-sufferers of the disease living in the community of sufferers and (c) medical personnel working at health centres patronised by sufferers of the disease.
- b. The perceived causes of the disease are also linked to the religious beliefs of the people, their level of education and other socioeconomic characteristics.
- c. The effects of the disease on sufferers depend greatly on the stage of the disease and the time of reporting of the disease by the sufferer to the appropriate health centre.
- d. Factors influencing the treatment costs of the disease include the income of sufferer, the employment status of the sufferer, the marital status of the sufferer and the biological stage of the disease.
- e. Social intervention strategies required to reduce human suffering from the disease are related to provision of information for early detection and treatment and preventive strategies.

#### **1.5 Significance of the Study**

Buruli Ulcer disease is a morbid and dehumanizing disease, which has no known mode of spread or means of infection. The disease is becoming rampant in several regions of Ghana especially the forest regions with a common assertion of its links with swampy forest regions. This study seeks to learn the perceived causes of and treatment of the disease from both

sufferers and non-sufferers including medical experts. There is so much cost involved in the treatment of the disease and many of the sufferers are poor and cannot afford the comprehensive treatment of the disease. Very few volunteers are available to support the cause to help eradicate the disease. This is an issue of high concern to both the sufferers and non-sufferers of the disease, and to the authorities providing healthcare solutions to treat the ulcers that are reported to the clinic. Though the cause of the disease is not known, it is a treatable disease that may be stopped from progressing into an aggressive ulcer. However, if not detected and reported at the appropriate health centre on time for treatment, the disease may lead to severe consequences including the loss of use of the limbs, amputation and in some cases death (Adoma, 2003).

This study is therefore relevant for the development of policies to support the continuous research into the causes of the disease and also to develop policies which will help promote the education on the possible preventive measures that can be adopted to help curb the incidence of the disease to help prevent human suffering, the introduction of campaigns to broadcast the possible causes of the disease and to promote early reporting of the disease. The study wishes to portray the disease as life threatening and to present it as a pressing national issue that needs to be paid more attention.

### **1.6 Limitations of the Study**

The limited available time for the survey reduced the possibility of reaching many sufferers of the disease. Further, accessing detailed records and statistics on the location of patients in the community was difficult. Sufferers of the disease were difficult to locate in the municipality thereby restricting the sample size for sufferers. Enough time would have allowed a better and larger sampling of the population and possibly a total census to reach out to all affected

persons in the community for a better reflection and in depth understanding of the challenges of the disease. There was no database for the sufferers of the disease and so there was a challenge in reaching as many sufferers of the disease as possible. This also made the survey expensive since many trips had to be made to the study area to get a reasonably large number of sufferers of the disease to take part in the study.

### **1.7 Organization of this Report**

This report is structured into six chapters. The first chapter provides a background of the study which includes a brief discussion of human development with emphasis on both income and non-income aspects. This chapter also presents an introduction of the Buruli Ulcer disease. The problem statement, objectives and hypotheses of the study are also clearly spelt out in this chapter. The next chapter of this study (Chapter 2) provides a review of literature concerning the topic. The methods applied in the study are discussed in Chapter 3. These include the detailed discussion of the survey method employed to elicit data from sufferers and non-sufferers of the disease. The results of the study are reported in Chapters 4 and 5. The results obtained from the simple statistical analysis are presented in Chapter 4 while those derived from the advanced statistical analysis of data related to sufferers of the disease are presented in Chapter 5. The conclusions and recommendations are summarised in Chapter 6. The references cited in this report and appendices are reported at the end of this report.

## CHAPTER 2

### LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

#### 2.1 Introduction and Definition of Buruli Ulcer

Buruli Ulcer is a skin disease that is caused by the mycobacterium ulcerans and is said to affect the subcutaneous tissues (Ofori Adjei, 2011). This skin disease, which usually begins as a painless nodule or papule, may progress to massive skin ulceration. If untreated Buruli Ulcer may lead to extensive soft tissue destruction, with inflammation extending to deep fascia. The parts of the body most affected are the extremities. Subsequent complications may include contractures and deformities (Duker *et al.*,2004).

In simple language, the disease gradually eats up the skin and rots the flesh away in a very distasteful manner and gradually affects the bone of the sufferer leaving a behind necrotic aftermath. Buruli Ulcer is prevalent all over the world with some major appearances of the disease reported in South-eastern Australia, Japan, in Asia, and several countries in Africa.

McCullum first discovered the disease in a child from Bairnsdale in Australia in 1940, and gave the name Bairnsdale as the name of the disease in reference to where he first recorded it. In 1948, McCallum published the first clinical description of the disease as stated in the work of Tjip S. Van der Werf and others (1999) (cited by Adoma,2003). However, previously in 1897, Sir Robert Cook had observed the disease characterized by some large ulcers in a region near the Nile River in Uganda. The area where he discovered the disease most prevalent was called Buruli near Lake Kyoga and therefore named the disease after that region (WHO, 2000. cited in Adoma, 2003). In Ghana, local names such as 'Odontehela' describing the cotton wool

appearance associated with the fatty necrosis is given to the disease. It is also called 'Aboagbonyo' (dreadful disease) and 'Asante asane' implying the disease might have originated from the Ashanti Region (Ennin, 2000). People in the Upper Denkyira District refer to the disease as 'Mpompo bone' (dangerous boil) (Adoma, 2003). Between the years 1923 and 1935, a missionary physician in the North eastern area of the Democratic Republic of Congo also observed similar skin undermining ulcers (Munyangi and Pika, 2011).

According to the WHO, Buruli Ulcer has been reported in over 30 countries all over the world. Limited knowledge of the disease, its focal distribution and the fact that it affects mainly poor rural communities contribute to low reporting of cases. The disease is said to occur in the swamps of sub-tropical and tropical climates. The common feature of the disease is that it is prevalent in areas located close to swamps with green and damp vegetation or aquatic areas. Progress is being made now to develop tools for early diagnosis, to understand how the infection is transmitted and to improve treatment even though there are several speculations stating that the disease is caused by a vector or insect in the environment (WHO, 2000). This vector or rather suspected causative organism requires a temperature ranging between 29- 33°C and a low oxygen concentration, of about 2.5%, to grow (WHO fact sheet no. 199).

In Ghana, the disease has been recorded and reported in the many communities. The first possible case of Buruli Ulcer in Ghana was reported in 1971 in the Greater Accra region according to research done by Bayley (Bayley, 1971). Ghana is reported to be the most endemic Buruli Ulcer nation after neighbouring Ivory Coast in Africa where the disease is described as chronic and ruthless and a necrotizing disease of the skin. After leprosy and tuberculosis, Buruli is the third most common mycobacterium disease of immuno competent

hosts. Buruli Ulcer disease has a negative impact on the health-related quality of life of the victims, not forgetting the socio cultural and economic impacts. The cause of the disease is not known even though strong evidence suggests that the *M. ulcerans* as the causative organism. Some victims do not report the disease in its initial stages for fear of stigmatization and in respect to religious beliefs and in other cases out of pure ignorance. They only report to the clinics in their worse state of the ulcers. The ulcers are dehumanizing and disfiguring with stigmatization, from members within the community, silently becoming the real killer.

## **2.2 Stages of the Disease.**

Buruli Ulcer has four main categories. It may be characterized as a painless nodule, a plaque, an oedema or a full ulcer, which at times may involve the bones. The stages are shown in Figure 2.1. The disease normally starts of as a painless mobile swelling called the nodule, if left unattended or goes undetected, it develops into the ulcerative form with undermined skin edges, which is normally not painful in the beginning, and the affected part of the skin tissue is completely destroyed. Infection often leads to extensive destruction of the skin and soft tissue with the formation of large ulcers usually on the legs or arms. If immediate action is not taken, it may affect the bone (Ministry of Health (MOH), 2004).

The stages of Buruli Ulcer may be described as pre-ulcerative or ulcerative stages. The non-ulcerative and pre-ulcerative stages are usually characterized by the nodule, papule, plaque or oedema. The pre ulcerative stages, which develop into full open sores or ulcers, are what categorize the ulcerative stage. Another stage that is sometimes considered is the healed scar stage, which may be prone to re-infection. The ulcerative stage, if not dealt with and given proper treatment, may go on to affect the bones causing gross deformities like osteomyelitis as shown in Figure 2.2.

Field observation revealed that the ulcers that developed from plaques usually turn up as smaller ulcers covering a much smaller area while those that develop from oedemas tend to cover a large area by hiding under the top visible tissue of the skin and collapse the full area when they finally develop into full ulcers. According to the WHO's fact sheet 199 on Buruli ulcer, the disease starts as a swelling which can also initially present as a large painless area. If patients seek treatment at the early stage, antibiotics can prove to be successful. Delayed treatment may cause irreversible deformity, long-term functional disability such as restriction of joint movement of which an example is shown in Figure 2.2, extensive skin lesions and sometimes life-threatening secondary infections (WHO, 2013)

**Figure 2.1: The Four Main Stages of the Disease**



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Source: WHO.int photo cropped from a poster at one of the health centres at Nsawam Adoagyiri.

**Figure 2.2: Osteomyelitis due to Progressed Buruli Ulcer**



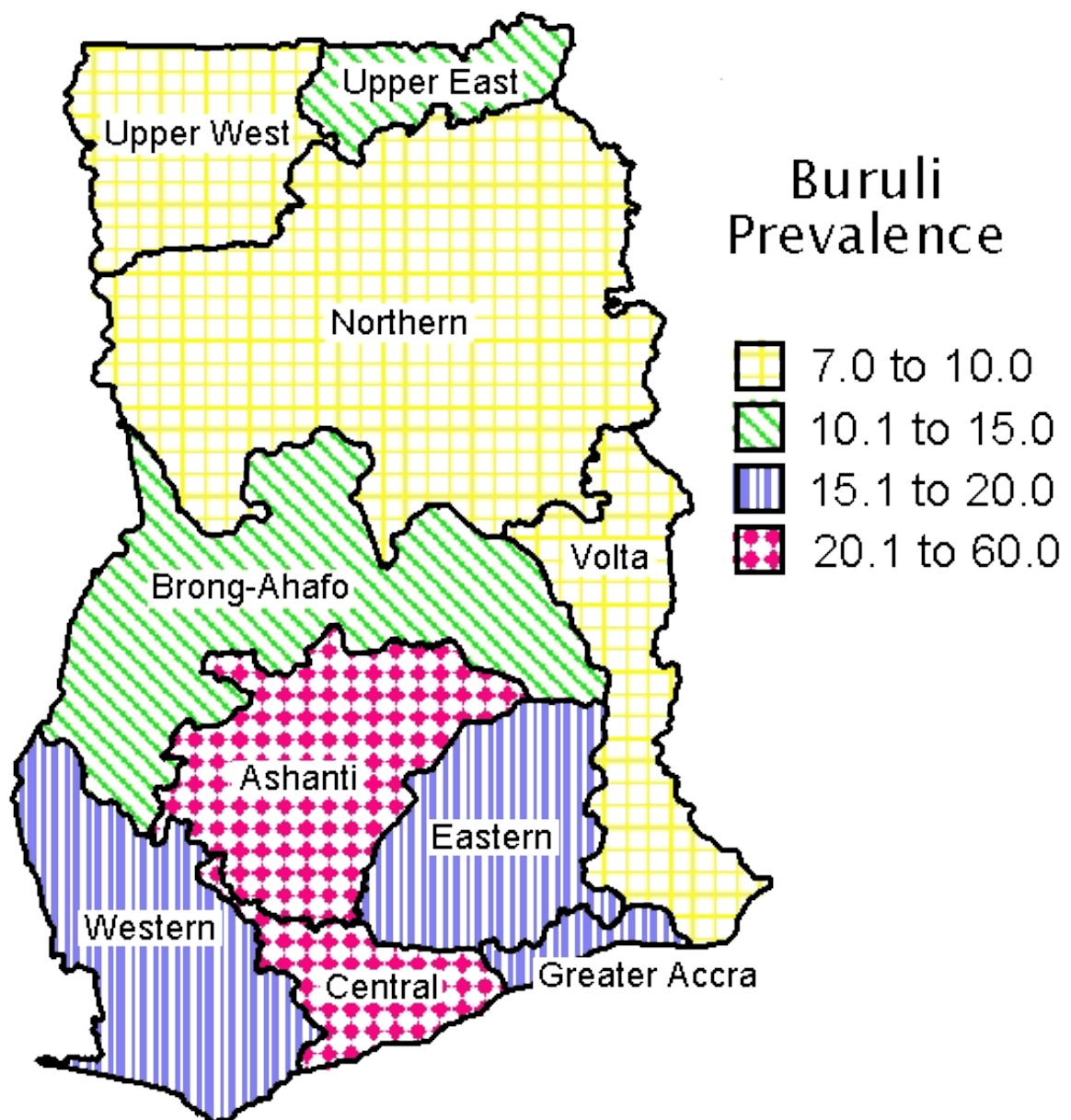
Source: WHO, 2000. (Provided by Dr. S Etuaful)

### 2.3 The Prevalence Rate and Morbidity of the Disease

The Buruli Ulcer disease has shown major prevalence on the African continent and in some other areas of the world including Australia Japan and peculiar cases in the Americas. The World Health Organization reports that the total Buruli Ulcer cases recorded globally in 2012 including that of Ghana was 5,076 with Africa being the worst affected region. Ghana is the second most endemic country after La Cote d'Ivoire globally, (WHO, 2012). According to an updated fact sheet of the World Health Organization, Buruli Ulcer has been reported in 33 countries in Africa, the Americas, Asia and the Western Pacific. Most cases occur in tropical and subtropical regions of the world except in Australia, China and Japan. West Africa, Benin, Côte d'Ivoire and Ghana report most cases with La Côte d'Ivoire reporting almost half of the global cases. Only 15 of the 33 countries reported data in 2012 (WHO, 2013).

The overall National prevalence in Ghana is 22.7 cases per every 100,000 inhabitants. Amofah *et al.*, (2002) report that cases of the disease have been reported in all the ten regions of the country with the Ashanti Region accounting for over 60% of all cases. The most affected district of the Ashanti Region is the Amansie West with a prevalence of 151 cases per 100,000 inhabitants. The map of Ghana shown in Figure 2.3 shows the prevalence of the disease recorded in Ghana by Amofah *et al.*, (2002) based on cases per 100,000 people. It can be seen that the study area, Nsawam Adoagyiri district, is located in one of the regions with the highest prevalence of the disease.

Figure 2.3: Map Showing the Prevalence of Buruli Ulcer in Ghana.



Source: Amofah *et al.* (2002).

[https://www.msu.edu/~merrittr/buruli\\_ulcer/bu\\_prevalence.html](https://www.msu.edu/~merrittr/buruli_ulcer/bu_prevalence.html)

## **2.4 Discussion of the General Concept of Human Development**

Sabina Alkire described human development in her article, *Dimensions of Human Development*, as human flourishing in its fullest sense in matters economic, social, political, spiritual, and in matters public and private (Alkire, 2002). She later referred to Amartya Sen's argument of human development, which did not centre only on human wellbeing at a particular time, but also about how they were able to control the other aspects of their lives and what they were able to make of situations that befall them. In Amartya Sen's world-renowned work on Capabilities Approach, development is not defined as an increase in GDP per capita, or in consumption, health, and education measures alone, but as an expansion of capability of human beings (Sen, 1990).

Capability refers to a person's, or group's freedom to promote or achieve valuable 'functioning's'. This, Sen argued further, represented the various combinations of 'functioning's' (beings and doings) that the person can achieve. This literature has become important to this study because, it seeks to reveal the importance in the struggle of many intellectuals to bring the importance of human based development to the forefront. Human development has been studied extensively in recent times to focus on the basic individual needs of any population everywhere in the world.

This study seeks to capture the importance of access to health and information on health among other things, as part of the basic needs of every individual. In considering the economic capability of any country time should be taken to study the human development of individuals of that particular country. The physical health, and other important basic needs, of the people should not be placed aside and treated with unimportance.

The human development of an individual as part of any nation is the key to the entire development and progress of the nation. The details entailed under human development cannot all be discussed within this sub heading. However, the ultimate plan is to engage our minds on the importance of the basic needs of the individual in any consideration of the levels of development. Most importantly when considering human development, it is really the quality of life of the individual that needs to be considered. Well-being is in the core of the discussion of the human development topic. Every human being has the right to the basic needs in life and these include water, food, shelter, clothing and information, just to mention a few.

This study seeks to consider an aspect of human development in reference to access to health and information. The Buruli Ulcer disease has been reported to affect people most often stricken with poverty. Poor people often view and experience poverty as a multi-dimensional situation where there is a lack of access to material well-being, bodily well-being, social well-being, security and psychological well-being. The linkage of human development in the context of the Buruli Ulcer disease is linked to an obvious failure of the market to provide relevant and timely information about the disease that allows sufferers to receive early treatment at public health centers that could effectively cure the disease.

## 2.5 The Effects of the Buruli Ulcer Disease on Human Development

As discussed earlier, development is seen as a means of increasing aspects of human dignity. Development is generally understood as the process of improving the quality of all aspects of human life. It becomes clear by this definition that health and development are, therefore, interrelated. The health of an individual affects generally everything that he/she does and the impact of disease on can easily be categorized into social and economic. The economic burden of the disease consists of indirect and direct costs (Adamba *et al.*, 2011). Direct costs may include that of drugs, hospitalisation, surgery and, while indirect costs tend to involve the opportunity cost of time lost to the patient seeking healthcare, feeding costs and productivity loss (Asiedu *et al.*, 1998).

Buruli Ulcer disease must be considered as a global development concern looking past the problem as just a health issue. HIV/ AIDS has been considered to impact human development in African countries so much so that, beyond health issues, this disease should and must be seen as a global development concern, affecting education and knowledge acquisition, income and social status, productivity and economic growth, and other direct and indirect components of human development such as gender equality and human rights (Boutayeb, 2009).

Buruli Ulcer disease is known to cause human suffering to the point that they cannot go on normally with their daily activities without struggling to get through it all. Even though the disease can affect any part of the body, it is more often found on the extremities (especially the limbs) as compared to the other parts (Barker, 1973; Hospers *et al.*, 2005; Ndobe and Ghotbi, 2008). This on its own indicates how difficult it can become for any individual suffering from the disease to go on normally with their lives.

The processes involved in getting treatment and healing the wounds from the disease is time consuming and also heavy on the individuals pocket. Considering the several or prolonged

treatment of the ulcers, with a large number of the affected persons suffering from poverty, it becomes a struggle for sufferers to maintain the frequency in attending health centers for treatment. Healthy people constitute a healthy nation and thereby having the poor of any nation struck by such a disease is a worrying situation. The fact that there has not been any cure for the disease does not imply that it has to be neglected by the authorities responsible. The disease is not one to be ignored. For example, the disease affects people in the farming community who provide food for the nation. They need to be attended to so that the disease does not diminish their input towards the community and the nation as a whole. This study is therefore significant to the government and the authorities to help develop solutions towards controlling the spread and totally curbing this disease from the community and the nation.

## **2.6 Inadequate Information about a Disease as a Source of Market Failure**

Information failure in medical markets may exist in various forms. The most common of information market failure is incomplete information. This situation arises from the participants in the exchange of information concerning the production, consumption and distribution of goods and services not having full information concerning all the activities related to the exchange. Secondly, information failure exists when one participant in an economic exchange knows more than the other, a situation referred to as the problem of asymmetric or unbalanced information.

Nobel Prize Laureate in Economics Sciences, Professor Kenneth Arrow is one of the original researchers who dealt with market failure in health markets. His works show that the lack of information about the quality of treatment of a disease and health services renders health markets highly imperfect illustrating a major source of market failures in health markets

(Arrow, 1963). He refers to the condition of uncertainty where accurate information becomes a very valuable commodity and that, in many ways, medical markets are really markets for information stating that where there is uncertainty, information or knowledge becomes a commodity and in this instance the information in the form of skilled care is precisely what is being bought from most physicians.

Market failure in health markets can be illustrated with the demand and supply of services related to Buruli Ulcer in Ghana. A person suffering from a disease such as Buruli Ulcer seeks treatment from a particular provider who can be a traditional healer, Christian religious priest, hospital technician or doctor according to what the person perceives is the cause of the disease and where he/she is likely to get the most appropriate treatment. In this case, the patient is demanding treatment service while the caregiver is also supplying treatment service. This can be described as the market. With Buruli Ulcer disease, both the patient and the caregiver do not have full information about the exact cause and cure of the disease and this situation represents a classic case of market failure related to lack of full information related to the service that is being exchanged between the consumer and the producer of the service.

When the patient reports the disease early to a qualified hospital or clinic, treatment can be effective as the level of damage is not then extensive and can be halted with antibiotics even though medical personnel do not have full information about the cause of Buruli Ulcer disease. This situation also represents an important case where the government or institutions can supply information to potential people at risk of the disease such as quick intervention by medical practitioners that can halt the damage caused by the disease. Without this information, patients may end up seeking all sorts of treatments from non-specialists or people who lack extensive knowledge about the disease. Hence early reporting of the disease to the appropriate health centre and the treatment using antibiotics can correct the market failure of information.

The most important decision a patient may make is from whom to get treatment recommendation and treatment. The problem of information market failure in medical markets also occurs when the physician is not that knowledgeable about the disease or is not able to correctly diagnose the problem at the first instance (Millenson, 2000). A classic practical case of the health experts at the hospital not being trained or equipped with the right methods of diagnosis for detecting this particular disease such as Buruli Ulcer disease in its early stages. Even if the patient reports the disease or its symptoms early and the medical personnel are not knowledgeable about the disease and misdiagnosis occurs with the patient giving the wrong treatment, negative health impacts will still occur. This is also a clear case of market failure due to the lack of knowledge of medical personnel about a disease. This situation occurs frequently in Ghana where even better informed patients may believe the prescriptions offered by medical personnel and continue to use inappropriate treatment options till the disease gets to an advanced stage and the patient then consults specialist health personnel.

Particular mention is made of this possibility in the context of Buruli Ulcer disease because from information gathered during the study several cases that were initially reported to the main Nsawam General hospital were misdiagnosed as common boils according to the hospital administrator who preferred to remain unnamed. This could have either occurred due to inadequate information on the detection of the disease or lack of logistics in detecting the disease. Further investigations reveal that patients who report to the clinic with boils are now directed to report at the appropriate treatment centers responsible for providing treatment for the disease. The Nsawam General Hospital does not treat Buruli Ulcer patients due to reports of stigmatization. According to the Administrator of the Nsawam General Hospital, the smell of the disease and how other patients reacted towards sufferers of the disease influenced the decision to create treatment centers elsewhere. This decision also made sufferers feel more comfortable in reporting to the health centers for their treatment.

In Selma Mushkin's publication "Toward a definition of Health Economics" she referred to how consumers' lack of information for quality could inform their medical decisions and result in a market failure in medical markets (Mushkin, 1958). This publication also informs this study by drawing attention to the perceptions that may be held about the causes of certain diseases which inform the choices of medical attention that are sought for. In the case of Buruli ulcer disease, the sufferers of the disease may make choices to treat their diseases according to the information available to them or not. The nature of the medical service itself may in fact initially reinforce the consumer's lack of knowledge about his purchases and impede a rational choice that could guide the allocation of resources.

Misinformation may lead to patients receiving too much or too little treatment; a situation that may exist due to imperfect consumer information about physician or treatment quality (Phelps, 2000). For the case of a sufferer of the Buruli Ulcer disease who patronizes the services of a traditional herbalist and where this traditional herbalist does not have adequate knowledge and information on the treatment of the disease, it is likely that the patient may not be properly treated causing the disease to develop into even more advanced stages.

## **2.7 Conceptual Framework for the Study**

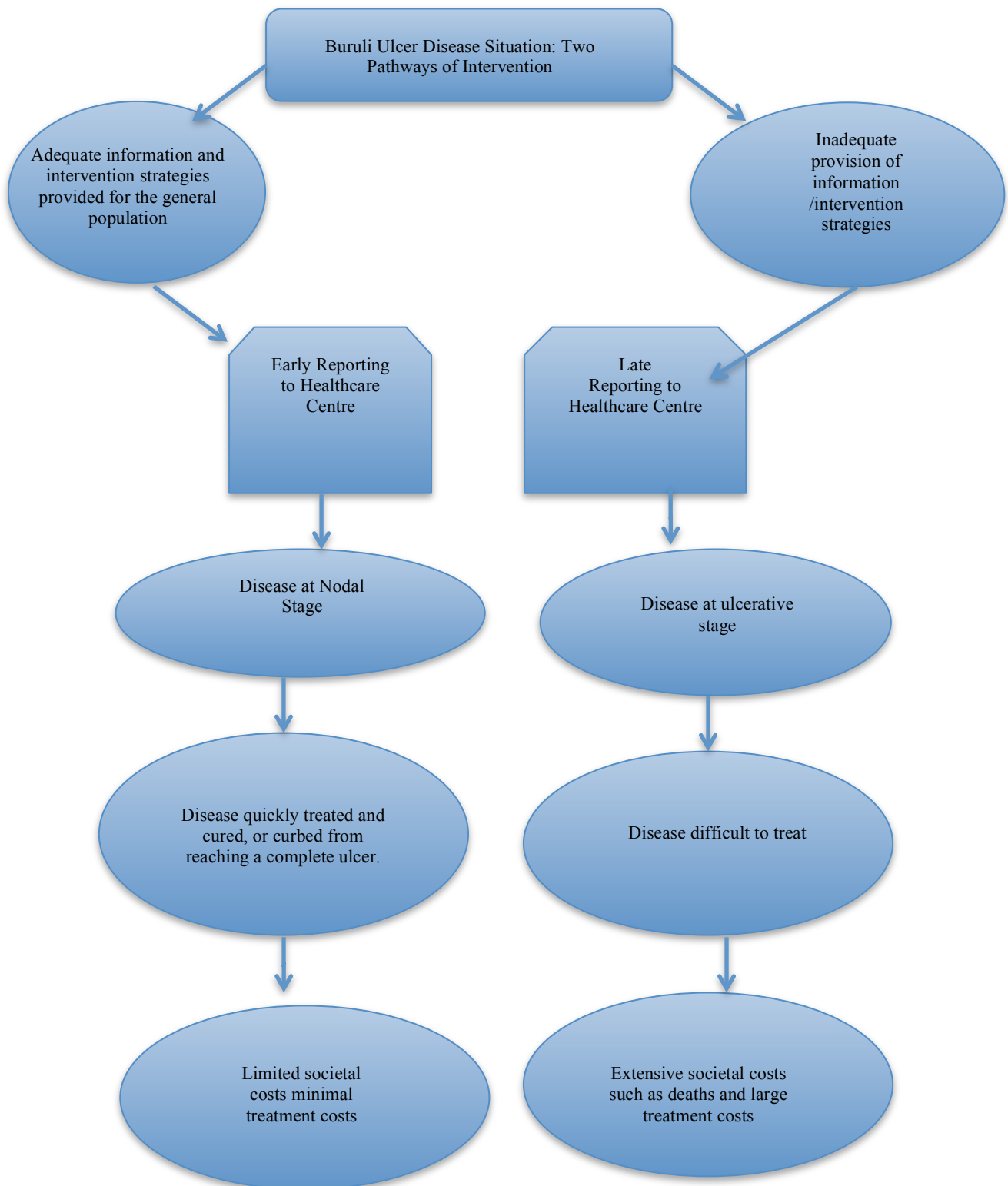
The conceptual framework illustrated in Figure 2.4 represents a diagrammatic representation of the linkage of the level of quality of information about the Buruli Ulcer disease and how this level of information influences the seeking of treatment at appropriate health centres. Further, the human welfare effects resulting from the degree of success of treatment of the disease are related to the stage of the disease that has been reached when the patient reports to the appropriate health centre. According to this framework, the amount of information available on treatment and detection and the interventions available informs the treatment

choices of the sufferer. Depending on the social interventions available, the sufferer may be influenced to report early or late to the appropriate treatment centre for prompt health care.

In other instances the sufferer may report late to the appropriate health treatment centre due to previous contact with herbalist or traditional religious consultants or even due to home treatments. This is usually as a result of the information available to them and/or societal interventions readily available to them. Sufferers of the disease who usually report later to the appropriate health centres end up with the severest of ulcers, which may leave the patients with deformed skin and or, permanent disabilities in the worst-case scenario. Those who are able to report earlier to the appropriate health centre may have the disease cured or curbed completely at the nodal stage of the disease where there are treatment procedures available to curb the disease from progressing.

Buruli Ulcer disease that is halted at the nodal stage reflects in the limited treatment costs and limited societal costs and consequences. When the disease progresses past the non-ulcerative stage to full ulcers, the societal impacts translate into severe and extensive societal costs both direct and indirect costs. Indirect costs include social abandonment, stigmatization and deaths.

**Figure 2.4: Intervention for Buruli Ulcer Disease Sufferers and Possible Societal Costs**



Source: Author, January 2015.

## CHAPTER 3

### RESEARCH METHODOLOGY INCLUDING A BRIEF PROFILE OF THE STUDY AREA

#### 3.1 Introduction

In this chapter, attention is paid to the methodology employed in this study with specific attention to research design and methods of data analysis explaining the instruments used in the data collection and analysis procedures. A brief profile and description of the study area is also discussed at the end of this chapter.

#### 3.2 Research Design

The study employed a cross sectional and descriptive survey approach in the research design to learn the perceived causes of Buruli Ulcer disease in the study area. The research design is the framework outlining the various research activities needed in order to satisfy the research question (Ahiadeke, 2008). The method employed was a scientific approach mainly in the form of quantitative research based on a survey. 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, 2014).

For this study, the survey was undertaken in two health centres in the municipality on sufferers of the disease, and also amongst non-sufferers, which included health workers who provided medical care for the sufferers of the disease. It is generally the intention of a researcher to employ the use of surveys for descriptive exploratory and explanatory purposes therefore, this survey was designed mainly to record the perceived causes of the disease and capture the view of the target population concerning what they expect to be done for them.

### **3.3 Sources of Data**

Data were collected through interviews from primary sources. This was mainly because there were no exact records that could give us a fair description on the location of the sufferers of the disease. There was also no available public data on the sufferers of the disease at the health centres or the municipal offices. The perception of sufferers with regards to the causes of the disease, which was a major objective of the study, had not been captured by any of the health authorities concerned though a lot of work was being done in treating the cases reported at the health centres.

Other information on the disease were researched and collected through secondary data sources including libraries, the Internet and from other thesis that have been written on this topic of Buruli Ulcer disease. Photographic evidence was adopted during the survey since this was an opportunity to exhibit live cases and the extent of current cases of the disease in the Nsawam Adoagyiri municipality. Photographs were taken during some of the treatment sessions held by the health representative in collaboration with an epidemiologist, who offered voluntary treatment and cleaning (minor surgery) of the ulcers for sufferers of the disease on each visit to the municipality.

Data was collected from two health centres namely Djankrom Health centre and Nsawam health centre with the aid of the structured questionnaire. Due to the fact that the disease was a rare situation, many sufferers were quite difficult to reach. A pilot survey was undertaken at the Pakro Health centre, which used to be the main centre for all Buruli Ulcer cases in the district, currently located outside the jurisdiction of the Nsawam Adoagyiri Municipality. Interviews conducted were treated with the utmost confidentiality and all the questionnaires

were administered face to face by the author of this report. The respondents were interviewed with the aid of a structured questionnaire reported in Appendix 1.

### **3.4 Unit of Analysis and Sampling Size**

The units of analysis of the survey were sufferers and non-sufferers of the disease. The sufferers of the disease were patients who visited the health centres for treatment of the disease while the non-sufferers of the disease were individuals who did not have the Buruli Ulcer disease but lived in the community and the medical health personnel who gave care to sufferers of the disease at the health centres.

The sample size was chosen with focus centred on individuals who had knowledge about the Buruli Ulcer disease. Several visits had to be made to the health centres to catch up with sufferers who had come in for treatment. Most of the sufferers of the disease visited the health centres only on the days when the epidemiologist was due to visit. Others who were still on the medical treatment of the antibiotics visited their health centres daily for the injection and antibiotic pill that are used for treating the ulcer. Therefore this informed the choice of random sampling for the sufferers of the disease. All patients who suffered from Buruli Ulcer disease and who were present at the health centre during each visit were interviewed as part of the sample size. Caution was taken so as not to interview the same respondent twice.

Non-sufferers of the disease were also interviewed using a random sampling method. All available health personnel at the health centres were interviewed using the same structured questionnaire. However, not all health personnel were available to answer the questionnaires due to their time constraints. To ensure a better analysis of the disease, the cluster random sampling method was employed in interviewing non-sufferers who lived in the community.

Non-sufferers were interviewed in each town that sufferers indicated they came from. Interviews were held within the communities of each town. In the towns, all houses were counted and one sixth of the houses randomly selected based on use of a handheld calculator. In total, 16 towns were visited and sampled (refer to Appendix 2). The total number of people interviewed was 200 but due to incomplete questionnaires only 193 were used for analysis. This was made of 43 sufferers, 128 non- sufferers and 22 medical personnel.

### **3.5 Survey Sampling and Administration Procedures**

A scientific survey based on random sampling method was used to interview all the respondents to the questionnaire in this survey. All the interviews were held in the most confidential manner since the information gathered was categorized to be personal considering the nature of the disease. The respondent was taken to a private area and a face-to-face interview was conducted using the prepared questionnaire shown in Appendix 1. The survey was conducted over a period of six months from April to September 2013.

For non- sufferers of the disease, who were residents in the villages, a scientific calculator was employed during the random cluster sampling to choose the non- sufferers randomly. Single clusters of a sixth of all the houses in the village town centre were artificially created. The optimal sample size arrived at for each cluster was based on the number of houses in that particular cluster. The calculator was once again used to compute which house needed to be interviewed. This was done through the use of a random number generator program available from a standard scientific calculator. The answer indicated the particular house, which the questionnaire was to be answered at. This sampling method was applied for all the 16 communities where the sufferers had reported they came from. In all, 107 non-sufferers respondents were randomly selected using this method as shown in Appendix 2. For non-

sufferers who were medical personnel, their interviews took place at their work places based on random sampling.

A pilot survey was initiated in April 2013 involving 9 respondents present at the Pakro health centre. This centre was chosen because the same characteristics of respondents reported at this health centre for treatment of the disease and the centre used to be the main treatment facility serving the entire Akuapim South district prior to the separation was separated into two. The feedback from this pilot survey was employed in the redesigning and restructuring of the final questionnaire that was used for the study (Appendix 1).

The final questionnaire, which was developed after the pilot survey, is divided into five sections, sections A to E. Section A was designed to handle the general information on the knowledge of the disease, the respondent's perception on its severity and their suggestions on intervention from the government of the country and the local authorities. Section B of the questionnaire focussed on the sufferers of the Buruli Ulcer disease and their perception about the causes of the disease and also their level of education on detecting the disease. Section C of the questionnaire focussed on non- sufferers of the disease and their perception of the causes of their disease. Finally, Sections D and E were focussed on obtaining information on the socioeconomic characteristics of the sufferers and non- sufferers of the disease respectively. The data was analysed using the Statistical Package for Social Sciences (SPSS) software to derive frequencies and means of important variables.

### **3.6 Methodology for Objective 1: Establishment of the Perceived causes of the Buruli Ulcer Disease.**

The perceived causes of the disease were established based on a simple descriptive analysis using the 1 to 5 Likert scale of importance as identified by sufferers and non-sufferers of the disease. The importance of perceived causes of the disease and its association with various socio-economic characteristics was analysed using the Chi square test of association based on grouped data. Chi-square test is used in social science research to test hypothesis concerning the degree of association between variables (Anaman, 2014;Gaur *et al.*, 2006).The chi-square test used in the study involved tests of association between perceived causes of the disease Buruli Ulcer by sufferers of the disease and socioeconomic characteristics of the sufferers.

Babbie (2001, p. 459) and Anaman (2004) indicate that a chi-square test is based on the null hypothesis that there is no association between two variables based on grouped or categorical data. A chi-square test begins by first computing cells in a contingency table of two variables. The chi-square value is derived by squaring the difference between the observed cell frequency (OCF) and expected cell frequency (ECF) and then dividing this squared difference by the expected cell frequency. The chi square value is the sum arrived by repeating these steps for all the cells in the contingency table as denoted below.

$$\text{CHI SQUARE VALUE} = \sum ((O-E)^2/E) \text{ where } \sum \text{ is the summation symbol.}$$

### **3.7 Methodology for Objective 2: Ascertaining the Effects of the Disease on Human Welfare from the Perspective of the Sufferers**

This was done by eliciting the effects of the disease including treatment costs from sufferers. Other human welfare effects elicited from sufferers included relationships with other members of the community.

### **3.8 Methodology for Objective 3: Establishment of the Factors Influencing the Treatment Costs of the Disease**

The factors influencing the treatment costs of the disease incurred by sufferers were established through a multiple regression analysis whereby the treatment costs of sufferers, during the previous 12 months, were designated as the dependent variable. The independent variables were deemed to be factors influencing the costs and included the income of the sufferer, the unemployment status of the sufferer, the marital status of the sufferer and the stage of the disease of the sufferer at the time of the survey.

### **3.9 Methodology for the Objective 4: Elicitation of the Societal Intervention Measures to Reduce Human Suffering from the Disease**

The societal intervention measures to reduce human suffering from the disease were elicited from sufferers and non-sufferers and health workers in the community.

### **3.10 Ethical Considerations**

Researchers often allow their work to reflect their own ideas and beliefs during their data collection, no matter how hard they try to avoid it as Weber (1946) states in his work. He stated that all research is somewhat tainted with the personal values of the researcher. During this research however, a conscious effort was made to base all conclusions and recommendation on the results gathered and processed from the field. Voluntary participation and informed consent were sought and the proper protocol was observed during the data collection process and throughout the study. Respondents were made aware of the purpose of the study and assured of confidentiality and anonymity during and after the survey. References were duly acknowledged to avoid the case of plagiarism and to ascertain originality.

### **3.11 Summary Profile Description of Nsawam Adoagyiri Municipality**

Nsawam Adoagyiri Municipal Assembly is located in the eastern region of Ghana. The Assembly was established under Legislative Instrument (L.I 2047) in 2012 when it was separated from the Akuapim South Municipal Assembly (Nsawam Adoagyiri Composite Budget, 2013). Nsawam was the capital of the Akuapim South Municipal Assembly and still remains the capital of the newly carved district. The Assembly has three zonal divisions and a fourth, which was split in two when the new district was formed. These zones comprise of Adoagyiri, Nsawam, Nkyenkyene and the fourth, Obodan- Fotobi that was split during the separation of the old and new assembly (Nsawam Adoagyiri Composite Budget, 2013).

The management of the municipality awaits its official status on the demarcation of Obodan- Fotobi zonal council. The assembly is still new and efforts are far advanced to separate the logistics and administrative content for the two districts especially for Nsawam Adoagyiri, which is the newer district (Nsawam Adoagyiri Composite Budget, 2013). Figures 3.1 and 3.2 are maps exhibiting the total land area and the different zones before and after the re-demarcation in to the two municipal assemblies respectively.

The municipality of Nsawam Adoagyiri lies about 23km from Accra. Figures from the 2010 population census indicate the population was made up of 42,790 males and 44,617 females. Nsawam, a sprouting peri-urban centre, is the capital of the municipality where the busiest business centre is located. There are about 121 other communities in the municipality, which share boundaries with the Akuapim South district assembly and the Ga West district. The road network in the area is of modest quality with some major roads constructed to connect some major farming areas with funds from the Millennium Development Authority of Ghana (MIDA). The existing national rail network passes through this municipality. Although there is pipe borne water supply available in the municipality, communities close to Densu River

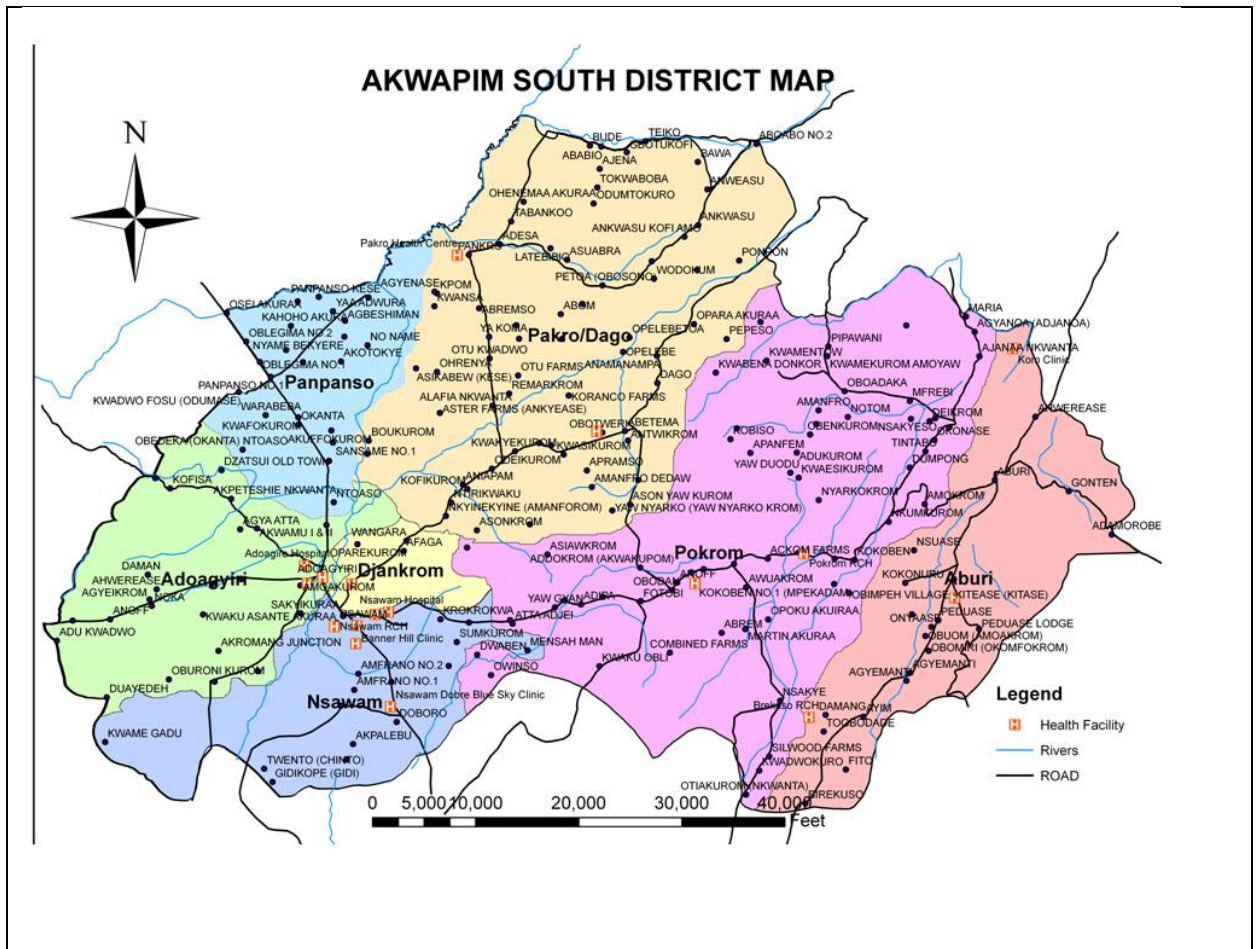
tend to use the water from the River for some activities like washing and watering their livestock. The Densu River, which is a suspected source of transmission of the Buruli Ulcer disease, is popular for swimming by the children. The District Assembly has constructed boreholes in several communities to improve water supply. It has also established several water and sanitation committees to manage the sanitary conditions within the communities.

There are two major senior high schools located at Nsawam and Adoagyiri. Agriculture is an important mainstay of the population employing about 37% of the population of which the majority are into crop farming. Pineapples and mangoes are important cash crops cultivated for export as well as local consumption. There are several small scale industries located within the municipality that have the capacity to become huge successes if given the financial support that they require in the form of soft loans and local patronage.

Nsawam is popular for the sale of freshly baked bread and fried turkey tail locally known as 'tsofe'. The municipality has attracted several manufacturing firms to operate in the area and these include pharmaceutical firms and agro-based companies. There is a budding tourism sector, with features such as waterfalls at Mensaman and Boade at Nsakyee and crocodiles and other interesting animals at Osudom Lake.

The Assembly undertakes several projects to improve the sanitation of the municipality. Some instances of these projects have been recorded in the Medium Term Development Plan (MTDP) of the municipality. These projects range from projects in the environment to improve sanitation like the evacuation of refuse dumps and the provision of water closet toilet facilities. Several water and sanitation committees have been created in over 16 communities where over 40 women have been trained to manage their own water and sanitation facilities (Nsawam Adoagyiri MTDP, 2013).

**Figure 3.1: Map Showing Area of Old District before Demarcation**



**Source: Nsawam Adoagyiri Municipal Assembly/ Municipal Health Administration**



## CHAPTER 4

### RESULTS OF SIMPLE DESCRIPTIVE AND STATISTICAL ANALYSIS

#### 4.1 Introduction

This entire chapter will be used to discuss the results of the analysis of the survey data. The results are interpreted in the view of sufferers of the Buruli Ulcer disease and non-sufferers of the disease living within the municipality. Government health personnel who offer medical services are considered in the interpretation of the data.

#### 4.2 Socio-economic Characteristics of Respondents

Table 4.1 provides a summary of the socio-economic characteristics based on frequency analysis for the 193 respondents of the survey consisting of a total of 43 sufferers, 128 non-sufferers living in the community and 22 government medical health personnel. About 22.3% of the respondents were sufferers of the Buruli Ulcer disease, 65.3% of them accounted for the non-sufferers of the disease who lived in the municipality and the remaining 12.4% were the government health personnel based at clinics and health centres in the municipality.

Considering the gender of the respondents, 51.2% of the total sufferers of the disease, 45.2% of non-sufferers living in the municipality and 75.0% of the government health personnel were female. The distinction was not significant enough to suggest or conclude that the disease had a higher incidence in either gender. With regards to the marital status of respondents, 41.9% of sufferers of the disease were married, about 9.3% had divorced, and 14% were widowed while 34.9% were single. None of the sufferers was engaged in informal unions. For non-sufferers, about 46.8% of them were single as compared to the 37.5% of medical personnel. About 38.9% and 45.9% of the non-sufferers and medical personnel, respectively, were married. A total of 3.2% of the non-sufferers were divorced in comparison to 8.3% of the medical health

personnel. While 40% of the non-sufferers were widowed, none of the medical personnel had experienced widowhood. A total of 7.1% and 8.3% of the non-sufferers and medical health personnel respectively, were engaged in informal unions.

Respondents were from diverse religious backgrounds. The majority of the respondents were Christians accounting for 79.1% of sufferers, 71.4% of non-sufferers and 75.0% of medical personnel. About 9.3% of sufferers, 27.0% of non-sufferers and 25.0% medical personnel practised the Muslim religion. About 7.0% of sufferers and 0.8% of non-sufferers practised traditional religions, while the remaining 4.7% and 0.8% of sufferers and non-sufferers, respectively, practised both traditional and Christian religions.

Approximately 11.6% and 2.4% of sufferers and non-sufferers, respectively, of the disease had no formal education as compared to 2.4% of non-sufferers and 8.3% of medical personnel, who had attained postgraduate levels of education. A total of 39.5% and 8.7% of the sufferers and non-sufferers had attended primary school and 18.6% sufferers and 16.7% non-sufferers had acquired junior secondary school level of formal education. About 9.3% of sufferers, 11.9% of non-sufferers and 8.3% of medical personnel had attained middle school certificates in education. About 20.9% of the sufferers of the disease were recorded to have attained the senior secondary school level of education. This was the highest level of education attained by this group of respondents. Both non-sufferers and medical personnel class of respondents attained much higher levels of education up to the postgraduate level.

With regards to the ethnicity, 58.2% of sufferers were Akans, 59.5% of non-sufferers and 50% of medical personnel were Akans. Gas made up 11.6% sufferers, 11.9% non-sufferers and 29.2% medical personnel. Ewe's constituted 18.6% of sufferers and 10.3% of non-sufferers.

There were no medical personnel who were Ewe. Ga Adangbes made up 7.0% sufferers, 16.7% of non-sufferers and 8.3% of medical personnel. The Dangbe Shais made up 2.3% of sufferers and 0.8% of non-sufferers. Kusasis made up 2.3% of sufferers and 0.8% of non-sufferers and the Gonjas (Guans) constituted 4% non-sufferers and 8.3% of medical personnel.

The respondents were engaged in various economic activities from domestic activities to formal employment. The largest group of respondents from the sufferers (20.9%) and non-sufferers (27.8%) were engaged in trading while students and self-employed individuals made up 16.3% each of the sufferers alone. The largest group of the medical respondents were nurses (83.3%). There were about 8.3% of physician assistants, 4.2% of doctors and epidemiologists each. Non-sufferers were largely farmers (12.7%), artisans (17.5%), and civil servants (11.1%). About 7.0% of the sufferers were unemployed as compared to 4.0% of the non-sufferers.

In Table 4.2, average figures of selected socio-economic characteristics of the respondents are reported. The mean age for the sufferers was 35.4 years with the youngest respondent aged 15 and the oldest aged 83. This showed that the disease affected a wide range of individuals across age groups. The average age for the non-sufferers was 40.1 years (18 to 76 years range) and 38.5 (24 to 59 years range) for the medical health personnel.

Sufferers of the disease were engaged in low income generating economic activities like farming and trading. Other jobs they engaged in were barbing driving and artisanship. Their average income as a group was the lowest with about 71.8% (between 0 to 950 GHS). Non-sufferers of the disease recorded an average income of 297.3% (50 to 1050 GHS) while the medical personnel recorded a much higher amount of 366.7% (50 to 1350 GHS).

Upon reflecting on the differences on their average income levels of the three groups of respondents, we can say that the sufferers are not able to earn that much money from their sources of employment. This may be as a result of their inability to work continuously because of the infection of the disease. It may also be as a result of the fact that they have to spend so much time in the hospital in treating their disease. From Table 4.1, we realize that non-sufferers obtained much higher educational qualification and also were able to secure high profile jobs than the sufferers of the disease, enabling them to access much more lucrative jobs, explaining the differences in the average incomes reported in Table 4.2.

Table 4.2 indicates that the average household size of household for sufferers was 7.9, the lowest of the three groups. The disease has not been proven to be contagious or not. However, if the disease is spread through a common source of water or sharing common household facilities, then a conclusion can be drawn that, an average number of the people living in the household are at risk of contracting or getting infected by the disease. The non-sufferers of the disease share a household with an average of 9.7% (2 to 26) of people with 3.64% (0 to 11) of them recorded as children. An average of 9.1% people lived within the household of the medical health personnel with an average of 3.5% of them recorded as children.

The above observation could be useful to help in spreading the word of the possible causes and effects of the Buruli Ulcer disease. If each person who had gotten infected by the disease or heard about the disease or even provided health services for the sufferers of the disease, can make an effort to be observant and look out for the earliest symptoms on the people in their household, then probably the response rate towards reporting of the disease to the appropriate medical centre could increase. This may help reduce or curb the incidence of the disease in the community.

**Table 4.1: Summary of Socio-Economic Characteristics of Respondents Based on their Buruli Ulcer Status using Frequency Analysis.**

<b>Item/ group</b>	<b>Sufferers of Buruli Ulcer (Percentage)</b>	<b>Non-sufferers of Buruli Ulcer Living in the same community with Sufferers of the disease. (Percentage)</b>	<b>Non-sufferers of Buruli Ulcer who are Government Health Personnel Based at Clinics (Percentage)</b>
<b>N=193</b>	<b>Total= 43</b>	<b>Total= 128</b>	<b>Total= 22</b>
➤ <b>Proportion of sub-group as percentage of whole group of respondents</b>	22.3	65.3	12.4
<b>Gender</b>			
➤ Female	51.2	45.2	75.0
➤ Male	48.8	54.8	25.0
<b>Marital Status</b>			
➤ Single	34.9	46.8	37.5
➤ Married	41.9	38.9	45.8
➤ Divorced	9.3	3.2	8.3
➤ Widowed	14.0	4.0	0.0
➤ Informal	0.0	7.1	8.3
<b>Religious Affiliation</b>			
➤ Christian	79.1	71.4	75.0
➤ Muslim	9.3	27.0	25.0
➤ Traditionalist	7.0	0.8	0.0
➤ Christian//Traditionalist	4.7	0.8	0.0
<b>Educational Level</b>			
➤ No formal education	11.6	2.4	-
➤ Primary school	39.5	8.7	-
➤ Junior secondary School	18.6	16.7	-
➤ Middle school	9.3	11.9	8.3
➤ Senior secondary school	20.9	19.8	4.2
➤ Secondary	-	7.9	8.3
➤ Vocational Technical Commercial	-	15.1	41.7
➤ Post middle/ Post-secondary certificate	-	4.8	4.2
➤ Post-secondary diploma	-	7.1	25.0
➤ Bachelor degree	-	3.2	-
➤ Post graduate degree	-	2.4	8.3

<b>Ethnicity</b>			
➤ Akuapim (Akan)	37.2	28.6	25.0
➤ Fante (Akan)	7.0	7.9	8.3
➤ Ga	11.6	11.9	29.2
➤ Ewe	18.6	10.3	-
➤ Asante (Akan)	7.0	16.7	16.7
➤ Nzema (Akan)	2.3	6.3	-
➤ Ga Adangbe	7.0	7.1	8.3
➤ Dangbe/Shai	2.3	0.8	-
➤ Kusasi	2.3	2.4	-
➤ Bono (Akan)	4.7	-	-
➤ KasenaNankani	-	4.0	4.2
➤ Gonja (Guan)	-	4.0	8.3
<b>Occupation</b>			
➤ Farmer	16.3	12.7	-
➤ Trader	20.9	27.8	-
➤ Civil servant	-	11.1	-
➤ Artisan	9.3	17.5	-
➤ Self employed	16.3	6.3	-
➤ Public servant	-	7.9	-
➤ Doctor	-	-	4.2
➤ Nurse	-	-	83.3
➤ Mechanic	4.7	2.4	-
➤ Student	16.3	6.3	-
➤ Retired	-	0.8	-
➤ Physician assistant	-	-	8.3
➤ Driver	4.7	3.2	-
➤ Barber	2.3	-	-
➤ Engineer (sea vessel)	2.3	-	-
➤ Unemployed	7.0	4.0	-
➤ Epidemiologist	-	-	4.2

**Table 4.2: Summary of Selected Socio-Economic Characteristics of Survey Respondents Based on Averages.**

<b>Item</b>	<b>Sufferers of Buruli Ulcer (Percentage)</b>	<b>Non-sufferers of Buruli Ulcer Living in the Community (Percentage)</b>	<b>Non-sufferers of Buruli Ulcer who are Government Health Personnel Based at Clinics (Percentage)</b>
Age (years)	35.4 (15 to 83)	40.1 (18 to 76)	38.5 (24 to 59)
Personal monthly income in Ghana cedis (GHS)	71.8 (0 to 950)	297.3 (50 to 1050)	366.7 (50 to 1350)
Total number of people in the household	7.9 (2 to 20)	9.7 (2 to 26)	9.1 (4 to 26)
Number of children in the household	3.4 (1 to 15)	3.64 (0 to 11)	3.5 (1 to 8)

*Notes*

**The figures in the parentheses are the ranges.**

### **4.3: Assessment of the Perceived Causes of Buruli Ulcer Disease**

Tables 4.3, 4.4 and 4.5 provide information on the perceived causes of Buruli Ulcer as ascertained by the various groups of respondents for Buruli Ulcer sufferers, non-sufferers living in the community and health personnel in the community who worked closely with patients. Since scientists have not fully established the causes of Buruli Ulcer conclusively, this study attempted to ascertain the perceived causes of the disease directly from respondents as a way of guiding scientific researchers in finding cures for the disease. The respondents were required to rate their responses using scores based on 5 denoting that item is extremely important, 4 very important, 3 moderately important, 2 of low importance, 1 not important and zero where the question was not applicable or relevant to the respondent.

Table 4.3 provides a summary of the assessment by Buruli Ulcer sufferers of the importance of their perception of the cause of the disease. The most important perceived cause of the Buruli Ulcer disease was drinking and using contaminated water for domestic and household activities, based on an average score of importance of 3.23 (out of a maximum score of 5.0). The second most important perceived cause of the disease with an average score of 3.19 was the nature of the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease. The sufferers indicated that there was a possibility of getting infected due to the contact they had with the swampy areas probably through farming activities or the dense forest region that surround them.

The sufferers also rated, by an average score of 3.0, poor hygiene as the next most important cause of the Buruli Ulcer disease. They felt that perhaps the disease could be contracted through keeping improper hygiene. Ranked as the fourth most important cause of the disease, was witchcraft and black magic with an average score of 2.28. This observation led to the

indication that even though this disease is clearly a medical condition, due to the ignorance about the causes of the disease, some of the sufferers have blamed sorcery and magic-religious sources as the cause of the disease. Other relatively unimportant reasons (with lower average scores of 2.23 and under) were swimming in the River Densu or other water bodies, generational curses, having physical contact with the infected person, eating some peculiar foods or through sexual contact.

Table 4.4 provides summary results of respondents' assessment of the importance of their perceived causes of the disease for non-sufferers of the Buruli Ulcer disease who lived in the community. From the table, the highest average score of 3.85 was attributed to the contraction of the disease from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease. Closely ranked with an average score of 3.69 was poor personal hygiene followed by drinking and using contaminated water for domestic and household activities with an average score of 3.25. This group of respondents ranked witchcraft and black magic as the fourth most important cause of the disease with an average score of 2.70. Sufferers of the disease ranked this cause at the same position as the non-sufferers even though the average score differed. There were other perceived causes with score that were not as important (with scores of 2.54 and under) like, swimming in the River Densu or other water bodies, contact with an infected person, giving care to sufferers or through sexual contact. With an average score of 1.19, eating specific foods was ranked the least important cause of the disease perceived by non-sufferers of the Buruli Ulcer disease.

Table 4.5 provides a summary of respondents' assessment of the importance of their perception of the cause of Buruli Ulcer by medical health personnel. This group of

respondents ranked poor personal hygiene the most important perceived cause of the Buruli Ulcer Disease with an average score of 4.13. With an average score of 4.08, the contraction of the disease from the environment due to the swamps in the area was ranked as the second most important perceived cause of the disease. The third most important perceived cause of the disease ranked by this group of respondents with an average score of 3.50, was drinking and using contaminated water for domestic and household activities.

Other perceived causes with lower average scores of importance, (from 3.24 or lower), included swimming in the river and witchcraft or black magic which scored relatively higher averages than generational curses physical contact with an infected person, sexual transmission, caring for sufferers or from eating specific foods which were of least importance to the respondent.

**Table 4.3: Buruli Ulcer Sufferers' Assessment of the Perceived Importance of Causes of the Disease.**

<b>No.</b>	<b>Cause</b>	<b>Average score of importance</b>	<b>Standard deviation of score</b>	<b>Coefficient of variation of score</b>
<b>1</b>	Drinking and using contaminated water for domestic and household activities	3.23	1.49	0.46
<b>2</b>	Contraction of the disease is from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease	3.19	1.50	0.47
<b>3</b>	Poor personal hygiene practices	3.00	1.77	0.59
<b>4</b>	Witchcraft and black magic	2.28	1.59	0.70
<b>5</b>	From swimming in the River Densu or other water bodies	2.23	1.62	0.73
<b>6</b>	Generational curses	1.53	1.32	0.86
<b>7</b>	Having physical contact with an infected person	1.44	0.80	0.56
<b>8</b>	From eating specific foods	1.29	0.77	0.60
<b>9</b>	Sexually transmitted disease	1.02	0.15	0.15
<b>10</b>	The disease is contracted from giving care to persons suffering from the disease	1.00	0.00	0.00

**Notes**

The scoring is based on 5 denoting that the item is extremely important, 4 very important, 3 moderately important, 2 of low importance, 1 not important and zero is not applicable or is not relevant to the respondent.

**Table 4.4: Assessment of the Perceived Causes of the Disease by Non-Sufferers who Live in the Community of the Sufferers**

<b>No.</b>	<b>Cause</b>	<b>Average score of importance</b>	<b>Standard deviation of score</b>	<b>Coefficient of variation of score</b>
<b>1</b>	Contraction of the disease is from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease	3.85	1.13	0.29
<b>2</b>	Poor personal hygiene practices	3.69	0.99	0.27
<b>3</b>	Drinking and using contaminated water for domestic and household activities	3.25	1.34	0.41
<b>4</b>	Witchcraft and black magic	2.70	1.31	0.49
<b>5</b>	From swimming in the River Densu or other water bodies	2.54	1.60	0.63
<b>6</b>	Having physical contact with an infected person	1.96	1.13	0.58
<b>7</b>	The disease is contracted from giving care to persons suffering from the disease	1.51	0.75	0.50
<b>8</b>	Generational curses	1.50	0.86	0.57
<b>9</b>	Sexually transmitted disease	1.34	0.60	0.45
<b>10</b>	From eating specific foods	1.19	0.39	0.33

*Notes*

The scoring is based on 5 denoting that the item is extremely important, 4 very important, 3 moderately important, 2 of low importance, 1 not important and zero is not applicable or relevant to the respondent.

**Table 4.5: Assessment of the Causes of the Disease by Non-Sufferers who are Medical Personnel**

<b>No.</b>	<b>Cause</b>	<b>Average score of importance</b>	<b>Standard deviation of score</b>	<b>Coefficient of variation of score</b>
<b>1</b>	Poor personal hygienic practices	4.13	1.26	0.31
<b>2</b>	Contraction of the disease is from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease	4.08	0.83	0.20
<b>3</b>	Drinking and using contaminated water for domestic and household activities	3.50	1.38	0.39
<b>4</b>	From swimming in the River Densu or other water bodies	3.42	1.53	0.45
<b>5</b>	Witchcraft and black magic	2.58	1.56	0.60
<b>6</b>	Generational curses	1.79	1.38	0.77
<b>7</b>	Having physical contact with an infected person	1.75	1.11	0.63
<b>8</b>	Sexually transmitted disease	1.38	0.88	0.64
<b>9</b>	The disease is contracted from giving care to persons suffering from the disease	1.29	0.69	0.53
<b>10</b>	From eating specific foods	1.25	0.44	0.35

*Notes*

The scoring is based on 5 denoting that the item is extremely important, 4 very important, 3 moderately important, 2 of low importance, 1 not important and zero is not applicable or relevant to the respondent.

#### **4.4: Health Effects of Buruli Ulcer Ascertained from Sufferers of the Disease**

Tables 4.6 and 4.7 provide some information on the health effects of the disease as reported by sufferers of the disease based on the use of frequency analysis and averages of important health effects respectively. From Table 4.7, 72.1% of the sufferers indicated that the disease had affected to perform their usual duties in the community. The disease limits the individual and at a point can totally incapacitate the sufferer when the disease becomes painful and delimits movement. The ulcer has a very terrible smell and this can cause the individual to shy away from public gathering and events to avoid being ostracized in the public. For people who believe that the cause of the disease is as a result of witchcraft or black magic, they will refrain from mingling with the public to avoid being called bewitched or cursed. The remaining proportion of sufferers of about 27.9%, felt that the disease had not limited their task performance in the community.

Out of the total respondents, 39.9% of them expressed the extent of the limitation as very severe, 16.3% said it was severe, 20.9% moderate, 14.0% very little and 14.0% said they were not limited at all. For the treatment of the disease, 97.7% of the respondents had sought treatment at the health centre over the previous 12 months. The delay in reporting to the appropriate health centre can cause an aggravation of the disease. About 14% of them self-medicated while 11.6% and 25.6% visited traditional shrines/ religious priests and traditional herbalists, respectively. However, only 27.9% of the sufferers sought treatment for the first time at a health centre. The largest proportion, 34.9% self-medicated the symptoms by using first aid methods due to their ignorance about the symptoms of the disease. A total of 25.6% of the sufferers consulted the traditional herbalist for treatment with local herbs while the remaining 11.6% went to the traditional shrine/ religious priest for divine consultation.

The average number of times that the sufferers visited a government health centre for treatment during the previous 12 months was 44.4. This indicated that out of the 52 weeks in the year, the sufferer was in the clinic almost once every week, spending an average of 7.00 Ghana cedis per visit. The average total cost per treatment at the health centre over the previous 12 months was 310.7 Ghana cedis. Considering the average monthly income of the sufferer, which was about 71 Ghana cedis, this indicated that the average sufferer was financially burdened with the cost of treatment for the disease. The high costs of treating the disease were also related to the transportation expenses to and from the health centre.

There were several reasons for the delay in reporting to the health centre. Over 50% of the sufferers blamed the delay on being ignorant about the disease. A total of 19.5% blamed the delay on both financial constraints and ignorance about the disease while 17.1% blamed the delay on financial constraint alone. The remaining 7.3% of the sufferers delayed in reporting to the hospitals for fear of being stigmatized. Due to delays in reporting on time and first to the health centres, 56.1% of the sufferers arrived at the health centre when the disease had progressed to the ulcerative stage, 24.4% at the oedema stage and 19.5% at the nodal stage.

A total of about 93% of the total sufferers reported that they had no prior education on detecting the early symptoms of the disease. This however may indicate that there is inadequate flow of information about the disease, which is a market failure to the municipality. Knowing that the disease is prevalent in the municipality, strenuous efforts must be set in place to educate and sensitize the entire population on the symptoms of the disease to reduce the level of ignorance about the disease. **Appendices 3 to 10 provide visual evidence of the disease captured by the author during field visits and interviews.**

**Table 4.6: Summary of Health Effects of Buruli Ulcer Identified by Sufferers of the Disease during the Survey and Places that they Sought Treatment.**

<b>Item</b>	<b>Percentage of sufferers</b>
<b>Has the disease limited the ability of the sufferer to perform tasks in the community</b>	
➤ Yes	72.1
➤ No	27.9
<b>Extent of limitation of ability caused by the disease</b>	
➤ Very severe	34.9
➤ Severe	16.3
➤ Moderate	20.9
➤ Very little	14.0
➤ Not at all	14.0
<b>Where the sufferer sought treatment over the previous 12 months</b>	
➤ Health centre	97.7
➤ Traditional shrine/religious priest	4.7
➤ Traditional herbalist	9.3
➤ Self medication	14.0
<b>Where the sufferer sought treatment for the first time</b>	
➤ Health centre	27.9
➤ Traditional shrine/religious priest	11.6
➤ Traditional herbalist	25.6
➤ Nursed at home/self medication	34.9
<b>Reason for the delay in reporting the disease at the health centre</b>	
➤ Ignorance of the disease	56.1
➤ Financial constraint and ignorance of the disease	19.5
➤ Financial constraint	17.1
➤ Fear of stigmatisation	7.3
<b>The stage that the disease was reported to the health centre</b>	
➤ Ulcerative stage	56.1
➤ Oedema stage	24.4
➤ Nodal stage	19.5
<b>Any prior education on detecting the early signs of the disease</b>	
➤ Yes	7.0
➤ No	93.0

**Table 4.7: Summary of Some Effects of Buruli Ulcer on Human Welfare as Ascertained by Sufferers of the Disease During the Survey Based on Averages.**

No.	Item	Outcome
1	Proportion of sufferers who indicated that the disease has limited their ability to perform in the community expressed as percentage	72.1
2	Number of times that the sufferer has received treatment at a government health centre during the previous 12 months	44.4
3	Average cost of treatment per visit to the health centre over the previous 12 months in Ghana cedis	7.0
4	The total average cost for treatment at the health centre over the previous 12 months in Ghana cedis	310.7

#### **4.5: Perceived Quality of Treatment Services Received by Buruli Ulcer Sufferers.**

From Table 4.8, the sufferers reviewed the perceived quality of the treatment given at various centres using a Likert-type rating score with 5 denoting excellent quality, 4 good quality, 3 moderate quality, 2 unsatisfactory quality and 1 low quality. As indicated in Table 4.6, only 27.9% of sufferers sought medical care for their ulcers from health centre when they were initially infected. However, the overall quality of service received at the health centre was rated at an average level of 3.86 indicating moderate to good quality.

The perceived quality of treatment rendered by the traditional herbalist was given an average score of 1.0 even though a total of 25.6% first reported their infection to traditional herbalist. Almost 34% of infected patients first nursed themselves at home before visiting the health centre. However the perceived quality of self-medicating averaged 2.0. This result clearly indicated that even though majority of sufferers initially resulted to self-medication, they perceived the treatment at the health centres to be of better quality.

**Table 4.8: Perceived Quality of Services Rendered by Various Treatment Centres as Ascertained by Buruli Ulcer Sufferers.**

<b>No.</b>	<b>Treatment centre</b>	<b>Average score of importance</b>	<b>Standard deviation of score</b>	<b>Coefficient of variation of score</b>
<b>1</b>	Government-owned health centre	3.86	1.00	0.26
<b>2</b>	Traditional herbalist	1.00	-	-
<b>3</b>	Self medication	2.00	-	-

*Notes*

The scoring is based on 5 denoting that the item is excellent quality, 4 good quality, 3 moderate quality, 2 unsatisfactory quality, 1 low quality and zero is not applicable or is not relevant to the respondent.

#### **4.6: Societal Interventions Requested by Buruli Ulcer Sufferers to Reduce Adverse Effects of the Disease**

Table 4.9 presents various suggestions by Buruli Ulcer sufferers to the national government to reduce the prevalence of the disease in Ghana in terms of importance based on frequency analysis. Majority of the sufferers representing (40.5%) expected the government to provide medication to treat the disease for sufferers including counselling advice related to treatment. About 29.7% suggested the government should undertake more research into the causes and possible treatment and cure for the disease.

A total of 10.8% of the respondent sufferers suggested an increase in awareness information about the disease and an equal proportion also requested a special treatment centre to be built for sufferers to award them some privacy of treatment without fear of stigmatization. The remaining proportion of the sufferers under 30% of the total sufferers indicated that the government should undertake ventures like improving the quality of sanitation and water in the community, provide assistance to sufferers for transportation to clinics and hospitals, ensure that more medical personnel and experts are trained to reduce the long queues at the health centres and also to ensure that funds directed towards the treatment of the disease are not misdirected into other government projects.

In Table 4.10, when asked what they expected the local government or district assembly to do to help reduce the prevalence of the disease in the community, 48.6% of them suggested that the District Assembly should engage in awareness and sensitisation drive within the community to inform the public about the disease including setting up zonal and area awareness committees followed by 28.6% who suggested that Elected District Assembly should be active in the efforts against curbing or reducing the prevalence of the disease. Two

groups of 8.6% each of the respondents suggested that the district assembly should provide mobile treatment centres and vehicles for the sufferers, and secondly provide an improved quality of environmental sanitation and water in the community including halting the use of polluted water by the community. They suggested that health care should be brought to them in the comfort of their communities so that there will be little room for the stigma attached to be operational. Finally, 5.7% suggested the national government and the district assembly should partner and join forces to fight the disease.

Table 4.11 recorded the suggestion of non-sufferers of the disease living in the community, on what they expected the national government to do to intervene in the effort to curb the disease. Most importantly, 48.3%, based on frequency analysis, suggested that the national government should provide medication to treat the disease for sufferers including counselling advice related to treatment. This was the most important suggestion made by the sufferers in Table 4.9 corresponding with 26% of the medical personnel who also ranked this suggestion as the most important action to be taken by the national government.

The second most important suggestion made by 22.4% of non-sufferers in Table 4.11, was the improvement of environmental sanitation and water in the community by the government. About 10.8% of them suggested that more research be done into the causes and to find treatment and a possible cure for the disease while 8.0% wanted more medical personnel and experts trained in providing treatment for the disease. The least proportion of the group, 7.1%, suggested that the government find ways in increasing the awareness information about the disease since that was important to reduce the incidence of the disease through detection of the symptoms of the disease and treatment of the disease at the appropriate health centres.

In Table 4.12, when asked their suggestions on what the local government or District Assembly should do to help reduce the prevalence of the disease, 50.9% of the non-sufferers of the disease said that, the District Assembly should engage in awareness and sensitisation drive within the community to inform the public about the disease including setting up zonal and area awareness committees. About two in five of respondents (19.6%) suggested the District Assembly should be active in the efforts against curbing or reducing the prevalence of the disease, 13.7% said an improved environmental sanitation and water in the community including a halt in the use of polluted water sources by the public should be enforced. An 11.8% of the respondents suggested that the District Assembly should provide mobile treatment centres and vehicles for sufferers. This was suggested because some sufferers had to travel very long routes to come for treatment and others were just reluctant to go anywhere considering the stigma attached to the disease.

Table 4.13 carried suggestions made by the medical health personal working with the Buruli Ulcer sufferers for the national government intervention to reduce the prevalence of the disease in Ghana in terms of importance based on frequency analysis. The most important suggestion made by 26.0% of the group suggested that the government provide medication to treat the disease for sufferers including counselling advice related to the treatment. About 21.7% of them felt that more research should be done into the causes and possible treatment and cure of the disease. Two groups of 13% each suggested the improvement of the quality of environmental sanitation and water in the community, and then to increase awareness information about the disease. The last two groups of 8.7% each also suggested that the government provide assistance for the transportation of sufferers and train more medical personnel and health experts in the treatment of the Buruli ulcer disease.

In final table in this section, table 4.14, the medical personal were asked their suggestions on what they thought should most importantly be done by the local government or District Assembly to reduce the prevalence of Buruli Ulcer disease in the community. A total of 28.5% of the group were of the view that the District Assembly should engage in awareness and sensitisation drive within the community to inform the public about the disease including setting up zonal and area awareness committees. This suggestion was made with the intention that the awareness of the disease will equip a majority of the people in the community with knowledge about the disease since a majority of the sufferers (about 93%) claimed that they had no knowledge of the disease until they got infected (refer to Table 4.6).

About 23.8% of the respondents were hoping that elected District Assembly members would be active in the efforts and make it a priority to help curb or reduce the prevalence of the disease. About 19.1% of the respondents suggested the improvement of the quality of environmental sanitation and water in the community including halting the use of polluted water by the public and also proper education related to hygiene. Suggestions were made by 19.0% of the group for the partnership of the National Government and the District Assembly to fight the disease and the remaining 4.8% suggested that mobile treatment centres or vehicles should be provided.

**Table 4.9: Buruli Ulcer Sufferers' Suggestions for National Government Intervention to Reduce the Prevalence of Buruli Ulcer in Ghana in Terms of Importance Based on Frequency Analysis of Reported Suggestions.**

No.	Suggestion	Proportion of sufferers indicating this response
1	Government should provide medication to treat the disease for sufferers including counselling advice related to treatment	40.5
2	Government should undertake more research into the causes and possible treatment and cure for the disease	29.7
3	Government should increase awareness information about the disease	10.8
4	Government should build a special hospital for sufferers of the disease	10.8
5	Government should improve the quality of environmental sanitation and water in the community	8.1
6	Government should provide assistance for the transportation of sufferers to clinics and hospitals	5.4
7	Government should train more medical personnel and experts in the treatment of Buruli ulcer	5.4
8	Government funds for treatment of the disease should not be misappropriated	2.7

**Table 4.10: Buruli Ulcer Sufferers' Suggestions for the Local Government or District Assembly to Reduce the Prevalence of Buruli Ulcer in the Community in Terms of Importance based on Frequency Analysis of Reported Suggestions.**

No.	Suggestion	Proportion of sufferers indicating this response
1	District Assembly should engage in awareness and sensitisation drive within the community to inform the public about the disease including setting up zonal and area awareness committees	48.6
2	Elected District Assembly should be active in the efforts against curbing or reducing the prevalence of the disease	28.6
3	The District Assembly should provide mobile treatment centres and/or vehicles for sufferers	8.6
4	The District Assembly should improve the quality of environmental sanitation and water in the community including halting the use of polluted water by the public	8.6
5	National Government should partner the District Assembly to fight the disease	5.7

**Table 4.11: Non-Sufferers' Suggestions for National Government Intervention to Reduce the Prevalence of Buruli Ulcer in Ghana in Terms of Importance based on Frequency Analysis of Reported Suggestions.**

No.	Suggestion	Proportion of sufferers indicating this response
1	Government should provide medication to treat the disease for sufferers including counselling advice related to treatment	48.3
2	Government should improve the quality of environmental sanitation and water in the community	22.4
3	Government should undertake more research into the causes and possible treatment and cure for the disease	10.8
4	Government should train more medical personnel and experts in the treatment of Buruli Ulcer	8.0
5	Government should increase awareness information about the disease	7.1

**Table 4.12: Non-Sufferers' Suggestions for the Local Government or District Assembly to Reduce the Prevalence of Buruli Ulcer in the Community in Terms of Importance Based on Frequency Analysis of Reported Suggestions.**

No.	Suggestion	Proportion of sufferers indicating this response
1	District Assembly should engage in awareness and sensitisation drive within the community to inform the public about the disease including setting up zonal and area awareness committees	50.9
2	Elected District Assembly should be active in the efforts against curbing or reducing the prevalence of the disease	19.6
3	The District Assembly should improve the quality of environmental sanitation and water in the community including halting the use of polluted water by the public	13.7
4	The District Assembly should provide mobile treatment centres and/or vehicles for sufferers	11.8
5	National Government should partner the District Assembly to fight the disease	6.9

**Table 4.13: Suggestions from Medical Personnel Working with Buruli Ulcer Sufferers for the National Government Intervention to Reduce the Prevalence of Buruli Ulcer in Ghana in Terms of Importance based on Frequency Analysis of Reported Suggestions.**

No.	Suggestion	Proportion of suffers indicating this response
1	Government should provide medication to treat the disease for sufferers including counselling advice related to treatment	26.0
2	Government should undertake more research into the causes and possible treatment and cure for the disease	21.7
3	Government should increase awareness information about the disease	13.0
4	Government should improve the quality of environmental sanitation and water in the community	13.0
5	Government should provide assistance for the transportation of sufferers to clinics and hospitals	8.7
6	Government should train more medical personnel and experts in the treatment of Buruli ulcer	8.7

**Table 4.14: Suggestions from Medical Personnel Working with Buruli Ulcer Sufferers for the Local Government or District Assembly to Reduce the Prevalence of Buruli Ulcer in the Community in Terms of Importance based on Frequency Analysis of Reported Suggestions.**

<b>No.</b>	<b>Suggestion</b>	<b>Proportion of suffers indicating this response</b>
<b>1</b>	District Assembly should engage in awareness and sensitisation drive within the community to inform the public about the disease including setting up zonal and area awareness committees	28.5
<b>2</b>	Elected District Assembly should be active in the efforts against curbing or reducing the prevalence of the disease	23.8
<b>3</b>	The District Assembly should improve the quality of environmental sanitation and water in the community including halting the use of polluted water by the public and proper education related to hygiene	19.1
<b>4</b>	National Government should partner the District Assembly to fight the disease	19.0
<b>5</b>	The District Assembly should provide mobile treatment centres and/or vehicles for sufferers	4.8

## CHAPTER 5

### STATISTICAL ANALYSIS OF SURVEY DATA DEALING WITH SUFFERERS OF THE DISEASE

#### 5.1. Introduction

This chapter provides the results of advanced statistical analysis of the survey data dealing with sufferers of Buruli Ulcer disease. The first set of results deals with chi-square analysis of grouped data related to the perceived causes of the disease from the viewpoint of the sufferer related to their socio-economic characteristics. The second part of the analysis is devoted to a multiple regression model of the factors influencing the level of medical expenditures incurred by sufferers of the disease.

#### 5.2. Results of the Chi-square Analysis of Association between the Perceived Causes of Buruli Ulcer Disease and Various Socio-economic Characteristics

The results of the chi-square analysis of the degree of association between the perceived causes of the Buruli Ulcer disease, and several socio-economic characteristics are reported in Table 5.1 to Table 5.7. The socio-economic characteristics of sufferers investigated with regards to their association with analysis are (1) sex, (2) marital status, (3) level of education, (4) religious affiliation, (5) ethnic background, (6) major occupational activity and (7) monthly income. The perceived causes of the disease investigated are (1) witchcraft and sorcery, (2) poor personal hygienic practices, (3) the natural environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or mode of spread of the disease, (4) swimming in the River Densu, (5) sexual transmission, (6) drinking and using contaminated water for domestic household activities, (7) having physical contact with

an infected person, (8) generational curses related to traditional religious edicts and (9) eating some specific foods.

Perceived causes 1, 8 and 9 are largely related to the traditional Ghanaian religious beliefs. Perceived causes 3 and 4 are linked to the natural environment in the place of residence of the sufferer. Perceived causes 2, 6 and 9 are associated with individual personal behaviour under his/her control. The last set of perceived causes are 5 and 7 deal directly with person-to-person contacts between the sufferer and another person.

Table 5.1 presents the chi-square analysis results dealing with the association between the perceived cause of the disease and the sex of the sufferer. Only the perceived cause due to physical contact with an infected person was statistically associated with the sex of the sufferer.

As reported in Table 5.2, for the statistical association linkage between the perceived cause of the disease and the marital status of the sufferer, all the perceived causes had no statistically significant association with marital status with the exception of sexual transmission.

Table 5.3 also indicates person-to-person contact in the form of sexual transmission was statistically associated with the level of education of the sufferer. None of the other eight forms of perceived causes of the disease was statistically associated with the level of education of the sufferer.

**Table 5.1: Statistical Significance of the Association between the Perceived Cause of Buruli Ulcer Disease and Sex of Sufferer of the Disease.**

No.	Items of Comparison	Pearson Chi-square Test Significance Level
1	Perceived level of importance of witchcraft and black magic as perceived of disease <i>versus</i> the sex of the sufferer of disease	0.789
2	Poor personal hygienic practices <i>versus</i> the sex of the status of sufferer of disease	0.748
3	The contraction of the disease is from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease <i>versus</i> the sex of the sufferer of disease	0.902
4	Swimming in the River Densu or other water bodies <i>versus</i> the sex of the sufferer of disease	0.242
5	Sexually transmitted disease <i>versus</i> the sex of the sufferer of disease	0.300
6	Drinking and using contaminated water for domestic household activities <i>versus</i> the sex of the sufferer of disease	0.590
7	Having physical contact with an infected person <i>versus</i> the sex of the sufferer of the disease	0.017*
8	Generational curses <i>versus</i> the sex of the sufferer of the disease	0.515
9	Eating specific foods <i>versus</i> sex of the sufferer of the disease	0.387

**Notes**

\* Accepted level of significance was 5% used throughout this study

*Source: Derived from survey data, 2013*

**Table 5.2: Statistical Significance of the Association between the Perceived Cause of Buruli Ulcer Disease and *Marital Status* of Sufferer of the Disease.**

No.	Items of Comparison	Pearson Chi-square Test Significance Level
1	Perceived level of importance of witchcraft and black magic as perceived of disease <i>versus</i> marital status of sufferer of disease	0.751
2	Poor personal hygienic practices <i>versus</i> marital status of sufferer of disease	0.782
3	The contraction of the disease is from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease <i>versus</i> marital status of the sufferer of disease	0.237
4	Swimming in the River Densu or other water bodies <i>versus</i> the marital status of the sufferer of disease	0.687
5	Sexually transmitted disease <i>versus</i> the marital status of the sufferer of disease	0.019*
6	Drinking and using contaminated water for domestic household activities <i>versus</i> the marital status of the sufferer of disease	0.976
7	Having physical contact with an infected person <i>versus</i> the marital status of the sufferer of the disease	0.087
8	Generational curses <i>versus</i> marital status of the sufferer of the disease	0.343
9	Eating specific foods <i>versus</i> marital status of the sufferer of the disease	0.672

*Notes*

\* Accepted level of significance was 5% used throughout this study

*Source: Derived from survey data, 2013*

**Table 5.3: Statistical Significance of the Association between the Perceived Cause of Buruli Ulcer Disease and the *Level of Education* of the Sufferer of the Disease.**

No.	Items of Comparison	Pearson Chi-square Test Significance Level
1	Perceived level of importance of witchcraft and black magic as perceived of disease <i>versus</i> the level of education of the sufferer of disease	0.658
2	Poor personal hygienic practices <i>versus</i> the level of education of the status of sufferer of disease	0.183
3	The contraction of the disease is from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease <i>versus</i> the level of education of the sufferer of disease	0.459
4	Swimming in the River Densu or other water bodies <i>versus</i> the level of education of the sufferer of disease	0.127
5	Sexually transmitted disease <i>versus</i> the level of education of the sufferer of the disease	0.041*
6	Drinking and using contaminated water for domestic household activities <i>versus</i> the level of education of the sufferer of disease	0.139
7	Having physical contact with an infected person <i>versus</i> the level of education of the sufferer of the disease	0.629
8	Generational curses <i>versus</i> the level of education of sufferer of the disease	0.880
9	Eating specific foods <i>versus</i> the level of education of the sufferer of the disease	0.596

*Notes*

\* Accepted level of significance was 5% used throughout this study

*Source: Derived from survey data, 2013*

The analysis of the statistical association between religious affiliation of the sufferer and his/her perceived causes of the disease is reported in Table 5.4. Not surprisingly, eating specific foods, a perceived cause directly linked to traditional religious beliefs is statistically associated with the religious affiliation of the sufferer. Table 5.5 reports the statistical association between the ethnic background of the sufferer and the perceived cause of the disease. With the observed differences in cultural practices related to sex and marriage among various ethnic and sub-ethnic groups in Ghana, it is not surprising that sexual transmission of the disease was statistically significantly associated with ethnic background (refer to Row Number 5 in Table 5.5). None of the other eight perceived causes of the disease was statistically associated with the ethnic background of the respondent.

The major occupational activity of the sufferer of the disease was the most important variable in terms of its statistically significant association with various causes of the disease. As shown in Table 5.6, as many as four out the nine reported perceived causes of the disease were individually statistically significantly associated with the major occupational activity of the sufferer. These four perceived causes were (1) poor personal hygienic practices, (2) transmission of the disease through sexual intercourse, (3) physical contact with an infected person and (4) generational curses. Thus major types of causes ranging from individual personal behavior and person-to-person contacts were identified as having statistically significant association with the major occupational activity of the sufferer.

Table 5.7 concludes the reporting of the results of the chi-square analysis of statistical association of perceived causes of the disease with the monthly income of the sufferer. Only the perceived cause of transmission through sexual intercourse was statistically significantly associated with the monthly income of the sufferer.

**Table 5.4: Statistical Significance of the Association between the Perceived Cause of Buruli Ulcer Disease and the *Religious Affiliation* of the Sufferer of the Disease.**

No.	Items of Comparison	Pearson Chi-square Test Significance Level
1	Perceived level of importance of witchcraft and black magic as perceived of disease <i>versus</i> the religious affiliation of the sufferer of disease	0.375
2	Poor personal hygienic practices <i>versus</i> the religious affiliation of the sufferer of disease	0.511
3	The contraction of the disease is from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease <i>versus</i> the religious affiliation of the sufferer of disease	0.598
4	Swimming in the River Densu or other water bodies <i>versus</i> the religious affiliation of the sufferer of disease	0.466
5	Sexually transmitted disease <i>versus</i> the religious affiliation of the sufferer of disease	0.965
6	Drinking and using contaminated water for domestic household activities <i>versus</i> the religious affiliation of the sufferer of disease	0.113
7	Having physical contact with an infected person <i>versus</i> the religious affiliation of the sufferer of the disease	0.949
8	Generational curses <i>versus</i> the religious affiliation of the sufferer of the disease	0.625
9	Eating specific foods <i>versus</i> the religious affiliation of the sufferer of the disease	0.012*

*Notes*

\* Accepted level of significance was 5% used throughout this study

*Source: Derived from survey data, 2013*

**Table 5.5: Statistical Significance of the Association between the Perceived Cause of Buruli Ulcer Disease and the *Ethnic Background* of the Sufferer of the Disease.**

No.	Items of Comparison	Pearson Chi-square Test Significance Level
1	Perceived level of importance of witchcraft and black magic as perceived of disease <i>versus</i> the ethnic background of the sufferer of disease	0.766
2	Poor personal hygienic practices <i>versus</i> the ethnic background of the sufferer of disease	0.970
3	The contraction of the disease is from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease <i>versus</i> the ethnic background of the sufferer of disease	0.386
4	Swimming in the River Densu or other water bodies <i>versus</i> the ethnic background of the sufferer of disease	0.338
5	Sexually transmitted disease <i>versus</i> the ethnic background of the sufferer of disease	0.000*
6	Drinking and using contaminated water for domestic household activities <i>versus</i> the ethnic background of the sufferer of disease	0.246
7	Having physical contact with an infected person <i>versus</i> the ethnic background of the sufferer of the disease	0.769
8	Generational curses <i>versus</i> the ethnic background of the sufferer of the disease	0.894
9	Eating specific foods <i>versus</i> the ethnic background of the sufferer of the disease	0.868

**Notes**

**\* Accepted level of significance was 5% used throughout this study**

**Source: Derived from survey data, 2013**

**Table 5.6: Statistical Significance of the Association between the Perceived Cause of Buruli Ulcer Disease and the *Major Occupational Activity* of the Sufferer of the Disease.**

No.	Items of Comparison	Pearson Chi-square Test Significance Level
1	Perceived level of importance of witchcraft and black magic as perceived of disease <i>versus</i> the major occupational activity of the sufferer of disease	0.463
2	Poor personal hygienic practices <i>versus</i> the major occupational activity of the sufferer of disease	0.007*
3	The contraction of the disease is from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease <i>versus</i> the major occupational activity of the sufferer of disease	0.095
4	Swimming in the river Densu or other water bodies <i>versus</i> the major occupational activity of the sufferer of disease	0.883
5	Sexually transmitted disease <i>versus</i> the major occupational activity of the sufferer of disease	0.000*
6	Drinking and using contaminated water for domestic household activities <i>versus</i> the major occupational activity of the sufferer of disease	0.688
7	Having physical contact with an infected person <i>versus</i> the major occupational activity of the sufferer of the disease	0.000*
8	Generational curses <i>versus</i> the major occupational activity of the sufferer of the disease	0.010*
9	Eating specific foods <i>versus</i> the major occupational activity of the sufferer of the disease	0.554

**Notes**

**\* Accepted level of significance was 5% used throughout this study**

**Source: Derived from survey data, 2013**

**Table 5.7: Statistical Significance of the Association between the Perceived Cause of Buruli Ulcer Disease and the *Monthly Income* of the Sufferer of the Disease.**

No.	Items of Comparison	Pearson Chi-square Test Significance Level
1	Perceived level of importance of witchcraft and black magic as perceived of disease <i>versus</i> the monthly income of the sufferer of disease	0.654
2	Poor personal hygienic practices <i>versus</i> the monthly income of the sufferer of disease	0.125
3	The contraction of the disease is from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease <i>versus</i> the monthly income of the sufferer of the disease	0.281
4	Swimming in the river Densu or other water bodies <i>versus</i> the monthly income of the sufferer of disease	0.756
5	Sexually transmitted disease <i>versus</i> the monthly income of the sufferer of disease	0.000*
6	Drinking and using contaminated water for domestic household activities <i>versus</i> the monthly income of the sufferer of disease	0.528
7	Having physical contact with an infected person <i>versus</i> the monthly income of the sufferer of the disease	0.878
8	Generational curses <i>versus</i> monthly income of the sufferer of the disease	0.488
9	Eating specific foods <i>versus</i> monthly income of the sufferer of the disease	0.970

**Notes**

**\* Accepted level of significance was 5% used throughout this study**

**Source: Derived from survey data, 2013**

### 5.3. Results of Regression Analysis for Factors Influencing Total Treatment Costs

#### Incurred by Sufferers of the Disease

A multiple regression analysis was undertaken to determine socio-economic characteristics of respondents that significantly influenced the level of treatment costs incurred by sufferers of the disease. The model for the study was as follows:

$$\text{EXPENDITURE} = C_0 + C_1 \text{ SINCOME} + C_2 \text{ MARRIED} + C_3 \text{ UNEMPLOYED} + C_4 \text{ STAGEOFTHEDISEASE} + U_i$$

Where **EXPENDITURE** was the dependent variable and was the reported total treatment costs for the disease incurred by the sufferer at health centres over the previous 12 months before the survey:

**SINCOME** was the reported monthly income of the respondent in Ghana cedi;

**MARRIED** was a dummy variable for the marital status of the respondent with 1 representing currently married persons and zero otherwise;

**UNEMPLOYED** was a dummy variable for the unemployment status of the respondent with 1 representing unemployed persons and zero for respondents who were employed at the time of the survey;

**STAGEOFTHEDISEASE** was the biological stage of the Buruli ulcer disease at the time of the survey. This was a dummy variable with 1 representing people who had the ulcerative stage of the disease and zero for those with nodal and oedema stages of the disease;

And  $U_i$  was the error term initially assumed to have a zero mean and constant variance.

Table 5.8 reports the results of multiple regression analysis of factors influencing the level of expenditures related to the treatment of the Buruli ulcer disease by sufferers. The overall power of the model was very high as measured by the 78.5%  $R^2$  and the 73.4% adjusted  $R^2$  with the statistical significance at the 0.000 level. The model was deemed to be correctly

specified based on the Ramsey Reset test of specification, which had a p value of 0.428, which meant that the null hypothesis of adequate and correct specification of the model could not be rejected. The error term was normally distributed based on the Shapiro Wilk test. This meant that the estimated sample coefficients could be extrapolated to the larger population. The test for homoscedasticity using the Langrange-Multiplier test showed that the error term was homoscedastic. Finally, the variance inflation factors of all the independent variables were very low and this result showed the relative absence of the problem of multicollinearity. The diagnostic tests summarised and reported in Table 5.8 confirmed a very strong model that could be used for interpretative analysis and discussion.

The results of the analysis reported in Table 5.8 showed that only SINCOME and UNEMPLOYED were statistically significant in influencing the variation in the dependent variable (EXPENDITURE). This result implied that higher treatment costs of the diseases were incurred with increasing income of the sufferer suggesting that wealthier people spent more money to treat the disease than poorer people assuming all other things constant. This also translates that unemployed people (where the unemployed=1), spent less money for treatment. Based on the standardized regression coefficient estimates reported in Table 5.8, the most important factor influencing the level of treatment expenditures incurred by sufferers was also the income of the sufferer (SINCOME).

**Table 5.8: Results of the Estimated Multiple Regression Model of Factors Influencing the Level of Expenditures for Treating Buruli Ulcer Disease Incurred by Sufferers.**

<b>Explanatory Variable</b>	<b>Parameter Estimate</b>	<b>Standardised Parameter Estimate</b>	<b>Student t Value</b>	<b>Probability level of significance</b>	<b>Variance Inflation Factor</b>
CONSTANT	849.31	0.000	4.077	0.001*	0.000
SINCOME	1.926	0.863	7.014	0.000*	1.194
MARRIED	-31.082	-0.034	-0.289	0.766	1.113
UNEMPLOYED	-690.409	-0.455	-3.844	0.001	1.107
STAGE OF THE DISEASE	-58.733	-0.060	-0.508	0.618	1.101

*Notes on Table 5.2:*

(1) The sample size used for this analysis was 22.

(2) The  $R^2$  was 0.785 and adjusted  $R^2$  was 0.734 and was statistically significant at the 0.000 level.

(3) The probability level of significance for correct specification of the model based on the Ramsey Reset test using the null hypothesis of adequate and proper specification of model was 0.428.

(4) The probability level of significance for normality of the error term based on the Shapiro Wilk test using the null hypothesis of normality of error term was 0.084.

(5) The probability level of significance for homoscedasticity based on the Langrange Multiplier (LM) test using the null hypothesis of homoscedasticity was 0.925.

(5) The asterisk (\*) indicates that the parameter was statistically significant at the 5% confidence level used for the study.

*Source: Derived from analysis on survey data, 2013.*

## CHAPTER 6

### CONCLUSION AND RECOMMENDATIONS

#### 6.1 Summary of the Study including Results and Conclusions

The main objective of this study was to determine the perceived causes of Buruli ulcer from both sufferers and non-sufferers in Nsawam Adoagyiri municipality to help analyse the prevalence of the disease and how it affects human development in the area. This chapter outlines a summary of the main findings and offers some policy recommendations that may help reduce human suffering from the disease. In order to address the four main objectives outlined in Chapter 1, a simple random cluster sampling method of data collection was used to randomly select 193 respondents from Nsawam Adoagyiri consisting of sufferers and non-sufferers of the disease as well as some medical health personnel offering care to patients in the government health centres within the community.

Out of the respondents to the questionnaire 51% of the sufferers, 45.2% of the non-sufferers and 75% of the medical health personnel were female. The average age of the respondents who were sufferers was 35.4 years with the youngest respondent aged 15 and the oldest aged 83. For sufferers and medical health personnel the average ages were 40.1 and 38.5 respectively. It was realized that the average income of the sufferers of the disease was very low as compared to the non-suffering respondents and medical health personnel. The average income of sufferers was GHS 71.8 while that of the non-sufferers and medical health personnel were GHS 297.3 and GHS 366.7 respectively. This clearly indicates that the incidence of the disease has caused a market failure in the sense that the disease limits the ability of the individual to maximise their economic opportunities.

The first objective of the study was to determine the perceived causes of the Buruli Ulcer disease from both sufferers and non-sufferers. Employing the simple statistical analysis based on the derivation of the average score, respondents were required to state their opinion in order of importance on the causes of the disease using a scoring based on 5 denoting that item is extremely important, 4 very important, 3 moderately important, 2 of low importance, 1 not important and zero is not applicable or relevant to the respondent. Out of all the options available the sufferers felt that drinking and using contaminated water for domestic household activities, was the most important cause of the Buruli Ulcer disease by scoring it at an average score of importance of 3.23. A score of an average of 1.0 was given to the contraction of the disease from giving care to persons suffering from the disease as the least important cause of getting infected by Buruli Ulcer. Non-sufferers, who were not medical personnel, offered an average score of 3.85 to the contraction of the disease from the environment due to swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease. They felt that the least important cause was from eating specific foods by awarding the suggestion an average score of 1.19.

Finally the medical health experts were of the view that the most important cause of the disease was poor personal hygiene practices by scoring it at an average of 4.13. They also agreed with the non- sufferers, with an average score of 1.25 that the disease was most unlikely to be spread from eating specific foods.

The second objective was to determine the view of sufferers and non-sufferers on the effects of the disease on human welfare. About 72.1% of the total sufferers agreed that the disease had limited their ability to perform tasks in their community while 27.9% of them felt that the disease had not inconvenienced them. However, only 34.9% of them felt that the extent of their limitation and inability to perform their tasks in the community was very severe. About 14% did not feel any limitation at all and the rest felt that the inconvenience was in between.

The third objective dealt with the analysis of factors influencing the treatment expenditures incurred by the sufferers of the disease over the previous 12 months before the survey. The main factor influencing treatment expenditures was the income of the sufferer with richer sufferers spending more on expenditures to treat the disease. The second significant determinant was the unemployment status of the sufferer with unemployed people spending less on treatment.

The fourth objective was to determine the social intervention, which may be adopted to help reduce the degree of human suffering from the disease. Several suggestions were provided from the three groups of respondents including suggestion to the national government and the local government or district assembly in order of importance based on frequency analysis. About 40.5%, 48.3% and 26% of the sufferers, non-sufferers and medical health personnel respectively, felt that the most important suggestion to the national government was to provide medication to treat the disease including counselling advice related to the treatment.

For the role of the local government or the District Assembly, about 48.6%, 48.3% and 28.5% of the sufferers, non-sufferers and medical health experts respectively agreed that the most important intervention needed from the local government and district assembly was for them to engage in awareness and sensitization drive within the community to inform the public about the disease including setting up zonal area awareness committees.

## **6.2 Policy Recommendations**

In this study, it was made clear that the perception of people about the causes of the disease was a major problem in the community since it influenced the way and manner the disease was treated and also the avenues where the treatment for the disease was sought. The prevalence of the disease in the area is largely due to lack of information on the causes of the disease. It was observed that many of the sufferers of the disease did not have prior knowledge of the disease before they got infected. A total of 93% of the suffering population reported that they had no prior education on detecting the early signs of the disease. Early detection and reporting of the disease is key for prompt treatment, and so the various gaps in the efforts on education on the symptoms of the disease should be abridged immediately. This can be done by the encouragement of groups to be formed for Buruli Ulcer Sufferers and volunteers from the community who will spend time in going round the community to educate people of the symptoms and early signs of the disease and also the benefits of reporting to the right treatment centres on time.

It is important that the community understands the importance of not having the wrong perception about the disease and to experience what it can mean to perceive wrongly about the disease. Educational efforts should be strengthened and also carried out frequently in various languages in which the respondents can make proper sense of, including other local dialects either than what is spoken locally in the area. Film shows can be organized with help from the

local or national government to express the plights of other people who have experienced the disease in a bid to convince the people to attend the clinics and report the earliest signs and symptoms. The communities must be trained and given vivid examples of the various initial stages of the disease.

Since the water and sanitation quality of the people of Nsawam has been set as one of the perceived causes of the disease, efforts should be made towards accessing cleaner and safer sources of water for the residents in the community. WATSAN committees are available in over 16 communities in the municipality with many women involved in the management of the water sources in the communities (MTDP 2013). Efforts by these committees should be intensified that the individuals in the community do not venture off into contaminated sources of water for use in their domestic activities.

The government in collaboration with the local district assemblies should ensure that hydrological investigations are carried out and cross-checked to ascertain the purity of water sources in the environment including all bore hole water sources. More safe and secure bore hole projects should be set up so that communities that depend on the rivers and other open water sources can use the alternative sources so that the various possible causes of the disease can be narrowed to enable the search for the cause become easier for the scientific researchers.

An important suggestion is that traditional herbalist can also be trained in detecting the early signs and symptoms of the disease and also to direct such cases to the relevant health clinics and collaborate with some medical centres to ensure that the right treatment is carried out at the health centres. The major learning point for them will also be on how to detect the earliest symptoms of the disease since most sufferers turn to attend traditional herbalist treatment centres for common boils which is usually the primary symptom of the disease.

The government in collaboration with the District assembly and volunteers can develop some incentives to help out the sufferers of the disease. These incentives may include a single meal, some clean water or free bandages for the patients to reduce their burden when they visit the hospital and health centres and sit in queues for several hours in the day. Some awards can also be organized for patients who complete all their medical procedures to encourage others to report their cases to the clinics. Government Funds can be made available for the procurement of a health vehicle, which can be used to visit or reach patients who are not able to travel the distance to receive the appropriate health care from the appropriate health centres. A sense of encouragement should be developed within the community so that both sufferers and non-sufferers partake in exercises to learn the early detection of the disease and the quick steps to take in reporting the disease to the appropriate health centres.

The government must encourage and sponsor the continuous and intensified research into the possible causes of the disease since the medical experts have still not developed any vaccine that can be applied against the infection of the disease. A suggestion to the national government in collaboration with the universities in the country, is to set up a special research centre that will investigate into the Socio- Economic challenges and characteristics that accompany the disease and come up with social interventions that can be employed in helping curb the disease and support individuals who have been maimed by the Buruli Ulcer disease and other diseases like it. More seriousness should be attached to the problem since it is spread nationwide and affecting the poorest and vulnerable in the society. Generally, perceptions and attitude towards the disease must be restructured to rather develop ways by which the disease can be curbed rather than aggravating the situation.

The study established that information about the causes and diagnosis of the disease and its treatment procedures was inadequate. Perceived causes and preferred initial treatment options by sufferers were not very suitable in helping the sufferers deal with the disease. Information available to health personnel in the community was also inadequate. This market failure has occurred as a result of information failure on the part of both the healthcare providers and the people of the community, and can be solved by creating policies in line with the recommendations provided above and making sure that they are implemented and adhered to by all means possible.

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**APPENDICES**

**APPENDIX 1: SURVEY QUESTIONNAIRE**

**CONFIDENTIAL**

**SURVEY OF THE PREVALENCE OF BURULI ULCER, AND ITS EFFECT ON HUMAN DEVELOPMENT IN THE NSAWAM ADOAGIRI MUNICIPALITY.**

**This study is being conducted in partial fulfilment for the award of a Masters Degree in Development Studies by The 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 confidentiality.**

**RESPONDENT NO:**

**ADDRESS:**

**TELEPHONE NUMBER:**

**SURVEY CODE NUMBER:**

**DATE OF SURVEY:**

\*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*

**SECTION A: GENERAL INFORMATION**

1. Please indicate where you live:.....
2. Have you heard of the Buruli ulcer disease?  
1- Yes[ ]  
2- No[ ]
3. What is the disease called locally \_\_\_\_\_
4. Do you believe that the incidence of Buruli Ulcer and its health effects is a problem of development in this area and other areas in Nsawam Adoagyiri?  
1- Yes  
2- No  
3- Indifferent
5. Please indicate the degree of seriousness of this problem.  
5 - Very serious 4 - Serious 3 - Moderately serious 2 - Low 1 - Not serious at all.
6. Are there other serious diseases such as Buruli Ulcer in the community you live in?  
1- Yes 2- No 3- Indifferent.
7. In your opinion, what do you expect the government to do to help curb the prevalence of the Buruli Ulcer disease in Ghana?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
8. What do you expect the local district authorities to do about the prevalence of Buruli Ulcer in Nsawam Adoagyiri?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
9. Are you a sufferer or a non-sufferer of the Buruli Ulcer disease?  
1. Yes [ ] 2. No[ ]

***If you answered "no" to the above question, please go directly to Section C.  
If you answered "yes", then continue with Question 10 onwards and skip section C.***

**SECTION B: Sufferers of Buruli Ulcer / Parents or carers of Buruli Ulcer sufferer**

10. Does anyone else suffer from Buruli Ulcer disease in your family?

1. Yes [ ] 2. No [ ]

11. How long have you been a sufferer of the disease? \_\_\_\_\_

12. At what stage is your disease? \_\_\_\_\_

1. Nodal stage [ ] 2. Oedema stage [ ] 3. Ulcerative stage ... [ ]

13. How do you perceive that you contracted the Buruli Ulcer disease?

<b>Cause</b>	<b>highly significant</b>			<b>least significant</b>	
Witchcraft and black magic	5	4	3	2	1
Poor personal hygiene practices	5	4	3	2	1
Contraction of the disease is from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease.	5	4	3	2	1
From swimming in the river Densu or other water bodies	5	4	3	2	1
Sexually transmitted disease	5	4	3	2	1
Drinking and using contaminated Water for domestic household activities	5	4	3	2	1
Having physical contact with an infected person	5	4	3	2	1
Generational curses	5	4	3	2	1
From eating specific foods	5	4	3	2	1
The disease is contracted from giving care to persons suffering from the disease	5	4	3	2	1
Others(please specify)	5	4	3	2	1

14. At what stage did you report the disease?

1. Nodal stage [ ] 2. Oedema stage [ ] 3. Ulcerative stage [ ]

15. State any reasons for the delay in reporting the disease.

1. Financial constraints [ ]
2. Distance to the health centre [ ]
3. Ignorance about the disease [ ]
4. Fear of stigmatization [ ]
5. Movement constraints [ ]

16. Where was your first point of reporting?

1. Health centre [ ]
2. Shrine/ Traditional religious priest [ ]
3. Traditional herbalist [ ]
4. Nursed it at home [ ]
5. Other [ ]

17. Why did you first choose to report the disease at this location? \_\_\_\_\_

18. Is this your preferred form of treatment?

1. Yes [ ]
2. No [ ]

19. Did you have any prior education on detecting the early signs of the appearance of the disease?

1. Yes [ ]
2. No [ ]

20. Has contracting the disease limited your ability to perform in the community?

1. Yes [ ]
2. No [ ]

21. To what extent has contracting the disease limited your ability to partake in social, economic and educational activities?

5. Very severely [ ]
4. Severely [ ]
3. Moderately [ ]
2. Very little [ ]
1. Not at all [ ]

22. During the last 12 months, how many times have you received treatment from the following sources?

1. Health centre
2. Traditional shrine/traditional religious priest
3. Traditional herbalist
4. Self medication
5. Others

23. How much do you pay each time you visit the treatment centre? \_\_\_\_\_

1. Health centre
2. Traditional shrine /traditional religious priest
3. Traditional herbalist
4. Self medication
5. Others

24. How would you rate the services provided at the health centre?

5. Excellent [ ]
4. Very Good [ ]
3. Good [ ]
2. Poor [ ]
1. Very Poor [ ]

25. How would you rate the services provided at the traditional shrine/traditional priest?

5. Excellent [ ] 4. Very Good [ ] 3. Good [ ] 2. Poor [ ] 1. Very Poor [ ]

26. How would you rate the services provided by the traditional herbalist?

5. Excellent [ ] 4. Very Good [ ] 3. Good [ ] 2. Poor [ ] 1. Very Poor [ ]

27. How would you rate the service that you provided through self medication?

5. Excellent [ ] 4. Very Good [ ] 3. Good [ ] 2. Poor [ ] 1. Very Poor [ ]

28. How would you rate the services provided by others?

5. Excellent [ ] 4. Very Good [ ] 3. Good [ ] 2. Poor [ ] 1. Very Poor [ ]

29. In what ways can the services provided at the centre be improved?

1. Health centre

---

---

2. Traditional shrine / traditional religious priest

---

---

3. Traditional herbalist

---

---

4. Self medication

---

---

5. Others

---

---

---

30. Kindly indicate the distance from your household to the nearest health centre? \_\_\_\_\_

31. With prior education on the disease, would you have acted differently in terms of seeking attention for the disease?

1. Yes [ ] 2. No [ ]

32. How differently would you have acted?

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**SECTION C non sufferers of Buruli ulcer**

33. Are there any sufferers of the disease in your family or household?

1- Yes 2- No

If yes, kindly answer the following questions. If no continue from question number ....

34. At what stage is their disease?

1. Nodal stage [ ] 2. Oedema stage [ ] 3. Ulcerative stage [ ]

35. Has their contraction of the disease caused any burden on you as an individual

- a. Financial
- b. Social
- c. Economic
- d. Stigmatization
- e. Other

36. In your opinion, does the rate of stigma surrounding the disease prevent sufferers from reaching out for medical help?

a. Yes [ ] 2. No [ ]

37. There are several perceptions held by individuals concerning the cause and spread of the Buruli Ulcer disease. How strongly do you feel about the following suggestions as the cause of the spread of the disease? 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").

Cause	extremely important					not important				
	5	4	3	2	1	5	4	3	2	1
Witchcraft and black magic	5	4	3	2	1					
Poor personal hygiene practice	5	4	3	2	1					
Contraction of the disease is from the environment due to the swampy nature of the area and the possibility of worms or insects being the carrier or the mode of spread of the disease.	5	4	3	2	1					
Swimming in the river Densu or other water bodies	5	4	3	2	1					
Sexually transmitted disease	5	4	3	2	1					

Drinking and using contaminated Water for domestic household activities.	5	4	3	2	1
Having physical contact with infected person	5	4	3	2	1
Generational curses from traditional religions	5	4	3	2	1
From eating specific foods	5	4	3	2	1
The disease is contracted from giving care to persons suffering from the disease	5	4	3	2	1
Others(please specify)	5	4	3	2	1

**SECTION D: SOCIOECONOMIC CHARACTERISTICS OF NONSUFFERERS OF THE DISEASE OR CARER/PARENT OF THE BURULI ULCER DISEASESUFFERER**

38. Are you:            1. Male [   ]            2. Female    [   ]

39. Marital status:

- 1. Single    [   ]
- 2. Married [   ]
- 3. Divorced [   ]
- 4. Widowed [   ]
- 5. Informal/ consensual unions    [   ]

40. What is your age? \_\_\_\_\_

41. What is your level of education? (Please tick the appropriate)

- 1. Never attended school \_\_\_\_\_
- 2. Nursery school \_\_\_\_\_
- 3. Kindergarten            \_\_\_\_\_
- 4. Primary \_\_\_\_\_
- 5. JSS/ JHS \_\_\_\_\_
- 6. Middle school \_\_\_\_\_
- 7. SSS/ SHS \_\_\_\_\_
- 8. Secondary \_\_\_\_\_

- 9. Voc/ Technical/ Commercial \_\_\_\_\_
- 10. Post middle/ post secondary certificate \_\_\_\_\_
- 11. Post Secondary \_\_\_\_\_
- 12. Bachelor Degree \_\_\_\_\_
- 13. Post graduate degree \_\_\_\_\_

42. Please indicate your religious affiliation.

- 1. Christian
- 2. Muslims
- 3. Traditionalist
- 4. Christian and Traditionalist
- 5. Muslims and Traditionalist
- 6. Buddhist
- 7. Atheist

43. Please indicate your exact ethnic background? \_\_\_\_\_

44. Please state the number of people in your house? \_\_\_\_\_ people

45. How many of these are children? \_\_\_\_\_

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

- 1. Farmer
- 2. Trader
- 3. Civil Servant
- 4. Artisan
- 5. Self employed
- 6. Public servant
- 7. Doctor
- 8. Nurse
- 9. Mechanic
- 10. Student
- 11. Retired
- 12. Others (please specify).....

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

- |                          |                           |
|--------------------------|---------------------------|
| 0. No income [ ]         | 11. GHS 1001-GHS 1100 [ ] |
| 1. Less than GHS 100 [ ] | 12. GHS 1101-GHS 1200 [ ] |
| 2. GHS100-GHS200 [ ]     | 13. GHS 1201-GHS 1300 [ ] |
| 3. GHS201- GHS300 [ ]    | 14. GHS 1301-GHS 1400 [ ] |
| 4. GHS301-GHS400 [ ]     | 15. GHS 1401-GHS 1500 [ ] |
| 5. GHS401-GHS500 [ ]     | 16. GHS 1501-GHS 1600 [ ] |
| 6. GHS501-GHS600 [ ]     | 17. GHS 1601-GHS 1700 [ ] |
| 7. GHS601-GHS700 [ ]     | 18. GHS 1701-GHS 1800 [ ] |
| 8. GHS701-GHS800 [ ]     | 19. GHS 1801-GHS 1900 [ ] |
| 9. GHS801- GHS900 [ ]    | 20. GHS 1901-GHS2000 [ ]  |
| 10. GHS901-GHS1000 [ ]   | 21. Over GHS 2000 [ ]     |

48. Any additional information provided by the respondent.

**SECTION E: SOCIO ECONOMIC CHARACTERISTICS ON SUFFERER OF BURULI ULCER DISEASE.**

49. Are you:            1. Male [  ]            2. Female    [  ]

50. Marital status:

- 1. Single                    [  ]
- 2. Married                    [  ]
- 3. Divorced                    [  ]
- 4. Widowed                    [  ]
- 5. Informal/ consensual unions    [  ]

51. What is your age? \_\_\_\_\_

52. What is your level of education? (Please tick the appropriate)

- 1. Never attended school                    \_\_\_\_\_
- 2. Nursery school                                \_\_\_\_\_
- 3. Kindergarten                                    \_\_\_\_\_
- 4. Primary    \_\_\_\_\_
- 5. JSS/ JHS    \_\_\_\_\_
- 6. Middle school                                    \_\_\_\_\_
- 7. SSS/ SHS    \_\_\_\_\_
- 8. Secondary    \_\_\_\_\_
- 9. Voc. / Technical/ Commercial                    \_\_\_\_\_
- 10. Post middle/ post-secondary certificate                    \_\_\_\_\_
- 11. Post Secondary                                    \_\_\_\_\_
- 12. Bachelor Degree                                    \_\_\_\_\_
- 13. Post graduate degree                                    \_\_\_\_\_

53. Please indicate your religious affiliation.

- 1. Christian
- 2. Muslims
- 3. Traditionalist
- 4. Christian and Traditionalist
- 5. Muslims and Traditionalist
- 6. Buddhist
- 7. Atheist

54. Please indicate your exact ethnic background? \_\_\_\_\_

55. Please state the number of people in your house? \_\_\_\_\_ People

56. How many of these are children? \_\_\_\_\_

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

- 1. Farmer
- 2. Trader
- 3. Civil Servant
- 4. Artisan
- 5. Self-employed
- 6. Public servant
- 7. Doctor
- 8. Nurse
- 9. Mechanic
- 10. Student
- 11. Retired
- 12. Others (please specify) .....

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

- |                          |                           |
|--------------------------|---------------------------|
| 0. No income [ ]         | 11. GHS 1001-GHS 1100 [ ] |
| 1. Less than GHS 100 [ ] | 12. GHS 1101-GHS 1200 [ ] |
| 2. GHS 100-GHS 200 [ ]   | 13. GHS 1201-GHS 1300 [ ] |
| 3. GHS 201- GHS 300 [ ]  | 14. GHS 1301-GHS 1400 [ ] |
| 4. GHS 301-GHS 400 [ ]   | 15. GHS 1401-GHS 1500 [ ] |
| 5. GHS 401-GHS 500 [ ]   | 16. GHS 1501-GHS 1600 [ ] |
| 6. GHS 501-GHS 600 [ ]   | 17. GHS 1601-GHS 1700 [ ] |
| 7. GHS 601-GHS 700 [ ]   | 18. GHS 1701-GHS 1800 [ ] |
| 8. GHS 701-GHS 800 [ ]   | 19. GHS 1801-GHS 1900 [ ] |
| 9. GHS 801- GHS 900 [ ]  | 20. GHS 1901-GHS 2000 [ ] |
| 10. GHS 901-GHS 1000 [ ] | 21. Over GHS 2000 [ ]     |

59. Any additional information provided by the respondent.

**Appendix 2: A List of 16 Areas Where Random Sampling Was Carried Out In The  
Nsawam Adoagyiri Municipality of the Eastern Region.**

<b>Areas where clusters were created</b>	<b>Number of houses in cluster</b>	<b>A sixth of the houses were chosen in each cluster.</b>
1. Ademu Ketekyi	60	10
2. Nsawam Ahenfie	27	5
3. Nsawam Akraman	22	4
4. Gidikope	41	7
5. Nsawam Asante Akura	29	5
6. Ahodjo	23	4
7. Oparekrom	47	8
8. Avaga	48	8
9. Chinto	35	6
10. Ahwerease	46	8
11. Nsawam Adoagyiri	57	10
12. Oboadaka Takyikrom	30	5
13. Wangara	44	7
14. Nkyinekyine	25	4
15. Agyeikrom	49	8
16. Noka	49	8
<b>Total number of houses chosen</b>	<b>632</b>	<b>107</b>

**Visual Evidence of the Various Stages of the Disease Captured By the Author during Field Visits and Interviews.**

**Appendix 3: An Early Reported Case Of A Nodule**



**Appendix 4: Developing Ulcer. Late Reporting. Undermining In Skin Far Advanced.**



**Appendix 5: Early Reported Ulcer Starting From Plaque Treated And Almost Healed.**



**Appendix 6: Unhealed Ulcer Developed From Oedema.**



## Appendix 7: An Oedema



**Appendix 8: A Fully Developed Oedema Exhibiting A Full Ulcer And Showing Signs Of Affecting The Bones.**



**Appendix 9: A Full Ulcer Developed From A Plaque**



**Appendix 10: A Full Ulcer Developed From An Oedema**



## Appendix 11: SPSS Synthax Programme Written to Analyse the Data Based on Simple Statistical Analysis, Chi Square Analysis and Multiple Regression Analysis.

```
GET DATA
/TYPE=XLS
/FILE='c:amaagyaaboagy\survey02.xls'
/READNAMES=ON.
if v95=0 sincome=0.
if v95=1 sincome=50.
if v95=2 sincome=150.
if v95=3 sincome=250.
if v95=4 sincome=350.
if v95=5 sincome=450.
if v95=6 sincome=550.
if v95=7 sincome=650.
if v95=8 sincome=750.
if v95=9 sincome=850.
if v95=10 sincome=950.
if v95=11 sincome=1050.
if v95=12 sincome=1150.
if v95=13 sincome=1250.
if v95=14 sincome=1350.
if v95=15 sincome=1450.
if v95=16 sincome=1550.
if v95=17 sincome=1650.
if v95=18 sincome=1750.
if v95=19 sincome=1850.
if v95=20 sincome=1950.
if v95=21 sincome=2000.
if v84=0 sincome=0.
if v84=1 nincome=50.
if v84=2 nincome=150.
if v84=3 nincome=250.
if v84=4 nincome=350.
if v84=5 nincome=450.
if v84=6 nincome=550.
if v84=7 nincome=650.
if v84=8 nincome=750.
if v84=9 nincome=850.
if v84=10 nincome=950.
if v84=11 nincome=1050.
if v84=12 nincome=1150.
if v84=13 nincome=1250.
if v84=14 nincome=1350.
if v84=15 nincome=1450.
if v84=16 nincome=1550.
if v84=17 nincome=1650.
if v84=18 nincome=1750.
if v84=19 nincome=1850.
if v84=20 nincome=1950.
```

if v84=21 nincome=2000.  
if v97=1 v2a=v2.  
if v97=1 v3a=v3.  
if v97=1 v4a=v4.  
if v97=1 v5a=v5.  
if v97=1 v6a=v6.  
if v97=1 v7a=v7.  
if v97=1 v8a=v8.  
if v97=1 v9a=v9.  
if v97=1 v10a=v10.  
if v97=1 v11a=v11.  
if v97=1 v12a=v12.  
if v97=1 v13a=v13.  
if v97=1 v14a=v14.  
if v97=1 v15a=v15.  
if v97=1 v16a=v16.  
if v97=1 v17a=v17.  
if v97=1 v18a=v18.  
if v97=1 v19a=v19.  
if v97=1 v20a=v20.  
if v97=1 v21a=v21.  
if v97=1 v22a=v22.  
if v97=1 v23a=v23.  
if v97=1 v24a=v24.  
if v97=1 v25a=v25.  
if v97=1 v26a=v26.  
if v97=1 v27a=v27.  
if v97=1 v28a=v28.  
if v97=1 v29a=v29.  
if v97=1 v30a=v30.  
if v97=1 v31a=v31.  
if v97=1 v32a=v32.  
if v97=1 v33a=v33.  
if v97=1 v34a=v34.  
if v97=1 v35a=v35.  
if v97=1 v36a=v36.  
if v97=1 v37a=v37.  
if v97=1 v38a=v38.  
if v97=1 v39a=v39.  
if v97=1 v40a=v40.  
if v97=1 v41a=v41.  
if v97=1 v42a=v42.  
if v97=1 v43a=v43.  
if v97=1 v44a=v44.  
if v97=1 v45a=v45.  
if v97=1 v46a=v46.  
if v97=1 v47a=v47.  
if v97=1 v48a=v48.  
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if v97=1 v50a=v50.

if v97=1 v51a=v51.  
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if v97=1 v72a=v72.  
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if v97=1 v96a=v96.  
if v97=1 sincomea=sincome.  
if v97=1 nincomea=nincome.  
if v97=3 v2c=v2.  
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if v97=3 v6c=v6.  
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**if v97=4 v90d=v90.**  
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**if v97=4 v92d=v92.**  
**if v97=4 v93d=v93.**  
**if v97=4 v94d=v94.**  
**if v97=4 v95d=v95.**  
**if v97=4 v96d=v96.**  
**if v97=4 sincomed=sincome.**  
**if v97=4 nincomed=nincome.**  
**if v94=16 empsuff=0.**  
**if v94 lt 16 empsuff=1.**  
**frequencies variables=v2 v3 v4 v5 v6 v7 v8 v9 v10 v11 v13 v14 to v26 v27 v28 v29 v30 v31**  
**v32 v33 v34 v45 to v49 v50 to v54 v56 v57 v58 v59 v60 v61 v62 to v74 v75 v76 v78 v79**  
**v80 v83 v84 v85 v86 v87 v89 v90 v91 v94 to v96.**  
**descriptives variables=v6 v12 v14 to v26 v34 v35 to v39 v40 to v44 v45 to v49 v55 v62 to**  
**v74 v77 v81 v82 v88 v92 v93 sincome nincome.**

frequencies variables=v2a v3a v4a v5a v6a v7a v8a v9a v10a v11a v13a v14a v15a v16a v17a v18a v19a v20a v21a v22a v23a v24a v25a v26a v27a v28a v29a v30a v31a v32a v33a v34a v45a v46a v47a v48a v49a v50a v51a v52a v53a v54a v56a v57a v58a v59a v60a v61a v62a v63a v64a v65a v66a v67a v68a v69a v70a v71a v72a v73a v74a v75a v76a v78a v79a v80a v83a v84a v85a v86a v87a v89a v90a v91a v94a v95a v96a.

descriptives variables=v6a v12a v14a v15a v16a v17a v18a v19a v20a v21a v22a v23a v24a v25a v26a v34a v35a v36a v37a v38a v39a v40a v41a v42a v43a v44a v45a v46a v47a v48a v49a v55a v62a v63a v64a v65a v66a v67a v68a v69a v70a v71a v72a v73a v74a v77a v81a v82a v88a v92a v93a sincomea nincomea.

frequencies variables=v2c v3c v4c v5c v6c v7c v8c v9c v10c v11c v13c v14c v15c v16c v17c v18c v19c v20c v21c v22c v23c v24c v25c v26c v27c v28c v29c v30c v31c v32c v33c v34c v45c v46c v47c v48c v49c v50c v51c v52c v53c v54c v56c v57c v58c v59c v60c v61c v62c v63c v64c v65c v66c v67c v68c v69c v70c v71c v72c v73c v74c v75c v76c v78c v79c v80c v83c v84c v85c v86c v87c v89c v90c v91c v94c v95c v96c.

descriptives variables=v6c v12c v14c v15c v16c v17c v18c v19c v20c v21c v22c v23c v24c v25c v26c v34c v35c v36c v37c v38c v39c v40c v41c v42c v43c v44c v45c v46c v47c v48c v49c v55c v62c v63c v64c v65c v66c v67c v68c v69c v70c v71c v72c v73c v74c v77c v81c v82c v88c v92c v93c sincomec nincomec.

frequencies variables=v2d v3d v4d v5d v6d v7d v8d v9d v10d v11d v13d v14d v15d v16d v17d v18d v19d v20d v21d v22d v23d v24d v25d v26d v27d v28d v29d v30d v31d v32d v33d v34d v45d v46d v47d v48d v49d v50d v51d v52d v53d v54d v56d v57d v58d v59d v60d v61d v62d v63d v64d v65d v66d v67d v68d v69d v70d v71d v72d v73d v74d v75d v76d v78d v79d v80d v83d v84d v85d v86d v87d v89d v90d v91d v94d v95d v96d.crosstabs tables=v14 by v87/cells=rows columns/statistics=chisq corr.

descriptives variables=v6d v12d v14d v15d v16d v17d v18d v19d v20d v21d v22d v23d v24d v25d v26d v34d v35d v36d v37d v38d v39d v40d v41d v42d v43d v44d v45d v46d v47d v48d v49d v55d v62d v63d v64d v65d v66d v67d v68d v69d v70d v71d v72d v73d v74d v77d v81d v82d v88d v92d v93d sincomed nincomed.

crosstabs tables=v14 by v86/cells=rows columns/statistics=chisq corr.

crosstabs tables=v15 by v86/cells=rows columns/statistics=chisq corr.

crosstabs tables=v16 by v86/cells=rows columns/statistics=chisq corr.

crosstabs tables=v17 by v86/cells=rows columns/statistics=chisq corr.

crosstabs tables=v18 by v86/cells=rows columns/statistics=chisq corr.

crosstabs tables=v19 by v86/cells=rows columns/statistics=chisq corr.

crosstabs tables=v20 by v86/cells=rows columns/statistics=chisq corr.

crosstabs tables=v21 by v86/cells=rows columns/statistics=chisq corr.

crosstabs tables=v22 by v86/cells=rows columns/statistics=chisq corr.

crosstabs tables=v15 by v87/cells=rows columns/statistics=chisq corr.

crosstabs tables=v16 by v87/cells=rows columns/statistics=chisq corr.

crosstabs tables=v17 by v87/cells=rows columns/statistics=chisq corr.

crosstabs tables=v18 by v87/cells=rows columns/statistics=chisq corr.

crosstabs tables=v19 by v87/cells=rows columns/statistics=chisq corr.

crosstabs tables=v20 by v87/cells=rows columns/statistics=chisq corr.

crosstabs tables=v21 by v87/cells=rows columns/statistics=chisq corr.

crosstabs tables=v22 by v87/cells=rows columns/statistics=chisq corr.

crosstabs tables=v14 by v89/cells=rows columns/statistics=chisq corr.

crosstabs tables=v15 by v89/cells=rows columns/statistics=chisq corr.

crosstabs tables=v16 by v89/cells=rows columns/statistics=chisq corr.

crosstabs tables=v17 by v89/cells=rows columns/statistics=chisq corr.

crosstabs tables=v18 by v89/cells=rows columns/statistics=chisq corr.



```

if v13=2 oedulcer=1.
if v13=3 oedulcer=1.
if v29=1 reporthc=1.
if v29 gt 1 reporthc=0.
if v87=1 married=0.
if v87=2 married=1.
if v87=3 married=0.
if v87=4 married=0.
if v87=5 married=0.
if v90=1 christ=1.
if v90 gt 1 christ=0.
regression variables=v40 nodal oedema ulcer sincome v55 v89 v86 v12 reporthc married
oedulcer v88 christ v92 empsuff/descriptives=corr/statistics=coeff r tol collin
anova/dependent=v40/method=
enter sincome married empsuff ulcer/residuals/save=pred(pred1) resid(resid1).
descriptives variables=resid1/statistics=all.
examine variables=resid1/plot=npplot.
compute absresid1=abs(resid1).
compute resid1sq=resid1*resid1.
compute pred1sq=pred1*pred1.
regression variables=pred1sq v40 nodal oedema ulcer sincome v55 v89 v86 v12 reporthc
married oedulcer v88 christ v92 empsuff/descriptives=corr/statistics=coeff r tol collin
anova/dependent=v40/method=
enter pred1sq sincome married empsuff ulcer/residuals.
regression variables=resid1sq pred1sq v40 nodal oedema ulcer sincome v55 v89 v86 v12
reporthc married oedulcer v88 christ v92 empsuff/descriptives=corr/statistics=coeff r tol
collin anova/dependent=resid1sq/method=enter pred1sq/residuals.
regression variables=resid1sq pred1sq absresid1 sincome married empsuff ulcer
v40/descriptives=corr/statistics=coeff r tol collin
anova/dependent=absresid1/method=enter sincome married empsuff ulcer/residuals.

```