POVERTY AND DISEASE:

EFFECT OF GUINEA WORM DISEASE ON SCHOOL ATTENDANCE IN THE TOLON-KUMBUNGU DISTRICT OF THE NORTHERN REGION OF GHANA

By

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DECLARATION

I hereby declare that except for references to other people's work which have been duly acknowledged, this work is the result of my own research and that it has neither in part nor whole been presented elsewhere for another degree

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DEDICATION

This work is dedicated to all hard working personnel of the medical field both within and outside Ghana, who are working feverishly towards the eradication of Guinea Worm disease in Ghana.

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My foremost gratitude to Jesus Christ, my personal savior by whose stripes I have been healed of all sicknesses that would have prevented me from accomplishing the result of this thesis.

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ABSTRACT

This thesis titled “Poverty and disease: Effect of Guinea Worm disease on school attendance in the Tolon/Kumbungu District”, is an attempt at measuring the socio-economic impact of Guinea Worm disease on endemic communities (measured in terms of school attendance). This is with the understanding that Guinea Worm disease is a result of poverty and can consequently trap its victims in a vicious cycle of poverty and ill-health. Background studies across the world reveal that the incidence of Guinea Worm disease had decreased by 93% in the year 2000 from 3.6 million cases in 1986. The reduction could be largely attributed to the interest developed by Jimmy Carter (former president of United States of America) and The Melinda and Bill Gates Foundation towards eradicating Guinea Worm disease within the nearest possible time.

Methodologies used in this study varied from utilization of formal questionnaires, focus group discussion and the employment of scoring and ranking tools. Heads of twenty (20) basic schools were interviewed comprising 10 primary schools and 10 Junior high schools, also focus group discussions were carried out with an average of ten (10) students in five (5) Junior high schools. At the community level, 10 endemic communities were selected to participate in focus group discussions whiles 38 patients infected with Guinea Worm disease between January and April 2008 (as presented by the district health directorate) were interviewed using formal questionnaires.

Results from data collected have shown that Guinea Worm disease is still a problem in the district and has had a negative effect on the productivity of residents. It also reveals that majority of those infected are within school going age (5 to 18 years) and that students/pupils are absent

from school due to direct infection or infection of a relative. More so, 50% of schools surveyed revealed that a number of pupils/students never returned after they had been infected by the disease. Recommendations based on the study include (amongst others) the need for properly equipped Guinea Worm disease containment centres and the inclusion of education on Guinea Worm disease into the curricula of schools in endemic areas. There is also the need to work at alleviating poverty as the only way of permanently eradicating Guinea Worm disease and a clarion call for intense vigilance at the critical end of the eradication process.

ACRONYMS

ADB	Asian Development Bank
CBRDP	Community Based Rural Development Project
CDC	Centre for Disease Control
IDWSSD	International Drinking Water Supply and Sanitation Decade
JHS	Junior High School
MMWR	Morbidity and Mortality Weekly Report
PRA	Participatory Rural Appraisal
SARI	Savannah Agricultural Research Institute
UDS	University for Development Studies
UNICEF	United Nations Children's Fund
WHO	World Health Organisation

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Poverty is usually defined in terms of a person's income or consumption pattern. For example, the World Bank has set the international poverty line at an expenditure level of $1 per person per day (World Bank, 2000). This figure represents the minimal amount on which a person can fulfil his or her physical needs, and a person is considered to be living in "absolute poverty" if his or her income falls below this line. It is estimated that a fifth of the world's population live in extreme poverty. The wealthiest fifth of the world's population now controls 85% of global gross national product and 85% of world trade, leaving the poorest quintile with 1.4% of gross national product and 0.9% of world trade (Oxfam, 1991).

Consequently, people live without fundamental freedom of action and choice that the better off take for granted. They often lack adequate food and shelter, education and health, deprivations that keep them from leading the kind of life that everyone values. They also face extreme vulnerability to ill-health, economic dislocation, and natural disasters. They are often exposed to ill treatment by institutions of state and society and are powerless to influence key decisions affecting their lives (Thaver and Bhutta, 2006). This represents the multi-dimensional veracity of poverty. Numerous studies have indicated a strong link between income level and disease prevalence. Most literature has pointed to this relationship as one of the most well established findings in health science (Haines and Smith, 1997). Historians of public health have extensively documented this "close and reciprocal" interrelation existing between sickness and poverty, stating that "the poor are poorer in health, and the sick, less able to do anything about their poverty" (Buor, 2003). Needy people tend to live on what they earn on a daily basis and have no cash reserves to pay for sudden illness. The loss of income and the inability to pay for the cost of treatment can push a family further into poverty and

debt, thereby perpetuating the cycle of poverty (World Water Day, 2001). In real terms, poverty is the principal cause of 12.2 million deaths a year in children under 5; 4.1 million of these deaths arise from acute lower respiratory tract infections and a further 3 million from diarrhoea and dysentery. In adults, poverty accounts for much of the annual 2.7 million deaths from tuberculosis and 2 million deaths from malaria (WHO, 1995).

The medical term for Guinea Worm disease (dracunculiasis) is derived from the Latin word "dracunculus" meaning "little dragon". Guinea Worm disease is described as a preventable infection caused by the parasite dracunculus medinesis (Abdikarim and Velema, 1999). The physical signs of the disease are the emergence of the female worm through the skin of its human host, usually one or two years after infection.

The disease can infect animals, and sustainable animal cycles occur in North America and Central Asia but do not act as reservoirs of human infection. The disease is endemic across the Sahel belt of Africa from Mauritania to Ethiopia, having been eliminated from Asia and some African countries. It has a significant socioeconomic impact because of the temporary disability that it causes. Dracunculiasis is exclusively caught from drinking water, usually from ponds. A campaign to eradicate the disease was launched in the 1980s and has made significant progress. The strategy of the campaign is discussed, including water supply, health education, case management, and vector control. Current issues including the integration of the campaign into primary health care and the mapping of cases by using geographic information systems are also considered **(**Cairncross, Muller and Zagaria, 2002).

In 1986, there were over 3.6 million cases of Guinea Worm disease, reducing by 33% in 2000. In 2000, statistics revealed 93% of all cases were from the three most endemic countries in the world; Sudan (73%), Nigeria (10%), Ghana (10%), 3% in Burkina Faso, 2%

in Niger and all other endemic countries making up the remaining 2% (WHO, 2000). In 2003, two of the top three endemic countries experienced considerable reduction with Sudan dropping to 63% and Nigeria, to 4.5%. However, Ghana's cases increased in percentile to 25.7% with approximately 8290 cases (WHO, 2004).

Within the past 20 years, industrious strides have been made by the Carter Centre, the Bill and Melinda Gates Foundation and World Vision International in collaboration with UNICEF and the various ministries responsible in the respective countries. These interventions have resulted in the total eradication of Guinea Worm disease in Yemen, India and Pakistan thereby constituting a total eradication from the Asian continent (WHO, 2000).

In Africa, previously endemic countries like Benin, Mauritius, Uganda, Central African Republic, Chad, Cameroon, Senegal and Kenya have been given the World Health Organization's Certificate of Eradication, whiles Nigeria, which started with 750,000 cases recorded only 16 cases in 2006 (WHO, 2006). Africa's greatest obstacle to total eradication lies within Sudan and Ghana which still recorded 5,569 and 3,981 cases respectively in 2005, with the third (Mali) recording 659 cases (CDC,2004).

In Ghana, cases of Guinea Worm disease dropped from 180,000 in 1989 to 4,000 in 1994, then rising to 8,290 in 2003 and then down to 3,981 cases in 2005. However, in January 2007, 1001 new cases were recorded with Savelegu-Nanton, Tolon/Kumbungu, Yendi, East Gonja districts and Tamale Metropolitan Area, all within the Northern region, recording 3,188 cases representing 77% of national cases (GHS, 2005).

Plate 1: Extraction of a worm from a patient in Woribogu
Source: Field survey, April 2008

In the Tolon/Kumbungu district, incidence of Guinea Worm has dropped since 2005. From a total of 907 cases in the district in 2005, it dropped to 827 in 2006 and 421 in 2007. This represents a 53.6% incidence reduction between 2005 (When the Carter centre took special interest in the disease in Ghana) and 2007. Total incidence data of the three year mentioned above show January with the highest number of cases and September with the lowest monthly sums. This is reflective in case statistics of 2005 and 2007, however in 2006; February registered that highest number of cases with another exception in 2007 with October manifesting the lowest monthly cases for the year. A combination of these statistics have proven that the highest incidence occur within the first four months of the year (January to February).

Poor communities are often forced to over exploit their natural resources in order to survive. Water sources are particularly vulnerable. In too many cases, they are abused to such an extent that they no longer can provide for a community's basic needs and end up posing serious health risks. A sixth (1.1billion people) of the world's population lack adequate

access to water and one third (2.4 billion people) lack access to basic sanitation services, all of whom live in poverty (Pittock, 2006). Study after study has shown that where a community improves its water supply, hygiene and/or sanitation then health improves (or example, diarrhoea can be reduced by 26% when basic water, hygiene and sanitation are supplied, yet statistics tell a terrible story). Forty percent of the world's 6 billion people have no acceptable means of sanitation, and more than 1 billion people draw their water from unsafe sources (WHO, 2005).

This extremely painful and debilitating illness occurs mainly in remote rural villages with low income levels and their poverty characterized by lack of access to potable drinking water. A direct link between poverty, water supply and disease is best illustrated by the anecdote below by a member of community prosperity.org, a non profit organisation working in Latin America:

"Millions are infected with roundworms, whipworms, hookworms and other parasites via contaminated water and crops. These parasites rob nutrients from foods; destroy body tissue and organs, cause structural problems in the small intestines, and cause pain and various health problems. With towns and cities not able to fund proper public sewage treatment plus with many families lacking alternative septic systems, disease causing micro-organisms have thus multiplied. Those becoming ill excrete increased sewage derived bacteria, viruses, parasites and their eggs further fuelling the spread resulting in epidemics of Cholera, Typhoid Fever, Hepatitis, Dysentery and other diseases which have disrupted work and education plus created fear and grief; Thus poverty has fuelled disease --- disease continues to fuel poverty" (Community prosperity.org, 2002).

Most studies on Guinea Worm disease have concentrated on its effects on productivity with regards to farming and economic activities and total disregard for the immense effect it could have on the attendance rates of children of school going age and the consequent drop out rate due to direct infections and/or that of family members. This study will however sought to establish the link between Guinea Worm disease, school attendance of its victims and the resultant effects on economic capabilities of the communities with the backdrop that education is being propagated as key to economic independence.

1.2 PROBLEM STATEMENT

Guinea Worm disease continues to be a major health issue in Ghana and its effect on infected populations cannot be overemphasized. These effects include rendering its victims unproductive and incapable of participation in social activities including school attendance (Hopkins, 1998). The disease is only transmittable through the drinking of infected water thereby making supply of potable water to endemic areas vital in other words; lack of potable drinking water is the only source to the spread of the disease.

The Tolon/ Kumbungu district is situated in the Northern region of Ghana which has been ranked as the third poorest region in Ghana with 69% of its population living below the poverty level (Ghana Statistical Service, 2008); it has a population of 132,883 and a growth rate of 2.7%. It also has a population density of 50 inhabitants per square kilometre.

Moreover, it is a district with of mainly farmers who grow a variety of crops such as cereals, legumes, vegetables, tubers, cotton and tobacco indicating the role the district plays in National food security and income generation.

However, 60% to 70% of the population does not have access to potable drinking water and also in the 2004/2005 academic year, a high school drop out rate of 63.7% for boys and 73% for girls was recorded, coupled with these, it is the second highest Guinea Worm endemic district in Ghana (Tolon/Kumbungu District, 2008).

In a district with a population growth rate of 2.7% and high potentials for agriculture, issues such as Guinea Worm disease cannot be over looked because it has a negative effect on the population consequently leads to a wider effect on the nation as a whole. Also, the drop out rates recorded and the incidence of the disease need to be examined to find if there is a link between Guinea Worm disease and school attendance.

Poor health can lead to poor participation, irregular attendance and high rates of school drop-out (Sridhar, 2009), a lack of education can lead to the inability to win oneself out of the vicious cycle of poverty and ill-health.

The problem that has been tackled in this study is based on the fact that water supply, Guinea Worm disease, education and poverty are intertwined in a vicious cycle of poverty and there is a need to find theses linkages to avert the event of Guinea Worm disease leading to deeper impoverishment and resulting in the occurrence of other poverty related disease. To be able to eradicate Guinea Worm disease, all these components must be studied to be certain that all possible channels of reoccurrence have been investigated and steps have been taken to secure those channels.

The results of these studies would compliment knowledge on best practices of eradicating Guinea Worm disease and consequently other poverty related diseases.

1.3 JUSTIFICATION

Guinea Worm disease is one of the few diseases that has been classified as amenable to total eradication; this is because of a number of factors, first of all, its vector (Cyclops) is not mobile like the mosquito; secondly, the Cyclops have a limited duration of infection; thirdly, the strategies to limiting transmission are inexpensive and easily attainable; and finally, the disease is only found in certain endemic communities and is only seasonal (Muller, 1979, WHO, 2001).

Based on this premise, the purpose of the study therefore sought to identify the reasons such an eradicable disease has been a major challenge in Ghana; to conduct a social assessment of the effect of Guinea Worm on the productivity of those infected using school attendance as a yardstick for measuring this productivity, identifying its effect on school attendance of children who have been directly infected by the disease and those who have been affected by the infection of a family member.

The study also sought to identify perceptions of the communities towards the disease; that is traditional beliefs, traditional methods of prevention and possible cures of the disease, and also identified their assessment of the various processes being adopted by numerous organisations towards the eradication of Guinea Worm disease.

The Effect of Guinea Worm disease on school attendance is inadequate unless other connecting factors are studied. These factors include socio-demographic characteristics of infected persons at home, the main source of water supply within communities and the perceptions of communities on Guinea Worm disease. This is mainly because the students

being studied reside in those communities and therefore community perceptions and water supply situations in those communities could contribute largely to their infection or otherwise. Besides, absenteeism due to Guinea Worm disease has been documented to be as a result of direct infection and also infection of a family member (Ilegbode, 1986), (Tayeh and Cairncross,1996). See section 2.6

The study also looked at Guinea Worm disease as a disease of poverty with lack of water supply as the main component of poverty being studied. This is considered noting that water supply as a major factor that influences the "huge disparities that exist in health between the rich and poor within developing countries (Thaver and Bhutta, 2006), also taking into account the fact that the District under study is the main route of the White Volta at Nawuni, with a water treatment plant at Dalun, supplying pipe-borne water to the Tamale Metropolis, yet rated as the second most endemic Guinea Worm disease District in Ghana.

Whereas numerous studies on Guinea Worm disease in Ghana has concentrated on the pathology, treatment, epidemiology and the socio-economic impact mostly studying agriculture and trade, this study looked at the socio-economic impact of the disease with regards to education especially in an area that has a high illiteracy rate coupled with low enrolment rates and high dropout rates (Tolon/Kumbungu District, 2008), See section 3.3.7 for more details; contributing to the eradication of the disease from the perspective of its effect on education which has been noted as an important component in breaking the Poverty – Disease continuum (Morrisson, 2002).

1.4 OBJECTIVES

The main objective of the study is to ascertain the effect of Guinea Worm disease as a major deterrent to productivity (measured in terms of school attendance) in endemic areas with absenteeism from school as a primary indicator.

In order to achieve the above primary objective, the following specific objectives have been formulated:

(1) Describe the demographic and socio-economic characteristics of patients infected by Guinea Worm disease between January and April 2008, in terms of age, sex, educational background and occupation.

(2) Examine community members' perception of Guinea Worm disease, its effect(s) and opinions on current the eradication methodologies being employed.

(3) Investigate the major and minor sources of water supply in communities

(4) Examine the effect of Guinea Worm disease on school attendance of basic school pupils/students.

(5) Examine the proportion of infected persons (across the district) that are of school going age.

(6) Suggest workable recommendations towards the total eradication of Guinea Worm disease.

1.5 PROPOSITIONS

(1) Guinea Worm disease has caused extensive periods of incapacity and inactivity to its victims.

(2) Guinea Worm disease has a negative effect on school attendance of affected children.

(3) Poverty alleviation interventions will contribute to the rapid eradication of Guinea Worm disease in endemic areas.

1.6 METHODOLOGY

1.6.1 Target population

The target population for this study included Guinea Worm infected persons between the period of January and April 2008, Guinea Worm incident communities within the same period and basic schools (primary and junior high schools) within the Tolon/Kumbungu District.

1.6.2 Sources and types of data

Primary Sources

Four types of primary data were collected; the first was the patient registry data and respondents were patients who had been registered by the district Guinea Worm monitoring team to be positive. Data collected include background of respondents, case per respondent for a year, date of first worm emergence, date reported to volunteer, type(s) of treatment given, community of respondent, and whether case was imported or not and if imported, community from which it was imported from.

The second type of data was based on focus group discussions with communities from which Guinea Worm disease had been reported in the period of January to April, 2008 on issues including knowledge of disease, causes and prevention, traditional perceptions, impact of disease on community, impact on school children, community's contribution to eradication efforts and a ten stone scoring and ranking to assess interventions being employed by various organisation. Discussions were followed by a cross-sectional (guided) walk and mapping of

communities to delineate sources of water, education and health facilities and filtration methods employed.

A third type of data was collected with the aid of structured questionnaires. Questionnaires used contained both closed and open ended questions based on the study objectives and research questions. Primary respondents were heads of basic schools and variables included school population, farthest distance travelled by pupils, obstacles to effective school attendance, evidence of Guinea Worm disease within one year, absenteeism due to infection of student or relative and number of weeks absent. It also included questions on Guinea Worm disease education and its impact on the pupils and community.

The final primary data type collected was a focus group discussion with a cross section of junior high school students from five schools. Discussions centred on awareness of disease, perceptions, attitude towards patients, causes of absenteeism and known cases by students or their relatives and effect on them as students.

Secondary sources

Secondary data were obtained from population census reports, Ghana Health Service reports, district Guinea Worm monitoring data, Carter centre district representative's reports, books, periodicals, newspapers and articles obtained from libraries at the Noguchi Memorial Institute, University for Development Studies Medical School, Komfo Anokye Teaching Hospital, KNUST and online/internet sources.

1.6.3 Data collection

Data was collected by the researcher and two field assistants who had knowledge of the disease, the study area and apt understanding of the local dialect of the area (Dagbani). The focus group discussions were carried out in Dagbani by the facilitator and recorded in writing by the designated recorder and the researcher (who has an above average knowledge of the language). Communities were informed three days prior to discussions. Community entry was appropriately done by initial contact with the relevant authorities; the District Health Office, the District Guinea Worm Eradication Programme, Ghana Education Service District Office, Chiefs, Elders, Assembly persons and Unit committee members. Focus group discussions were carried out with a maximum of 10 participants; details of participants are shown in table 1.1

Table 1.1 Distribution of participants; focus group discussions

Community Based Volunteers	**2** (1 male, 1 female)
Youth Representatives	**2**
Women representatives	**3** (including Women leaders:"Magazia")
Elders/ Chief's representatives	**2**
Unit committee member/ Assembly man	**1**
Total	**10**

Source: Field survey, April 2008

Guinea Worm infected patients were interviewed after focus group discussions and as was envisaged, 2 patients were unavailable and further probing informed the researcher that they had travelled to be taken care of by family members in other communities outside the district. One other patient was located in Gbanjola, an inaccessible community at the time of the survey.

Questionnaires were administered to head teachers of selected schools (Table 1.4) to respond to, field assistants returned two days after to collect questionnaires and verify that appropriate information was given. Focus group discussions with an average of ten students from five (5) Junior High Schools were carried out in a normal classroom scenario with facilitator acting as teacher and using the black board to emphasize points made.

1.6.4. Sampling design

Between January and April 2008, the District Guinea Worm Monitoring Team recorded forty-one (41) cases across the district and all patients were covered in interviews using formal questionnaires. These forty-one (41) patients were spread across 15 communities and 10 communities were selected by simple random sampling to conduct focus group discussions and a "ten stone ranking and scoring" assessment of interventions being applied by various organisations. A list of communities, number of prevalent cases at the time of survey and sampled communities is presented in table 1.2.

Table 1.2 Guinea Worm disease prevalent communities (Jan-Apr 2008)

Community	Number of Cases	Percentage (%)	Community	Number of Cases	Percentage (%)
*Bilisi	2	4.9	Nyankpala	1	2.4
*Dingoni	2	4.9	*Tali	3	7.3
Gbanjola	1	2.4	Tolon	2	4.9
*Gburimani	2	4.9	*Wantugu	17	41.5
Kangbagu	1	2.4	*Woribogu	3	7.3
*Kasuyili	2	4.9	*Yipeligu	2	4.9
Kumbungu	1	2.4	*Yizegu	1	2.4
*Kunguri	1	2.4			
			TOTAL	**41**	**99.9**

* Sampled communities
Source: Tolon/Kumbungu District Health Directorate.

A total number of 20 schools were selected. Sampling was first purposive, in order to select schools that are either located in or closest to endemic communities. Out of those selected,

further simple random sampling was used to select the 20 schools; this comprises 10 Junior high schools and 10 primary schools.

Five Junior High Schools were selected for Focus group discussions with a minimum of ten (10) students and a maximum of fifteen (15) students, comprising school prefects and representatives from JHS 1 and JHS 2 selected by the students. JHS 3 students were not included because at the time of the survey they were writing the Basic Education Certificate Examination (BECE). Table 1.3 shows number of the schools sampled, whiles Table 1.4 provides a list of schools visited.

Table 1.3 Distribution of schools sampled

School	Total Population	Sample size	Percentage of population (%)
Primary	140	10	7.1
Junior High School	18	10	56
Total	**158**	**20**	**12.7**

Source: Field survey, April 2008

Table 1.4 List of schools visited

	Primary school	Junior High School
1	Kunguri *D/A Primary	Voggu R/C JHS
2	Kasuyili R/C Primary	Dalun R/C JHS
3	Tolon D/A Primary	Chirifoyili R/C JHS
4	Kumbungu E/A Primary	Wantugu D/A JHS
5	Yipeligu D/A Primary	Nyankpala D/A JHS
6	Namdu AME Zion Primary	Gbullung D/A JHS
7	Tali R/C Primary	Tali R/C JHS
8	Tingoli D/A Primary	Gbanjong D/A JHS
9	Wantugu R/C Primary	Kasuyili Baptist JHS
10	Woribogu-Kukuo Ahmad. Primary	Tolon JHS "A"

*D/A: District Assembly; R/C: Roman Catholic; E/A: Electoral Area
Source: Field survey, April 2008

1.6.5 Data Analysis

After carefully coding and editing of questionnaires, data were entered using Microsoft Access templates to minimize errors usually encountered from entry of data. The coding system was necessary in order to translate qualitative variables into measurable quantities.

The Statistical Package for Social Sciences (now referred to as the Statistical Product and Service Solution) (SPSS) was used for the analysis of data. Results from analysis include descriptive statistics, frequencies and charts. Where necessary, cross-tabulation was used for comparison of various variables. All analysis based on coded variables have been interpreted by the researcher for easy reading and comprehension.

1.6.6 Limitations of study

At the apex of limitations was that of financing the research which indubitably incapacitated the researcher and his team from covering the entire district which is 2,741 square kilometres large with approximately one hundred and ten (110) communities/settlements scattered across it.

Even though the period the data was collected was best with regard to Guinea Worm incidence, it was however not appropriate for focus group discussions as majority of the participant are farmers and were clearing land for the farming season. The rains also limited the researcher from travelling across the White Volta from Nawuni to the “overseas” communities of the district.

Finally, a major limitation was the non-cooperation of volunteers, teachers, patients and community members of the most endemic community in the district (Wantugu).

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter investigates various researches and literature that have been documented from numerous experts on subject matters that are related to the topic under discussion. Chapter two has been subdivided into eight (8) sub-sections. These sub sections include literature on pathology, clinical manifestation, treatment and epidemiology of Guinea Worm disease. It also includes reviewed literature on poverty and disease, socio-economic impact and eradication of Guinea Worm disease and concludes with the conceptual framework that has been selected to support the structure of this study.

2.2 PATHOLOGY

The pathology of Guinea Worm disease is largely undisputed by all authors and researchers of the disease. For many years, dracunculus was included among the filariae but was later discovered that even though they belong to the same order, they differ distinctively from them. These differences are mainly in the disparate sizes of the sexes and life history (Blaxter et al, 1999). According to this publication, dracunculus is a nematode known as dracunculus medinensis belonging to the order of spirurida, which are tissue parasites that produce eggs containing larvae or release free larvae and require arthropods as intermediate hosts.

According to Greenaway, the best known examples of this order are the filariae (super-family filarioidea), including the important human parasites like Wuchereria bancrofti and Brugia

malayi, Onchocerca volvulus and Loaloa (Greenaway, 2004). Among nematodes, the mature female guinea worm is one of the longest, measuring up to one meter in length but is only 1-2 mm thick (Brandt and Eberhard, 1990). Muller has written that the same or similar species of dracunculus have been reported sporadically for mammals and reptiles (snakes and turtles) in many parts of the world (Muller, 1971), however several writers (Nwosu et al, 1982; Issaka-Tinorgah et al, 1994; and Aylward et al, 2000) have asserted that there is no known animal reservoir of infection which makes eradication much more probable if safe drinking water can be assured. Nevertheless, Greenaway categorically states that this assertion has not been conclusively disproved (Greenaway, 2004).

Humans become infected by drinking unfiltered water containing copepods (small crustaceans also referred to as cyclops or water fleas by Kelly and Pereira, 2006) which are infected with larvae, which penetrate the host stomach and intestinal wall and enter the abdominal cavity and retroperitoneal space (CDC, 2004). Larvae develop to the infective stage in the body cavity in 14 days at 26°C (Brandt and Eberhard, 1990). In the human body, larvae are released in the stomach and migrate through the intestinal wall across the peritoneal cavity and into the wall of the abdomen and thorax by 15 days (Cairncross and Tayeh, 1989). Over the next 60 to 90 days (100 days according to W.H.O, 2006) the larvae matures into adult and mate, and according to Greenaway, 2004, the male dies afterwards. However one literature has disputed that the male dies, it states that in experimental infections by dracunculus insignis in ferrets, males live for at least 330 days and therefore are potentially able to fertilize females for another year (Brandt and Eberhard, 1990). Despite this assertion, an internet based encyclopaedia agrees with Greenaway and proceeds further to state that the male is usually consumed by the female after mating (Wikipedia, 2007).

The female moves down the muscle planes and by 10 months (10 to 14 months according to Cairncross et al, 2002), have grown greatly with the uterus being filled with larvae, worms emerge about 1 year after infection, usually from the feet and lower extremities but have been documented to emerge from other parts of the body (Carter Centre,2007) . On the course of emergence, the female worm induces a blister on the skin which is soothed if immersed in water. When lesion comes into contact with water, the female worm emerges and releases its larvae (Rohde et al, 1993). The larvae are ingested by a copepod and after two weeks (and two molts) have developed into infected larvae, the cycle continues.

2.3 CLINICAL MANIFESTATIONS

Infected people remain asymptomatic for about a year after infection at which time the matured female worm approaches the skin and forms a papule in the dermis, this is usually painful because of host reaction (Nwosu et al, 1982). Other writings have added that the host reaction is preceded by a slight fever, an urticarial rash with intense pruritus and systematic symptoms of nausea, vomiting, diarrhoea and dizziness (Hours and Cairncross, 1994). Upon the final bursts of the blister, Muller writes that a marked inflammatory response against the cuticle of the entire worm is manifested thereby preventing its removal (Muller, 1976). Furthermore, Muller and a host of other writers note that the pain and systematic symptoms decreases with the rupture of the blister and the worm usually is manually extruded by winding it onto a stick over several weeks (Ilegbodu et al, 1991 and Muller, 1976). However, this does not mark the end of the pain, Ruiz-Tibien and Guiterrez (1991) have documented complications of ulcers which may “lead to abscess formation, tetanus, septic arthritis or systematic sepsis with subsequent infections of joints leading to deformities or contractures”.

With respect to duration of incapacity per episode of Guinea Worm disease, literature varies in terms of number of days. According to Lyons (1972) in a study in Ghana, continuing pain for 12-18 months after the emergence of the worms was experienced by 28% of people with Guinea Worm disease in one study and 0.5% of this same population had permanent physical impairment in the form of "locked" knees or other joints. In another survey in Nigeria, 58% of patients, mostly in the 15-49 year old working age group or school going age, were disabled for an average of 12.7 weeks (Smith et al, 1989). In yet another study in Benin, there was a recorded 0.3% mortality rate from tetanus and septicemia (Chippaux and Massougbodgi, 1991).

In general terms, Guinea Worm disease is said to be rarely fatal with a 0.1 fatality rate (Adeyeba, 1985). Other writers (Imtiaz et al, 1990; Rao and Reddy, 1965; and Singh and Raghavan, 1957) in separate studies concluded that the proportion of patients permanently disabled by the disease is small with a less than 1% occurrence. However, other studies seem to differ from the above conclusion; this is especially so since the social impact of Guinea Worm disease is mainly attributable to temporary disability suffered by patients (Cairncross et al, 2002). For example, two longitudinal studies in Nigeria, researchers (Adeyeba and Kale, 1991; Smith et al, 1989) found that 58 to 76 percent of patients were unable to leave their beds for approximately a month during and after emergence of the worm. In another study in Ghana (Hours and Cairncross, 1994), it was found that between 12 and 18 months after emergence of the worm, 34% of patients still had some difficulty performing everyday activities, usually due to pain attributable by its location and the date of onset of the episode.

2.4 TREATMENT

There is no known literature with variations in methods of treatment; however a few drugs have been tried with little or no effect on the disease or the worm. Traditionally, treatment is carried out by winding worms out on a stick a few centimetres a day. This has been practised since ancient times and is still useful, particularly when combined with a clean dressing and antibiotic ointment to prevent secondary bacterial infection (Magnussen et al, 1994)

According to Nwoke, there is no evidence that any chemotherapeutic agent has a direct action against guinea worms although various benzimidezoles (a large chemical family used to treat nematode and trematode infections in domestic animals) may have an anti-inflammatory action aiding elimination (Nwoke, 1992) and aspirin was found elsewhere to be equally effective (Muller, 1979).

Eberhand et al (1990) further published their findings based on therapeutic treatment of disease and concluded that Ivermetin (a broad spectrum anti parasite medication) was effective against many other nematodes but had no action in one trial, nor in experimental infections. This conclusion was also certified by Issaka et al in a journal published in 1994. Chippaux, (1991) found that treatment with mebendazole was associated with aberrant migration of worms which were more likely than usual to emerge in places other than the lower limbs. Hence the conclusion of all these findings is that prevention is the only effective intervention to reduce the incidence of Guinea Worm disease.

2.5 EPIDEMIOLOGY

Dracunculus larvae need a period of 12 to 14 days to develop in the cyclops and become infective (Cairncross et al, 2002). This has prompted many researchers of the disease to question the water sources necessary for transmission of the disease.

According to Muller (1979) and later, Tayeh, Cairncross and Maude (1993), Guinea Worm disease is not normally caught from flowing water sources such as rivers and streams. Both documents insist that deep wells are also rarely implicated in transmission. Few cyclops are found in them, probably because the lack of light at the bottom constrains the population of zooplankton, which are the cyclops' natural diet. They therefore conclude that ponds, and sometimes shallow or steep wells are the main sources of the disease and the epidemiology of Guinea Worm disease is therefore chiefly determined by the use of such sources of drinking water.

Numerous studies in both Africa and Asia have illustrated this predominant role of ponds in guinea worm transmission; these include Edungbola (1980, 1983); Edungbola and Watts (1984, 1985, 1990) in Nigeria; Lyons (1972) and Scott (1960) in Ghana; Gbary, Guiguemde and Quedraogo, 1987 in Burkina Faso; Petit et al (1989) in Togo. Others include Henderson, Fontaine and Kyeyune, 1988 in Uganda; Hopkins et al 1995 in Pakistan; Johnson and Joshi, 1982 in India and finally, what is now known as Uzbekistan (WHO, 1998). In all these studies, it was clearly emphasized that many of the ponds involved in transmission are man-made.

According to Cairncross et al (2002), two broad patterns of seasonality are found in African areas of endemicity, depending on climatic factors. They add that in some countries, both patterns occur, each in a different climatic zone. This was first noted by Guiguemde in 1985

where he added that to the North in the Sahelian zone, transmission of the disease is generally limited to the rainy season from May to August with peak in June and July. Steib and Mayer in 1988 attributed Guiguemde's claim of this pattern to the presence of T.Inopinus in the surface and shallow water used for drinking. Yelifari, Frempong and Olsen (1997) however found it difficult to correlate occurrence of cyclopoids in local water sources with the prevalence of infection among the people using them.

Proceeding from Guiguemde's avowal, further south in the humid savannah and forest zone the opposite pattern is found with a peak in the dry season. This may be early dry season (September to January) as in some parts of Oyo State, Nigeria (Edungbola and Watts, 1985 and Kale, 1977); Danfa in Ghana (Belcher et al, 1975) and southern Togo (Petit et al, 1989). The dry season transmission is often associated with the consumption of water from ponds or water bodies formed in the beds of seasonal rivers when flow has ceased (Macpherson, 1981 and Chippaux et al, 1992). Chippaux and Massougbodji (1991) also suggest that transmission does not occur when there is less than one susceptible cyclopoid per litre in the pond and that this accounts for seasonal variations in incidence.

Apart from seasonal variation in disease transmission, the incidence of Guinea Worm disease has been found to vary with age and gender in different ways. Jemaneh and Taticheff, 1993 discovered a significantly higher prevalence in women of Ethiopia. Prior to this, Johnson and Joshi (1982) found the opposite result in India as was discovered by Adekolu-John (1983) and a decade later, by Nwoke (1992) in some West African countries. Nevertheless, Tayeh et al, 1993 concluded that the issue of significance was behavioural risk factors (such as work in the fields or collection of water) and not necessarily the gender component.

With respect to age, two possible age prevalence profiles have been pointed out by Cairncross and Tayeh, 1989. According to this article, high prevalent villages with an infected water source shows similar prevalence in children and adults whiles lower prevalent villages show low prevalence in all ages but significantly less in children than in adults. They further explain that the former is characteristic of communities where the water carried home is infected, whiles the latter is indicative of an association with mobility, where infection is acquired from water sources outside the community.

2.6 SOCIO-ECONOMIC IMPACT

A potpourri of factors leads to devastating effects on an affected population's socio-economic status. In recent years, the understanding has grown that biological and technical feasibility is not the only criterion to consider before launching an eradication programme; costs and benefits are no less important (Dowdle and Hopkins, 1998). According to Aylward et al (2000), the benefits of guinea worm eradication in contrast to those of small pox and polio will accrue almost exclusively to the population in which the disease is endemic.

In terms of direct socio-economic effect, Smith et al (1989) write that the disease tends to predominantly affect people of working age or school going age, citing an example in a Nigerian study where 58% of those affected were between 11 and 49 years with 100 days of inability to work, and that children were absent from school for 25% of the school year. Ilegbode et al, 1986 has asserted that this absenteeism occurs because of either direct infection or to cover the workload of a parent or sibling disabled by the illness. Based on another study in Kordofan, south Sudan, Tayeh and Cairncross (1996) discovered that children of affected families were three times more likely to be malnourished. This was

thought to reflect the lost income to the household induced by the incapacity of the breadwinner.

With regards to education, numerous researchers and writers (Brieger et al, 1989; Edungbola and Watts, 1985; Edungbola et al, 1988; Ilegbodu et al, 1986 and, Nwosu et al, 1982) have written that children miss school when they have Guinea Worm disease (in rural Africa, School is usually a long walk away) and also when they have to substitute for their ill parents in doing agricultural work and other household tasks. As a result, school attendance suffers during the peak season. Edungbola et al (1988) concludes that schools in areas of endemicity often have to close for one month in each year as a result of vast absenteeism.

Some studies have attempted to place figures on the economic impact of Guinea Worm disease by multiplying the number of days of labour lost by the mean value of production per day or by the wage rate. One such study (de Rooy and Edungbola, 1988), based on a survey of 87 households, estimated that the rice growing areas in three states of southern Nigeria sustained an annual loss of $20 million due to Guinea Worm disease. Based on this same calculation, it was estimated that the annual cost of Guinea Worm disease in Benin was 16000 CFA francs per patient (US $60) (Chippaux et al, 1992). However, it has been argued previously that this method of calculation uses an over-simplified approach and is likely to over estimate the cost (Guiguemde et al, 1986 and Paul, 1988), as it does not allow for the various coping strategies by which households respond to illness (such as abandoning other tasks and using additional labor), which qualitative studies have found to be common in peasant farming (Brieger et al, 1989 and Chippaux et al, 1992). A more complicated approach is to examine the impact on actual production (Brieger and Guyer, 1990) or even to include the incidence and duration of Guinea Worm disease- induced disability as prediction

variable in an agricultural production function. Audibert (1993) used this approach in north-eastern Mali where incidence of Guinea Worm disease was “relatively low” (between 3 and 33% in the villages studied) to show that temporary disability accounted for a reduction of 5% in overall production of two important subsistence crops: sorghum, mainly grown by men and peanuts, cultivated by women.

Apart from the direct impact of Guinea Worm disease on production and productivity, there is also the ability to produce a direct economic rate of returns from incidence reduction. This is particularly so because expenditure on the disease can be redirected to other development activities. The World Bank for example (Kim et al, 1997) has estimated that the economic rate of return on the investment in guinea eradication will be about 29% per year once the disease is eradicated, with an estimated cost of the global eradication campaign between 1987 and 1998 being $US 87.5 million.

2.7 ERADICATION OF GUINEA WORM DISEASE

Guinea Worm disease has been reported in writings from India, Greece and the Middle East since antiquity, and dead female worms have been found in 3000-year-old Egyptian mummies. Historically, the disease occurred in Algeria, Egypt, the Gambia, Guinea Conakry, Iraq, Brazil and the West Indies but died out spontaneously in these areas. Guinea Worm disease was eliminated from Uzbekistan in 1932 and from southern Iran in 1972 through case identification and containment and through elimination of the parasite from water reservoirs (Cairncross et al, 2002).

Guinea Worm disease is a promising candidate for successful eradication. The cyclopses are not a mobile vector like a mosquito, and the carrier state in both the cyclops and human hosts

is of limited duration. Diagnosis is easy and unambiguous; cheap and effective measures are available to prevent transmission. The disease has a limited geographical distribution, and even within this area it is found only in certain communities of endemicity. Its markedly seasonal distribution in time also permits a more intensive focus on its prevention in seasonal campaigns and transmission from animals to people is practically unknown (Muller, 1979).

The United Nations declared 1981–1990 to be the International Drinking Water Supply and Sanitation Decade (IDWSSD), raising the possibility that Guinea Worm disease could be eradicated by improving the quality of human drinking water. In 1981 the US Centres for Disease Control and Prevention (CDC) proposed that Guinea Worm disease would be the ideal indicator with which to measure the success of this global initiative.

By the mid-1980s, however, it was evident that it would not be possible to gather all of the resources needed to achieve the intended goals of the IDWSSD. As a result, in 1986 The Carter Centre led a movement, in collaboration with the CDC, UNICEF and the WHO, to increase advocacy and funding for the Global Dracunculiasis Eradication Campaign. High-level advocacy has been an important aspect of the campaign, with sustained support by former US president Jimmy Carter and two former African heads of state, Amadou Toumani Touré of Mali and General Yakubu Gowon of Nigeria (Brieger et al, 1997). As the campaign gained momentum, transmission of Guinea Worm disease decreased in several countries, and in 1991 the World Health Assembly passed a resolution calling for the eradication of Guinea Worm disease by 1995.

Since the beginning of the Global Dracunculiasis Eradication Campaign, 7 countries have eradicated the disease, including Pakistan (1993), Kenya (1994), India (1996), Cameroon, Senegal and Yemen (1997) and Chad (1998) (Hopkins et al, 2002).

Attributable to the campaign, the number of reported cases decreased from 2.25 million cases in 20 countries in Asia and Africa in 1986, to fewer than 55 000 cases in 13 African countries in 2002 (Sudan, 41 493; Ghana, 5606; Nigeria, 3820; Togo, 1479; Mali, 857; Burkina Faso, 580; Côte d'Ivoire, 266; Niger, 233; Benin, 157; Mauritania, 42; Ethiopia, 24; and Uganda, 6 [number not reported for Central African Republic])(Greenaway, 2004).

The ultimate success of an eradication programme depends not only on favourable biological factors but also on societal acceptance of the intervention and the political will to carry it out. Guinea Worm disease is a good candidate for eradication for several biological reasons. First, the disease has a limited geographic distribution and the marked seasonal occurrence allows for periods of more intensive intervention.

Second, transmission is only from those with clinical disease and there is no known animal reservoir. Third, because symptoms develop within one year after infection, with predictable timing, the disease is easy to recognize and diagnose, which facilitates identification and containment of active cases. Finally, effective preventive measures such as health education and water filtration are available to prevent transmission (Aylward et al, 2000).

The main strategies of the Global Dracunculiasis Eradication Campaign have been to identify all communities with endemic disease transmission, contain all active cases (thereby

preventing contamination of drinking water sources) and educate the population about methods to avoid ingestion of contaminated drinking water. These objectives have been achieved through training volunteer village-based health workers to educate villagers about the origin of the disease, its mode of transmission and methods of prevention. Villagers are taught to avoid ingestion of contaminated water by filtering water through cloth filters and are educated about the care and management of people with active infections so that they do not contaminate sources of drinking water. Vector control through the monthly addition of Abate (a coecide) to unsafe sources of drinking water to control the copepod population (the intermediate host) has also been used. Another important aspect of the control programme has been the provision of monthly reports, based on active surveillance of cases, to the community by the volunteer village-based health workers (Hopkins and Ruiz-Tiben, 1991).

The successful implementation of these strategies led Global Dracunculiasis Eradication Campaign to target the eradication of Guinea Worm disease in all countries except Sudan by the end of 2004. Sudan has the greatest burden of disease in the world, primarily because a 20-yearlong civil war has made it difficult to implement an effective eradication programme. An eradication programme was first established in Sudan in 1995 when former president Jimmy Carter negotiated a successful 4-month "guinea worm cease fire." All fighting ceased during this period, allowing health care workers to educate villagers about Guinea Worm disease and to disseminate cloth filters in some of the remotest areas of the country (MMWR, 1995). This did not have a lasting effect, however, as the civil war currently prevents access to affected villages, particularly in the southern part of the country. It is estimated that at least 5 years will be required to eradicate Guinea Worm disease in Sudan once an effective programme is established (MMWR, 2002).

In Ghana, eradication efforts yielded a drop of cases from 180,000 in 1989 to about 4,000 in 1994. Eradication in Ghana has been a continuous process of “two steps forward and one step backward”. Between 1995 and 2005, more than 66,000 Ghanaians have suffered additional cases of the disease and Ghana has missed five target dates for eradication. Within this same period, the government of Ghana and the Carter Centre has provided $5 million and $9 million in assistance, respectively, to the Guinea worm eradication programme (CDC, 2006).

However, after another failed deadline for eradication on in December 2006, 1,001 new cases emerged in January 2007; almost double the number a year ago. Ninety percent of Ghana's remaining cases are within 100 miles of Savelugu, a semi-arid region prone to drought, where guinea worms breed in manmade dams with about 25,000 people living in the area (VOA, 2007).

Continued success of the Global Dracunculiasis Eradication Campaign will depend on adequate funding, the ongoing cooperation of affected villagers, continued political support and political stability in affected countries (MMWR, 2002).

2.8 POVERTY AND DISEASE

Poverty has been defined severally by various writers and cognoscenti of the subject. The major dispute that has occurred throughout literature on poverty has been based on the income/expenditure definitions being questioned by supporters of the multidimensional approach. However, the aim of this document is not to discuss these disparities. Therefore, in line with the broad definitions and the necessity of this study, Chambers’ definition would be resorted to. He outlines what he calls the ‘deprivation trap’, in which five ‘clusters of disadvantage’ interact with each other to trap people in a situation of disadvantage. One of

the five clusters is poverty and it is used in the narrow sense of lack of assets. The others are powerlessness, physical weakness, isolation and vulnerability, which are the wider dimensions of poverty (Chambers, 1983). These five "clusters of deprivation" are further outlined as:

1. POVERTY (LACK OF ASSETS): Small house, little land, few or no livestock. All family members work unless they are too young, old or sick.
2. PHYSICAL WEAKNESS: Adults unable to work due to illness or disability, or migration of active adults.
3. ISOLATION: Household is remote or on the edge of a community, and may lack access to markets or information.
4. VULNERABILITY: Household becomes poorer through having to deal with unforeseen circumstances such as crop failure, accident, sickness, funerals or flooding.
5. POWERLESSNESS: Weak negotiating position with those in control, ignorant of the law, competing for employment.

With respect to links between poverty and ill-health, Thaver and Bhutta, (2006) have written that "huge disparities exist in health between the rich and poor within developing countries. Poor health is closely associated with poverty. Across and within countries, differences in income can account for as much as 70% of variance in infant mortality. In addition, they mention that the poor are most vulnerable to ill-health and have the least means to combat it, and conclude that there is a growing body of evidence which shows that better health contributes to greater economic security and growth concluding that "better health reduces

poverty and reduced poverty improves health" (Thaver and Bhutta, 2006). These assertions have been further strengthened by Anand and Chen (1996) who stress that the effect of poverty on health are never more clearly expressed than in poor communities of developing countries. In the discussion paper, they further write that the absence of safe water, environmental sanitation, adequate diet, secure housing, basic education, income generating opportunities and access to health care act in obvious and direct ways to produce ill-health, particularly from infectious diseases, malnutrition, and reproductive hazards.

In a continuing discussion of the link between poverty and ill-health, Jamine Schooley writes that there is an interwoven issue of health and poverty which form a cycle. She elaborates on the "cycle of poverty and ill-health", stating that the cycle comprises of poverty, ill-health, malnutrition and lack of education (Schooley, 2007). In support of this "cycle concept", Guerrero et al (1998) writes in a medical journal that "the number one health problem is poverty" emphasizing that for the poorest countries, the health sector alone cannot ensure better health even if it were able to function at maximum effectiveness and concluding that medical personnel have to accept that they can no longer deal with health while ignoring poverty.

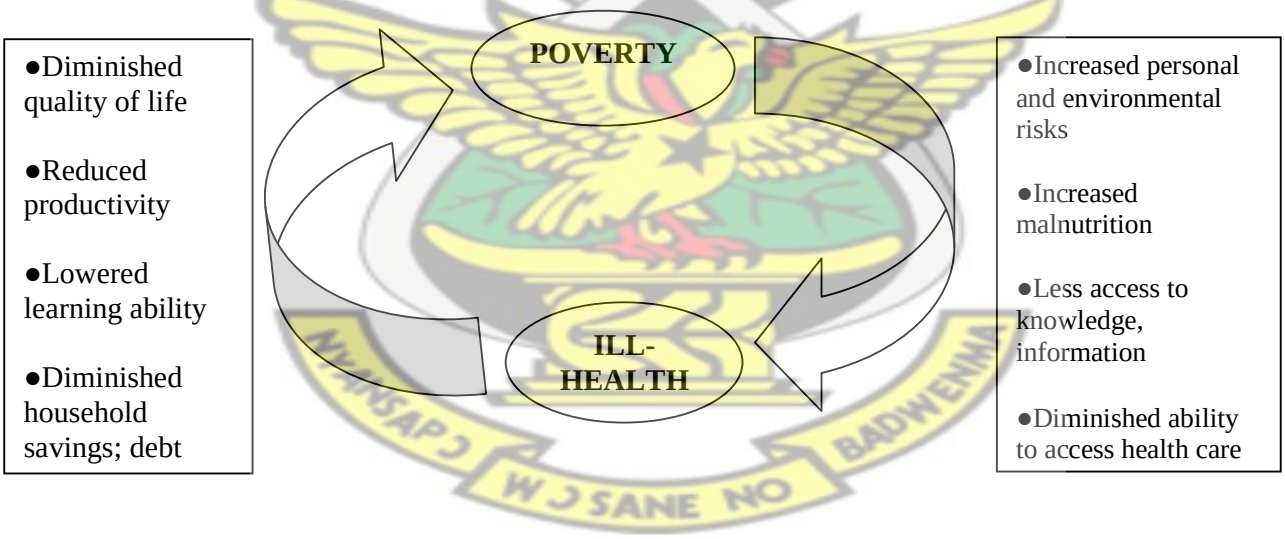
To fortify the argument on the poverty- ill health linkage, the WHO (1995) writes that in real terms, poverty is the principle cause of 12.2 million deaths a year in children under five; 4.1 million of these deaths arise from acute lower respiratory tract infection and a further 3 million from diarrhoea and dysentery. According to this same publication by the world health body, malnutrition is estimated to be an underlying cause in 30% of child deaths and is overtly expressed as growth retardation in 230 million children and severe wasting in 50 million children. It further states that in adults, poverty accounts for much of the annual 2.7

million deaths from tuberculosis and 2 million deaths from malaria. With all this, Kevany (1996) concludes that maternal mortality is strongly associated with high fertility and lack of access to health services and causes a further 500,000 deaths a year, with associated impact on surviving offspring.

2.9 CONCEPTUAL FRAMEWORK

The conceptualization in figure 2.1 simplifies an understanding of the link between poverty and ill-health in the context of Guinea Worm disease. Poverty has been defined, in the context of this work, as multi-dimensional and multi-faceted in nature (Chambers, 1983).

Figure 2.1: Poverty and Ill-health: the Vicious Cycle



Source: Adapted from Thaver and Bhutta, 2006.

In Thaver and Bhutta's model, poverty has a tendency of leading to increased personal and environmental risks, increase malnutrition, less access to knowledge and information and

diminished ability to access health care, thereby leading to ill-health. These components are further expanded to create a clear understanding of the components of the framework.

Increased personal and environmental risk:

Poverty has been noted as a major cause and effect of environmental problems. According to the World Bank (2000), environmental health risks fall into two broad categories. The first are the traditional hazards related to poverty and lack of development such as lack of safe drinking water, inadequate sanitation and waste disposal, indoor air pollution and vector borne diseases. The second category is the modern hazards such as rural air pollution and exposure to agro-industrial chemicals and waste that are caused by development that lacks environmental safe guards.

The first of these categories falls into the background of this framework and consequently the study. Poverty increases the vulnerability of the poor to numerous environmental risks, in this sense, lack of safe drinking water and exposure to vector borne diseases. They are unable to gain access to potable drinking water and therefore resort to water sources that are affordable to them yet contaminated with various water borne vectors including the Guinea Worm Cyclops.

Increased malnutrition:

Malnutrition has long been recognized as a consequence of poverty. It is widely accepted that higher rates of malnutrition will be found in areas with chronic widespread poverty (ADB, 2001). Malnutrition is the result of marginal dietary intake compounded by infection. In turn, marginal dietary intake is caused by household food insecurity, lack of clean water, lack of knowledge on good sanitation, and lack of alternative sources of income. It is also

compounded by inadequate care, gender inequality, poor health services, and poor environment.

Less access to knowledge and information:

Poverty is known as both a cause and as a result of the lack of access to knowledge and information. Knowledge is vital in all spheres of productive life; this could be knowledge on prices of commodities, knowledge of disease prevention, knowledge on constitutional rights and responsibilities, knowledge on weather conditions and appropriate farming periods. Poverty deprives its victim of the ability to access these forms of knowledge emanating from the lack of appropriate education on issues concerning them to smaller issues like a lack of a radio set. Chambers (1983) outlines this as isolation in his "deprivation trap". He explains that services do not reach the remote and these services include information flow and education.

Diminished ability to access health care:

The poor lack assets to pay for health care, this cost includes hospital bills and drugs .This apart, distance to health facilities also prevents the poor from having access. This is explained by chambers as a relationship between poverty, vulnerability to ill-health, physical weakness, powerless and isolation playing their roles in keeping the poor in the "deprivation trap", or in the above framework, the vicious cycle of poverty. This lack of access to the health facilities also leads to a lack of knowledge on health issues and preventive measures.

Access to health care includes a system of health care and protection that is available, accessible, acceptable, and of good quality. Access to health care should imply functioning public health and health care facilities, goods and services are available in sufficient quantity

within a State. It also means that they are accessible to everyone without discrimination. Accessibility has a number of dimensions, including physical, information and economic accessibility. Thus, 'information accessibility' includes the right to seek, receive and impart information concerning health issues, subject to the right to have personal health data treated with confidentiality. 'Economic accessibility' means that health facilities, goods and services must be affordable for all. Further, all health facilities, goods and services must be acceptable (that is; respectful of medical ethics and culturally appropriate, and of good quality (Wen et al, 2003).

Ill-health is both a cause and consequence of poverty. According to the framework under scrutiny, illnesses can reduce household savings, lower learning ability, reduce productivity and lead to diminished quality of life – thus creating or perpetuating poverty. The left side of the framework deals with components that emanate from ill-health and create or perpetuate poverty.

Diminished quality of life, reduced productivity and diminished household savings leading to debt are interlinked in several ways. Each bout of illness presents a range of negative economic consequences for households and loss of productivity for the sectors in which the sick and their caregivers are involved (Nolan, 2009). Loss of labour and consequently income when a breadwinner falls ill coupled with rising medical costs and ultimately funeral expenses may plunge a household into chronic poverty. Furthermore, the poorest households are most likely to resort to non-reversible coping strategies including the sale of land or livestock or withdrawal of children from school.

Ill health thwarts the ability of the patient to learn in several ways. The sick are too weak to learn, sickness distracts the patient from learning due to uncomfortable feelings or pain leading to lowered learning abilities. Health has effects on cognitive development and school participation; poor health can lead to poor participation, irregular attendance and high rates of school drop-out (Sridhar, 2009). Furthermore, better child health improves school attendance, cognitive ability and learning. Miguel and Kremer (2004) found that de-worming of children in Kenya increased school attendance.

In terms of learning abilities, ill health leads to problems of three types (Sridhar, 2009); First, due to inadequate nutrition and ill health either inutero (within the uterus) or early in life, children are unprepared to attend school, Bleakley (2003) notes that parasitic worm diseases, which are most common in children, have effects on school attendance, literacy and physical development.

Second, due to illness caused by helminthic infections, micronutrient deficiencies, and chronic protein malnutrition, children fail to learn at school. For example, vitamin A deficiency contributes to measles mortality and diarrhoeal illness and is the leading cause of preventable child blindness in developing countries (Sommer and West, 1996). Similarly, iron deficiency results in impaired cognitive development and lowered school achievement (Grantham-McGregor and Ani, 2001).

Thirdly, in many contexts, there is unequal participation of girls in schools due to the intertwining of biological and cultural forces. For example Miller (1992) writes that menstruation exacerbates iron-deficiency anaemia while early marriage and then pregnancy increases the nutritional demands. In addition, when illness strikes families, girls are more

likely to discontinue their studies to assume household chore duties and care for younger siblings.

To forge a relationship between these components explained above and the subject under study, water is central to Guinea Worm disease and the presence of Guinea Worm disease indicates the absence of Potable drinking water in the endemic communities. Poverty leads to increased personal and environmental risks (in this situation, a lack of potable water) which further leads to the risk of disease (Guinea Worm) affecting productivity, the quality of life, learning ability and household savings.

Inferring from this, a school student who lacks potable water is at risk of being infected by Guinea Worm disease. This infection could affect the student's productivity (ability to go to school) and further inhibit the student's learning ability. Without adequate interventions, the said student will remain entangled in this vicious cycle of poverty and ill-health and possibly drop out of school which could deepen the state of poverty and ill-health. The risk of a continuous cycle of poverty and ill-health is imminent except an intervention is carried out to improve one or more of the conditions mentioned above.

With regards to Guinea Worm disease, interventions are being taken to eradicate the disease but a glaring question is if this is necessarily the most effective form of intervention. The suggestion at this point is that a well crafted intervention to eradicate poverty would automatically eradicate Guinea Worm disease and other poverty related diseases, whiles effective eradication of Guinea Worm disease would eventually eradicate only Guinea Worm disease leaving the persons vulnerable to all other diseases and a possible re-infection of Guinea Worm disease and a potential return to the vicious disease-poverty cycle.

CHAPTER THREE

STUDY AREA

3.1. INTRODUCTION

Chapter three (3) aims to describe into details the district under study. The chapter is divided into ten (9) sub sections based on various subject matters that concern the district.

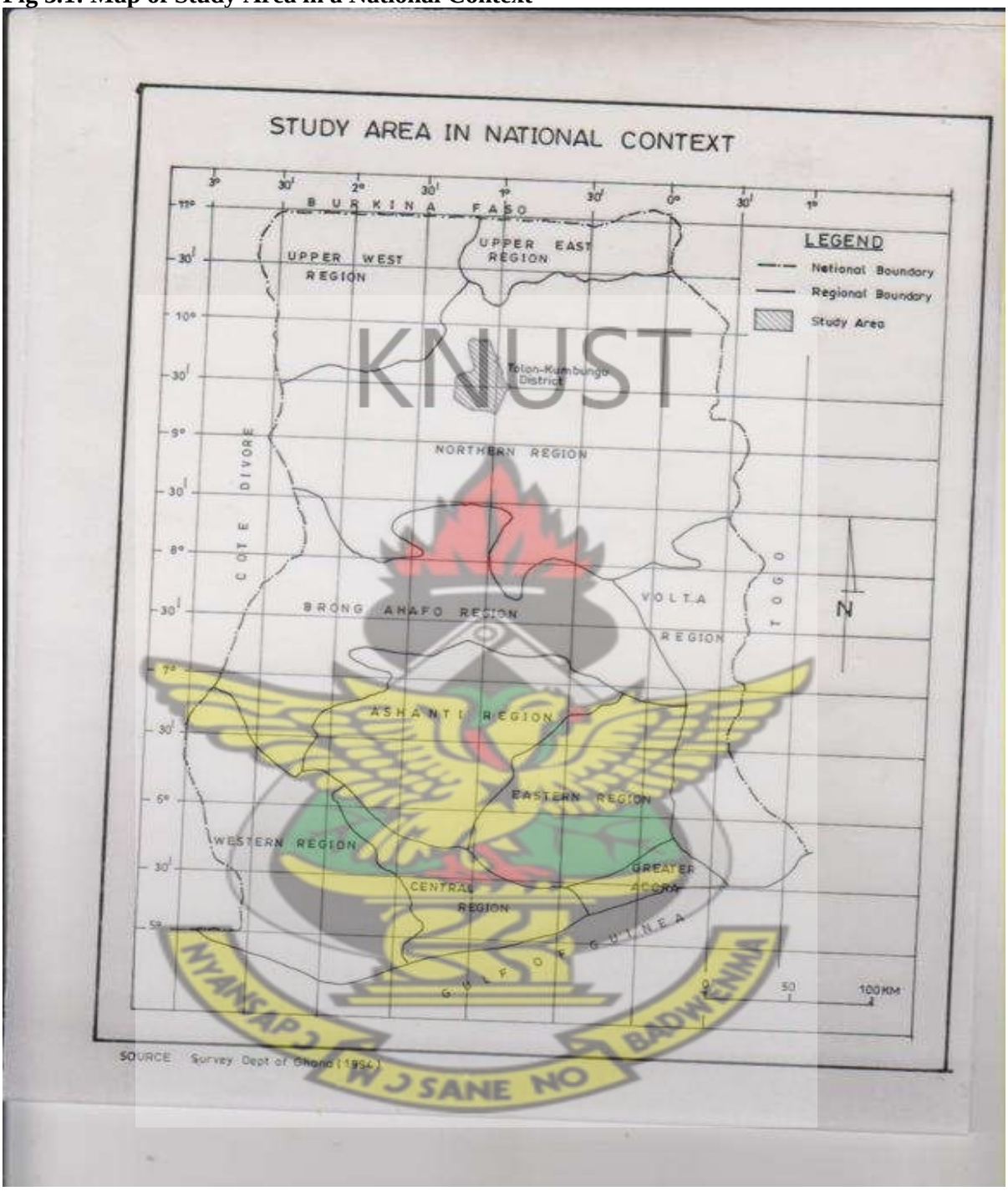
This study was carried out in the Tolon/Kumbungu District; The Tolon/Kumbungu District is one of the first forty-five (45) districts created under the decentralization law of 1988 (PNDC law 207) with Tolon as it district capital. Fig 3.1 is a map of the study area.

3.2 GEOGRAPHIC SETTINGS

3.2.1 Location and Size

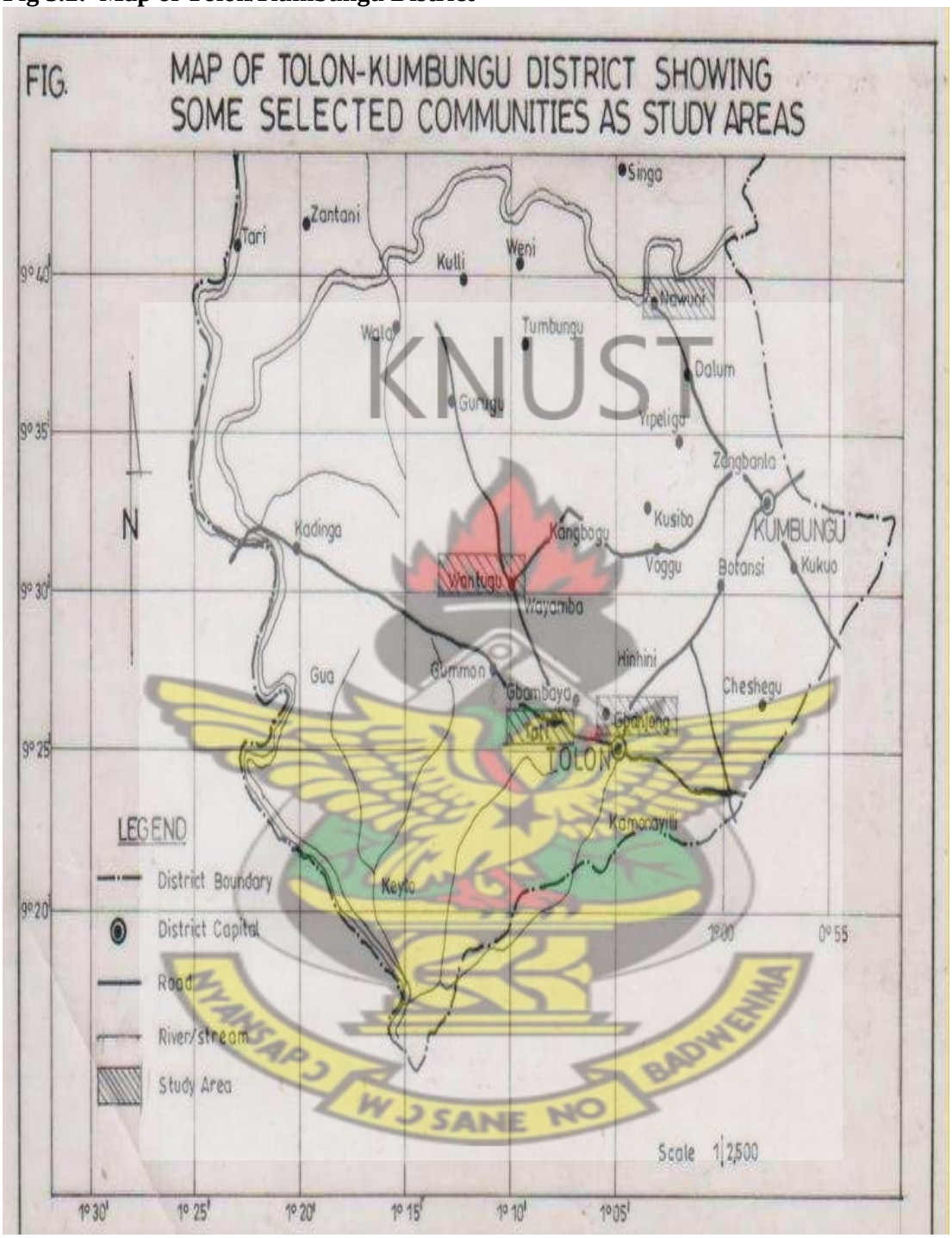
Tolon/Kumbungu lies between latitudes 90° and 201° north and longitudes 10° and 50° west. The district covers a land area of 2,741 square kilometres which is about 3.9% of the total land mass of Northern Region. Northwards, the district is bounded by the West Mamprusi District, Central Gonja District to the south and West Gonja to the west. Tamale Metropolis and Savelegu/Nanton District share the eastern boundaries with the district. Figure 3.1 is a map of the district from a national perspective whiles Figure 3.1 is a detailed map of the district highlighting major study communities.

Fig 3.1: Map of Study Area in a National Context



Source: Survey Department of Ghana

Fig 3.2: Map of Tolon/Kumbungu District



Source: Tolon/Kumbungu District Assembly

3.2.2 Climate and Vegetation

The district lies in the Guinea Savannah zone with Voltaian characteristics dominated by clayey and loamy soils. Major tree species include nim, baobab, shea and dawadawa. The zone is characterized by a single maximum rainfall regime which starts from April/May and becomes irregular from August and ceases in October, ushering in the dry season. Mean monthly rainfall ranges between 500 and 1100mm whiles mean monthly temperatures range between 17°C and 40°C.

3.2.3 Relief and Topography

The Tolon/Kumbungu District is mainly drained by the White Volta and its tributaries including *Kulabong, Koraba, Salo Bawa* and *Winibo*. The lands are flat and generally undulating. There are however few hills at Jagbo and Santang with valleys around Nawuni-Singa, Gbrumani and Santang areas. The area has heights ranging between 12 – 180 mm above sea level.

3.3 SOCIO-DEMOGRAPHIC FEATURES

3.3.1 Population size and Distribution

According to the 2000 Housing and Population census, the population of the district is pegged at 132, 883. This consists of 67, 494 males and 67,590 females with a growth rate of 2.7%. Population density is estimated at 50 inhabitants per square kilometre. This feature however varies with settlements. It is high in the major towns of Tolon, Kumbungu, Nyankpala, Lungbgunga, Chirifoyili and Kpendua, whiles lower in the smaller communities.

3.3.2 Migration

There are few immigrants in the district. They include Fulani herdsmen, Bato and Gonjas (who are mainly fishermen). A large number of youth in the district migrate to the southern parts of the country in search for jobs. It is widely known that the district has a large number of emigrant porters, popularly known as “kayayei” in mainly Accra and Kumasi. This reduces the youthful working population in the district which affects productivity in the district.

3.3.3 Health

The district has a high level of infant and child mortality in the district. For instance, there were 80 reported cases of infant deaths in the district for 2005. Five top diseases include diarrhoea, malaria, guinea worm, intestinal worm and respiratory infections. The district is the second most endemic Guinea Worm disease area in the country after Savelugu/Nanton District due largely to inadequate supply of potable water to the district. Prevalent diseases include malaria, which constitute over 60% of reported illnesses, diarrhoea, viral respiratory tract infection, malnutrition and Guinea Worm disease.

3.3.4 Ethnicity and Religion

The people of the district are predominantly Dagombas with few migrants who are Gonjas and Batos living along the White Volta. The people are mostly Moslems with small groups of other religions including Christian and Traditional religions.

3.3.5 Housing and Settlement Patterns

Tolon/Kumbungu District is mainly rural with over 95% of the houses built with mud and thatch and 2% of roofing sheets (zinc). There are however inadequate housing facilities for

workers. Communities have a nucleated settlement pattern with rounded housing, sparsely dotted resulting in low population density.

3.3.6 Water and Sanitation

The main sources of drinking water in the district are streams and dams with few boreholes and dug-outs in some communities. Between 60% and 70% of the population do not have access to safe drinking water especially in the dry season. Mechanization of boreholes is however being earmarked in a few communities. Biwater Company which executed the Tamale water extension project is being contacted to extend water to Nyankpala and Tolon townships. When this is completed, the district will be able to extend potable water to needy communities with the help of development partners. Sanitation in the district is all but poor, there are no drainage canals and refuse containers. Toilet facilities are inadequate with about 89.8% of the people attending natures call in open places and bushes.

3.3.7 Education

The district has 140 primary schools, 18 Junior High Schools, 2 Senior High Schools and 1 university. There is a high illiteracy rate in the district, coupled with low enrolment rates and high drop-out rates in the district. The enrolment rates for 2006 were 76% in primary, 67% in JHS and 57% in SHS. The drop-out rates in primary schools in 2004/2005 academic year for boys were 63.7% for boys and 73% for girls. Other problems include inadequate teaching and learning materials and shortage of teaching staff.

3.4 PHYSICAL INFRASTRUCTURE

The infrastructural situation in the district is all but poor. There are ten (10) health facilities with no district hospital. These facilities are poorly equipped with health material and

equipment. The educational sector exhibits similar problems. With regards to roads, there are two main trunk roads: Tamale-Kumbungu and Tamale-Tolon roads, the rest are feeder roads and lanes. The road network situation is appalling and there is no bridge across the White Volta, cutting off the "overseas" areas from the rest of the district during the raining season.

3.5 ECONOMIC

3.5.1 Agriculture

The main agricultural activity in the district is crop farming with cereal crop farming dominating. The main crops grown are maize, rice, millet, yam, cowpea, pigeon pea and soya beans. Vegetable crops grown include tomatoes, pepper, okro, onions and garden eggs, whilst cash crops include cotton and tobacco. Other agricultural activities include fishing, livestock and poultry breeding.

3.5.2 Small-Scale Business and Industries

Even though Tolon/Kumbungu District is mainly agrarian, the people are also engaged in make-shift jobs. These include hospitality services of chop-bars and guest houses, petty trading, shea-butter and groundnut oil extractions. These three sub-sectors are dominated by women. Others are blacksmith, bicycle repairs and fitting services, mostly dominated by men.

3.6 LOCAL AUTHORITY

Tolon/Kumbungu District has two (2) town councils, ten (10) area councils and fifty-six (56) unit committees. It also has two constituencies of Tolon and Kumbungu. The assembly is made up of 61 members with 42 elected and 19 appointed (consisting of 4 women; 1 elected and 3 appointed).

3.7 TRADITIONAL AUTHORITY

There are 17 divisional chiefs in the district under Dagbon chieftaincy system. Under them are sub-chiefs and village chiefs. Tolon and Kumbungu skins have been chosen to be elevated into paramouncies.

3.8 DEVELOPMENT POTENTIALS

The development potentials of the district include vast arable land for large scale agricultural production, including pastoral farming for animal rearing. The tourism potentials of the district, to a large extent, remain untapped. These include the Jagbo Shrine, river beaches, a quiver room, artefacts and crocodile ponds and shrines.

Other development potentials include Research and Development (R and D) from the Savannah Agricultural Research Institute (SARI and the University for Development Studies (UDS).

The irrigation dams of Botanga and Golinga can also be tapped for developing agriculture and horticulture.

3.9 INVESTMENT POTENTIALS

The investment potentials in this district are vast and can be divided into seven sub-categories;

Land: The district has approximately 500 acres of arable land; 1000 acres of irrigable land and marshy areas suitable for rice and vegetable farming.

Forest Resources: the Tolon/Kumbungu District is endowed with economic trees like shea, mango and cashew, vast sites for eco-tourism and plants of medical values.

Water Resources: in terms of drainage and water resources, the district is resourced with numerous dams (including Botanga irrigation dam), rivers such as the White Volta, ponds and beautiful river beaches along the White Volta banks.

Agricultural production: Tolon/Kumbungu district is mainly an agrarian district with over 70% of the working population engaged in husbandry of Cereals (maize and millet), legumes (cowpea and soya beans), livestock fishing (cattle, goats and sheep) and tubers (mainly yam).

Mining: Due to the physical character of the soils in the district, there is high potential for the mining of sand, gravel and stone.

Fishing: In terms of fishing potential, there is a vast expanse of water bodies for the rearing of fish (in and around the Botanga dam) and river fishing on the White.

Tourism: The potential for tourism in the district cannot be over emphasized. This is due to the numerous tourist sites that have been demarcated by the Ghana tourist board. Table 3.1 shows the numerous tourist sites and their locations.

Table 3.1: Tourist sites and locations in the Tolon/Kumbungu District

	SITE	LOCATION
1	Jagbo shrine	Jagriguyili
2	Crocodile pond	Chirifoyili
3	Cultural artefacts	Tolon and Kumbungu palaces
4	Chan Tuni crocodile shrine	Nyujagyili
5	Quiver room	Mbanaayili
6	Wonderful sitting mats	Logshegu and Zangballung
7	Crocodiles	Cheyohi and Kuliginni
8	Attractive river beaches along the White Volta	Nawuni

Source: Ghana Tourist Board, 1999

3.10 CONSTRAINTS

Constraints and challenges of the district include erratic rainfall, low revenue generation, poor road network and inadequate telecommunication systems. Others are high illiteracy rates, poverty, environmental degradation, inadequate physical infrastructure, food insecurity, poor health facilities and high rates of Guinea Worm disease.

CHAPTER FOUR

COMMUNITY PERCEPTIONS ON GUINEA WORM DISEASE

4.1. INTRODUCTION

This chapter seeks to present and discuss qualitative data collected in respect of the fulfilment of objective two (2) which is to "examine community members' perception of Guinea Worm disease, its effect(s) and opinions on the current eradication methodologies being employed".

Focus group discussions were carried out in ten communities, topics discussed include knowledge of disease, community support, effect of disease on communities, effect of intervention so far, traditional beliefs and treatments of disease, and barriers to eradication. In pursuit of conducting a concise assessment of the eradication process, a ten stone, fixed ranking and scoring tool was used.

Ten stone, fixed ranking and scoring:

Ranking means putting various alternatives in order of importance, value or preference whiles scoring means assigning values to different alternatives, according to some convenient scale. Ranking and scoring is used as a Participatory Rural Appraisal (PRA) tool to understand people's preferences and choices, drawing on their own categories and classifications rather than imposing those of outsiders (Waters-Bayer and Bayer, 1994). Rather than using numerical symbols, ranking in PRA is done with locally available materials, such as beans or stones. These are used to represent quantities according to local counting systems.

The Ten stone, fixed ranking and scoring method involves the use of ten stones to evoke the scoring and ranking of a particular situation in order of importance and also to induce discussion by participants on the reasons for their order of preference.

With respect to the collected data, ten stones were placed at the centre of the group, whiles various methods of eradication were mentioned by the participants and an available material (a leaf, a bucket, a stool etc) used to symbolize the method mentioned. After an exhaustion of the methodologies, the participants were asked to rank these methodologies in order of efficiency (in their opinion). Along with the ranking, each participant discussed why he or she placed X number of stones on a particular methodology. This continued until they had all come to an agreement as to where to rank a particular method in order of preference.

Below are the results of the discussions that ensued. First being discussions on the Knowledge of the disease, followed by discussions on the effects of the various interventions, the results of the fixed ranking and scoring, traditional beliefs and treatment of disease, effect of disease on communities, community support in eradication process and finally, barriers to eradication of the disease.

4.2. KNOWLEDGE OF DISEASE

An understanding of the dynamics of Guinea Worm disease is of prime importance to its eradication, this includes knowledge of the causes, prevention and effects of the disease. Discussions therefore began with the question of what Nyerifu (Dagbani name for Guinea Worm

Disease) was. Ninety-five (95) percent of respondents had ample knowledge of Guinea Worm disease; most of the participants mentioned that Guinea Worm disease is caused by the drinking of infected water; however some believe that the drinking of any sort of unfiltered water could result in the disease.

The origin and habitation of the worm was in dispute among some respondents; whereas they all accept that the "eggs" are found in water, some argue that there are some species (types) found in the soil, yet not harmful to humans. The discussions on knowledge of the disease drew various comments some of which caught the attention of the researcher; these include:

"Nyerifu is a living creature existing in the human body" - Alhassan Bomba, Wantugu

"It is caused by drinking dirty and unfiltered water from dams" – Fati Seidu, Kasuyili

"We can get the disease from wells too. We have shallow wells where sometimes people step into during the dry season to reach the water" – Andrew Musah, Yipeligu

"We never knew that it was caused by water, we used to blame it on witches and evil people but now we know better" – Amina Abukari, Woribogu.

The above statements coupled with numerous others established the fact that the locals have an enabling understanding of the causes of the disease and consequently, methods of prevention. This comes as a welcomed result since a clear understanding of the disease is catalyst to its

eradication. The results also attest to the effectiveness of the house to house education team of the district.

4.3. EFFECT OF INTERVENTIONS

Interventions to eradicate Guinea Worm disease are being carried out by the Guinea Worm eradication programme, Ghana and the various district assemblies in collaboration with the Carter Centre, Atlanta, United States of America, UNICEF and various Non governmental organizations. These interventions include Daily case management, monitoring of suspected case, house to house health education, school health education, filtration and water development projects (including provision of boreholes).

On issues of interventions, respondents presented a positive picture of the eradication process. They mentioned that the interventions were effective because it had reduced the occurrence of the disease and improved their health status and consequently, their ability to work. Kojo Abukari, a participant in Tali gave a distinction to the eradication process by stating that

"if not for the interventions, you (directed at the researcher) would have seen many more cases than you are seeing, especially around this period (early rains)".

Other participants alluded to the effectiveness of the interventions by mentioning that the communities have been educated on the disease, others stated that aid from district assembly and some Non-governmental organizations were helpful. Support mentioned includes education videos, filter provision and disinfection of some water sources.

An analysis of the scoring and ranking exercise used in appraising communities' perception on the efficacy of the various eradication methodologies employed over the past 20 years is broken down from community to community in table 4.1, followed by a computation of the totals of all 10 communities with their minimum and maximum score values and their mean values in table 4.2.

Table 4.1: Community analysis of interventions (results of ten stone fixed scoring and ranking exercise)

Intervention	Wantugu	Yipeligu	Gbrumani	Tali	Bilisi	Woribogu	Kasuyili	Dingoni	Kunguri	Yizegu
Daily case management	8	7	9	8	8	7	10	9	5	8
Monitoring of suspected Cases	7	7	9	10	8	9	5	5	7	6
House to House health education	9	7	10	9	9	8	10	9	7	9
School health education	10	8	9	10	10	9	8	9	10	9
Filtration	6	7	8	2	2	5	4	8	7	5
Water developmen projects/boreholes	2	1	5	2	3	4	1	2	1	2

Source: Field survey, May 2008

Table 4.2: Compilation of Community analysis of interventions (results of ten stone fixed scoring and ranking exercise)

	N	Minimum	maximum	Mean	Standard Deviation
DCM	10	5	10	7.9	1.37
MSC	10	5	10	7.3	1.703
HHHE	10	7	10	8.7	1.059
SHE	10	8	10	9.2	.789
Filtration	10	2	8	5.4	2.221
Water development projects/boreholes	10	1	5	2.3	1.337
Valid N	10				

Source: Field survey, May 2008

4.3.1 Daily case management (DCM)

A mean of 7.9 was scored for daily case management representing an above average (5) score. This indicates an approval of the method. Discussions during the exercise included reasons for the ratings. The participants mentioned that the daily case management was effective because the volunteers and district health personnel were vigilant and able to prevent a patient from reaching the state of decapitation and also prevent patients from contaminating water sources.

4.3.2 Monitoring of suspected cases

The district assembly has taken steps to treat suspected cases with the same sense of emergency as confirmed cases. This is aimed at maintaining early case detection as someone would visit the person on a daily basis until the sore heals or a worm emerges. To help document this process, the district produced a suspected case form to reflect its efforts to visit each suspected case on a daily basis. An average of 7.3 was scored for the monitoring of suspected cases indicating an above average approval for the intervention. Participants explained that the monitoring of suspected cases mostly proved to prevent suspected patients from painful episodes caused by the exit of the worm and helps them to monitor and ascertain that suspected patients stay away from drinking water sources.

4.3.3 House to house health education

Participants discussed the importance of the house to house education programme and how it had exposed them to understanding the origin of the disease and the effect it had on them. It has also enlightened them on how to prevent the disease and recognize early signs of the disease. This mode of intervention scored a mean of 8.7 indicating a high approval. Arguing that the score should be higher than was given in Woribogu (8), Musah Adam, a respondent said that they previously attributed the disease to so many other causes some of which ended up harming innocent individuals and that made them search for cures in all the wrong places but ever since the education, they have been able to tackle the disease from the right direction.

4.3.4 School Health education

The school health education scored a mean score of 9.2, scoring the highest mean with 10 in four communities and a minimum score of 8. According to participant, this mode of intervention has taken major prominence because the pupils are receptive and ready to grasp change. They also mentioned that it has broadened their children's understanding of the disease and there is a huge year to year decrease in cases especially related to children.

"The children are now concerned about the source of water they drink from and they in turn educate us on the things they are taught in school"- Teni Mahama, Yizegu.

4.3.5 Filtration

The district distributed 2,683 cloth filters within the month of March to endemic and at-risk communities. Although most of the non-endemic communities appeal for provision of cloth filters, the district adheres to distribution protocol. Filtration scored a 5.4 average this is a reflection of some dissatisfaction for the intervention method. Participants complained about their inability to use the cloth filters in all situations and also that its usage slowed down work progress and was difficult to use, especially on farms. Some of the women however argued that it was the best method to disease prevention and they were comfortable using the filters.

4.3.6 Water development and boreholes

Three forms of water development projects are taking place within the district; the abate application, borehole constructions and extension of pipe-borne water to all parts of the district.

The abate system is also known as the copepod density checks which involves monitoring the amount of copepods per square meter of water in dams and dug outs to either ascertain it's usability or treat the water source. This application is however expensive and technically laborious and the district assembly believes that conducting case searches and holding health education discussions is a more appropriate use of time and resource.

Borehole provision in the district is mainly being conducted by World Vision Ghana and the Rotary club however, majority of the boreholes dug are either empty, with little water that dry up in the dry season or undrinkable due to high mineral contents. This aspect of the intervention process scored the lowest mean of 2.3 with a the lowest minimum score of one (1) and also the lowest maximum score of five (5) occurring in only one community (Gburimani). This is significant because Gburimani has an improved water system handed over to the community on the 12th of March, 2008 by the Rotary club.

Even with the average approval by the community, the participants still complained about the expensive nature of the water system. Adam Mesuna explained: *"The system is expensive; each household has to pay GHC 5.00 which is high especially since we have to go far to get the water"*. This was intercepted by Alhassan Musah who mentioned that the chief had paid the money needed and they had started pumping the water. However, Lamisi Mahami asked the other participants if they were concerned that they were supposed to pay so much money for water and still walk a distance to fetch it. She also explained that they were required to pay some other levies for diesel every two weeks to pump the water.

Other communities did not see any impact from the water development projects. Some complained that Bi-water, a water construction company, was taking too long to extent the pipe water system from Dalun to their areas. They also complained that most of the boreholes constructed by World Vision, Ghana had no water in them whiles others had little water that dried up very fast prompting them to return to their previous water sources. In Wantugu, respondents mentioned that Rotary club had provided a water system which is yielding insufficient water. In Kasuyili, participants said they had boreholes but that the water had a salty taste and therefore undrinkable.

Plate 2: Women at Kunguri walking long distances to fetch water
Source: Field survey, April 2008

4.4 TRADITIONAL BELIEFS AND TREATMENTS

Traditionally, there are numerous beliefs about the origin and causes of guinea worm disease. According to participants, it was believed to be caused by witchcraft or some other spiritual entity. Adam Lanbandoo in Wantungu pointed out that:

"We always thought that it was a disease inherited from our parents or a curse from God, look at my legs, all these scars are from that dreadful disease but I have not had any for ten years now; that is ever since we were told that it was caused by water".

The preceding paragraph amplifies the belief of many locals that guinea worm disease is inherited or a spiritual attack of some sort. They were previously oblivious of its origin but further education cleared this ignorance and most now accept that it is a water-borne disease.

With respect to traditional treatments (prophylaxis), participants informed the team that herbalists were noted to prescribe locally brewed medicines; a treatment they believed killed the worm within the body. With this form of treatment, they were barred from eating a myriad of foods including eggs.

4.5 EFFECT ON COMMUNITIES

According to respondents, the disease had a negative effect on their communities including extreme poverty because an infected person could not work, farm or go to the market for months. Fatimata Mohammed, Dingoni explained that it takes the community backward and further stating

"I had worms coming out of me every year for four years and it comes out around this time of the year (first rains). So for four years, I could not go to the farm".

According to Razak Gundadoo in Tali, *"You do not need to ask to know that guinea worm disease causes poverty. It is even difficult to walk to the toilet when you are plagued with the disease"*.

Others spoke of the manner in which innocent members of the community were attacked previously because of their previous perceptions that they were the cause of the disease. Two statements summarized participant's perception of the effect on the communities:

"The disease makes you useless and totally dependent on other family members" – Peter Alhassan, Kasuyili.

"One needs to be healthy to make ends meet. The disease is painful, especially at night and you can't sleep. You wake up in the morning weak and unable to go to the dam" – Azara Seidu, Kunguri.

4.6 COMMUNITY SUPPORT

Every community has at least two volunteers whose duty is to conduct house to house monitoring of existing and suspected cases. According to participants, the communities cooperate with the volunteers by supporting them in various ways like reporting suspected cases and helping manage cases.

Some of the participants in Tali, Woribogu and Dingoni made mention of sanctions imposed on people who are caught drinking unfiltered water and those who refuse to report cases. The chiefs and elders are also vigilant and cooperating with volunteers and the guinea worm eradication programme.

According to the Regent of Tali, *"We collaborate well with the volunteers; we filter our water and prevent people from entering the dam. We have appointed dam guards who ensure that women don't enter into the dams when fetching water".*

In reference to the dam guards, all communities visited have appointed dam guards with the main purpose of patrolling the dams very early in the morning when women go to fetch water.

4.7. BARRIERS TO ERADICATION

The following were mentioned by respondents as barriers to guinea worm eradication:

- Lack of pipe-borne water
- Lack of water in the dry season
- Imported cases; *"if there is a case in this community, then it is imported. We are very vigilant here"* – Fati Yakubu, Kunguri (community volunteer).

  "As much as we can prevent transmission in our community, other communities still have the disease and sometimes cases are imported" – Issah Seidu, Gburimani.

- Issues of entrenched traditional beliefs where majority of the inhabitants still believe that the disease is as a result of curses or retribution of some sort for a previous sin.

- Disobedient community members who refuse to follow by-laws and regulations that have been given to prevent further spread of the disease.

It can be concluded from the results presented that the communities under study, are highly aware of the causes, effects and preventive methods. This corresponds to Alyward et al, 2000, that effective preventive measures such as health education are available to prevent transmission.

It can also be extrapolated from the discussion that communities are aware of the eradication methodologies and have preferences as to which methodologies work better. Participants scored school health education highest with a mean of 9.2 out of 10 points, indicative of the general pleasure and approval with the education of Guinea Worm disease in schools. However, the provision of borehole was the least ranked with a mean score of 2.3 out of 10 points. These results may be valid in the Tolon/Kumbungu District than most endemic areas mainly because of the mineral infested taste of their ground water.

Furthermore, in communities where there are water systems, community members have expressed their inability to pay for expenses incurred in operating them.

CHAPTER FIVE

EFFECT OF GUINEA WORM DISEASE ON SCHOOL ATTENDANCE

5.1. INTRODUCTION

This chapter seeks to analyze and discuss results based on data gathered in pursuit of the achievement of objectives' one (1), three (3), four (4) and five (5) and consequently, complement results presented in chapter four (4) towards the accomplishment of the main objective of the study. The chapter is therefore divided into four (4) sub-sections; demographic and socio-economic characteristics of patients infected by Guinea Worm disease, sources of water supply in communities, Guinea Worm disease and school attendance of basic school pupils/students (with results based on objective 5 incorporated into this section) and Guinea Worm disease education and its impact.

5.2. DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS OF PATIENTS INFECTED BY GUINEA WORM DISEASE

This sub-section seeks to describe and discuss the demographic and socio-economic characteristics of patients infected by Guinea Worm disease between January and April of 2008. This component of the work is important in the sense that it deals with those infected and the characteristics of those likely to be infected based on age, sex, educational status, occupation and communities; the section also provides information on the duration of incapacity of patients. This can be integrated into the knowledge of what could happen to a basic school pupil who is infected by the disease and also support discussions on the most

likely, in terms of age group and occupation (taking schooling into account), to be infected by the disease.

5.2.1 Age and sex of patients

In all, 41 patients were interviewed comprising 28 males (68.3%) and 13 females (31.6%). Age groups (10 year intervals), distributed according to sex is presented in Table 5.1.

Table 5.1. Patient's population by age and sex

Age groups	Males		Females		Total	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
0 – 9	2	4.9	2	4.9	4	9.8
10- 19	13	31.7	5	12.2	18	43.8
20 – 29	3	7.3	1	2.4	4	9.8
30 – 39	4	9.8	3	7.3	7	17
40 – 49	3	7.3	1	2.4	4	9.8
50 – 59	2	4.9	1	2.4	3	7.3
60 +	1	2.4	0	0	1	2.4
Total	**28**	**68.3**	**13**	**31.6**	**41**	**99.9**

Source: Field survey, April 2008

The age bracket most affected by Guinea Worm disease is 10 to 19 years (43.8%), followed by the 30 to 39 age brackets (17%). The least infected age group is the 60 + group with only one recorded case representing 2.4% of cases. Smith et al (1989) has written that the disease tends to predominantly affect people of working age or school going age and this is evidential from data collected. However, the prime significance of this distribution can be drawn from Cairncross and Tayeh (1989) in noting that the prevalence of the disease can be concluded as infection associated with mobility where majority of the respondents acquire infection from water sources outside the home, whiles infection is least for those who are immobile and therefore consume water sources at home.

In terms of sex distinction, males represent a larger proportion of cases captured with 68.3% of cases, almost doubling cases recorded for females (31.6%). This distribution is supported by Adekolu-John (1983) and Nwoke (1992) who have observed this occurrence in some West African countries, yet contradicts with Jemaneh and Taticheff (1993) in their study in Ethiopia. The conclusion drawn is that the gender distribution of infected persons has more to do with behavioural risk factors such as work in the fields, as captured by Tayeh et al, 1993, and not necessarily gender. It should also be noted that based on age distribution for both sexes, children of basic school age fall under the highest percentile of infected patients.

5.2.2 Educational status of respondents by sex

Out of the 41 patients covered, 23 (56.1%) had acquired some form of education ranging from primary to senior high school education whiles 18 (43.9%) had no formal education as is displayed in Table 5.2.

Table 5.2: Educational status of respondents by sex

Education	Males		Females		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
No formal education	11	26.8	7	17.1	18	43.9
Primary	11	26.8	5	12.2	16	39
JSS/Middle	4	9.8	0	0	4	9.8
SSS	2	4.9	1	2.4	3	7.3
Total	**28**	**68.3**	**13**	**31.7**	**41**	**100**

Source: Field survey, April 2008

Deducing from the fact that most of the infected people are either uneducated or educated to the primary level, education plays a key role in the probability of an individual being infected by Guinea Worm disease. However, the fact that a high percentage of respondents had attained some education is worrisome because it is expected that they would have more knowledge on the disease and methods of prevention.

5.2.3 Occupation of respondents

The occupational status of respondents, as presented in table 5.3, is important in this survey as this is necessary in determining if the study population (pupils/students) has been covered and if Guinea Worm disease is a threat to those captured under age groups that are usually of school going age.

Table 5.3 Occupation of respondents

Occupation	Frequency	Percentage
Farmer	15	36.6
Herder	3	7.3
Housewife	1	2.4
Those of school going age but not in school	11	26.8
Student	11	26.8
Total	**41**	**99.9**

Source: Field survey, April 2008

Farmers represent the highest number of respondents with 36.6% of infection, whereas the least infected group in terms of occupation are housewives (2.4%). The distribution of disease by occupation is supported by Tayeh et al (1993) who have written that disease prevalence was less of an issue of gender and more of a matter of behavioural risk factors. It also supports earlier assertions that majority of the infections are associated with mobility rather than water

drank at home. Majority of the farmers travel long distances to their farms and therefore patronize water sources around their farm lands.

It should be emphasized that 53.6% of respondents were either students or of school going age, significantly and based on the mobility assertion, Children of school going age who do not attend school are mostly cow boys who herd cattle to far distances (especially in the dry season) to graze and drink water from available water sources and these children are most likely to drink from these same water sources.

5.2.4 Duration of incapacity due to infection

Contrary to literature on duration of incapacity of patients as is presented by Smith et al (1989), durations of incapacity are significantly lower than in studies conducted in Nigeria, table 5.4 shows that majority of the respondents (41.4%) had been incapacitated for just one day to a period of one week, whiles 29.3% had been incapacitated for more than a week yet less than two weeks. Only three of the 41 patients had been incapacitated for more than two weeks.

Table 5.4: Duration of incapacitation

Duration	Frequency	Percentage
0 days	2	4.9
1 day – 1 week	17	41.4
More than 1 week	12	29.3
More than 2 weeks	3	7.3
Don't know	7	17.1
Total	**41**	**100**

Source: Field survey, April 2008

In terms of incapacity, 4.9% of respondents said that they had not been incapacitated at all citing early detection and removal of worm coupled with disinfection of blisters by the guinea worm eradication team as reasons. Furthermore, 17.1% of respondent could not give definite answers for the question because they had either just been diagnosed or the worm had been extracted a few days before survey was conducted.

Plate 3: Sadia has been unable to attend school for the past three weeks
Source: Field Survey, April 2008

5.3 WATER SUPPLY

The source of drinking water is vital in the survey as this determines the population's vulnerability to acquiring Guinea Worm disease. It is generally accepted that the only source of acquiring Guinea Worm disease is through contaminated water since the cyclops that carries the larvae of dracunculus medinesis can only be active in water. Consequently, accessibility to source of water is equally vital because it is a major determinant of the water that is most patronized. Table 5.5 shows statistics of responses of patients concerning the various sources

of water patronised in both dry and rainy seasons whiles table 5.6 indicates distances to these sources of water.

Table 5.5: Drinking water sources in dry and rainy seasons

	Dry season		Rainy season	
Water source	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Safe water supply				
Piped water in compound	3	7.3	4	9.8
Public stand pipe	4	9.8	6	14.6
Borehole	3	7.3	6	14.6
Protected well	2	4.8	5	12.2
Unsafe water supply				
Unprotected well	4	9.8	7	17.1
River/Stream	5	12.2	7	17.1
Pond/dug out/dam	20	48.8	6	14.6
Total safe water supply	12	29.2	21	51.2
Total unsafe water supply	29	70.8	20	48.8
Total	**41**	**100**	**41**	**100**

Source: Field survey, April 2008

"Unsafe water sources" refers to sources that are prone to vector infestation, especially dracunculus medinesis Cyclops. These likely water sources have been described in chapter two (2.4) under epidemiology; Rivers and streams by Muller, 1979; Tayeh et al, 1993; ponds, dug outs, dams and unprotected wells by Edungbola, (1980, 1983); Edungbola and Watts (1984, 1985, 1990) and a host of other writers on the subject. It can be concluded from these literatures that all other water sources are safe in the context of Guinea Worm disease infection.

From the respondents answer to the question of water sources, it can be stated that during the dry season 29.2% of respondents' household patronise safe water sources; that is water from piped water either in the compounds or from public stand pipes (17.1%), boreholes (7.3%) and protected wells (4.8%) whiles 70.8% are riddled with usage of unsafe water sources (this include use of water from unprotected wells (9.8%), rivers and streams (12.2%) and ponds/dug out/dams (48.8%) .

In the rainy season, the statistics vary from that of the dry season particularly with some particular water sources. It shows that 51.2% patronize safe water sources; that is from piped water either in the compounds of from public stand pipes (24.4%), boreholes (14.6%) and protected wells (12.2%) whiles 48.8% are riddled with usage of unsafe water sources (this include use of water from unprotected wells (17.1%), rivers and streams (17.1%) and ponds/dug out/dams (14.6%) .

There is notable seasonal distinction between borehole, protected well and significantly, pond/dugout/dam usage. The distinction in high dry season patronage of pond/dugouts and dams concurs with Edungbola and Watts (1985), Kale (1977), Belcher et al (1975) and Petit et al (1989) who have written on the transmission of Guinea Worm disease within the Savannah region occurring during the dry season, and the associative suggestion by Macpherson (1981) and Chippaux et al (1992) that this dry season transmission is as a result of the consumption of water from ponds and water bodies formed in beds of seasonal rivers when the flow has ceased.

A conclusion can also be drawn from the seasonal disparity of outcomes in the use of boreholes and protected wells that these source, most likely, dry up in the dry season and later fill up with the advent of rains. This conclusion is supported by the district assembly's information on water and sanitation, that access to safe drinking water is a major problem in the dry season (see section 3.3.6 for more details).

In terms of distance to water sources, most of the households (68.2% in the dry season, and 87.8% in the rainy season) use water sources located either within their compounds or within a convenient distance from their households (less than 500 meters distance).

Table 5.6: Distance to source of drinking water in dry and rainy seasons

	Dry season		Rainy season	
Distance	**Frequency**	**Percentage**	**Frequency**	**Percentage**
In the compound	2	4.8	5	12.2
Less than 500 meters away	26	63.4	31	75.6
More than 500 meters away	12	29.3	4	9.8
Unknown	1	2.4	1	2.4
Total	**41**	**100**	**41**	**100**

Source: Field survey, April 2008

However, 29.3% of respondents patronize water sources that were more than 500 meters away from their households during the dry season whiles 9.8% for the same distances in the rainy season. This information supports previous assertions that the patronage of certain water sources had to do with the ability of the people to acquire water in them at particular times of the year.

Plate 4: Water is life: the early morning rush for water in Tali
Source: Field Survey, April 2008

One vital question asked during the survey had to do with water treatment because the treatment of water from an infested source could be the crucial distinction between being infected by Guinea Worm disease and not being infected (Aylward et al, 2000) and according to Brieger (1996), a cyclopoid is over 1 millimetre long and can therefore be easily removed by filtering.

Out of the total 41 respondents, 70.7% did not treat their drinking water and 29.3% treated their drinking water with filtering as their means of treatment. According to respondents who were not filtering, the process of filtration is time consuming and difficult to undertake.

In consonance the fact that Guinea Worm disease is a disease of poverty with poverty being defined in terms of provision of potable water (Pittock, 2006), the third proposition states that Poverty alleviation interventions will contribute to the rapid eradication of Guinea Worm disease in endemic areas. It also agrees with the conceptual framework (section 2.9) which

looks at the vicious cycle of poverty and ill-health. As was earlier stated in section 2.8, interventions are essential in a quest to break this cycle of poverty. The key contention is whether the interventions to eradicate the disease are the best suited interventions or if the best interventions will be interventions towards provision of potable water and alleviation of poverty.

Previous analysis (chapter four) sought to examine the various intervention methods being employed and their effectiveness (as assessed by the communities). It was clear that education on the disease was effective; this was further supported by 80% of the heads of schools that were interviewed (refer to section 5.5). However the main issue of contention was that of provision of potable water which some community members ranked 2.3 out of ten (10) points. The other issue expressed in this study had to do with the lack of provision of pipe borne water to residents of a district that supplies treated water to the regional capital.

The proposition can therefore be stated as true because an effectual combination of the two methods of interventions (that is disease eradication and poverty alleviation interventions) are necessary to break the vicious cycle of poverty and ill-health.

Plate 5: Guinea Worm disease volunteers disinfecting a pond in Wantugu
Source: Field Survey, April 2008

5.4 GUINEA WORM DISEASE AND SCHOOL ATTENDANCE

This subsection comprises data collected from heads of ten (10) primary and ten (10) junior high schools across the study area. Also incorporated are results from focus group discussions with students from five of the junior high schools surveyed. The subsection is in pursuit of finding out the dynamics that are integrated into understanding the effect of Guinea Worm disease on school attendance.

Plate 6: Sualisu (a research assistant) having a discussion with JHS one students of Chirifoyili R/C JHS
Source: Field Survey, April 2008

5.4.1 Primary schools

As indicated in Table 5.7, the total of 10 primary schools which were covered in the survey had a sum total of 3010 pupils. Primary one had the highest number of students, 771 (25.6%) with a mean of 77.1 pupils per school whiles primary six had the least total of 385 pupils (12.8%) with a mean of 38.5 pupils per school.

Table 5.7: Primary Schools' enrolment by class

	Frequency	Percentage (%)
Primary one	771	25.6
Primary two	506	16.8
Primary three	449	14.9
Primary four	438	14.6
Primary five	461	15.3
Primary six	385	12.8
Total	**3010**	**100**

Source: Field survey, April 2008

5.4.2 Junior High Schools

Ten Junior high schools were covered, comprising of a total of 1442 students that is 556 in JHS one, 503 in JHS two and 383 in JHS three. JHS three students were however not available during the time of survey because they were writing the Basic education certificate examination (BECE); However response from head teachers covered these students. Table 5.8 illustrates the enrolment by class.

Table 5.8: Junior High School enrolment by class

	Frequency	Percentage (%)
JHS one	556	38.6
JHS two	503	34.9
JHS three	383	26.6
Total	**1442**	**100**

Source: Field survey, April 2008

5.4.3 Impediments to school attendance

Eighteen (18) heads of schools said there were existing impediments to school attendance; they were tasked with listing three major impediments to school attendance in their schools, they mentioned several impediments including negative parental attitude to school attendance, teenage pregnancies, parents given their wards goods to send to the market on market days, distance of some of the communities to school, rains that make roads and paths to schools inaccessible and diseases (ill-health). Table 5.9 is a break down of responses by heads of schools on the subject matter.

In response to the subject of impediments, rains was mentioned by 12 (60%) of the heads as a major impediment citing that during the rainy season, most pupils/students missed school because of various reasons which include; inability to cross rivers, having to stay at home and farm or just sheer laziness. Ill-health was mentioned as a most prominent impediment with 18 (90%) of the heads mentioning two major diseases; malaria and Guinea Worm disease. Whiles some mentioned only one disease as an impediment, (that is 10% of heads mentioned only

Guinea Worm disease and 20% mentioned only malaria) 12 (60%) of the head teachers mentioned both malaria and Guinea Worm disease. The two head masters who mentioned only Guinea Worm disease were incidentally from Wantugu R/C primary and Wantugu D/A JHS indicative that a major concern in the community was that of Guinea worm incidence.

Table 5.9: Impediments faced by pupils/students in attending school

Are there impediments to school attendance?	**Frequency**	**Percentage (%)**
Yes	18	90
No	1	5
Don't Know	1	5
Total	**20**	**100**
Impediments		
Negative parental attitude to school	6	30
Teen age pregnancy	3	15
Market days	6	30
Distance to school	9	45
Disease	18	90
Rains	12	60
Total Responses	54	
Disease		
Malaria	16	80
Guinea Worm disease	14	70
Total Responses	30	

Source: Field survey, April 2008

With some students walking or travelling for a maximum distance of eleven kilometres or an average of six kilometres, distance to school plays an important role as a barrier to school attendance. For example, a student residing in Woribogu would have to travel either six kilometres to attend JHS in Tolon or 5 kilometres to attend in Nyankpala. 45 % of head

teachers noted this as a major impediment and further mentioned that a combination of distance, rains and/or disease could totally discourage students/ pupils from attending school.

Negative attitude of parents towards formal education and market days each occurred six times representing 30% of heads with one head teacher indicating that it is gradually becoming a normal phenomenon for his school to be almost empty on Kpachi market days (which occurs every six days). Finally, Teenage pregnancy was least mentioned (that is by 15% of head teachers); however this in no way under estimates the effect that these two could have on absenteeism. The Headmistress of Gbanjong D/A JHS said she could not tell if there had been any impediments in her whiles the Headmaster of Yipeligu D/A primary school said there were no impediments he knew of. Both head teachers explained further that they had just been posted to their respective schools and would therefore be speculative in their answers.

It has become clear that Guinea Worm disease does have a negative effect on school attendance of affected children. Further discussion in section 5.4.6 indicates that these negative effects transcends beyond direct infection of the pupils/students to the infection of family members this is because some of the children have to stay at home to cater for ailing siblings or parents (Smith et al, 1989), therefore proposition two (2) can be stated as true.

In discussing issues of absenteeism with Pupils/students some stated that they had to run errands at times for their parents and others (mostly girls) said they had to go to the market on market days to help their mothers sell. Majority of the boys said that they had to sometimes

(mostly in the dry season) take cattle to distant water sources and this prevented them from attending school.

5.4.4 Absenteeism from school

Section 5.4.4 described various impediments to school attendance and 14 (70%) of the head teachers mentioned Guinea Worm disease as an impediment. When asked if any case of absenteeism had occurred due to Guinea Worm disease over the past year, 85.7% of the 14 head teachers said some duration of absenteeism had occurred whiles the other 14.3% said that they had not recorded any within the past one year. This is illustrated in table 5.10

Table 5.10: Absenteeism due to Guinea Worm disease

	Frequency	Percentage (%)
Absenteeism due to Guinea Worm disease?		
Yes	12	85.7
No	2	14.3
Total	**14**	**100**
How many cases in the past one year?		
One	3	25
Two	2	16.7
Three	1	8.3
Four or more times	6	50
Total	**12**	**100**

Source: Field survey, April 2008

Concerning the number of times that absenteeism had occurred in their schools due to Guinea Worm disease in the past one year, 6 (50%) of the 12 heads said that there had been four or more times that pupils/students had been absent; these were heads of Wantugu D/A JHS, Wantugu R/C Primary, Kasuyili R/C primary, Voggu R/C JHS, Chirifoyili R/C JHS and Tali

R/C primary school. Three (3) respondents from Kumbungu E/A primary, Namdu AME Zion primary and Kasuyili Baptist JHS, representing 25% said they had recorded one case of absenteeism each in their schools whiles two Head teachers (Nyankpala D/A JHS and Tingoli D/A primary), representing 16.7% had each recorded two cases.

One head teacher from Kunguri D/A primary school had recorded three cases of absenteeism due to Guinea Worm Disease in his school. It should be emphasized that this represents cases that head teachers had recorded in schools, leaving out home cases that had not been reported to schools or teachers. During a discussion with some of the students, they mentioned that some of them hide cases from their peers and teachers in order to avoid ridicule or any form of stigmatization.

Information of infected pupils/students in the past year was easy to attain because the Guinea Worm disease volunteers had recorded every occurrence of the disease both at schools and at home. This information is illustrated in table 5.11.

Table 5.11: Age and Sex distribution of infected pupils/students

	Frequency	**Percentage (%)**
Sex		
Male	14	63.6
Female	8	36.4
Total	**22**	**100**
Age		
5 – 10	5	22.7
11 - 16	12	54.6
17 +	5	22.7
Total	**22**	**100**

Source: Field survey, April 2008

Cases recorded at schools totalled 22 pupils/students comprising 14 males and 8 females with ages ranging between 8 years and 17 years with a mean age of 11.95.

Duration of absenteeism from school was calculated in weeks (as indicated in table 5.12). Forty one percent (41%) of students infected had been absent for 7 to 9 weeks, whiles 13.6% of infected students had been absent for 10 to 12 weeks.

Table 5.12: Duration of absence due to disease

	Frequency	Percentage (%)
Duration (in weeks)		
1 – 3	7	31.8
4 – 6	3	13.6
7 – 9	9	41
10 – 12	3	13.6
Total	**22**	**100**

Source: Field survey, April 2008

Brieger et al (1989), Edungbola and Watts (1985) and numerous other writers have indicated the extensive duration of absenteeism from school as a result of Guinea Worm disease with Edungbola et al (1988) indicating that in some areas, schools close down for over a month as a result of vast absenteeism. These literary works support the information collected above however a notable data is the absence from school for up to 12 weeks, this can be interpreted that the student in question will spend the entire term at home due to Guinea Worm disease.

In section 5.2.4, the duration of incapacity due to Guinea Worm disease was captured in the study of those infected by the disease between January and April 2008, it was discovered that 29.3% of patients had been incapacitated for a period of more than one week whiles 7.3% had

been debilitated for over two weeks as a result of infection from blisters caused from the immergence of the worm.

Moreover, in section 5.4.3, Guinea Worm disease was captured as one of the major impediments to school attendance. Section 5.4.4 further captured this absenteeism due to Guinea Worm disease ranging from a minimum of one week to a maximum of 13.6% of infected students being absents form school for 10 to 12 weeks.

These results coupled with literature reviewed under section 2.6 (Socio-economic impact) prove the proposition that "Guinea Worm disease has caused extensive periods of incapacity and inactivity to its victims", to be true.

5.4.5 Absenteeism due to infection of a family member

In conformity with Ilegbode et al (1986) and Tayeh and Cairncross (1996), eighty five percent (85%) of head masters stated that the absenteeism due to Guinea Worm disease was not always entirely as a result of direct infection but as a result of infection of a family member. In discussions with students, some of them said that they had to stay at home and do household chores for their infected parents and siblings.

Fifty percent (50%) of head teachers cited that they were situations where infected pupils/students never returned to school even after recovery, however they could not specify

how many times this situation had occurred within the past one year; this could be attributed mainly to a lack of properly kept school records.

5.5 GUINEA WORM DISEASE EDUCATION AND ITS IMPACT

Education on Guinea Worm disease in schools is a vital aspect of eradicating the disease in the district and other endemic areas. As has been pointed out in many parts of this work, a well educated student/pupil has a high probability of educating members of his/her household.

5.5.1 Guinea Worm Disease Education

As illustrated in table 5.13, Ninety percent (90%) of head teachers said that their students had been educated on the disease. Out of these 90%, 72.2% had been educated by the District Guinea Worm disease volunteers, 16.7% by US Peace Corps and 11.1% by school teachers.

Table 5.13: Guinea Worm disease education

	Frequency	**Percentage (%)**
Yes	18	90
No	2	10
Total	**20**	**100**
By whom?		
Guinea worm volunteers	13	72.2
US Peace corps	3	16.7
Teachers	2	11.1
Total	**18**	**100**

Source: Field survey, April 2008

Topics taught are important to ascertain the impact of the education. Prevention was prominent, representing 32.6% followed by causes of disease with 18.6%. The least taught

topics are physical signs of the disease and impact of disease, each mentioned by 4.7% of respondents.

Pupils/students mentioned that the education on Guinea Worm disease was being done on a regular basis. They mentioned that they had been taught on the disease by their science teachers, head teachers, class teachers and occasionally, by volunteers and Peace Corps personnel who visit them from time to time.

5.5.2 Impact of education

The reason for measuring the impact of education on Guinea Worm disease (as perceived by the head teachers) is important. This is drawn from the results of ranking and scoring of intervention methodologies in chapter 4 where School health education was ranked the highest.

Out of the 20 heads of schools surveyed, table 5.14 points to 80% concurring to the fact that education was making an impact, whiles 15% had no idea if it was making an impact or not. However another 5% said that the process had no impact on the students and the eradication process for that matter.

Out of the 80%, 37.5% said it had reduced incidence, 31.3% said it had improved vigilance of students, 25% mentioned that it had improved understanding of the disease among students and 6.3% said that students now knew how to prevent occurrence of the disease.

Table 5.14: Impact of education on Guinea Worm disease in schools

	Frequency	Percentage (%)
Is education making any impact?		
Yes	16	80
No	1	5
Don't know	3	15
Total	**20**	**100**
If "yes" what impact is it making?		
Reduced incidence	6	37.5
Improved Vigilance	5	31.3
Improved Knowledge	4	25
Know how to prevent disease	1	6.3
Total	**16**	**100**

Source: Field survey, April 2008

Pupils/students expressed that the education was making a positive impact because they previously had no formal (scientific) understanding of the disease and therefore depended on what their parents had taught them. However, they now understand the causes, origin and science of the disease and moreover, now know how to prevent themselves and family members from acquiring it. Some pupils/students said that they were able to carry what they had been taught home to educate their parents and family members.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 SUMMARY OF FINDINGS

The study was conducted to ascertain the effect of Guinea Worm disease as a major deterrent to productivity (measured in terms of school attendance) in endemic areas with absenteeism from school as a primary indicator. Specifically to describe the demographic and socio-economic characteristics of patients infected by Guinea Worm disease between January and April 2008, in terms of age, sex, educational background and occupation, examine community members' perception of Guinea Worm disease, its effect(s) and opinions on current the eradication methodologies being employed,

In addition, the study sought to investigate the major and minor sources of water supply in the study communities, examine the effect of Guinea Worm disease on school attendance of basic school pupils/students, to examine the proportion of infected persons (across the district) that are of school going age and to suggest recommendations that are both workable and result oriented for the total eradication of the disease. Methodologies employed include use of primary and secondary data with primary data comprising use of semi-structured questionnaires, focus group discussions and PRA tools.

Findings of the study revealed that Guinea Worm disease is still a problem in the district and has had a negative effect on the school attendance. It also reveals that majority of those infected are within school going age (10 to 19 years) and that students/pupils are absent from school due to direct infection or infection of a relative. More so, 50% of school head teachers surveyed revealed that a number of pupils/students never returned to school after they had been infected by the disease.

Education on the disease is being carried out from house to house and in schools. Ninety percent (90%) of schools surveyed had been educated on the disease by Guinea Worm volunteers, US Peace corps or teachers, touching on all possible topics that would influence a change of attitude that is much needed to eradicate Guinea Worm disease.

Wantugu had the highest record of cases within the first quarter of 2008 registering almost half of the cases within this period. Various reasons come into play to facilitate this outcome; these include the large and scattered nature of the community rendering it difficult to monitor infections, community members' irritation to being criticized for not supporting the eradication process, the central nature of Wantugu which serves as a major market centre for other communities therefore rendering it vulnerable to the importation of cases from other communities and finally, the distance of water development projects from the centre of town.

There is adequate knowledge of the disease resulting from continuous education by the Guinea Worm eradication programme at schools and from house to house. Other interventions are

being carried out. However the biggest barrier to total eradication remains the absence of potable drinking water, especially in the dry season, constituting a form of poverty. With respect to water supply, the study reveals that borehole provision is not the best solution to prevent the disease as most residents refuse to patronize boreholes maintaining that the water is either salty, undrinkable for no stated reason or dry for most of the year.

There is a greater truth to the issue of water supply which most water resource experts refer to as "the economics of water". Most water supply systems in Africa have either been privatized or placed under the management of private organizations seeking to maximize profit. Ghana lies in the second group with the water system being managed by Aqua Vitans Rand, a private company. Due to the company's profit oriented nature, it would be agreed by any economist or financial expert that it is "corporate suicide" to spend its capital in developing a water system for rural folk who would be unable to pay for the services at a profitable rate.

This situation is best exemplified in the Tolon/Kumbungu District which is home to a large portion of the White Volta. Pipe-borne water is pumped at Nawuni and treated at Dalun (both in the district) and served to the Tamale metropolis. Currently the only portion of the Tolon/Kumbungu District benefitting from this supply are communities along the pipeline to Tamale metropolis; a case of the poor being deprived by capitalism.

Traditional beliefs with regards to Guinea Worm disease is rapidly losing its grip on residents as most of them have been able to compare the traditional explanation of its origin (witches

and spiritual attacks) to what the educators have told them and have accepted that Guinea Worm disease cannot originate from a source other than water.

6.2 CONCLUSIONS

It can be concluded that even though the number of cases of Guinea Worm infections have reduced in the Tolon/Kumbungu District within the past years, there is still a need to closely monitor the currently existing cases.

The period of incapacity due to Guinea Worm disease has been shortened by the early detection and application of disinfectants. However, it has not improved school attendance of infected children, much of the development can be noticed in number of days of absence from school due to the disease has been drastically reduced. Absence from school is a critical issue especially in communities where education is not a priority as after a few weeks of absence, previously enthusiastic children might not be interested in returning to school and no one to encourage them.

Moreover, the study was meant to use the situation of school attendance in an attempt to generalize the result to cover all socio-economic activities of the district. This being said, the period of the year where most worms emerge is within the farming season. An infected farmer may be unable to sow seed rendering the household insecure with regards to nutrition or impoverished (if produce were meant to be sold). The other alternative would be to ask family

members (including those of school going age) to help in farming this thereby leads to absenteeism due to indirect infection.

Furthermore, there is no evidence that the district has benefitted from any direct poverty alleviation programmes excluding those that have been carried out by non governmental organisations. This poses numerous difficulties in the eradication of a disease that can be directly related to poverty. The major issue of water supply is more of a political blueprint than a reality. This is because there has been no extensive (scientific) investigation and testing of water sources in the district and this has repeatedly yielded the same results when boreholes are drilled.

Finally, World Vision International and a host of NGOs and donor agencies must be commended for their continuous activities at providing potable water for the residents of the district not withstanding the meagre support they are receiving from ministries, departments and agencies associated with rural water supply.

6.3 RECOMMENDATIONS

Based on the results of the survey, various recommendations have been derived for the numerous organizations and agencies involved one way or the other in the Guinea Worm disease eradication process.

6.3.1 Recommendations to the Tolon/Kumbungu District Assembly

There is a dire need for the Guinea Worm containment centres to be properly equipped with both facilities and personnel. The currently existing facilities are white elephants with hardly any personnel to attend to patients. This is exemplified in Wantungu where during the survey; it took the researcher two weeks of daily visits to meet any personnel.

Future district planning should incorporate a Guinea Worm centre that would give a complete history of the eradication process. These centres would be valuable resource centre for future reference to researchers and planners.

6.3.2 Recommendations to Ministries of Health, Education and Ghana Education Service

The Ministry of Health has been effective in the eradication process through its District health office, yet it must be mentioned that information on Guinea Worm disease is lacking to researchers without whom the eradication process remains a mere wish. Furthermore, the ministry has not highlighted Guinea Worm disease among its priority diseases on its website (www.moh.gov); this gives a notion that the eradication of Guinea Worm disease is not a political priority but is being talked about because the carter centre has taken particular interest in the disease. Finally, the ministry should develop a research support department that would support researchers in all its priority diseases financially, materially and with personnel.

The Ministry of Education and the Ghana Health Service needs to develop a comprehensive data system that gives information on its schools, their location and socio-demographics. More so, it is essential that the MOE/GES train some teachers in disease endemic areas to effectively

educate students/pupils on Guinea Worm disease and for education on Guinea Worm disease, malaria and malnutrition to be incorporated into the curricula of districts noted to be endemic. Finally, there is a need to understand the effect of the disease on school attendance so as to assist infected students/pupils through the disease and ensure they return to school as soon as is medically possible.

There is a need for effective collaboration between the various ministries in the eradication process in order to achieve fervent results. This is important so that none of the ministries replicate the work of another.

6.3.3 Recommendations to Non-Governmental Organizations

Most NGOs working to eradicate Guinea Worm disease have repeatedly concentrated on eradicating Guinea Worm disease as a medical problem yet there is a need to appreciate the fact that the reason for the existence of Guinea Worm disease is because of the inability of rural folk to access potable drinking water and this is also as a result of their perceived inability to pay for the resource. Non governmental organisations working in this field within the district therefore need to understand that amongst other things, their vital aim should be to alleviate poverty. They should concentrate on efficient poverty alleviation programmes/projects that would raise the living standard of residents.

Non-governmental organisations should liaise more with other organisations working towards Guinea Worm eradication and provision of potable water to develop a water research unit that

would research into understanding the mineral and soil components of the district and how the problem of high mineral content could be arrested for good.

Mr. Adam Weiss and the Carter Centre, like all organisations working in the district should be commended for their efforts but it is important that extreme monitoring should be continued especially at this critical period where incidence has reduced drastically. Profound, precise and unvarying scrutiny needs to be carried out now more than ever. It is not the time for anyone to rest their oars in premature celebration of success but a time to guardedly end this painful, sordid and debasing disease for good.

6.3.4 Recommendations to other researchers

More research needs to be carried out to ascertain if there any possible life long effects of the disease on those infected, if there are any variations of the worm yet undiscovered and if the eradication processes employed in the case of Guinea Worm disease could be replicated on other eradicable diseases.

As should be the case of research on other disease, researchers intending to undertake further studies on Guinea Worm disease should collaborate with researchers from other fields to develop comprehensive results. Doctors and other medical personnel should involve social scientists especially medical geographers and medical sociologists in social surveys and vice versa.

APPENDIX ONE

PATIENTS SURVEY QUESTIONNAIRE

Questionnaire Number…….

Date of Interview: …….

Name of Household: ……..

Module 1: Socio-demographic characteristics

Name	Sex	Age	Education	Occupation	Religion	Ethnicity	Marital status

Codes

Education	Occupation	Religion	Ethnicity	Marital status
1. No formal education 2. Primary 3. JSS/middle 4. SSS 5. Tertiary 6. Islamic	1. House wife 2. Sheabutter/gnut oil extraction 3. Charcoal processing 4. Cooked food seller 5. Petty trading 6. Seamstress 7. Pito brewing 8. Mechanic 9. Bicycle repairer 10. Farmer 11. Salaried worker 12. House wife 13. Other (specify)	1. Islam 2. Christianity 3. Traditional 4. Other (specify)	1. Dagomba 2. Gonja 3. Bato 4. Fulani 5. Other (specify)	1. Married 2. Divorced 3. Seperated 4. Single 5. Widowed

Module 2: Guinea Wormdisease statistics and containment

1. Is this the first time you have been infected by the disease?	1.Yes 2. No 3. Don't know
2. If no, how many times have you been infected?	1. Once 2. Less than five 3. More than five
3. Did you reside in any community in the last one year?	1. Yes 2. No 3. Cant remember
4. If no, where were you?	……
5. How long were you in location stated in 4?	1. A month 2. Three months 3. More than six months
6. When was current case first detected?	……
7. Did you report case to anyone?	1. Yes 2. No 3. Don't Know
8. If yes, who?	……..
9. What was done?	

Module 3: Water and sanitation

1. Where do you fetch drinking water for your household in the dry season	1. Piped water in compound 2. Public stand pipe 3. Borehole 4. Protected well 5. Unprotected well 6. Pond/dugout/dam 7. River/stream 8. Other (specify)…….
2. What is the distance to this source of Drinking water	1. In the compound 2. Less than 500 meters 3. More than 500 meters 4. Don't know
3. Where do you fetch drinking water for your household in the rainy season	1. Piped water in compound 2. Public stand pipe 3. Borehole 4. Protected well 5. Unprotected well 6. Pond/dugout/dam 7. River/stream 8. Other (specify)…….
4. What is the distance to this source of Drinking water	1. In the compound 2. Less than 500 meters 3. More than 500 meters 4. Don't know
5. Do you treat the water before drinking?	1. Yes 2. No
6. How do you treat the water before drinking?	1. Boiling 2. Use of Alum 3. Filtering 4. Other (specify)…….

APPENDIX TWO

SCHOOLS SURVEY QUESTIONNAIRE FOR HEADTEACHERS

Name of school: ……...

Position of Respondent: **Location of school:**

Data of enumeration: **Date of Data entry:**

ATTENDANCE INFORMATION

1) Number of pupils in school

Boys: ……

Girls: ……

2) Number of pupils per class room

Primary one: …….. JHS one: ……

Primary two: …….. JHS two: ……..

Primary three: …….. JHS three: ……

Primary four: ……..

Primary five: …….

Primary six: …….

3) What is the farthest community/village pupils attend the school from

---

4) How far is this? _____(*in KM)*

5) **Are there any impediments faced by your pupils in attending school?**
Yes (go *to 6)*
No (*skip to 7)*
Don't know (*skip to 7)*

6) **List three major impediments**
_____
_____
_____

7) **If disease is mentioned in 6, please state which disease**
_____
_____
_____

GUINEA WORM DISEASE INFORMATION

8) Have you recorded any cases of absenteeism due to Guinea Worm disease?
Yes *(go to next)*
No *(skip to 11)*
Don't know *(skip to 11)*

9) **How many cases have been recorded over the past year?**
_____

10) Fill in the information needed below

Pupil's number	**Sex (M/F)**	**Age**	**Duration of absence (In weeks)**
1			
2			
3			
4			
5			

11) **Are there any cases of absenteeism that are not due to direct Guinea Worminfection but due to infection of relative/s?**
Yes
No
Don't know

12) **Have you had any situation where the infected pupil never returned to school?**
Yes, *(go to next)*
No, *(skip to 14)*
Don't know *(skip to 14)*

13) **How many within the past one year?** _____

GUINEA WORM EDUCATION

14) **Are the pupils educated on Guinea Worm disease?**
Yes *(go to 15)*
No *(skip to 19)*
Don't know

15) **By whom?** _____

16) **What are they taught?**
_____
_
_____
_
_____
_
_____
_
_____
_

17) **Is the education making any impact?**
Yes *(go to next)*
No *(skip to 19)*
Don't Know

18) **What impact has it had on the pupils?**

_____
_____
_____
_____
_____

19) **If No, Why not?**

_____
_____
_____
_____

APPENDIX THREE

CHECKLIST FOR COMMUNITY FOCUS GROUP DISCUSSIONS

1) Have you heard of Guinea Worm disease (Nyerifu)?
2) What is it?
3) What are the causes of this disease?
4) How does the disease affect you as individuals and the community as a whole?
5) What are community members doing to prevent its occurrence?
6) What are your barriers in preventing the disease?
7) Are there any traditional treatments for Guinea Worm disease?
8) Have you had any support/ interventions from other groups and institutions?
9) How effective are these interventions?
10) List institutions and support given, and allow for rating and assessment by group (10 stone scoring and ranking).
11) How important is the eradication of Guinea Worm disease to your community?

Guided walks will be carried out to observe sources of drinking water, health facilities, schools and settlement patterns and also to observe methods applied to decontaminate drinking water.

APPENDIX FOUR

CHECKLIST FOR SCHOOLS FOCUS GROUP DISCUSSIONS

1. Have you heard of Guinea Worm disease?
2. What have you heard?
3. Where did you hear about it from?
4. What are the causes of this disease?
5. How does the disease affect you as students?
6. What are you doing to prevent the disease?
7. What barriers do you face in preventing the disease
8. Do you think it is important to prevent the disease?

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