THE SPATIO-TEMPORAL PATTERNS OF GUINEA WORM DISEASE IN THE WA AREA OF THE UPPER WEST REGION, GHANA

BY

ALFRED KPIETA BAIRENYUUR

A THESIS SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY AND RESOURCE DEVELOPMENT, UNIVERSITY OF GHANA, LEGON, IN PART FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PHILOSOPHY (M.PHIL) DEGREE

AUGUST, 2006
DECLARATION

I, KPIETA ALFRED BAIRENYUUR, the author of this thesis titled “THE SPATIO-TEMPORAL PATTERNS OF GUINEA WORM DISEASE IN THE WA AREA OF THE UPPER WEST REGION GHANA,” do hereby declare that this thesis work was produced solely by myself in the Department of Geography and Resource Development, University of Ghana, Legon. I therefore accept all responsibility that may arise from this work.

Kpieta Alfred Bairenyuur
(Student)

Dr. Samuel Agyei-Mensah
(Dr. Mariama Awumbila
(Major Supervisor) (Co-Supervisor)
DEDICATION

This Thesis is dedicated to my wife Mrs. Freda Kpieta, to my children; Salome Kpieta, Jesse Kpieta, Japheth Kpieta and Shema Kpieta. I appreciate you for the sacrifices that you have made for me to go through this Programme.
I am thankful to God for His Grace and protection throughout the course. I wish to sincerely thank my Supervisors, Dr. Samuel Adjei-Mensah and Dr. Mariama Awumbila for their untiring efforts and commitment to ensure that this work is in shape. Without your sacrifice of time, and the advice, direction and encouragement, this work would not have been possible. I would wish to thank all the Lecturers of the Geography and Resource Development Department, University of Ghana Legon for their contribution in divers’ ways. Their inputs, criticism and encouragement are duly acknowledged. I am particularly thankful to the Head of Department, Prof. A. B. Aseidu and Dr. E. M. Attua for your kindness and support. I also appreciate the Dean of Graduate students Prof. Jacob Songsore for your support.

My appreciation to the University for Development Studies for granting me study leave to pursue this course in Legon. Special thanks go to the Vice Chancellor and the Pro-Vice Chancellor, and the Dean of Students Rev. Prof. Saa Dittoh, for their fatherly care. Special thanks to Dr. Andrews Korkor, the National Coordinator of the Ghana Guinea Worm Eradication Programme and Dr Daniel Yayemain the Regional Public Health Director Upper West Region, for readily providing vital information for the work.

I am grateful to Reverend Estwood Anaba the Charmin of International Presbytery, Fountain Gate Chapel, Reverend Clement Anchebah Head Pastor Fountain Gate Chapel Accra, for their support. And to Rev Cornelius Yakung and wife, Mr. and Mrs. Richard Dery, your love and support to me was great.
The study examines the spatio-temporal patterns of the guinea worm disease in the Wa Area of the Upper West Region. Guinea Worm Disease is the largest parasitic disease to have plagued people worldwide. Humans become infected with the disease by drinking contaminated water containing Copepods, which are infected with larvae of Dracunculiasis. The research tools used are key informant interview, focus group discussions, semi-structured interview and observation. The survey has established significant findings. First, the spatial variation of the guinea worm disease shows Wa East to be suffering the greatest disease burden than Wa West and Wa Municipal. The disease burden on endemic villages does not depend on the absence of boreholes; the study found out that provision of adequate boreholes in the guinea worm endemic areas might not lead to the eradication of the disease in the area. The survival and spread of the disease is due to the belief systems of the people where they attribute the cause of the disease to unseen forces, and their refusal to adapt to drinking borehole water or filtering unsafe water. Secondly, the most afflicted age group with the disease is the school going age of 6-15, followed by the productive age group of 16-40 year group. This is as a result of their risky behaviors that expose them to the disease infection. Thirdly, the effect of guinea worm disease has been severe on household food production. It affects individual and household incomes. Development is affected in these areas, as formal workers refuse posting to work there. Health education in the area aimed at eradicating the disease should be focus on the belief systems of the people. The study recommends a further survey in the belief systems of residents of the study area; the findings may promote the eradication of the guinea worm disease.
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<th>104</th>
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<td>98</td>
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DEFINITION OF TERMS

Some of the terms used in the thesis presentation are defined according to the Ghana Health Service Guinea Worm Eradication Programme definitions.

IMPORTED CASE

A case of Guinea worm disease that was acquired in a place other than the village where it was detected and reported.

ENDEMIC VILLAGE

A village with one or more active indigenous cases during the previous and/or current calendar year.

REINFECTED VILLAGE

A previously endemic village that reported indigenous cases after at least one calendar year of zero reporting and where interventions need to be reinstated.

NEW ENDEMIC VILLAGE

A village that appeared on the list of endemic villages for the first time since records were kept, where intervention and surveillance activities need to be initiated.

AT RISK VILLAGE

A village is considered as a at risk of local transmission of Guinea worm if at least two of the following factors are associated:

- Past history of endemic transmission of Guinea worm disease.
- Absence of safe drinking water and located close to endemic villages.
- Share unsafe source of drinking water with neighbouring endemic village.
- Established degree of links/movement of population with endemic villages/areas.
A village is considered highly endemic with ingenuous guinea worm cases that kept increasing yearly.
CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND
Dracunculiasis, (less commonly, dracuntiasis) is popularly called the Guinea Worm Disease; it is also called the “Fiery Serpent, Medina Worm, and Pragon Worm”. It is described ‘end-of-the road” disease because it is not seen in big cities. The scientific name of dracunculiasis is *Dracunculus medinensis*; it is the largest parasite or disease burden to have plagued people worldwide. From the early seventeenth century, European travelers along the coast of West Africa recorded seeing many victims of the disease, hence the name guinea worm (Hunter, 1996).

Dracunculiasis is a 3000 year-old parasitic disease endemic in remote regions of the world’s least developed countries. Dracunculiasis is mentioned in the Ebers Papyrus, which goes back to around 1550 BC. The disease has been around for centuries, calcified guinea worms have been discovered in 3000 year-old Egyptian mummies. Egyptian priest regarded the infection in those days as an important clinical entity and even physicians during the Greek and Roman era were familiar with it. Philosopher Abu Ali Ibn Sina known in the West as Avicena gave a detailed description of the disease (in the 11th century), its treatment, evolution and complications caused by the worm being ruptured during extraction. It was in 1870 that Alekei P. Fedchenko (a Russian) established the life cycle of dracunculus medinensis and identified the Cyclops as it intermediate host. However, it is believed that Linnaeus first detected the disease in 1758 and later by Gallandant in 1773 (Fedchenko, 1971; Hunter, 1996).
By the end of the nineteenth century, the scientific world had become well aware of how the disease was transmitted and had started to advocate suitable eradication measures of the disease.

Humans become infected with the guinea worm by drinking untreated or unfiltered water containing copepods (small crustaceans), which are infected with larvae of *Dracunculus medinensis*. According to an estimate made in 1947, about 48 million people were living in different endemic countries of which India alone accounted for 25 million. In the 1970’s, 1980’s and 1990’s the disease was eradicated from many endemic areas in different countries including India. The geographical extent of the disease considerably shrank during the first half of the 20th Century largely due to the supply of good drinking water (Carter Center, 2005).

Due to the simple life cycle of dracunculiasis, and the apparent lack of animal reservoir, the eradication of the guinea worm seems feasible. The recently concluded water decade, officially known as the United Nations International Drinking Water Supply and Sanitation Decade (1981-1991), has created a high level of public awareness of dracunculiasis. The decade has also seen the launching of a strong international concerted effort to eliminate dracunculiasis as a biological entity. In 1986 the World Health Organization declared dracunculiasis the next infectious disease to be eradicated after Small Pox. (Cook G.C.1996). The World Health Assembly then adopted a resolution (WHA 44.5 May1991) to eradicate dracunculiasis by 1995, (James, 2000).
Currently, many organizations including United Nations Children's Fund (UNICEF), the World Health Organizations (WHO), and Center for Disease Control (CDC) Atlanta, Carter Presidential Center and the United States Peace Corps are helping the governments of countries where Guinea Worm is found, to eliminate the disease worldwide. Since 1986, when an estimated 3.5 million people were infested, the international campaign has eliminated much of the disease and prevented millions of cases. In 1995, the total number of infested people worldwide had dropped to about 130,000, less than 4% of the total in 1986. Globally, the Carter Centre has seen the recorded number of the disease drop from 3.5 million to 32,193 as at 2003.

The Guinea Worm Disease has been reduced or eradicated in many parts of the world. The disease was eradicated in the Soviet Union in the 1930s, Iran in the 1970s and reduced in India and Pakistan in the 1980s. The disease is now prevalent in 12 countries in Sub-Saharan Africa. As at the end of 2004, the total infections of the disease reported in these countries were 16,026 cases. The distribution of the reported cases of the disease by countries is indicated in Figure 1.1: Ghana (7,275); Sudan (7,266); Nigeria (375); Togo (278); Niger (240); Burkina Faso (60); Ivory Coast (21); Ethiopia (17); Benin (3); Mauritania (3).

Currently Ghana is the most endemic country in the world; it bears the heaviest burden of the disease, accounting for approximately 45 percent of the worldwide cases. As at now, Ghana records 60% of the 4,189 indigenous Guinea Worm cases reported globally, followed by the war-torn Sudan, Nigeria, and Mali.
The most endemic districts of the Guinea Worm Disease are in the Northern Region, Brong Ahafo Region, Volta Region and Upper West Region. Northern Region is still the epicentre of the disease; accounting for 80% of the 2,659 cases reported so far in the country as at July this year (2005). The Tolon/Kumbungu District recorded 728 cases of the disease making it the most endemic district in the country; and Diare in Savelgu/Nanton district recording 68 reported cases of the disease, thus, the most endemic community of 8,000 populations in Ghana.
Reported cases of Guinea Worm Disease in the Upper West Region as at December 2005 were 320 cases. In the Upper West Region, the Wa area is the only endemic area in the region. According to Dr Daniel Yayemain, (Regional Public Health Director, UWR), the disease is controlled in all the other districts in the Upper West Region except the Wa area where there is increasing incidence of the disease.

The purpose of this thesis therefore is to examine the nature of the Guinea Worm Disease, its transmission, spread, persistence, and spatial variation/patterns in the light of a wide range of social, environmental, and ecological circumstances in the Wa area.

1.2 PROBLEM STATEMENT

In 1989, the Ghana Health Service in partnership with the Carter Center (USA) and other International Organizations began the Ghana Guinea Worm Eradication Programme (GGWEP) in Ghana. Much has been achieved in the country since the implementation of the programme; the reported cases of the disease decreased by 96 percent from 179,556 cases in 1989 to 7,275 cases in 2004. In the Upper West Region alone, the Ghana Health Service recorded 3,174 Guinea Worm cases in 1989. By the end of 1999, the number of reported cases dropped to 69. This was achieved through health educational campaigns; the distribution of nylon household filters and pipe filters to strain out water fleas with infected larvae; safe monthly treatment of stagnant water sources with Abate Larvicide; and direct advocacy through Village Volunteers.
However, cases of the Guinea Worm Disease started increasing from the year 2000 in the region and the Wa area in particular despite all efforts to control or eradicate the disease. In 2001, reported cases of the disease increased to 152, and by the end of 2005, 320 cases were reported in the region. The Wa area alone accounts for 90.6 percent of the disease burden, recording 290 cases in 2005. The remaining 9.4 percent reported cases from Jirapa, Lawra and Nadowli Districts were all imported cases either from the Wa area and or the Brong Ahafo Region. There are 11 Guinea Worm endemic communities in the Wa area (GGWEP, Wa 2005). Despite all the efforts to control or eradicate the disease there are still increasing trends in the number of infected persons in the Wa area. What are the causes of this increase in the incidence of the Guinea Worm Disease in the Wa area?

The Wa area is both urban and rural, with over 90 percent of the population living in the rural areas and engaged in subsistent agricultural activities – crop and livestock production. The spatial pattern of the district indicates geographical variation with some locations having large tracks of virgin/fertile lands for agricultural activities. According to Edungbola (1980), rural people use water for a wide variety of purposes from any water sources. The most prominent uses of the water being drinking, bathing and swimming. These activities increase the potential for direct transmission and infection of the Guinea Worm Disease.

There have been a constant surveillance and case search in the study area and the region as a whole, but a holistic study of the Wa area on the spatial variation, the trend of the disease and the factors accounting for the peaking of the disease may contribute
significantly to knowledge and eradication of the disease. Similar study was conducted by Akwasi (1998), but his study was limited to only the Brong Ahafo Region. He looked into the spread and effects of the guinea worm disease in the Brong Ahafo Region. However, because of the geographical and climatic differences in the study areas, it’s imperative for this study to be conducted in the Wa area.

The study will therefore seek to find out what is peculiar about the Wa area, thus, making it difficult for the disease to be controlled despite the GWEP interventions in the area. The research work will seek to answer the following questions:

1. What is the spatial distribution of the disease in the Wa area?
2. What are the factors responsible for the spatial patterns of the spread of dracunculiasis in the Wa area?
3. How does dracunculiasis affect the socio-economic activities of people living in endemic areas?
4. Are there some challenges in the implementation of the Guinea Worm Eradication Programme in the Wa area?

1.3 RESEARCH OBJECTIVES:

This research study examines the spatial patterns of the disease and factors affecting its spread.

The specific objectives are:

1. To identify the spatio-temporal distribution of the disease of the guinea worm disease in Wa area.
2. To identify the factors influencing the observed patterns.

3. To identify and discuss the socio-economic effects of the disease on persons living in endemic areas in the Wa area.

4. To examine the challenges of the Guinea Worm Eradication Programme implementation in the Wa area, and suggest recommendations for curbing the disease.

1.4 JUSTIFICATION OF THE STUDY

The eradication of Guinea Worm Disease in the Wa area is of significance to the complete eradication of the disease in the entire Upper West Region and Ghana as a whole. Because of the mobility of persons within the district and the entire region, other districts in the region could be re-infected with the disease if the disease is not completely eradicated.

Also, eradicating guinea worm completely will lead to increase agricultural productivity, thus, improving the well being of the people living in these endemic communities. The agricultural sector, which is basically a rural activity, has employed over 80% of the Ghanaian population; it feeds the urban dwellers and also contributes to the total Gross Domestic Product of about 39.8%. Thus, the results of the study may contribute immensely to the Guinea Worm Eradication Programme.
1.5 PROPOSITIONS:

The following propositions are formulated for examination:

1. Provision of adequate boreholes for residents of guinea worm endemic communities in Wa area will facilitate the early eradication of the disease in the area.

2. Internal mobility and interaction of people in guinea worm endemic areas in Wa area influences the spread of the disease in the area.

3. The belief system of residents of the guinea worm disease endemic communities in the Wa area are hindering the progress of eradication of the disease in the area.

1.6.0 THE STUDY AREA

The Study Area includes the Wa East, Wa West, and Wa Municipality of the Upper West Region. This area constitutes the old Wa District of the Upper West Region. Figure 1.2 shows the location of the study area. The Map shows the Wa area in the context of the Upper West Region and the National Map.

1.6.1 THE WA AREA IN CONTEXT

The Wa area, which forms the study area covers the southwestern parts of the region, stretching from longitude 1° 40’N and to 2° 45’N and from latitudes 9° 32’W to 10° 20’W, thus covering an area of approximately 5,899.30 square kilometers. This area is about 32% and 2.56% of the Upper West region and the nation respectively. The area shares boundaries with the Northern Region and Nadowli district to the south and North-East respectively, and to the West with Burkina Faso.(Wa District Profile, 2004).
1.6.2 DRAINAGE AND TOPOGRAPHY

The Wa area is not well drained; no major rivers are found in the area except the intermittent tributaries of the Black Volta River. In the long dry season, these tributaries dry up leaving the area with no surface water catchments for domestic and agricultural purposes. The valleys of these tributaries are however suitable for the development of small-scale irrigation dams and dugouts for dry season gardening, fishing and watering of animals (especially cattle). Topographically, the landscape of the district is generally flat and low-lying with average height of between 180 meters and 300 meters above sea level.

1.6.3 SOIL

The soil of the area is mainly sandy loam with underlying hard iron pans, granite and metamorphic rocks. There are few strips of alluvial soil along the dry valleys of the tributaries of the Black Volta suitable for rice cultivation. The sandy loam is susceptible to severe sheet and gully erosion, caused by surface run-off during the peak of the wet season. The wide spread erosion adversely affects not only fertility of the soil but also causes silting of the few small-scale dams and dugouts in the area. Generally, the sandy loam is very fertile and enhances large-scale cultivation of groundnuts and cowpea, which the area is a net exporter. Areas where large tracks of fertile soil abound are the Wa East and West areas.
1.6.4 CLIMATE AND VEGETATION:

The district falls in the Guinea Savanna Climatic Zone and experiences a single season of rainfall and a long dry spell. The rainy season starts from June to September giving way to the dry season from October/November to May. The rainfall distribution varies from year to year sometimes with intermittent droughts and floods mostly peaking in September. Generally, the rainfall ranges between 900-1400mm per annum. Day and night temperatures range from 18°c – 40°c. During the dry harmattan, the humidity is so low that the rate of evapo-transpiration is high, favoured by the dry winds. During this period of extremely warm weather, deaths caused by outbreaks of Cerebro-Spinal Meningitis (CSM) and other diseases are common in the districts.

The vegetation of the districts is Guinea Savannah woodland with light under growth and scattered trees. The major and economic trees are Shea, Dawadawa, and Baobab. Kapok, Cashew and Mango are exotic species; growing well in the area. Human activities such as bush burning, tree felling for fuel, inappropriate agricultural practices, contribute immensely to the destruction of the vegetation and consequently the environment. The savannah vegetation consisting of short trees and grasses constitute the critical element of the natural environment in the districts. Over the years, however, over reliance on fuel wood for cooking and Pito brewing (local beer) on the one hand, annual bush fires, road construction and inappropriate farming practices on the other have degraded the environment.
1.6.5 DEMOGRAPHIC CHARACTERISTICS: POPULATION SIZE

The 2000 National Population and Housing Census results put the population of the Wa area at 224,066, with a population density of 30 persons per square kilometres, which is higher than the regional average of 24 per square kilometres. There has been a marked concentration of people within the Wa Township, and to some extent, in the western part of the study area. The southeastern part, which is incidentally endowed with fertile soil for farming purposes, is sparsely populated. Wa is the only urban centre with a population of 66,648 persons, that is 30% of the population as against 70% rural (157,257 persons). Most of the communities are small and dispersed with population sizes ranging between 500 and 2000 people.

The young population (0-14 years) constitutes approximately 47% of the total population, while the aged (65 years and above) constitutes 4.3%. The economically active population (15-64 age groups) accounts for 48.7% of the population. The three main tribes in the Wa area include the Wala, Dagaaba and the Sissala. Other minority tribes are the Lobis and Chakali.

1.6.6 ECONOMIC ACTIVITIES

Agriculture remains the major economic activity in the Wa area. About 90% of the people are engaged in crop and animal farming, with occasional fishing in a few communities where there are dams and rivers. Much of this agriculture is subsistence in nature, with few instances of large scale farming in the eastern and western parts of the
study area. Cereals, legumes, tubers and vegetables are the main crops cultivated in the districts. Cash crops cultivated are cotton and groundnut. Cattle, sheep, goats, pigs and poultry are the livestock that are indigenous to the Wa area with a few introductions of exotic breeds for cross breeding.

Marketing of agricultural produce is done in a number of major and minor markets in the study area. The major markets are located in Wa, Funi, Wechiau and Dorimon. Other minor economic activities include pito brewing, chop bar operation, petty trading, shop keeping and dawadawa processing. Most of the business activities are concentrated in Wa town (Wa District Profile, 2004).

1.6.7 HEALTH AND EDUCATION

For the purpose of health services delivery, the Wa area has been divided into 14 Sub-Districts by the Regional Health Directorate namely; Wa, Bulenga, Busa, Charia, Dorimon, Ponyentanga, Gurrungu, Loggu, Yalla, Holimuni, Wechiau, Baayiri, and Lassie Tuolu. Each of these sub-districts has a Health Management Team (SDHMT) that oversees health delivery at it level. Apart from the private clinics, the Funi and Lassie Tuolu Health Centers, all other health facilities in the Wa area are directly under the administration of Ministry of Health. The Wa sub-district operates mobile clinic to cover its catchment area. The distributions of Health Care Centers are indicated in Table 1.1 and Educational Institutions in Table 1.2 in the Wa area.
Table 1.1: Number and Type of Health Facility

<table>
<thead>
<tr>
<th>Type of Facility</th>
<th>Number</th>
<th>Location</th>
<th>Remarks</th>
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<tr>
<td>Government Hospital</td>
<td>1</td>
<td>Wa</td>
<td>Serves as Regional Hospital</td>
</tr>
<tr>
<td>Community initiative and DANIDA Support Health Centres</td>
<td>9</td>
<td>Bulenga, Busa, Charia, Drimon, Poyentanga, Gurungu, Loggu, Yaala, Holimuni.</td>
<td>DANIDA provided a portion of funding for their establishment.</td>
</tr>
<tr>
<td>Government Health Centers</td>
<td>2</td>
<td>Wechiau</td>
<td>Government Funded</td>
</tr>
<tr>
<td>Religious Organizations Health Centres</td>
<td>3</td>
<td>Funsi, Lassia Tuoli and Baayiri</td>
<td>Owned and funded by Catholic Church and Baptist Mission</td>
</tr>
<tr>
<td>Private Clinics</td>
<td>5</td>
<td>Wa</td>
<td>Owned by private Individuals</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
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Source: Ghana Health Services, Wa.

Table 1.2 Educational Institutions in Wa area

<table>
<thead>
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</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>2</td>
<td>169</td>
<td>5</td>
<td>110</td>
</tr>
</tbody>
</table>

Source: Ghana Education Service, Wa.
FIG. 1.1: A MAP OF UPPER WEST REGION

Legend

- Regional Capital
- District Capitals
- Other Towns

- Roads
- Study Area Boundaries
- Other Boundaries
- The Study Area

District Boundaries Around Wa are not final.

Map Composed By: GAB Yiran
Dept. of Geog. & Res. Gev., UG, Legon
Map Source: Survey Dept., Accra
1.7 CULTURAL BACKGROUND OF THE PEOPLE

Information gathered during the focus group discussion and a key informant has provided the cultural background of residents of the study area presented here.

Residents of the study area include Wala, Dagaaba, Lobi and Chakali. The Wala’s and Chakali’s have a slightly different culture from that of the Dagaaba and Lobis because they are predominantly Moslems. Majority of the Dagaaba and Lobis are practicing Christianity and Traditional Religion. The Wala, Dagaaba and Lobis speak the same dialect (Dagaare) with slight difference in ascent.

The Moslems usually bury their dead immediately according to the Islamic faith and perform the funeral later. While the Christians and Traditionalist stage or lay the dead in place between 2 and 3 days. Funeral mourners are usually served with the TZ mashed water. Culturally, a visitor is usually welcome into the home with mashed TZ water.

Moslems celebrate a festival call Damba Festival, the celebration last up to 7 days. Moslems and non-Moslems in the area attend the Damba Festival. The Traditional Worshipers also celebrate Bagere festival lasting between 2 to 3 days. This festival is highly patronised in the area by non-traditional adherence.

Over 90% of the residents are subsistent farmers; they depend solely on crop and livestock production. Farmers have a life style of relocating to the farms during peak farm activities. There are mini-markets dotted across the study area, which attract lots of
people from within and out side the area. There is therefore a rapid mobility and interaction of the people through funerals, celebration of festivals and on market days.

A common perception in the area is that, God permits any event or misfortune else it will not happen. There is also a superstition and belief in the spirit world. Every misfortune or disaster deserve finding out the cause from the Soothsayers and Malams. The spirit world must always be consulted before an action is taken on an issue pertaining to life. A case in point is the health of a widow. It is believed that a widow belongs to her dead husbands who are in the spirit world and may call her home at any time they need her in “Dapare” the spirit world. That is why a widow is not treated immediately when she fell sick, the dead husbands must be consulted through the soothsayers before she can receive treatment. There is also a general belief that when a person is sick it is an indication that the body of that person is weak and could not stand-up against the disease in the blood. Those who have stronger blood are able to stand-up against diseases.

1.8.0 RESEARCH METHODOLOGY

1.8.1 METHODS OF DATA COLLECTION

The study used both primary and secondary data. The secondary data were gathered from the Ghana Guinea Worm Eradication Programme Secretariat (National Secretariat and Upper West Regional Health Directorate), Ministry of Health. Other sources include the Internet; Health related Journals, Magazines, and Books, Published Reports, Research findings and the Ghanaian Newspapers.
Primary Data were collected through a field survey. Combinations of techniques or data collection tools were used. These included focus group discussions (FGDs), key informant interviews, semi-structured questionnaires and personal observation. These tools were used to collect both qualitative and quantitative data from the field survey.

1.8.2 SAMPLING DESIGN

The population of the study includes staff of Ministry of Health in the study area, household heads, victims of the guinea worm disease and elders in the study area. The study adopted Sub-districts for the selection of the sample endemic communities. There are 11 endemic communities located in 4 sub-districts of the 14 sub-districts of the Wa area as indicated in Table 1.3.

Table 1.3: Number of Endemic Villages in the Wa Area, December 2005

<table>
<thead>
<tr>
<th>Sub-District</th>
<th>Communities</th>
<th>Population</th>
<th>Number of Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulenga</td>
<td>1. Ducia</td>
<td>1,336</td>
<td>203</td>
</tr>
<tr>
<td></td>
<td>2. Motigu</td>
<td>950</td>
<td>189</td>
</tr>
<tr>
<td></td>
<td>3. Chaggu</td>
<td>1,500</td>
<td>256</td>
</tr>
<tr>
<td></td>
<td>4. Chaggu – pani</td>
<td>540</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>5. Soglo</td>
<td>750</td>
<td>168</td>
</tr>
<tr>
<td>Loggu</td>
<td>1. Kulpkong</td>
<td>1,029</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>2. Bulle</td>
<td>800</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>3. Buarayiri</td>
<td>658</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>4. Chassia</td>
<td>758</td>
<td>142</td>
</tr>
<tr>
<td>Holimuni</td>
<td>1. Gurumbelle</td>
<td>560</td>
<td>95</td>
</tr>
<tr>
<td>Dorimon</td>
<td>1. Sigri</td>
<td>228</td>
<td>41</td>
</tr>
</tbody>
</table>

Source: Computed from 2000 Population and Housing Census Data (GSS, 2000).
A total of 120 households were interviewed in 7 endemic communities. The endemic communities included 2 highly endemic communities (Ducia, and Gurembella); these were selected purposively because of their long-term endemic status. 4 endemic communities (Motigu, Kulkpong, Bullee, and Buoriyiri) were selected by simple random sampling method. The only endemic community, Sigiri in Dorimon sub-district was also selected purposively as a result of its peculiar geographical location in the Wa West District.

Systematic sampling technique was then used to select compounds in each of the selected 7 endemic communities. However, the simple random method was used to select compounds in Bulle and Sigiri; these settlements are dispersed settlements with compounds far apart. A household each from these compounds was selected by simple random sampling, adding up to the 120 households. The household heads were interviewed. A household in this study was seen as “consisting of people who own the same productive resources, live together and feed from the same pot.” (Yaro, 2000).

People who are currently suffering from the disease or who were victims of the disease were selected using purposive sampling. A total of 57 guinea worm disease victims were interviewed using a questionnaire guide. A case study of a man from Ducie who suffered five consecutive times from the guinea worm disease since 1974. Purposive sampling was also used to select four focus groups consisting of elders, members (men/women) of some of the sampled communities. The focus group members ranged between 8 and 9
members. In purposive sampling, the units of the sample are intentionally picked for the study because they satisfy certain qualities that are not randomly distributed in the universe but are typical (Kumekpor, 2002).

Key informant interview questionnaire guide administered to the Ministry of Health Staff including; the Regional Public Health Director, the Regional Coordinator of the Guinea Worm Eradication Programme (GWEP), the Technical Assistant to the GWEP from Carter Centre (USA), 3 District Coordinators of the GWEP, and 2 Sub-District Coordinators of the GWEP. In addition, the observation technique was employed in the field to capture sources of water that are mostly used and behaviors and attitudes of persons in the study area.

1.8.3 SAMPLE SIZE

The survey is an empirical, cross-sectional, covering the Wa area. A sample of 210 respondents, representing 0.1% of the population of 224,066 of the Wa area was used for the study. The sample size drawn from the 7 guinea worm endemic communities in the Wa area are shown in Table 1.4.
Table 1.4: Selected Endemic Villages and Respondents

<table>
<thead>
<tr>
<th>Sub-District</th>
<th>Communities</th>
<th>No. of Households selected</th>
<th>No. of Victims selected</th>
<th>FGD’s members</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulenga</td>
<td>1. Ducia</td>
<td>30</td>
<td>16</td>
<td>9</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>2. Motigu</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Loggu</td>
<td>1. Kulpkong</td>
<td>20</td>
<td>5</td>
<td>8</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>2. Bulee</td>
<td>15</td>
<td>5</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>3. Buorayiri</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Holimuni</td>
<td>1. Gurumbelle</td>
<td>20</td>
<td>12</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>Dorimon</td>
<td>1. Sigri</td>
<td>15</td>
<td>16</td>
<td>8</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>120</td>
<td>57</td>
<td>33</td>
<td>210</td>
</tr>
</tbody>
</table>

Source: Field Survey 2006

The sample size included 120 households, 57 victims of the guinea worm disease and 33 focus group discussion members, rounded up to a total sample size of 210. In addition, the Regional Director of Public Health, Regional Coordinator of the Guinea Worm Eradication Programme, the Technical Assistant of the GWEP from Catter Center, 3 district Coordinators of the GWEP, 2 Sub-district Coordinators of the GWEP were also interviewed.

1.8.4 DATA ANALYSIS

Multivariate techniques were adopted in the data analysis. Both the descriptive and the inferential techniques were also used. Cross tabulations and frequencies are some of the tools of descriptive techniques used to produce the percentages, graphs, charts, diagrams.
and tables for a clear understanding of the relationships. The inferential technique also provided solutions to the multiple comparison problems.

1.9 STRUCTURE OF THE THESIS

The thesis is composed of seven chapters. Chapter 1 is the introductory chapter highlighting the background to the study. This is followed by the research objectives, justification of the study, the propositions to be tested, the study area, the research methodology and the structure of the thesis. Chapter 2 is the literature review on the guinea worm disease. This chapter also discusses the conceptual frame work. Chapter 3 discusses the spatial pattern of guinea worm disease in the study area. Chapter 4 identifies factors that are influencing the spread of the disease in the Wa area. It focuses on the life transmission cycle of the disease, and the environmental conditions which facilitates its persistence and spread to a new environment. Chapter 5 provides an inside into the characteristics of respondents and the multifaceted socio-economic effects of the disease on individuals, households, and the community as a whole. Chapter 6 discusses the Guinea Worm Eradication Programme implementation and some challenges to the eradication of the disease. The seventh chapter covers the summary, conclusion, policy implication and recommendations.
CHAPTER TWO: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1.1 INTRODUCTION

This chapter reviews the ecology of dracunculiasis, its mode of transmission, the socio-economic effects, and the efforts made towards the eradication of the disease. The conceptual framework is also presented here.

2.1.2 ECOLOGY OF GUINEA WORM DISEASE

Disease ecology is an actual illustration of the reciprocal relationships between infection, agents, hosts and the environment. The agent is the immediate antecedent cause of a disease process in its simplest definition. The infectious agents may be viruses, ricketts, protozoa, fungi, or helminthes. In order to survive, a parasite must be able to do the following: multiply, emerge from the host, reach a new host, and infect the new host (Hunter 1996; Carter 2000).

According to Fox et al., (1990), three aspects of infection remain of particular importance. The first is the clinical status of the host whether recovery was really complete or there were permanent squealer. The second is the persistence of the disease agent, whether silent or covert. The third is the state of post infection resistance. Recovery usually is followed by some degree of immunity to re-infection. If this is incomplete, the recovered individual may experience re-infection, with or without disease and again become a potential source of infection for others. The occurrence of an infection and its outcome are in part determined by the host (population). Apart from determining the occurrence of infection, the host’s immune responses also modify the
nature of the pathological reaction to infection. Characteristics of the host involve anatomical and physiological, such as genetic susceptibility, or resistance, its nutritional status, its immunological status, and age.

The environment has many facets’, seen and unseen, real and abstract. It encompasses all the surroundings in which the individual live. The main components of the environment included the physical, biological, and social environments. According to Melinda et al., (1988), the physical environment includes the climate, atmosphere, topography, and water bodies. The biological includes the flora and fauna. The social includes the society in which man lives and all its psychological attitudes, the family into which he is born, his education and work. A number of environmental influences are frequently involved; there is a “web of causation.” Habitat, Population, and Behavior form the vertices of a triangle that encloses the state of human health.

Dracunculus medinensis is the organisms (agent) that causes the guinea worm disease. It is a type of helminthes (parasitic infection). There are intermediate and final host. Cyclops (aquatic snails) acts as an intermediate host for dracunculus medinensis. It is a habitat for the larvae. Human beings serve as habitat (final host) for the disease agent where it multiplies. The environment is all inclusive; embracing the entire ambient external to the individual host and so includes not only the agent, but also the host’s fellow man. At an equilibrium state of the agent, host and environment, a transmission cycle of the disease is established (Figure 2.1).
As indicated in Figure 2.1, humans become infected by drinking unfiltered water containing copepods (small crustaceans) which are infected with larvae of *Dracunculus medinensis*. Following ingestion, the copepods die and release the larvae, which penetrate the host stomach and intestinal wall and enter the abdominal cavity and retroperitoneal space. After maturation into adults and copulation, the male worms die and the females (length: 70 to 120 cm) migrate in the subcutaneous tissues towards the skin surface. Approximately one year after...
infection, the female worm induces a blister on the skin, generally on the distal lower extremity, which ruptures. When this lesion comes into contact with water, a contact that the patient seeks to relieve the local discomfort, the female worm emerges and releases larvae. The larvae are ingested by a copepod, and after two weeks (and two molts) have developed into infective larvae. Ingestion of the copepods closes the cycle.

The female worm is designed to bear an enormous load of larvae. It has a double ovaries, double ovary ducts, and double uteri. The body length of the worm comprises mostly uterus and, by 8 month, it is filled with developing embryos, three million in total number. As embryos approach maturity, the gravid dracunculus begins a downward migration through the human body towards the lower extremities, particularly legs and feet. A process called “geotropism”, (drawn towards the earth). Additionally, the worm is water-influenced, that is seen as “hydro-philic” reaction to water molecules (Hunter, 1996).

The strongest signal of approaching distress is the raising of a burning blister followed by an ulcer caused by the gravid worm. General symptoms are urticaria (skin wheals and eruptions), nausea, vomiting, diarrhoea, asthma, giddiness, and fainting. The disease is also a debilitating, and would sometimes leave its victims crippled for life. Permanent disability like stiff knees, locked ankles, and “frozen” immobilized joints are found in guinea worm villages. The Achilles, knee, ankles and hamstring tendons can be permanently contracted, and ease of physical movement chronically impaired.
The guinea worm disease is associated with blisters and ulcers, causing extreme pain and frequent secondary infection like bacterial infection, cellulites, sepsis, ulceration, tetanus, and gangrene. Some of the worms may fail to emerge and die in the body. Usually they become encysted and calcify, and could cause joints of legs to become stiff, thereby, causing severe inflammatory reaction followed by an ulcer and latter scar tissue. Calcified worms may also lead to formation of a sterile subcutaneous abscess. When the worm is closed to a joint it may cause arthritis (Cook, G.C. 1996; Leticia, 1997; Dion, 1995). A Nigerian woman, with a history of second-trimester spontaneous abortions, was found to have multiple calcified coiled worms, found embedded in uterine muscle, were implicated in the history of her miscarriage (Hunter, 1996).

Though fatalities from the disease are rare, usually, death resulting from complications due to secondary infections like tetanus may result if medical care is not given early. (Dion, 1995; Brieger, et al., 1982). A Study conducted in Burkina Faso on the disease confirmed that about 7 percent of the persons with the disease in a village died out of secondary infections like tetanus (Muller, 1971). Varying durations of illness and disability is reported to be ranging from 3–9 weeks. The disease could even go beyond the 9 weeks to 14 weeks before recovery (James, C. 2000; Leticia, 1997; Belcher et al., 1977; Hunter, 1996; Carter Centre, 2005). Although favouring emergence through the lower leg, the worm may appear at any site of the body. Worms per person ranges from 1 worm to 15 multiple worms.
Hunter (1996) observes in Ghana, ulcers in the scrotum, between the fingers in the hand, on a person's chin, in the male breast, Achilles tendon, sole of the foot, and the spinal column. He observed a spinal "tumour" of unknown origin, removed from young man; turn out to be a dead guinea worm. Proptosis, an extruded eyeball, caused by a coiled guinea worm has reportedly been misdiagnosed as Burkett's tumour (lymphoma). Diabetic patients are reported to be at special risk in Nigeria where dracunculiasis with invasion of the foot is associated with ketaiccidosis and limp amputation.

2.1.3 THE DISEASE DIFFUSION

The survival and spread of the disease will be examined within the context of disease diffusion. Diffusion is the spread of phenomenon, idea or technique throughout a population or region. Diffusion incorporates basic geographic elements such as distance, direction, spatial variation, and thus, forms a valid field of geographic interest. The fundamental step in examining the diffusion process is the identification of the spatial characteristics of information flow and resistance to adoption.

In Hagerstrand (1965) conceptualization in Figure 2.2, information transmission originates in the form of messages. He indicated that factors related to the effectiveness of information include personal characteristics, intensity and frequency of the messages. This is dependent on the presence of barriers. Terrestrial barriers such as lakes, forest, and geographical distance separating the potential communications impede information. Hagerstrand (1965) further recognize that resistance levels differ from individual to another. The resistance level is a function of both personal and group characteristics, and
higher levels of resistance require that the potential adopter receives more information before adoption. (Hagerstrand, 1965a, 1965b). Many of the models and concepts used in studying spatial diffusion of innovation are also applicable in disease diffusion. A disease may spread outward like a wave from a central focus. This is a form of contact diffusion. If infection enters the larger city in a central place urban hierarchy, it is likely to diffuse in a stepwise manner down through the hierarchy. The long distance jump of an infection by means of a traveler on an airplane or other means of rapid transportation is essentially relocation diffusion. The amount and types of human interaction are crucial for both innovation and disease diffusion.

The possibility of external spread of the guinea worm disease is dependent on local survival and diffusion. It is through the establishment of the transmission cycle in a community that the incidence and prevalence rates increase. The probability of being infected by the disease depends on the direct contact and use of contaminated water. The Model labeled in figure 2.2 could be used to highlight further on the infection and spread of the disease in the Wa area. The model assumes a source of water free of dracunculus medinensis. Contamination of this source occurs by direct contact when a lesion is immersed. People become infected when they use the infected water without any intervention. It has been observed that some people are immune to the disease. But people with low resistance to the disease become infected and develop lesions. By direct contact, there is further infection of similar sources of water. Then more people are infected and consequently, there is an out break of the disease and its spread to other areas ensues. The spread therefore continues until the transmission cycle is interrupted.
FIGURE 2.2: A MODEL SHOWING SPATIAL INTERACTION AND DIFFUSION OF GUINEAWORM INFECTION

1. Source of drinking water free from the disease
2. Source of drinking water infested with the agent of disease
3. Final Hosts with resistance
   - Yes
   - No
   - No
4. Potential Victim
   - Yes
   - No
   - No
5. Infection with the disease
6. People with reduced resistance but not infested
7. Immune Resistant Persons
8. REMOVALS

Source: Hagerstrand 1965 b
2.1.4 TREATMENT OF THE DISEASE

There is no effective medical treatment or prophylaxis of dracunculiasis (Bloch, et. al., 1998; Bloch P. and Simpson P. E. 1998). An earlier report on the effectiveness of Metronidazole in the disease treatment is disputed by Belcher et al., 1975; Kalkani and Nagalotimath, 1975. Antani et al., (1972); Padonu, (1973) had indicated that Metronidazole could effectively treat the disease. Modern drugs like Nitridazole (given orally at 12.5mg/ kg body weight daily @ five days), Metronidazole, and Thiabendazole have also been shown to accelerate recovery by reducing the swelling around the worm in India. It is been found to aid faster removal of the worm but it does not affect the worm (Antani et al., 1972; Padonu, 1973; Kale, 1974& 1975; Dion, 1995). But the courses of treatment with Niridazole (Ambilhar) reportedly eased the worm removal, but noxious side-effects, including nausea, vomiting, headaches, and abdominal pain, discouraged patients and cause them to drop out.

A drug like Diethylcarbamazine when given in prohibitive doses is said to have chemoprophylactic potential (Onabamiro, 1956). Analgesics such as aspirin or ibuprofene can help reduce the pain and swelling; antibiotic ointment and drugs can also help prevent bacterial infections.

There is a proposed treatment that uses the gravid worm’s known propensity for water, the “hydrophilic” effect. A continuous 24 hour water drip directed on a gauze-covered ulcer, the constant water stimulus causes copious embryo evacuation so that an “empty
In 1986, the Carter's Guinea Worm Eradication Programme began its work against Guinea Worm Disease in Ghana in partnership with other International organizations. Ghana and other West African countries dramatically reduced the number of guinea worm cases in the worldwide by more than 99.5%: from an estimated 3.5 million cases in 1986 to 16,026 reported cases in 2004. Since the inception of the eradication programme, there have been health educational campaigns; the distribution of nylon household filters and pipe filters to strain out water fleas with infected larvae; safe monthly treatment of stagnant water sources with Abate Larvicide's; and direct advocacy through Village volunteers.

2.1.5 THE GUINEA WORM ERADICATION PROGRAMME

In 1986, the Carter's Guinea Worm Eradication Programme began its work against Guinea Worm Disease in Ghana in partnership with other International organizations. Ghana and other West African countries dramatically reduced the number of guinea worm cases in the worldwide by more than 99.5%: from an estimated 3.5 million cases in 1986 to 16,026 reported cases in 2004. Since the inception of the eradication programme, there have been health educational campaigns; the distribution of nylon household filters and pipe filters to strain out water fleas with infected larvae; safe monthly treatment of stagnant water sources with Abate Larvicide's; and direct advocacy through Village volunteers.

The Guinea Worm Eradication Programme has been on-going in Ghana since 1989. Major activities/interventions carried out over the years under the guinea worm eradication programme in Ghana included:

1. Training of health workers and village volunteers on the case management and filter use;
2. House to house surveillance for guinea worm cases by the village volunteers;
3. Case management, including exclusive bandaging and worm extraction
4. Filter distribution and/or replacement;
5. Abate larvicide's application to treatable water sources; and,

The average time of worm expulsion was 13.6 days compared to 89 days for untreated person (Hunter, 1996).
6. Health education

The filtration of domestic drinking water obtained from ponds and streams has long been one of the standard technical interventions within a multi-strategy approach for the control of dracunculiasis (Brieger, et al., 1991; Aikomu, et al., 2000). Over the years, different forms of monofilament nylon filters have been designed and tried, including those sewn with rubber or elastic in the hem to fit tightly around the mouth of the drinking pot; filters with drawstrings flaps that can tied around a pot; filter cloth inserted into a funnel and pipe filters (Brieger et al., 1987; Akimsola and Kala, 1997).

2.1.6 THE SOCIO-ECONOMIC EFFECT OF THE DISEASE

Dracunculiasis has a negative impact on communities; it affects their social gatherings like festivals, funerals and community voluntary work (Ward, 1982 & 1985; Leticia, 1997). According to Ward, 1982 & 1985, guinea worm affects community and household productivity as a result of its occurrence at seasons of peak farming activities like clearing, planting, weeding and harvesting.

Dracunculiasis has been blamed for much disability and loss of agricultural productivity amongst African farmers in Sub-Saharan Africa (Carter Center 2005). In 1972, World Bank report estimated global losses of marketable goods as a result of the disease amounted to between 300 million to 1 billion USA Dollars per year (Goladay, 1983). Study in Nigeria shows that farmer's loss over 20 million USA dollars as a result of
outbreak of guinea worm in southern Nigeria on rice farmers (Belcher et al., 1982; Nwosa, et al., 1982). Survey conducted on the disease in the Brong Ahafo Region of Ghana also indicated late cropping, late harvesting and poor yields are associated with the disease in farming communities (Akwasi, 1998).

A study conducted in two villages in central Benin showed that 6 and 9 percent of all working days in the year were lost to dracunculiasis. Peak season’s loss was 19 percent. Income loss per sick farmer was 15 percent of total annual income. In the Accra plains endemic zone of southern Ghana, it is reported that average work loss per farmer is exceeds 5 weeks, occurring at the peak of agricultural activities. A study of 87 households domestic rice production in eastern Nigeria showed that 2-4 persons were incapacitated in each household for 1.9 - 3.75 months each. In addition, Brieger et al., 1987; estimated anecdotally that in Cote d'Ivoire, agricultural activities in many guinea worm endemic communities were considered ‘immobilized’ due to high infection of the disease.

Dracunculiasis and malnutrition has a positive correlation in West Africa (Shulman, 1985). Prospects of reducing or eradication of the disease will increase agricultural production, and thus, improve upon nutritional status of the population, without having placed additional pressure on the environment. Shulman, (1985), further indicated that the eradication or reduction of the disease will not only relieve rural communities of severe and recurrent suffering, but would also improve the labour-hour work at the peak of agricultural activities especially in the guinea worm endemic areas. According to
Akwasi, (1998), guinea worm infection in endemic communities in the Brong Ahafo Region was responsible for about 44.4% malnutrition amongst children.

Dracunculiasis has a vicious cycle of socio-economic problems (Ward, 1985). Briegerand et al., 1980) have documented how the disease disables mothers and make them unable to carry out their domestic work like caring for their children and family. Guinea worm greatly disrupts family life. When a woman is incapacitated, most of her household duties like child care and food preparation are diminished. Since the role of a mother is so critical, it follows that there is much household disruption consequent to her illness. Stricken family members may be disabled for three months each year at a vital time, just at the beginning of farming season or time of harvesting farm crops. Labour inputs, crop yields, and harvest are affected. Village and household food supply is seriously marginalized.

Dracunculiasis has been shown to be the major cause of school absenteeism and a serious cause of permanent school dropout. In Benin, it was observed that extensive secondary absenteeism in schools in the endemic areas was attributed to dracunculiasis. That is, children were used in emergency replacement roles (e.g. for farming and child care) to cover for sick adults in the family. This redistribution of tasks, and use of replacement labour, often involves school-children helping the family, and staying away from school, never to return. The negative effect of dracunculiasis on education in endemic areas is confirmed by Akwasi (1998) reported that 32.7% of absenteeism of children from school in the rural communities of Brong Ahafo Region was as result of guinea worm infection. According to Edungbola and Watts (1985), of about 1,800 children enrolled in the
schools in guinea worm endemic areas in Nigeria, 40% were infected with the disease. Ilewgbodu et al., (1986), indicated that absenteeism of infected children in schools was up to 25% as compared to non-guinea worm infected areas absence rate of 2.5% in non-endemic communities in Nigeria.

The disease is also reported to have increased household dependency ratio as infected persons depend solely on other member of the household. The disease makes its victim less capable to take opportunity for alternative cash income activities. Household incomes are also eroded as scarce resources are spent in hospital or traditional herbal homes in search for treatment.

Various estimates of illness duration of dracunculiasis are reported. In western Rajasthan, where dracunculiasis has been very rampant for centuries, the Director of Health Services reported an average period of disability of about 90 days (13 weeks or 3 month). For the Ibadan rural district, the average duration of incapacitation from effective work was 14.3 weeks, 3.6 months. An Average duration of symptoms of 12.7 weeks has been reported in Imo State, Nigeria, with a range from 3to 39 weeks. In a longitudinal case study of 20 farmers in Idere, Oyo State, Nigeria, the mean duration of the illness was about 15weeks (or about 3 months), and the range was 1to 7 months. Kale (1975) also found out in central Benin, average duration of the illness to be 106 days (15 weeks). The difference according to Hunter may reflect higher endemic status, worm loads, unhygienic and unsuccessful treatment with complications, less aggressive treatment, or differences in case studies.
2.1.7 SPATIAL DISTRIBUTION OF THE DISEASE

The distribution of guinea worm in endemic communities was determined by the relationship of village communities to perennial rivers and streams (Scott, 1960; Hunter, 1996). It was indicated that shallow ponds serving as a source of drinking water provides conditions for high incidence of the disease. Lyons (1972), in an epidemiological survey of the Wa district in the Upper West Region in 1967 – 1968, indicated that guinea worm had a scattered distribution. The timing, duration, and intensity of the transmission were shown to vary widely from one locality to another, as well as from year to the other, depending on the local source of drinking water.

According to (Brieger et al., 1982; Hunter, 1997; WHO, 1996), the disease could most drastically respond to provision of safe drinking water. But Meyers (1985) however stated that providing good drinking water without any effort at correcting the cultural beliefs and practices surrounding the disease would not promote the reduction or the eradication of the disease. The pattern of social structure that determine water use for consumption has resulted repeatedly in the reappearance of the disease in localities where it was once eradicated The disease is both a sociological and environmental problem which deserve combined control strategies like both health education and provision of good drinking water.

According to Desfontain and Prodhor, (1985), some persons in villages would simply not give up the drinking of the pond water. An investigation conducted by Onabamiro (1980), on the occurrence of guinea worm disease in villages of Iwoye in South - Western
Nigeria, shows that at the peak of the dry season and at the close of the season, majority of guinea worm infections in human population occurred only during the dry season. This therefore suggest that seasonal incidence of the disease is closely associated with the nature of water supply, which could vary greatly from community to community. Whenever people depended on village ponds for drinking water, the incidence of the disease was high, but when they depend on rivers or streams which flow all year round the incidence of the disease was found to be low.

Differential Guinea worm cases may occur amongst communities that use variety of water sources (Sahba et al., 1973). Similarly, the extent to which there is a selective access to a water site may influence infection and contamination of the water source. It was found out that men are infected when they move out of the village to new farming settlements or when attending occasions or festivals, and are exposed to untreated water sources. Women and children travel less and are more likely not to be infected with the disease because of their reliance on domestic water sources in the village that may be treated (Watts, 1986). Migration individuals in endemic areas and their subsequent return may lead to recurring contamination of the local water sources after a period of containment/abatement (Sahba et al, 1973; Hopkins, 1970)

2.1.8 SUGGESTED APPROACHES TO THE DISEASE ERADICATION

It has been suggested that an interdisciplinary approach to the eradication of the disease could be more effective than the usual fractional departmental planning in control measures (Abolayin, 1981; Kale, 1975; Brieger 1995). They suggested that eradication
programmes must include both the preventive measures like provision of good drinking water and an aggressive primary health care component. Education and low-technology measures to promote behavioral change are the most effective measures of controlling the disease. The disease can be eradicated in many ways: preventing persons with an emerging guinea worm from entering sources of drinking water; constructing boreholes or deep wells, treating sources of water with Abate Larvicide's; and boiling or filtering all drinking water (Aikomu, et.al., (2000); Carter Center (2005).

2.2 CONCLUSION

The literature review has revealed that, the disease can easily be eradicated because human beings are known to be the only host of the disease. The transmission of the disease is also solely through drinking contaminated water. The provisions of good drinking water all year round, protected from contamination with the disease can eliminate the disease (Hopkins 1984; WHO, 1996). These are however relatively expensive intervention strategies as the cost of providing good drinking water in the rural communities of Sub- Saharan involves a high capital investment.

Since Lyons, (1972) conducted the survey in the Wa District of the Upper West Region in 1967/1968, further studies on the spatial patterns of the disease has not been fully investigated in the study area. This research study is therefore focus on the spatial patterns of the disease infection, its intensity in various communities, and the impact of the disease on persons living in the endemic communities.
2.3 CONCEPTUAL FRAMEWORK

Figure 2.3: The Basic Model: Host-Agent-Environment Inter-relationship Model

![Diagram of the Basic Model showing relationships between Behavior, Population (host), and Habitat (Environment).]

Source: Melinda et al., (1988)

The conceptual framework of the study is the Host-Agent-Environment Inter-relationship Model. This ecological approach examines interaction between Population (host), Environment (physical, socio-economic, and biotic). The level and types of interactions is either symbiotic or parasitic becomes important. Habitat, population, and behavior form the vertices of a triangle that encloses the state of human health. Habitat is that part of the environment within which people live, that which directly affects them. It contains the physical and biotic environment. Behavior is the observable aspect of culture. It springs from cultural precepts, economic constraints, social norms and the individual psychology. It includes mobility, roles, cultural practices, and technological inventions. Population is concerned with humans as organisms, as the potential hosts of the disease.

The Agent is the disease causing micro-organism call Dracunculiasis medinensis. The Host is Man, when infected with the disease; the agents multiply in the victim. The Environment includes the physical environment (soils, forest, ecosystem, climate, and...
water bodies), socio-economic environments (agriculture, housing, health care, political system, family system etc) and the biological environment (flora and fauna, pathogens and vectors). The vector is water fleas, which is ingested when contaminated water with guinea worm is taken. The intermediate host is the copepod, ingested by the host when contaminated water is taken in. The conceptual framework will be used to show how the interaction between the habitat, population and behavior affect the guinea worm disease control measure.
CHAPTER THREE: SPATIO-TEMPORAL PATTERNS OF THE GUINEA WORM IN THE WA ARE

3.1 INTRODUCTION

The guinea worm disease burden in the Upper West Region varies from community to community. This chapter is a presentation of the temporal trend and spatial variations of the disease. Wa districts (Area) are the only endemic districts amongst the eight districts in the region. According to Dr Daniel Yayemain, (Regional Public Health Director, UWR), the disease has been successfully controlled in all the other districts in the region except the Wa area where there are increasing incidences of the disease.

3.2 TREND OF THE GUINEA WORM DISEASE IN THE UPPER WEST REGION

The disease trend in the Upper West Region is alarming. The reported cases of Guinea Worm Disease in the region as at December 2005 were 320 cases. Figure 3.1 shows the temporal trend of the Guinea Worm Disease in the districts of the Upper West Region from 1989-2005. Following the GWEP implementation in the region, there was a significant decline of the disease from 1989-1994. According to the Regional Director of Public Health, it was as a result of adequate human and material resources which allowed for effective programme implementation. But from 1995-2000, resources dwindled from the principal donors coupled with complacency by the Ghana Health Services and the shortages of health professionals. As a result, guinea worm case search and surveillances was minimal. It was from 2000 to 2005 that resources were made available for funding the programme. He stated that the peaking of the disease from 2000 to 2005 is because of
the case search being conducted weekly in the endemic and high risk communities by the District Guinea Worm Eradication Team that more hidden guinea worm cases are found.

Figure 3.1 Guinea Worm Incidences in the Upper West Region 1989 – 2005.

Source: Computed from GWEP Recorded Data, Ministry of Health, Wa.

The time dimension of the disease according to Hunter (1996) is not known. During the focus group discussions, none of the groups could tell the exact time the disease began afflicting their communities. An elder made a statement:

“As for this disease, it comes and goes at will. Some years we see it afflict people, some other years it goes away. Before any of us was born the guinea worm was there, even from the days of our ground fathers. It is God’s will that it comes.”

This statement is significant because it confirms the accession that guinea worm disease has no time dimension.
A case study of a 47 year old man presented in page 100: Daniel, from Ducie who was afflicted five times by the disease since 1974 also said "The disease has been in this village before I was born." This is a prove that none of the residents in the endemic areas could establish the time the guinea worm disease began its plaque on the inhabitants of the Upper West Region. It may be the time that human beings identify the disease through a field survey or observation should be the disease time frame. In the Wa area, guinea worm was formally reported during the base line survey in 1989 preceding the Guinea Worm Eradication Programme Implementation. The focus group discussion in the four villages did not come up with any specific time frame for the disease. The members were all emphatic that the disease has no time it began to afflict them, but just that the infection is on and off in some of the years. This suggest that the disease is indigenous in the Wa area

There are spatial variations in the disease incidence in the eight districts of the Upper West Region. The Wa area which includes the current Wa Municipality, Wa East and Wa West Districts recorded increasing cases of the disease burden from 2000 to 2005 as shown in Table 3.1. The trend of the disease in the region shows the Wa area having the highest disease incidence over the years.
Table 3.1 Variation of the Guinea Worm Disease in the Districts – Upper West Region

<table>
<thead>
<tr>
<th>District</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wa</td>
<td>47</td>
<td>152</td>
<td>104</td>
<td>114</td>
<td>181</td>
<td>290</td>
</tr>
<tr>
<td>Jirapa</td>
<td>21</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Nadowli</td>
<td>5</td>
<td>5</td>
<td>21</td>
<td>34</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Lawra</td>
<td>15</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Tumu</td>
<td>5</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>88</td>
<td>186</td>
<td>128</td>
<td>152</td>
<td>224</td>
<td>320</td>
</tr>
</tbody>
</table>

Source: Computed from GWEP Recorded Data, Ministry of Health, Wa.

The reported guinea worm cases in the other districts in the region are said to be imported cases either from the Wa area or from the Brong Ahafo Region where the disease incidence is also high in some areas (Erasmus, et al., 2003). One case was imported in the study area in 2004 and 34 imported cases in 2005. It is however worth noting that these cases were imported from the “hot spots” of the disease in the Wa area (Ducia, Gurumbella, and Sigri). This is an indication that the guinea worm disease is an indigenous disease in the Wa area. People living in these endemic villages and sharing the same unsafe sources of drinking water are all at risk of the disease. Immigrants into these villages and inhabitants of near by villages in the Wa area are all equally at a higher risk of infection with guinea worm disease. Individuals traveling to endemic areas are at a higher risk of infection with the disease and upon their subsequent return home may also cause contamination of the unsafe water sources (Sahba et al, 1973; Hopkins, 1970).
3.3 GUINEA WORM CASE CONTAINMENT

According to the Carter Center (2000), Guinea Worm Case Containment is aimed at preventing infected persons with the guinea worm disease from further contamination of sources of water bodies that a community uses to forestall further spread of the disease. A Guinea Worm Case is contained if ALL the following conditions are met:

a. The patient is detected before or within 24 hours of worm emergence;
b. The patient has not entered any drinking water source since the worm began to emerge;
c. The Village Volunteer has properly managed the case: that is; he has cleaned and bandaged the worm exit site and the worm is fully removed, and by giving health education to discourage the patient from contaminating any water source.
d. Within seven days a supervisor verifies that this person has or had guinea worm and validates the process of containment (that is, determines that the case was detected within 24 hours of worm emergence, that the person did not enter any source of drinking water since the worm emerged, that the Village Volunteer bandaged the worm exit site until the worm was fully out, and that education was given). If two or more emerging worms are present, the case cannot be considered contained until the last worm is pulled out completely.

Guinea Worm case containment in the Upper West Region and the study area in particular is very low as indicated in Table 3.2. In 2005, out of the 320 reported cases in the region, only 96 cases (30 percent) were contained. 70 percent of the reported cases could not be contained. The uncontained cases may have contaminated more water...
sources in the area, and this may lead to increase in the incidence of the disease in 2006 in the Wa area and the entire Upper West Region.

### Table 3.2 Guinea Worm Cases Containment in the Region 2003 - 2005

<table>
<thead>
<tr>
<th>District</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reported Cases</td>
<td>Contained Cases</td>
<td>Reported Cases</td>
</tr>
<tr>
<td>Wa</td>
<td>83</td>
<td>62</td>
<td>181</td>
</tr>
<tr>
<td>Jirapa</td>
<td>4</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>Nadowli</td>
<td>34</td>
<td>19</td>
<td>11</td>
</tr>
<tr>
<td>Lawra</td>
<td>6</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Tumu</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>91</td>
<td>221</td>
</tr>
</tbody>
</table>

Source: Computed from GWEP Data, Ministry of Health, Wa.

### 3.4 Spatial Variations of the Disease in the Wa Area, 2000 – 2005.

The trend of the guinea worm disease in the Wa area indicates increasing reported cases from 2000 to 2005; this is shown in Figure 3.2. The curve shows a significant peaking of the disease between 2000 and 2001, and declined in 2001 and 2002; there after continue peaking up to 2005. The Regional Director explained this as periods where serious case surveillance and case search are conducted and recorded. The declining curve also indicates the reverse. The decline does not indicate reduction in the incidence of the disease but lack of adequate resources to sustain the programme.

The reported guinea worm cases however vary from sub-district to another; while some sub-districts are recording fewer cases, others are recording increasing cases. Some communities in the sub-districts are classified as newly infected communities as they are reporting their first guinea worm cases over the years. Such communities are Sogla,
Chagu-pani, and Motigu in the Bulenga sub-district, and Chassie in the Kulkpong sub-district, and Sigiri in the Dorimon sub-district.

Figure 3.2 Trend of the guinea worm disease in the Wa area 2000 – 2005.

Source: Computed from GWEP recorded Data, Ministry of Health, Wa

The epicenter of the guinea worm disease in the Wa area is the highly endemic areas mapped out in Figure 3.5. These communities are in Bulenga Sub-district and Holimuni Sub-district. The communities suffering the heaviest dracunculiasis burden are Ducie and Gurembella. This is also shown in Table 3.3. These communities are highly endemic villages as the incidence of the disease increase annually. Sigiri in the Wa West area, which became an endemic community in 2004, is drifting to a highly-endemic status if cases continue to rise in subsequent years. Loggu sub-district has significant reported cases as indicated in Table 3.3. The old endemic communities like Bullee, Bouriyiri, and
Kulkpong reported fewer cases as compared to Chassie, which is a newly endemic community. Bouriyiri used to be a highly endemic community, but reported cases have declined significantly in 2005. Wa Municipal did not record any guinea worm case since 2000 to 2005. There were however 3 imported cases from Ducie and Gurembella into the Municipality in 2004 and 2005. The reasons given by the Regional Coordinator of the GWEP and the Regional Public Health Director are that, the Municipality enjoys a constant flow of pipe water, as such resident don’t drink from ponds. In addition, the literacy level of the residents in the Wa Municipality is high, thus making people aware of their health needs.

Table 3.3: Spatial Variation of Guinea Worm Disease in the Endemic Communities - Wa area

<table>
<thead>
<tr>
<th>District</th>
<th>Sub-district</th>
<th>Community</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wa East</td>
<td>Bulenga</td>
<td>1. Ducie</td>
<td>64</td>
<td>16</td>
<td>2</td>
<td>59</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Sogla</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Motigu</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Chaggu</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Loggu</td>
<td></td>
<td>1. Kulkpong</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Bulee</td>
<td>0</td>
<td>1</td>
<td>17</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Bouriyiri</td>
<td>21</td>
<td>46</td>
<td>3</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Chassie</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Holimuni</td>
<td></td>
<td>1. Gurembella</td>
<td>6</td>
<td>17</td>
<td>46</td>
<td>87</td>
<td>45</td>
</tr>
<tr>
<td>Wa West</td>
<td>Dorimon</td>
<td>1. Sigiri</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>33</td>
</tr>
<tr>
<td>Wa Municipal</td>
<td>Wa</td>
<td>None</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>163</td>
<td>104</td>
<td>83</td>
<td>180</td>
<td>290</td>
</tr>
</tbody>
</table>

Source: Computed from GWDEP Data, Ministry of Health, Wa.
It can be observed from the Table 3.3 that spatially, Ducie, Gurembella and all the nearby villages are the most endemic. Areas around Kulkpong, Bulle and Buoriyiri are reporting fewer cases are equally exporting cases to other villages at the same time importing from Ducie and Gurembella areas. Sigiri, Chassie and Chaggu are newly endemic communities; they both export and import guinea worm cases.

3.5.0 AGE AND SEX DISTRIBUTION OF THE DISEASE IN THE WA AREA

3.5.1 AGE DISTRIBUTION OF THE DISEASE

The guinea worm disease burden on age groups in the Wa area as indicated in Table 3.4 shows a higher burden amongst the school going age group of 6-10, and the active productive age group of 20-40. People within the 6 to 40 age groups are the most affected with the disease as shown in Figure 3.3. The high disease burden amongst the 6 to 15 age groups may be attributed to the risky live style they live. Young boys were observed during the field survey swimming in the ponds and dams. The possibility of they drinking the unsafe water exposes them to infection with the disease. Secondly, it was also observed that the young men go hunting for rats and other bush meat. They drink unfiltered water in the bush during their hunting expedition. Young men were also seen herding cattle and sheep around, and when a group of the herdsmen were ask whether they use the pipe filter to drink unsafe water in the field, none of these shepherd/herdsmen confirm having a water filter with them. The effect of the high incidence of guinea worm on the 6-15 age groups grossly affects school attendance and promoting high school drop out rate.
The second most affected group of people with the disease is the productive age group of 16 to 40. This age group is said to be more mobile; they attend funerals and festivals at longer distances using their bicycles. This age group also spends longer hours in a day working the farms. These findings confirm other research reports that dracunculiasis has a very serious negative effect on school attendance and agricultural productivity in endemic communities (Hunter, 1997; Ilewgbodu et al., 1986).

The severity of the disease is between the months of September and December when more guinea worm disease cases are detected and reported. But these particular months are the peak farming activities; such as making yam mounts and harvesting farm crops (groundnuts, maize, sorghum, millet, yams and rice). The implication is food insecurity, as infected persons with the disease may be unable to harvest their food crops (Belcher et al., 1982; 1982; Hunter, 1997).

Table 3.4 Disease burden on age groups from January – December 2005

<table>
<thead>
<tr>
<th>Age Grp</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>6-10</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>12</td>
<td>6</td>
<td>45</td>
</tr>
<tr>
<td>11-15</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>11</td>
<td>20</td>
<td>11</td>
<td>65</td>
</tr>
<tr>
<td>16-20</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>8</td>
<td>2</td>
<td>5</td>
<td>27</td>
</tr>
<tr>
<td>21-25</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>8</td>
<td>35</td>
</tr>
<tr>
<td>26-30</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>12</td>
<td>12</td>
<td>34</td>
</tr>
<tr>
<td>31-35</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td>36-40</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td>41-45</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>
Figure 3.3 Guinea Worm Disease Burden on Age Groups, January – December, 2005

3.5.2 GENDER DIFFERENTIALS IN THE DISEASE BURDEN

The toll of the disease burden on gender as shown in Figure 3.4 indicates that more men are infected with the disease than women. Hunter (1997) and Watts et al. (1986) indicated in their findings on research conducted in guinea worm endemic areas in Ghana and Nigeria that men are infected more with the disease because they move out of the village to new farming settlements where they drink untreated water. They also engage
themselves in economic activities like hunting and fishing. Staying out of home for longer hours make them drink unsafe water sometimes. In addition, men attend more of the social gatherings (festivals and funerals) in neighboring communities; thus, they are likely to be drinking unfiltered contaminated guinea worm water outside the home. Women and children travel less and are more likely not to be infected with the disease because of their reliance on domestic water sources in the village that may be treated or abated.

Higher records of the disease burden on women were recorded in the month of December in Sigri in the Dorimon sub-district; where there is no safe drinking water (borehole) except the ponds and rivers. There were no tangible findings on why more women got infected in this community than men. But it is proven that it was a woman who attended a funeral in Bullee in the Wa East area where she contracted the disease. She subsequently contaminated the drinking water source in the Sigiri community leading to the spread of the guinea worm disease in the area.
3.6.0 ENVIRONMENTAL BURDENS OF DRACUNCULIASES IN WA AREA

Environmental burdens and spatial variations in levels of risk within the Wa area are associated with the broad levels of water stress and or burdens associated with water related risk within the communities, thus increasing the risk of infection with the disease. Wa Municipality is an urban area and better planned. Consequently the municipal area enjoys potable water and has a lower risk of spread of the disease burden as compared to Wa East and Wa West areas. Communities suffering from the guinea worm disease burden are exclusively in Wa East and the Dorimon Sub-district in the Wa West.

The structural patterns of the disease which have emerged indicate some obvious clusters as shown in Figure 3.5. Since access to adequate potable water is essential to good health, the observed pattern of the disease shows that the guinea worm disease infection in the
study area is the norm of the rural communities, indicating a strong link between dracunculiasis prevalence and the consumption of water from ponds/dams, rivers and streams.

The disease spreads outward like a wave from a central focus shown by arrows in Figure 3.5. This is a form of contact diffusion. The long distance jump of the infection by means of a traveler from other villages by means of rapid transportation is essentially relocation diffusion. This type of diffusion took place between Bulle in Loggu Sub-District and Sigiri in Dorimon Sub-District. The amount and types of human interaction are crucial for the disease diffusion. The possibility of external spread of the guinea worm disease is dependent on local survival and diffusion. It is through the establishment of the transmission cycle in a community that the incidence and prevalence rates increase. The probability of being infected by the disease depends on the direct contact and use of contaminated water. The disease is exported from the endemic areas as indicated on the Map with arrows. There is no specific direction or location that the disease is exported to. Any person that visits an endemic community and drank guinea worm contaminated water will get infected and return home with the disease. This means the disease is exported from the original village to a new village, which is serving as the importing village.
Figure 3.5: A MAP SHOWING THE SPATIAL PATTERNS OF GUINEA WORM DISEASE IN THE STUDY AREA

Legends:
- Other Towns/Villages
- District Capital
- Regional Capital
- Study Communities
- Roads
- Rivers
- Districts Boundaries

Nature:
- Highly Endemic Area
- Endemic Area
- Importing Areas
- Dams

Map Composed By: GAB Yiran
Data Source: Field Work

District Boundaries Around Wa are not final
3.6.1 DIFFUSION OF THE GUINEA WORM DISEASE IN WA AREA

The possibility of external spread of dracunculiasis according to Hagerstrand (1965b) Model of Spatial Interaction and Diffusion of Guinea Worm Infection in Figure 2.1 is dependent on indigenous survival and diffusion of the disease. This is applicable in the study area. It is obvious that through the establishment of a transmission cycle in these endemic communities that the incidence and prevalence rates of the disease increases.

People are infected with the disease when they come into direct contact and use of guinea worm contaminated water in these endemic communities. The model assumes a source of water free of Dracunculus medinensis. Contamination of the open water sources occurs when infected persons refused bandaging and come into direct contact by immersing lesion in the uncontaminated water, contaminating the water with guinea worm. People then become infected when they drink the guinea worm infected water without filtering.

The conceptual frame work of Host-Agent-Environment Interaction Model emphasize the human behaviour as the main factor responsible for seeding and re-seeding of ponds, dams and rivers with guinea worm. When afflicted members of a village are afflicted with guinea, it becomes established that they don’t filter unsafe water before drinking. The Agent (Cyclops) will continue to strive as long as there are ponds and dams, and attitudes are not also changing. Until the equilibrium of the disease transmission is broken, there will be more contamination open water bodies leading to the spread of the disease. The transmission cycle is broken either by abating the water bodies with Abate or by filtration of all unsafe water with pipe or cloth filters before drinking.
3.6.2 DISTRIBUTION OF WATER SOURCES IN THE ENDEMIC VILLAGES

Guinea Worm is water born disease and the provision of safe good drinking water is recommended for the eradication of the disease. There are 320 boreholes located throughout the Wa area and dotted dugouts, rivers, streams, ponds, and small dams. Table 3.5 shows the different sources of water in the study area. Streams and rivers throughout the area are also shown in Figure 3.6. Access to sources of water is not a problem to residents of the study area; it is rather how they can manage the use of the available water sources for their good health.

Currently, it is only Wa Township that enjoy pipe-born water supply from underground water and some boreholes. The rest of the towns and villages in the Wa area rely solely on boreholes, hand-dug wells, ponds/dams, rivers and streams as their sources of water supply. It was however observed that many of the boreholes were either dried up or having reduced water yields. Communities like Chaggu-Pani in Wa East and Sigiri in Wa West do not have a single borehole to serve the people. In other communities like Bulle in the Kulkpong sub-district, it was observed that the community is a dispersed settlement resulting in the sitting of the borehole about 4 kilometres away from some of the compounds. As the ponds and streams are nearer to these compounds, the Distance Decay Model expounded by Bour (2000) applies as the people resort to drinking the ponds and stream water nearer to them. In some cases the single borehole provided in some communities cannot serve the given population. Chassie and Sogla in Wa East are some of the communities having a single borehole each. It was observed during the field work that a considerable pressure is on these single boreholes as many women were seen...
forming long queues, waiting for their turn to fetch water. The long waiting-hours at the pump site may compel the people to resort to the ponds/dam and stream water, thus increasing the risk of infection with water born diseases especially dracunculiasis.

In the most endemic villages like Ducie, and Gurembella, the ponds/dams constructed by Ministry of Agriculture (MOFA), to provide the animals with water in the dry season and also for dry season gardening are less than half a kilometres to the compounds; whiles the boreholes are sited between 1.5 and 3 kilometres away from some of the communities. This is due to hills that surround these villages thus making it difficult to drill the boreholes in or nearer to the communities.

There are 12 boreholes in Kulkpong and its surrounding areas; however the MOFA dam and the streams divide the communities ostensibly making it easier for the people to use the dam and stream water than the borehole water. These Ministry of Food and Agriculture dugout ponds/dams are considerably deep and large that the District Guinea Worm Eradication Team cannot abate them.
Table 3.5: Sources of Water in the Endemic Villages

<table>
<thead>
<tr>
<th>Community</th>
<th>Sub-District</th>
<th>Sources of Water in the Community</th>
<th>Water Serving Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Kulpong</td>
<td>Loggu</td>
<td>1. Two ponds (Kuozulungpuo and Kuowugo)&lt;br&gt;2. Two Streams&lt;br&gt;3. Twelfth Boreholes</td>
<td>1,029</td>
</tr>
<tr>
<td>2. Bullee</td>
<td>Loggu</td>
<td>1. One Stream&lt;br&gt;2. One Borehole</td>
<td>800</td>
</tr>
<tr>
<td>3. Bouayiri</td>
<td>Loggu</td>
<td>1. Stream&lt;br&gt;2. One Borehole</td>
<td>400</td>
</tr>
<tr>
<td>5. Chaggu</td>
<td>Bulenga</td>
<td>1. One Pond (Peeduro)&lt;br&gt;2. Two Dug-outs (Salifu Bulee and Chiebulee)&lt;br&gt;3. Two Streams&lt;br&gt;4. A Dam&lt;br&gt;5. Four Boreholes</td>
<td>1,500</td>
</tr>
<tr>
<td>8. Chasie</td>
<td>Loggu</td>
<td>1. A Stream&lt;br&gt;2. One Borehole</td>
<td>786</td>
</tr>
<tr>
<td>10. Soglo</td>
<td>Bulenga</td>
<td>1. A Stream&lt;br&gt;2. One Borehole</td>
<td>750</td>
</tr>
<tr>
<td>11. Sigri</td>
<td>Dorimon</td>
<td>1. A Stream&lt;br&gt;2. Three Ponds</td>
<td>228</td>
</tr>
</tbody>
</table>

Source: Field Survey 2006.
FIG. 3.2: A MAP SHOWING SOME WATER SOURCES IN WA AREA

Legend
- Other Towns/Villages
- District Capital
- Regional Capital
- Study Communities
- Roads
- Rivers
- Districts Boundaries
- Dams

District Boundaries Around Wa are not final.
3.6.3 DISTANCE DECAY MODEL

The Distance Decay Model by Melinda et. al., (1988), states that an increase in distance to places of service weakens the desire of potential users to use the service. When the "friction of distance" – the rate at which interactions decrease as distance increases for a certain level of service is high. Distance shows an inverse relationship with the use of services. It confirms a great impact of distance on utilisation of services like health services and water points. For women the relationship is stronger due to the complications of their reproductive functions. This means that the boreholes provided for residents of guinea worm endemic communities should not be further away than the ponds and dams. As much as possible boreholes should be sited in the community. However, as a result of technical difficulties boreholes in the disease “hot spots” like Ducie and Gurembella are sited at a distance between 1.5 to 3.5 kilometres away from the communities while the ponds/dams are close by the communities. The borehole water service providers should ensure that the borehole water is accessible to the residents of Ducie and Gurembella by mechanizing the boreholes for water to flow into the communities.

The Distance Decay Model effect could have been minimised if the residents of these guinea worm endemic communities had gone through formal education to some level. But the survey found out that about 89 percent of respondents are illiterate. Literates usually take their health issues seriously as compared to the illiterate. It is revealed in the study that those with formal education know more about the disease and are at lesser risk of infection as compared to the illiterate.
The analysis has shown the need to mechanize the boreholes in Ducie and Gurembella community to pump the water into the communities, thus neutralizing the distance decay effect. The second option is to promote a sustained health education in these endemic areas where illiteracy is high. This may lead to a change in attitude and belief system of the people.

3.7 CONCLUSION

The spatial pattern of the guinea worm disease in the Wa area gave credence to the assertion that guinea worm disease is “at the end of the road disease”, signifying that rural areas are vulnerable to the disease than urban areas. In every locality where there are significant variation in development, the less developed areas to some extent suffers these untold parasitic and infectious disease as is seen in the case of dracunculiasis in Wa east. Also, the socio-economic activities residents engaged themselves and couple with their way of life predisposes them to the disease. This is clearly shown in Figures 3.3 and 3.4, where more men and younger people are suffering from the guinea worm disease affliction.
CHAPTER FOUR: FACTORS RESPONSIBLE FOR THE SPREAD OF DRACUNCULIASIS IN THE WA AREA

4.1 INTRODUCTION

The survival and spread of dracunculiasis is facilitated by varied environmental factors. Some of these factors that were identified during the field survey are the topical issues covered in this chapter.

4.2.0 ENVIRONMENTAL FACTORS

The Environment includes the physical environment (soils, forest, ecosystem, climate, and water bodies), socio-economic environment (agriculture, housing, health care, political system, and family system) and the biological environment (flora and fauna, pathogens and vectors). The vector is water flea, which is ingested when humans take contaminated water with guinea worm. The intermediate host is the copepod, ingested by the host when contaminated water is taken.

4.2.1 RAIN FALL DISTRIBUTION AND TEMPERATURES

The classic pattern of seasonality of guinea worm disease is seen in Northern Ghana, lying approximately 8-10° N. latitude in savannah woodland. The three northern regions receive 40-45 inches (1015-1142 mm) of annual rain rainfall, mostly in May-October, associated with the air mass movements of the Inter-tropical Convergence Zone (ITCZ). The Upper West Region therefore has only one rainfall regime of 5 months in a year. The rains commences from late May through to September. It is within this period that waters
are collected into pond/dams, rivers and streams leading to the overflow of these water bodies. Ecologically, the carnivorous copepods are less concentrated or absent from running waters but are usually highly concentrated in stagnant waters. (Hunter, 1996 and 1997; Sattenspile, 2000)

The long 7 months dry season starts from October to April, leading to the drying up of streams and rivers as observed during the field survey in January/February. In West Africa, it is reported that the visitations of dracunculiasis pain occur towards the end of the dry season and before the onset of the heavier monsoonal rains. Climatologically, this is when the dry Saharan-based air mass (cT) from the Gulf of Guinea blow across the sub-region. It is a time when many water sources dry out and a time of highly concentrated human use of scarce water sites for drinking and building of new houses.

Daily maximum temperatures in Upper West Region during the dry season are between 38°C and 42°C. The minimum relative humidity drops to 20 percent in January. Over the 7-month period of October–March dry season, total rainfall is 41.5mm (1.6 inches). Under these desiccating conditions, families face serious dehydration and must drink many litres of water daily. This is as a result of increased extra work activities, which were observed in the field, such as clearing farms, harvesting sorghum, maize and yams, cutting yam mounds, and walking long distances as the means of transport for those who did not own bicycles.
Boreholes, ponds/dams, rivers, and streams remain the only source of water in the area. As shown in Table 3.5, a single borehole serves large numbers of people in some of the endemic communities. Pressure on the boreholes few boreholes results in low water yields or drying up of the borehole. It was observed at Chassie, Bulle and Sogla during the field survey women forming long lines waiting for their tern to fetch water. Many of these women resort to the ponds/dams and rivers for their household water use to save time for their farm work. The problem is compounded when boreholes breakdown. With village pump-water jeopardized, people are forced back to their traditional disease bearing water sources. These include the ponds/dams, streams, dry riverbeds, and excavated holes. Such alternative sources are used continuously today in conjunction with boreholes, particularly where demand exceeds borehole supply and access to clean water becomes stressful. Notwithstanding the water stress, residents of endemic villages can avoid getting afflicted with the disease if they develop the attitude of constantly filtering unsafe waters before drinking.

Agricultural dams, small reservoirs, and village ponds or dugouts seen doted across the study area are focal points for guinea worm transmission. Within a pond/dam, infected Cyclops tends to concentrate in the shallows or peripheries of the dam/ponds presumably because they require more oxygen. It has been noted that Cyclops carrying third-stage infective larvae tends to sink deeper towards the bottom of the ponds (Hunter, 1996). From the disease transmission point of view, lower water levels in ponds at the end of the raining season maximize copepods densities, giving a peak in copepods ingestion by humans. As women were observed during the field survey wading through the shallows
of water to scoop up drinking water, they end up harvesting greater yields of the disease-carrying crustaceans.

4.3 ECONOMIC ACTIVITIES

Agriculture is the main occupation of the people in the Wa area. About 91 percent of the people are engaged in subsistent crop and livestock production. Large tracks of fertile soil abound in the Wa East and West areas. The soil of the area is mainly sandy loam with underlying hard iron pans, granite and metamorphic rocks. There are few strips of alluvial soil along the dry valleys of the tributaries of the Black Volta, which is very suitable for rice cultivation. Generally, it was observed during the field survey that the sandy loam is very fertile and enhances large-scale cultivation of groundnuts and cowpea, sorghum, yams, and millet, which the area is a net exporter.

According to Hunter (1996), farmers drink volumes of the contaminated water in their farms due to hunger and the heat under which they work. This puts the farmers at a higher risk of infection with the disease. According to the respondents, many farmers usually move to stay in their farms during the peak of the rains as they may be risking crossing the many streams to their farms. Others said they usually relocate to virgin lands when the soil in the area they are farming is exhausted, moving the entire family to the new farmstead. The temporal relocation of farmers to stay in their farms during the peak season of rains or unto virgin lands makes the provision of borehole water to reduce the risk of infection untenable. Some farmers visited in their farms during the field survey did not really have the water filters. It was observed that they drink their water unfiltered.
Other farmers engaged in cattle rearing also kept relocating from one place to another in order to find good pasture for the animals. Large herd of cattle could be seen all around the areas where there were pastures for grazing. These shepherd men/women cannot be targeted in the provision of boreholes as a result of their nomadic life. If their attitude towards the use of the cloth/pipe filters is negative, it becomes a challenge to the guinea worm eradication. Even if they adopt the use of these filters, it may still be difficult for the health workers to track them for the replacement of the old and torn filters.

4.4 MIGRATION

Analysis on migration shows that external migration does not really promote the spread of the disease in the Wa area. Migration in the area is negligible. 83 percent of the households indicated that their household members do not migrate. The victims of the disease were also found not to have migrated over a period of 6 to 12 months. The internal rapid mobility and interaction of people from the endemic and non-endemic communities is found to be the major cause of the spread of the disease in the Wa area. It was observed in the field that the Dagaabas/Lobis do always stage their dead between 2 to 3 days. Relatives, friends and sympathizers travel far and near to these funeral ceremonies. TZ water and food is usually served to all visiting mourners, this may lead to people drinking untreated contaminated water. Even if people wanted to filter the water but one cannot filter TZ Mashed water.

According to the Wa West Guinea Worm Coordinator, it was one of such funeral ceremonies a woman from Sigri attended at Bulle an endemic community in the Kulpong
sub-district of the Wa East District in 2002; she contracted the disease there when she drank guinea worm contaminated water. She subsequently contaminated the only source (ponds) of drinking water in the Sigiri community in 2003. This led to the outbreak of guinea worm disease in Sigiri- Dorimon Sub-district, in 2004 and 2005.

Other indirect sources of guinea worm infection observed during the field survey are the dotted mini-markets in these endemic villages. As people patronized these mini-markets from all over the Wa area, they drink ponds/dams water unknowingly. For example Kulkpong and Ducia have mini-markets, which are well patronized by people from the surrounding villages. Meanwhile the dams in these communities cannot be abated or treated with abate because they are quite large in size and deep. Common facilities like the markets and schools are shared with other communities. They jointly perform funerals and celebration of festivals. People from all over the Wa area interact in these markets. A woman from Mangu, a suburb of Wa Municipality attended a village market in Ducie where she drank guinea worm contaminated water in 2004 and developed the disease in 2005. These social interactions like funerals and festivals contribute significantly to the spread of the disease. In examining the second proposition that “Internal mobility and the rapid interaction of persons from guinea endemic and none endemic areas have proven to have influence the spread of the disease.” Reported imported cases from other districts in the region shown in Table 3.2 are traced to the Wa area as their origin (Erasmus et, al., 2003).
4.5 BELIEF SYSTEMS

The perceptions of people in the study area about sickness in general are mostly associated with the unseen forces and or from their enemies. In some cases it is seen to be in the blood of afflicted persons. To the many rural people, a cultural matrix of witches, juju, and punishment from the gods, and God sent is equally plausible causations. In such a circumstance it would be normal to consult the oracles/ancestors and appease the gods when the community is afflicted with a disease like guinea worm. Traditional belief extends to the notion that the guinea worm is a natural phenomenon, a natural part of a body like the tendon or innate part of the human anatomy. Others think it is an inherited family trait, the worm resides in the blood and sooner or later, “stand up”, push up a blister chamber and emerge. Both the focus group discussions and the cultural background of residents in the endemic villages have confirmed these observations.

The belief systems has greatly influenced and contributed significantly to the attitude and behaviour of the people living the guinea worm endemic areas. The fact that perception of the people about the guinea worm disease is pointing away from the real cause of the disease could be a great set back to the eradication of the disease. In the field survey it was found out that 60 percent of the households drink unsafe water at home. 91.7 percent of the respondents’ also drink unsafe water in their farms. Unfortunately only 48.7 percent stated they filtered their unsafe drinking water in the farm. Again, knowledge of the cause of the disease in the Wa area was found to be 53.1 percent, but this did not really reflect in the behaviour of the residents. The observed behaviour and attitude of the people in the field did not reflect what they know. Women were seen fetching water from...
ponds/dams without filtering it. Younger children were seen in these ponds/dams swimming along with pigs, while the women and younger girls fetched the water at the same time. There was no restraint on these younger children to swim the contaminated waters from the elderly people around. As these younger children kept swimming these guinea worm contaminated waters, there is the possibility of drink it. This affirms the high incidence of the disease burden amongst the school going age in the Wa area (see Figure 3.3).

In Northern Ghana especially the Wa area, transmission of guinea worm by porridge could be wide spread in the endemic zones. Porridge or TZ left over are softened with unsafe water and served to workers in the farm, mourners at funeral grounds and visitors.

4.6 MINERAL DISCOVERY

The discovery of gold deposits in Kande, Bulenga, Danyo-yiri and other undisclosed locations in the Wa East area has attracted many “galamse operators” small-scale illegal minors into the area. These “galamse operators” live right in the operation sites and drink from all manner of unsafe sources of water. It was observed during the field survey that it was not only guinea worm disease that could spread in these small-scale mining areas but sexually transmitted diseases like HIV/AIDS, Hepatitis B, Syphilis and Gonorrhoea may spread faster as many young men and women are engaged in brisk business at the “galamse” sites.
4.7 HOST-AGENT-ENVIRONMENT INTER-RELATIONSHIP MODEL.
The conceptual framework of the study - Host-Agent-Environment Inter-relationship Model is an ecological approach examines the interaction between Population (host) and Environment (physical, socio-economic, and biotic).

Operationalizing the Model in relation to the environmental factors in the study area has established an equilibrium transmission cycle of the guinea worm disease. The climatic patterns of the study area which usually lead to the drying up of some water bodies; in addition to the attitude/behaviour of the inhabitants of guinea worm endemic areas and couple with the presence of the disease causation agent (Dracunculus medinensis) has interplayed to maintain equilibrium of the disease transmission. An inter-sectoral collaboration and interventions are therefore imperative to break the disease equilibrium before it can be eradicated.

4.8 CONCLUSION
Dracunculiasis is noted by many researchers to have a spatial prevalence rate due to the environmental factors prevailing in the different geographical location or defined areas. Some geographical areas show a high prevalence rate due to the prevailing environmental factors, which promote the life cycle of the disease. Dracunculiasis has a simple life cycle that can be interrupted at several points, thus making the disease effectively eradicable.

The rapid mobility and interaction of persons from endemic and high-risk communities is linked up to the guinea worm disease diffusion. Many persons in mobility are carriers, resistant host or susceptible to the guinea worm disease. The high incidence rate of the
disease in some of the endemic communities in the Wa area is therefore associated with the mobility of persons, the presence of unsafe water sources, and the attitude or belief system of the inhabitants. The factors influencing the spread of the disease do not actually influence the observed patterns of the guinea worm disease in chapter three. Because, there are similar villages with the same physical environmental conditions, yet they don’t suffer from the disease as a result of their adaptive life style of filtering unsafe water and drinking from the boreholes.
respondents have never gone to school, 11.0 percent have primary education, and whiles 6.7 percent have Junior Secondary/ Middle School education (Table 5.1).

Figure 5.1 Age Groups of Respondents (n=210)

Source: Field Survey data, 2006

Table 5.1 Educational Characteristics of Respondents (n=210)

<table>
<thead>
<tr>
<th>Level of education</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>47.0</td>
<td>31.0</td>
<td>78.0</td>
</tr>
<tr>
<td>Primary</td>
<td>7.6</td>
<td>3.3</td>
<td>11.0</td>
</tr>
<tr>
<td>JSS/Middle</td>
<td>5.2</td>
<td>1.4</td>
<td>6.7</td>
</tr>
<tr>
<td>SSS/Technical</td>
<td>2.9</td>
<td>0.0</td>
<td>2.9</td>
</tr>
<tr>
<td>Post Sec.</td>
<td>0.5</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Tertiary</td>
<td>0.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>63.8</td>
<td>36.2</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Field Survey data 2006
CHAPTER FIVE: PEOPLE'S PERCEPTION OF THE GUINEA WORM DISEASE

5.1 INTRODUCTION

This chapter discusses the socio-economic characteristics of respondents. The discussion also focuses on the peoples' perception of the cause of the disease, the treatment and preventive methods. The socio-economic effects of guinea worm disease are also discussed.

5.2 SOCIO-ECONOMIC CHARACTERISTICS OF SAMPLED POPULATION

5.2.1 PERSONAL CHARACTERISTICS

The Wa area is inhabited by indigenous ethnic groups like the Wala, Dagaaba, Lobi, Chakili and migrants from within and outside Ghana. The communities studied are homogenous in character and rural. Households in the area do not vary significantly in any respects except the household sizes which average size is 7.1 (2000 Population and Housing Census). Out of the 210 respondents, 36.2 percent are females whiles the remaining 63.8 percent are males. This is explained in the fact that majority of the 120 household heads respondents were males. Ghanaian rural areas are mostly predominantly patriarchal with men heading the households, thus more male respondents.

The age of respondents shown in Figure 5.1 ranges from 10 to >50 years. Respondents whose ages range between 10 and 20 were among the guinea worm victims interviewed. It was realized that illiteracy is very high in the study area. 78.1 percent of the
Ethnic composition of respondents in figure 5.2 shows that the Chakali ethnic group constitute 43 percent of the respondent. The Chakalis are the most affected by dracunculiasis in the Wa area. Their communities are Ducia, Gurembella, Sogla, and Motigu. These communities are the “hot spots” of dracunculiasis in the entire Upper West Region.

Table 5.2: Respondents Ethnic Groups (n=210)

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Wala</th>
<th>Dagaati</th>
<th>Lobi</th>
<th>Chakali</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Household heads</td>
<td>24</td>
<td>29</td>
<td>21</td>
<td>46</td>
<td>120</td>
</tr>
<tr>
<td>Guinea worm victims</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>32</td>
<td>57</td>
</tr>
<tr>
<td>FGD’s Members</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>33</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>44</td>
<td>39</td>
<td>88</td>
<td>210</td>
</tr>
</tbody>
</table>

Source: Field Survey 2006

The primary occupation of respondents is agriculture. As indicated in Table 5.3, 90 percent of respondents are farmers and 8.6 percent are pupils/students. The pupils/students are amongst the category of the guinea worm victims interviewed. The secondary occupation of respondents is hunting. Straying animals from the Mole Game Reserve, which borders the Wa area, attracts hunters into the area.
Table 5.3: Primary Occupation of Respondents (n=210)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming</td>
<td>57.1</td>
<td>32.9</td>
<td>90.0</td>
</tr>
<tr>
<td>Charcoal burning</td>
<td>0.0</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Pupil/Student</td>
<td>6.2</td>
<td>2.4</td>
<td>8.6</td>
</tr>
<tr>
<td>Cattle herder</td>
<td>0.5</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Professional</td>
<td>0.5</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Total</td>
<td>63.8</td>
<td>36.3</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Field Survey 2006

Religion is an integral part of life of residents in Wa area. Islam is the dominant religion in the area. 45.8 percent of the respondents are practicing Moslems, 26.8 percent are Christians while 27.4 percent are Traditionalists. Religion dictates greatly the perception of believers towards health care. During a focus group discussion in Ducia, an opinion leader was emphatic that “Allah” is the one that permits anything to happen. If guinea worm disease is on their land it was Allah’s will for them. A health education programme was also postponed by members of the District Guinea Worm Eradication Team in a near by village around Gurembella because the elders decided to consult their ancestors through a soothsayer before the health education could come on.

The religious factor borders on the belief system of the people clearly stands in contrast with the guinea worm eradication programme aims and objectives. It also affirms the proposition that the believe system of residents of guinea worm endemic communities in the Wa area is influencing the spread of the disease. As some residents do not believe the real cause of the disease is the water they drink, they might have been wrongly informed.
by their faith. The attitude of refusing to drink borehole water and also not filtering the unsafe waters they drink brings into play the conceptual framework of the study “Host-Agent-Environment Inter-relationship Model.” As long as human beings continue with their observable aspect of their culture of drinking pond/dam water, the disease will continue to spread in the study area until the guinea worm transmission cycle is interrupted by a behaviour change of residents in the Wa area.

5.3 PERCEPTION OF THE DISEASE BY RESIDENTS OF WA AREA

Focus group discussion was conducted in four endemic communities in the study area. The communities are Ducie located in the Bulenga sub-district, Gurembella located in the Holimuni sub-district, Bulle located in the Loggu sub-district and Sigri, which is located in the Dorimon sub-district.

The focus group members selected from the communities include Village Elders, Guinea Worm Village Volunteers, Red Cross Mothers and Village Water Committee Members. These groups of people were selected because of their unique role in the eradication of the guinea worm in Wa area. Out of the total of 33 focus group members from the four endemic communities, 13 members were women and 20 men. The focus group discussion was held in a relaxed atmosphere in their respective villages. A check list was used by the student to facilitate the discussions. Recordings were made with a Tape recorder and the information transcribed later. Some of the issues raised are presented here.
Using the focus group discussion, it was found out that the residents of the guinea worm endemic areas have their own perception of the disease. Generally, the residents believe that guinea worm disease is like any other disease that come and go when the period is over. The group members associated the disease more with the spiritual. Some statements recorded attest to this are:

“If God don’t allow the disease it will not be here.” “Our ground fathers grew up to meet guinea worm here and we are also into it.”

The chairman of the village water committee in Ducie stated during the discussion:

“This disease is older than all of us sitting here. How can we tell when it began in this village? It goes in some years and in other years it comes again to afflict us. It is Allah that allows it in our village.”

During discussion in Sigiri a woman said:

“This disease has just come to our village; we use not to see it here. It was in other villages but now it has reached our village.”

In Gurembella, a member made a statement:

“You see the human body, there are diseases in it, at any time if the body blood is weak or low the disease will then come up. We think this disease is in our blood, but the health people are now telling us that it is in the water we drink”.

Another group member in Gurembella said: “all don’t catch the disease. What do you think about that?”

In Ducie a man in the group drew attention to how they use to treat guinea worm disease.

He said:
“Look at my leg, and see the scars of guinea worm. We usually wait until the disease form white water, and then we put a sharp knife in fire until it is red-hot. We hold the patient and cover the eyes. The red knife is then removed and cut open the blister for the guinea worm water to come out. If they don’t do that you will die. A Teacher who was here died because he did not agree to the cutting with the knife when he got the disease. You see, we heat the knife to kill the dirt and also to open the water easily. But now many people don’t do that, they see the hospital people to treat them.”

During the discussion in Bulle, an elder asked:

“Can we all drink from the one borehole that is far away from here? Go there now and see the line of women that are waiting to fetch water. We have to drink from the river.”

Generally the effect of guinea worm disease on the residents of endemic communities was seen by the various focus groups as severe. They mentioned the effect of the disease on the health and education of their children. That many teachers are refusing postings to the area because of the fear of contracting the disease. Their finances are also affected due to their ill health, and their agricultural activities come to a stand still when afflicted with the disease. This common statement was coming up during discussions in the four endemic communities:

“Can a sick person work; no one can work with that sickness. Any year that this sickness comes plenty in the village there is always hunger because the sick people cannot farm.”

In all the various group discussions, the members said their contribution to the eradication of the disease is what they are doing now. They join the village volunteers,
the Red Cross Mothers Club, and the village water committees to help search for guinea worm cases in their communities and report to the zonal coordinator. They also undergo training on how to use the water filters and intern move from house to house educating their people how to use the water filter. The implication of the responses from the focus group discussion is that people living in the guinea worm endemic areas attach a great deal of superstition to the cause of the disease. The on-going health education by the health personnel may have to be re-focused on the belief system of the people in addition with the provision of boreholes.

At the sub-district levels, the 120 households and the 57 guinea worm victims’ responses are analysed here. The 120 households plus the 57 victims stand for the \((n=177)\). What stands out in the analysis is that knowledge of the cause of the guinea worm disease is High. In Table 5.4, 84.2 percent of the respondents know that drinking contaminated guinea worm water contracts the disease. The challenge however is that, 15.9 percent of respondents did not really know the cause of the disease. Ignorance of the disease is confirmed to be a major cause of the spread of dracunculiasis in rural areas (Hunter, 1996; Bernard Bierlich, 1995).
Table 5.4: How people are infected with the disease, Sub-districts (n=177)

<table>
<thead>
<tr>
<th>How infected with Guinea worm</th>
<th>Bulenga (%)</th>
<th>Holimuni (%)</th>
<th>Loggu (%)</th>
<th>Dorimon (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking worm</td>
<td>26.0</td>
<td>15.3</td>
<td>32.2</td>
<td>10.7</td>
<td>84.2</td>
</tr>
<tr>
<td>Contaminated water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drinking dirty water</td>
<td>4.0</td>
<td>0.6</td>
<td>1.1</td>
<td>2.8</td>
<td>8.5</td>
</tr>
<tr>
<td>Entering dirty water</td>
<td>0.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Don’t know</td>
<td>1.7</td>
<td>1.1</td>
<td>0.6</td>
<td>3.4</td>
<td>6.8</td>
</tr>
<tr>
<td>Total</td>
<td>32.3</td>
<td>17.0</td>
<td>33.9</td>
<td>16.9</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Field Survey 2006

The cause of the disease represented in Table 5.5 show that 46.7 percent of respondents has attributed the cause of the disease to spiritual beings. In all the four sub-districts it is the Loggu sub-district that recorded the highest response attributing the disease to God sent. It is a general view in the study area that the disease is sent by God. This therefore calls for a conscious health education strategy targeting the belief system of the residents of Wa area to explain the real causes of the guinea worm disease.

Table 5.5: Cause of Guinea Worm Disease, Sub-districts (n=177)

<table>
<thead>
<tr>
<th>Cause of guinea</th>
<th>Bulenga (%)</th>
<th>Holimuni (%)</th>
<th>Loggu (%)</th>
<th>Dorimon (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guinea worm</td>
<td>16.4</td>
<td>11.9</td>
<td>17.5</td>
<td>7.3</td>
<td>53.2</td>
</tr>
<tr>
<td>Witchcraft/juju</td>
<td>2.8</td>
<td>1.7</td>
<td>1.1</td>
<td>0.6</td>
<td>6.2</td>
</tr>
<tr>
<td>Hereditary</td>
<td>2.8</td>
<td>0.6</td>
<td>2.3</td>
<td>1.1</td>
<td>6.8</td>
</tr>
<tr>
<td>God sent</td>
<td>5.1</td>
<td>1.7</td>
<td>10.7</td>
<td>3.4</td>
<td>20.9</td>
</tr>
<tr>
<td>Punishment from gods</td>
<td>1.1</td>
<td>0.0</td>
<td>1.7</td>
<td>0.0</td>
<td>2.8</td>
</tr>
<tr>
<td>Don’t know</td>
<td>3.4</td>
<td>1.1</td>
<td>0.6</td>
<td>4.5</td>
<td>9.6</td>
</tr>
<tr>
<td>Total</td>
<td>32.2</td>
<td>16.0</td>
<td>33.9</td>
<td>16.9</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field Survey 2006
In the various sub-districts the respondents use both the modern health system and the traditional health care system to treat the disease when afflicted. However the modern health care treatment is higher. 76.8 percent accept treatment from health workers while 22 percent still use the traditional treatment as depicted in Table 5.6. The increased numbers of afflicted persons accepting treatment from the health workers was attributed to the presence of the village volunteers and the zonal coordinators who daily conduct case search and give free treatment to victims. Secondly, the victims recover faster than the traditional method of treatment.

Table 5.6: Mode of Treatment of the Disease, Sub-districts (n=177)

<table>
<thead>
<tr>
<th>How infected</th>
<th>Bulenga (%)</th>
<th>Holimuni (%)</th>
<th>Loggu (%)</th>
<th>Dorimon (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self medication</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Treatment by health workers</td>
<td>23.7</td>
<td>11.3</td>
<td>26.6</td>
<td>15.3</td>
<td>76.8</td>
</tr>
<tr>
<td>Traditional treatment</td>
<td>8.5</td>
<td>5.6</td>
<td>7.3</td>
<td>0.6</td>
<td>22.0</td>
</tr>
<tr>
<td>Total</td>
<td>32.2</td>
<td>16.9</td>
<td>33.9</td>
<td>16.9</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Field Survey 2006

The gender analysis of the 120 household heads and the 57 guinea worm victims' responses in Table 5.7 indicate that both male and females have a high knowledge on the cause of the disease. They both have attached the cause of the disease to spiritual beings. The respondents perceive the disease to be in the blood (hereditary). 6.2 percent believed
the disease is caused by witchcraft/juju, 20.9 percent attributed the disease to the will of God or punishment from the "gods" and 9.6 percent expressed ignorance of the cause of the disease. This therefore means that the guinea worm health education should be conducted in a manner that both men and women are covered. Special programmes could also be designed targeting the age group of 6 to 15 year group and implemented in the primary and Junior Secondary Schools, because they are suffering greater burden of the disease as shown in Figure 3.4.

Table 5.7: Gender Responses of Cause(s) of the Guinea Worm Disease (n=177)

<table>
<thead>
<tr>
<th>Cause of the Guinea worm</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guinea worm</td>
<td>33.3</td>
<td>19.8</td>
<td>53.1</td>
</tr>
<tr>
<td>Witchcraft/juju</td>
<td>3.4</td>
<td>2.8</td>
<td>6.2</td>
</tr>
<tr>
<td>Hereditary</td>
<td>2.8</td>
<td>4.0</td>
<td>6.8</td>
</tr>
<tr>
<td>God sent</td>
<td>15.8</td>
<td>5.1</td>
<td>20.9</td>
</tr>
<tr>
<td>Punishment from gods</td>
<td>1.1</td>
<td>1.7</td>
<td>2.8</td>
</tr>
<tr>
<td>Don't know</td>
<td>5.6</td>
<td>4.6</td>
<td>10.2</td>
</tr>
<tr>
<td>Total</td>
<td>62.0</td>
<td>38</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field Survey 2006

The illiterate respondents are the group of people that are attributing the disease to the spiritual. In Figure 5.2, 36 percent are pointing to the unseen forces as the source of the disease. This could mean the illiterate population in the study area may be ignorantly contaminating water sources in the area with guinea worm when they are afflicted with it. This is a clear challenge to the disease eradication. Because they either attribute the disease to the will of God or to some unseen forces. Appropriate health education programmes on radio and the market places targeting the illiterate population will in the
long run raise the awareness of the disease among the illiterate residents of the endemic communities.

Figure 5.2: Cause of guinea worm disease among non-educated respondents (n=177)

Source: Field Survey 2006

5.4 HOUSEHOLD MEMBERS INFECTED WITH THE DISEASE

Household heads responses about the rate of infection taking place in their families from 2003-2004 was alarming. Table 5.8 show that 72.5 percent of respondents indicated that at least a family member suffered from the disease each year. 27.5 percent however said their household members did not suffer from the disease. The unaffected households said they regularly filter their unsafe water before using it to cook/drink.
Table 5.8 Household members that suffered from Guinea Worm Disease (n=120)

<table>
<thead>
<tr>
<th>Household members that suffered from guinea worm</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>46.7</td>
<td>25.8</td>
<td>72.5</td>
</tr>
<tr>
<td>No</td>
<td>14.2</td>
<td>13.3</td>
<td>27.5</td>
</tr>
<tr>
<td>Total</td>
<td>60.9</td>
<td>39.2</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field Survey 2006

The disease burden on the households appears very high as it is shown in Table 5.9. Twenty (20) households reported one (1) guinea worm case each in the year 2003, while 25 households reported 2 cases each the same year. The year 2004 was not different as the disease burden on households never reduced. This is a clear indication that household food production and income will always be affected during the peak periods of the guinea worm disease.

Table 5.9 Reported Guinea Worm cases by Households, 2003-2004 (n=120)

<table>
<thead>
<tr>
<th>Year that cases were reported</th>
<th>Number of Households reporting Cases</th>
<th>Number of guinea worm cases reported in the household</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>20 25 1</td>
<td>1 2 3</td>
</tr>
<tr>
<td>2004</td>
<td>18 27 2</td>
<td>1 2 3</td>
</tr>
</tbody>
</table>

Source: Field Survey 2006
5.5 TREATMENT OF DRACUNCULIASIS

According to the medical professionals, there is no effective medical treatment or prophylaxis for dracunculiasis. An earlier report of the effectiveness of Metroniduzole in the disease treatment is disputed by Belcher et al., (1975); Kalkani and Nagalotimath, 1975; Hunter (1996).

A new proposed treatment uses the gravid worms known as propensity for water- the "hydrophilic" effect. The constant water stimulus causes copious embryo evacuation so that an "empty bag of worms be pulled out with relative ease" (Hunter, 1996). Another recent method of treatment, which was observed in the field, is the application of "Tamale Oil" to the worm when it emerges. This oil is produced in Tamale using extracted oil from the Neem Tree Seeds. When the oil is applied to the worn, it becomes weak and easy to be rolled out in 3 to 5 days.

In finding out how the disease is treated, 76.8 percent of respondents said they accept bandaging or treatment from the health workers. 22 percent however said they always use traditional herbs. The traditional method of treating the disease involves some form of surgery. A sharp knife is put into fire to become very red. Strong young men then hold the patient while the face is blindfolded with a piece of cloth. The patient is constantly told or deceived that the "Knife is not yet red". An experience old man "surgeon" removes the red knife from the fire and surgically cut open the blister of the worm. The worm is then wound round a small stick for the patient to constantly and gently pull and wound the worm round till is fully removed. Shear butter oil is then constantly applied with some herbs to the sore to soothing the pain and facilitates fast recovery. This is a
confirmation of the results from the focus group discussion about the traditional treatment of the guinea worm disease.

### 5.6 PREVENTIVE MEASURES OF DRACUNCULIASIS

According to the Regional Director of public health, Wa, the Ghana Health Service is using the Global Guinea Worm Eradication Programme Strategies in their operations. They include the following multi-strategies aimed at prevention or eradicating the disease:

a. Continuing Surveillance of endemic and high-risk communities to ensure 3 years continuous guinea worm free villages;

b. Health Education, which include community durbars, house-house education, drama, posters;

c. Vector Control: Interruption of transmission of the disease by abating all ponds and small dams in endemic and high-risk communities;

d. Distribution of Cloth filters for households to use in filtering unsafe water, and Pipe filters for hunters and travelling population;

e. Case Containment; and

f. Water Advocacy.

Respondent’s knowledge on prevention of the disease was solicited. Figure 5.3 shows that 91 percent of respondents indicated the disease could be prevented whiles 6 percent said it couldn’t be prevented. A few of the respondents have no knowledge of any prevention method.
On how the guinea worm disease can be prevented, Table 5.10 show that 49.2 percent of the household heads indicated the disease could be prevented if they drink only borehole water. 36.7 percent of the households said that prevention can be achieved if unsafe water is filtered before drinking. 0.8 percent of the households said it is only the Ghana Health Service that can prevent the disease. The remaining 12.4 percent of respondents think the disease cannot be prevented by human beings cannot prevent the disease, except the spiritual forces.
Table 5.10 How the Disease is prevented (n=120)

<table>
<thead>
<tr>
<th>Prevention of guinea worm Disease</th>
<th>Males (%)</th>
<th>Females (%)</th>
<th>Totals (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drink borehole water</td>
<td>25.0</td>
<td>24.2</td>
<td>49.2</td>
</tr>
<tr>
<td>Filter all unsafe water</td>
<td>25.2</td>
<td>10.8</td>
<td>36.7</td>
</tr>
<tr>
<td>Unless God prevent it</td>
<td>0.8</td>
<td>0.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Is in the blood (Genetic)</td>
<td>4.1</td>
<td>1.6</td>
<td>5.7</td>
</tr>
<tr>
<td>Health workers must prevent it</td>
<td>0.8</td>
<td>0.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Don’t know</td>
<td>4.2</td>
<td>1.7</td>
<td>5.9</td>
</tr>
<tr>
<td>Total</td>
<td>60.8</td>
<td>39.2</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field data 2006

5.7.0 CONTROL MEASURES OF THE DISEASE

The filtration of domestic drinking water obtained from ponds and streams has long been one of the standard technical interventions within a multi-strategy approach for the control of dracunculiasis (Brieger, et al., 1991; Hunter 1996). Out of the 120 households interviewed, 91.7 percent clearly indicated that the disease could be controlled and showed how the disease can be controlled. 5.8 percent said if they use borehole water; 10 percent said if they accept bandaging when they contract the disease. 33.3 percent said if they filter all unsafe water; 15 percent indicated that following the ministry of health education; whiles 3.3 percent said the disease has been there and cannot be controlled. This is clear demonstration of the belief that the disease is from unseen forces.
5.7.1 CASE CONTAINMENT

According to the Carter Center (2000), Guinea Worm Case Containment is aimed at preventing infected persons with the guinea worm disease from further contamination of sources of water bodies that a community uses. This is to forestall further spread of the disease. A Guinea Worm Case is contained if ALL the following conditions mentioned in page 45 are met:

Respondents’ knowledge on the guinea worm case containment is shown in Table 5.11. 97.4 percent indicated that the disease can be contained by health workers/village volunteers. This is clear indication that the current on-going guinea worm health education by the health personnel is effective but the problem is whether the residents accept to observe them.

Table 5.11: Guinea Worm Case Containment (n=120)

<table>
<thead>
<tr>
<th>How cases are contained</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inform Village Volunteer</td>
<td>54.7</td>
<td>37.8</td>
<td>92.5</td>
</tr>
<tr>
<td>Attend health centre</td>
<td>4.2</td>
<td>0.8</td>
<td>5.0</td>
</tr>
<tr>
<td>Apply local herbs</td>
<td>0.8</td>
<td>0.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Others</td>
<td>0.8</td>
<td>0.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Total</td>
<td>60.5</td>
<td>39.5</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field data 2006
5.8 DURATION OF DISABILITY WITH THE DISEASE

Various estimates of week’s illness duration of guinea worm are reported. Average period of disability of about 90 days (13 weeks or 3 month) has been reported by various researchers (Hunter 1996).

The 57 victims of the guinea worm disease interviewed stated the number of weeks a victim takes before full recovery. Table 5.12 indicates varied responses, with 35.9 percent saying that it takes 4 weeks before they recover from the disease, 36.4 percent said it takes 3 weeks for them to recover. The few victims that said it took them between 1 week and 2 weeks to recover may not have known the exact number of weeks of their affliction. According to the village volunteers and the district coordinators, it may take between 2 to 4 weeks for patients to fully recover when the disease is contained. But when the disease is not contained some patients may be afflicted up to 3 or 4 months before recovery.

Table 5.12 Weeks of disability with the disease (N=57 Victims)

<table>
<thead>
<tr>
<th>Disability period</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Week</td>
<td>5.3</td>
<td>1.8</td>
<td>7.1</td>
</tr>
<tr>
<td>2 Weeks</td>
<td>8.8</td>
<td>3.5</td>
<td>12.3</td>
</tr>
<tr>
<td>3 Weeks</td>
<td>22.8</td>
<td>10.5</td>
<td>33.3</td>
</tr>
<tr>
<td>4 Weeks</td>
<td>21.1</td>
<td>15.8</td>
<td>36.9</td>
</tr>
<tr>
<td>Don’t know</td>
<td>4.2</td>
<td>6.2</td>
<td>10.4</td>
</tr>
<tr>
<td>Total</td>
<td>62.2</td>
<td>37.8</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field data 2006
In all the sub-districts, the season of the disease burden is shown to be high in the dry season as indicated in Figure 5.4 show that 75 percent confirm the season of the disease to be higher in the dry season. 22 percent of respondents said the disease affliction is in the rainy season. Records of reported guinea worm cases from the Regional Secretariat of the Guinea Worm Eradication Programme, Upper West Region, analysed in Table 3.5; did show that the disease is more intense from October to April, the dry season period in Upper West Region.

Figure 5.4: Season of the Disease

![Pie chart showing the season of the disease](chart.png)

Source: Field Survey 2006

5.9.0 WATER USAGE BY RESIDENTS OF GUINEA WORM ENDEMIC AREAS

Residents of the guinea worm endemic areas use boreholes, pond/dam, rivers, streams and dug-out water listed in Table 3.5 pp., depending on where they find themselves and which of the source of water is available. Respondents indicated they use the borehole water to drink at home while using other sources of water to bath and wash their clothes. However, 45 percent of the households confirm that they use pond/dam water in the home as drinking water. The preference of a particular source of water listed by
respondents show that 89.1 percent prefer borehole water, 1.9 percent prefers pipe water and 9.2 percent also prefer the pond/stream water. Household decision on water usage is the sole responsibility of the woman. 82.4 percent of respondents stated it was the woman that decides on which source of water to fetch. The survey results also show that 99.2 percent of respondents saying it were the women and their daughters that fetch the household water.

About 90 percent of the residents in the endemic villages are farmers. It was observed in the field that they mostly stay in their farms during the peak of farming activities, suggesting that they must rely on pond and river water, as there are no boreholes in the farms. Table 5.13 shows that 92.4 percent of respondents confirm their sources of farm water to come from ponds, rivers and streams.

Table 5.13: Source of farm water

<table>
<thead>
<tr>
<th>Water sources use</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ponds/Dams</td>
<td>59.1</td>
<td>33.3</td>
<td>92.4</td>
</tr>
<tr>
<td>Borehole</td>
<td>1.7</td>
<td>5.8</td>
<td>7.5</td>
</tr>
<tr>
<td>Total</td>
<td>60.8</td>
<td>39.2</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field Survey 2006

5.9.1 WATER TREATMENT

Water treatment means residents of guinea worm endemic areas using the cloth or pipe filters supplied by the guinea worm eradication team to filter all unsafe water before...
drinking it. It is shown in the data analysis that 60.8 percent of household said they treat their water regularly in the home. 39.2 percent fail to treat their household water.

Figure 5.5, shows that only 48.7 percent of the respondents said they always filter their farm unsafe water before drinking while 51.3 percent indicated they do not filter their farm unsafe water. Such attitude of drinking unsafe water without filtration promotes the spread of the dracunculiasis in the area. Every household in the endemic villages are supplied with the water filters by the District Health Management Team and taught how to use them.

Figure 5.5 Treatment of farm water

Source: Field Survey 2006

The attitude of not treating their unsafe water before drinking is therefore a challenge to the disease eradication. Examining the first proposition of the study, the survey results reject the proposition that “Provision of adequate boreholes in guinea worm endemic areas will promote the early eradication of the disease.” Because, the survey results in Table 3.5 showed that Ducie, Kulkpong and Gurembella in Wa east have adequate
boreholes provided for the residents since the year 2000. But the incidence of the guinea worm disease in these communities is still very high. During the field survey, residents were seen fetching water from the ponds and streams while the boreholes stand idle. This therefore suggests that providing boreholes to residents of endemic communities must be accompanied with behavior change on the part of the residents. They must adapt to drinking borehole water. Secondly, as residents re-locate to their farms during peak farming activities, each household must develop the habit of filtering their unsafe farm water.

5.10 EFFECT OF GUINEA WORM DISEASE ON HOUSEHOLD FOOD PRODUCTION

Effect of dracunculiasis on household food crop production is known to be very devastating. Plates ‘a’ and ‘b’ shows pictures of afflicted persons in the finger and the foot with guinea worm. With such severe affliction, the victim invariably cannot engage in any socio-economic activity. The study found out that 57.5 percent of households indicated in Figure 5.6, that guinea worm affected their food crop production severely. 27.5 percent said the disease affected their food crop production and 15 percent of the households said guinea worm disease did not affect their households’ food crop production because their household members did not suffer from the disease. The effect of the disease on household income shown in Figure 5.7 shows that household incomes are also affected. 46 percent of the people said that sick household members could not contribute in the family farm activities and other off-farm activities like charcoal burning to earn income. 19 percent of respondents however said that the effect of the disease on
their household income was not that severe since they did not buy drugs or attend hospital to pay bills. Households' members that did not suffer from the affliction of the disease did not mention incurring any cost from the disease
Plate ‘a’

Plate ‘b’

Source: GWEP Secretariat, Wa
5.11 EFFECT OF DRACUNCULIASIS ON COMMUNITIES

The guinea worm disease has a major effect on communities and household productivity as it usually occurs during the peak of farming activities (Hunter, 1996; Ward, 1985). In
the Wa area, the peak of harvesting food crops like maize, groundnuts, sorghum, millet and yam is from September to February. The period coincides with the high incidence of the guinea worm disease in the Wa area (see Table 3.4). The disease is therefore a major cause of agricultural work loss in many guinea worm endemic areas (Hunter, 1986; Belcher et al., 1982).

Considering the disease burden on households in Table 5.9, it is evident that the effect of the disease on communal farm work, childcare, and other social responsibilities are affected. Extended family systems based primarily on the sharing of task and obligations and the effective coping strategies may mitigate the effect of the disease on individuals and households, but not financial or monetary resources. The social cost, economic cost, and emotional cost of the disease is born by the community as individuals afflicted by the disease in the community are completely unable to take part in any community gatherings like funerals, festivals, markets and communal labour within the period of incapacitation.

A case study of a 47-year-old man called Daniel from Ducie who suffered five consecutive times from the disease since 1974 shared his experience and the long-term effect the disease has left on him. He said:

*I first contracted the disease when I was in Middle School form four in 1974. Two years latter I got the disease again. In 1981 the disease afflicted me again. I have to run away from the house to Tamale. I thought it was witches that were dealing with me. When I came back to the house in 1984 I contracted the disease again the next year. The last time I got the disease and never suffer from it again was 1999. I learn from that time how to*
Daniel has since been appointed the Zonal Coordinator of the Guinea Worm Eradication Programme in Ducie area by the Regional Health Directorate.

5.12 CONCLUSION

Dracunculiasis is a disease that has lasting effect on individuals, families and communities. The disease affects men, women, and children. Family life is severely disrupted when a family member is afflicted, especially women. The dependency ratio increases as afflicted members depend solely on other family members for daily needs. Human labour is seriously eroded when there is an outbreak of guinea worm disease in villages. Farming activities are left unattended leading to a significant decline in agricultural productivity. Children are removed from school to partake in household work. The long-term impact of guinea worm disease is felt in the households, communities, and the nation as a whole.
6.1 INTRODUCTION
The disastrous impact of the guinea worm disease as discussed in the proceeding chapters makes the Guinea Worm Eradication Programme expedient and relevant. The disease has for sometime been a scourge on the health and economy of the people of the Upper West Region where the campaign for the eradication of the disease started in 1989. A remarkable achievement has been chalked in guinea worm case reduction from 3,174 to 320 reported cases as at the end of December 2005. Despite the remarkable achievement of the programme over the years, the disease is still a problem in some parts of the region especially in the Wa area where the disease is more pronounced. This chapter focuses on the implementation of the Guinea Worm Eradication Programme in the Upper West Region.

6.2 IMPLEMENTATION OF GUINEA WORM ERADICATION PROGRAMME IN GHANA
Following the 2nd African Conference on dracunculiasis held in March 1988 for the eradication of the guinea worm disease, the Ministry of Health and the Global 2000 which is an organization of the Carter Presidential Centre in Atlanta, USA were mandated to coordinate the activities of participating agents. A base line survey was conducted to establish the actual extent of the disease burden and to draw up a control plan for the
disease. The survey found out that 6,515 villages nationwide were infected with reported cases of 179,485 (Figure 6.1).

After the implementation of the Ghana Guinea Worm Eradication Programme in 1989, there was a 95 percent decrease in the guinea worm cases by 1992 indicating a significant progress from 1989–1992. However, there was stagnation of the programme from 1993–2002 as a result of ethnic conflicts in the Northern Region. In addition, fatigue of the health workers, complacency on the part of government and problems of funding brought the programme to a halt. Health reforms undertaking in the country in 1997 brought about decentralization and integration of the health sector. This compounded issues as health personnel and resources were virtually re-directed away from the Ghana Guinea Worm Eradication Programme into other health areas. As guinea worm cases began to increase and more villages got infected from 1998–2002, the Ministry of Health embarked on reassessment and re-strategization to contain the disease. There was intensification of all interventions from 2002–2005 to control or eradicate the disease. Reported guinea worm cases began dropping from the year 2002 as shown in Figure 6.1. Reported guinea worm began fluctuating in 2001 to 2005. By the close of 2005, reported cases of the disease had dropped significantly to 3,974 cases as indicated in Table 6.1. It is anticipated that higher guinea worm cases will be reported in 2006 because of the low case containment in 2005.
Figure 6.1 Annual Incidence of Guinea Worm Disease in Ghana from 1989 – June 2005.

Source: GWEP/Ghana Health Service

Table 6.1: Annual Number of Cases by Regions (2000 – 2005)

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>20001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>4,317</td>
<td>2,929</td>
<td>4,273</td>
<td>5,999</td>
<td>4,979</td>
<td>2,321</td>
</tr>
<tr>
<td>Volta</td>
<td>1,432</td>
<td>595</td>
<td>305</td>
<td>1,511</td>
<td>1,604</td>
<td>260</td>
</tr>
<tr>
<td>B. Ahafo</td>
<td>1,330</td>
<td>860</td>
<td>779</td>
<td>492</td>
<td>336</td>
<td>157</td>
</tr>
<tr>
<td>Upper West</td>
<td>90</td>
<td>186</td>
<td>128</td>
<td>152</td>
<td>222</td>
<td>320</td>
</tr>
<tr>
<td>Ashanti</td>
<td>50</td>
<td>50</td>
<td>39</td>
<td>45</td>
<td>85</td>
<td>43</td>
</tr>
<tr>
<td>Eastern</td>
<td>97</td>
<td>83</td>
<td>45</td>
<td>37</td>
<td>27</td>
<td>12</td>
</tr>
<tr>
<td>Upper East</td>
<td>31</td>
<td>13</td>
<td>29</td>
<td>23</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Western</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>28</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Central</td>
<td>26</td>
<td>11</td>
<td>9</td>
<td>-</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>7,395</td>
<td>4,739</td>
<td>5,611</td>
<td>8,290</td>
<td>7,275</td>
<td>3,974</td>
</tr>
<tr>
<td>Indigenous cases</td>
<td>-</td>
<td>4,729</td>
<td>5,611</td>
<td>8,290</td>
<td>7,275</td>
<td>3,974</td>
</tr>
</tbody>
</table>
Commitment to the Guinea Worm Eradication has led to the installation of systems of surveillance and reporting system in every endemic area using the community based structure as the chain of command shown in Figure 6.2. The chain of command consists of the Ghana Health Service line of command and the Ghana Red Cross line of command. The Regional Coordinator of the Guinea Worm Disease is the overall director of all activities in the structure. Activities that are conducted through the chain of command include case containment, filter distribution, health education, and safe water advocacy. Where it is appropriate the District Guinea Worm Eradication Team using Organophosphate Temephos/Abate for Cyclops control treats ponds/dams.

The involvement of community village health workers is critical to the success of the programme. The entire Guinea Worm Eradication Programme activities are at the grass root level. It is the “Village Volunteers” and the “Red Cross Mothers” that are trained to actually conduct case search, surveillance, and to some extend handle case containment in the various localities. The zonal coordinators who also intern report to the area or district coordinator supervise them. The chain of command is followed until all reported and recorded guinea worm cases in Ghana are transmitted to the National Guinea Worm Eradication Programme Secretariat in Tamale. The collated national guinea worm reports are finally forwarded to the International Guinea Worm Centre – Carter Centre in Atlanta, USA, and the World Health Organization (WHO).
FIGURE 6.2: COMMUNITY BASED SURVEILLANCE STRUCTURE OF GWEP

GHS, National Secretariat GWEP

GHS, Regional Guinea Worm Coordinator

Reg. Red Cross Dir.

Dist Guinea Worm Coordinator

Red Cross Mothers

Sub- Dist. Guinea Worm Coordinator

Red Cross Women Volunteers

Area Guinea Worm Coordinator

Zonal Coordinator

Village Volunteer

Source: Regional Secretariat, GWEP, Wa
6.3.0 IMPLEMENTATION OF THE GUINEA WORM ERADICATION PROGRAMME IN WA AREA

The Guinea Worm Eradication Programme in the Wa area has chalked success since its implementation in 1989. From the records of activities of the programme in the Upper West Region, indications are that many former endemic villages in the Wa area and the region as a whole has been declared guinea worm-free. Wa Municipal has no single endemic community while Wa West has only 1 newly endemic community - Sigiri. Newly endemic communities in Wa East include Chassie, Soglo, Motigu and Chaggu-pani in addition to the old endemic communities. Case detection and case containment in Wa area has also improved drastically. Notwithstanding these great achievements in the region and the Wa area in particular, there are some challenges to the realization of the goal of eradicating the disease. Some of these challenges are discussed below.

6.3.1 CHALLENGES OF THE GUINEA WORM ERADICATION IN WA AREA

Responses from the key informant interviews are presented in this section. The key informants include the Regional Director of Public Health, the Regional Coordinator of the Guinea Worm Eradication Programme (GWEP), the Technical Advisor of the Programme (Carter Centre, USA), the 3 District Coordinators of the GWEP in Wa area, and 2 Sub-District Coordinators of the GWEP. Some of the challenges listed by these key informants are discussed below.

Collaboration between the health workers and the beneficiary endemic communities in the eradication or control of any disease is important. But according to the coordinators,
the serious challenge to the guinea worm eradication is the unwillingness of persons living the endemic communities to follow the health education given them. They indicated that some residents of the endemic communities are unwilling to drink the borehole water with the excuse that the water smells. At the same time they are not adapting to the use of the pipe and cloth filters in treating their unsafe pond/dam waters. In addition, some of the afflicted people with guinea worm also hide the disease from the zonal or the village volunteers because they always complain they experience pain and so much discomfort when the health workers bandage the disease. Such afflicted persons continue to enter water bodies seeding and re-seeding water sources with the guinea worm; in effect promoting the spread of the disease.

The coordinators also said it was difficult to convene or gather people in some of the endemic communities for durbars, drama and or decisions on the disease eradication. A case in point is the unwillingness of the people of Ducie to contribute one thousand cedis (¢1,000) per head towards the mechanization of the six boreholes to bring the water into the community.

Again, the coordinators pointed out the indifference of some of the village volunteers. Some of the volunteers are uncommitted to the whole programme activities. Volunteers give excuses of their farm work unattended to, as such they have no time to conduct case search and give health education in the villages. But the coordinators did mention that the lack of commitment on the part of the village volunteers might be due to the unrewarding incentives given to them. For one day meeting with the volunteers that could last between
3 to 5 hours, each volunteer was given €15,000 as sitting allowance. Each volunteer is also given a ‘T’ shirt and some few items along the line in the year, which is just not enough to motivate them to give up their best.

According to the key informants, attitude of the women in the endemic areas leaves much to be desired. Many women went fetching water for household use from the dams/ponds instead of fetching from the boreholes. During the field survey, women fetching water from the pond/dam site were asked why they were not going to the boreholes to fetch. Some reasons given still borders around the issue that: “Borehole water smells; there will be nobody to help me carry my basin of water at the borehole, but at the dam we stand with the basin on the head and fetch the water. The boreholes were too far away from the community.”

It was actually observed during the field survey women fetching water from the ponds/dams. None of the women seen fetching the pond/dam water filtered the unsafe water. When they were asked why they don’t filter the unsafe water, the response was always “we will go home and filter it.” But from the household responses, only 48.7 percent said they always filter their unsafe farm water, whiles 51 percent said they do not filter it. The most worrying aspect is that some of the respondents do not even believe the disease is contracted from drinking guinea worm contaminated water.

The key informants also identified the main economic activity of residents in the endemic communities as a risk factor for guinea worm infection. Over 90% of residents in the
endemic villagers are farmers. During the peak of farming and harvesting of farm crops, they temporally move the whole household to live in the farm away from home. The farmers relocate to their farms because of elephants, monkeys and other wild animals from the Mole Game Reserve that destroy their farm crops. Hence they stay in the farms to ward-off these animals. Also, during the peak of the rainy season, many streams on the way to their farms overflow their banks, making it very dangerous to cross or risk drowning. Lastly, the period of crop harvesting is between September and January, farmers live in their farms to watch the crops against bush fires. The student went to some farms were visited during the field survey near the Mole Game in Chassie, and farmers interviewed there did confirm their temporal relocation to live in their farms.

The coordinators also added the problem of transportation, which is the backbone of the Guinea Worm Eradication Programme. There is one pick-up and 2 motor bicycles that are dedicated to the programme in the region. A number of bicycles were also given to the zonal coordinators. But considering the vast area to be covered by the District Guinea Worm Eradication Team, it becomes difficult to effectively conduct surveillance in all the high-risk and endemic communities.

The terrain of the Wa area also possess a serious hindrance to the programme. Some of the communities are mountainous and inaccessible in the Wa east area. Making it difficult for volunteers to ride bicycles up these mountains to conduct case search and case containment in the villages. The zonal coordinators felt it would have been better if motor cycles were given them to facilitate easy movement in-between the villages. The village
volunteers also indicated that because they were natives, some of the inhabitants don’t usually take their health education seriously.

Both the Modern Political System and the Traditional Political System were also identified to play a role in the programme. However, the key informants stated the lack of commitment of the District Assemblies in the Wa area to the Guinea Worm Eradication Programme. “The politicians see the disease as a problem for health and not for the entire nation,” as one of them stated. He added, “Even drilling of bore holes in the villages has political undertones.”

On the Traditional leadership, the key informants said there was a leadership problem in some of the endemic communities. They observed that Ducie that is a “hot spot” of the guinea worm disease for example, has a “power vacuum”. The Wala’s sees the chief of the town as an imposition on the Chakalis. The paramount chief of the Wala traditional area is said to always appoint his sons (Wala), to rule over the Chakali communities in the Wa East. The chief resides or stay in Wa while ruling the people in the villages. Loyalty of residents of these communities to traditional authority in terms of decision-making is therefore seen to be lacking. The landlord in the community is also blind, and in one of the interviews, he stated that “the guinea worm disease in this community is the will of God to them, if not so it would not have been there.” The key informant stated that the absence of a strong traditional leadership in these “hot-spots” of the disease is making the implement of the Guinea Worm Eradication Program difficult. A case in point sited was the inability to effectively mobilize the people in Ducie community to contribute just a ¢1000 per head towards the community water mechanization programme initiated by
the Carter Centre in 2005. According to the key informant, the Ducie residents are to contribute a percentage of the project cost before the donors support is released.

Another areas mentioned was the lack of coordination between the Guinea Worm Eradication Secretariat in Wa and other agencies like Community Water Project (COWAP), the District Assemblies and other Non-Governmental Organizations (NGOs). This may have led to the drilling of more than enough boreholes in some endemic communities’ whiles others are left out. For example, Ducie has 6 boreholes and Kulkpong and its surrounding areas have 12 boreholes whiles Sigiri and Chaggu-pani, which are also endemic communities, did not even have a single borehole. Some other endemic communities like Bulle, Chaggu and Chassie have a borehole each.

Some other challenge identified is the sitting of ponds/dams by the Ministry of Food and Agriculture/Agriculture Sector Improvement Project in the communities. These ponds/dams though helpful during the dry season for gardening and a water source for livestock, they are a disincentive to the guinea worm disease eradication. This is because the pond/dams are sited right in the communities while the recently drilled boreholes especially in Ducie and Gurembella communities are relatively far away from the communities. The nearest borehole to the Ducia community is 1.5 km. The residents are therefore not persuaded to walk such a distance to fetch water while the pond/ dam water are less than a kilometre away from their compounds.
High-level illiteracy and poverty was also identified as a contributory factor to the spread of the disease in the area. Over 70 percent of the people are illiterate and engaged in subsistent farming. But it is an established fact that rural subsistent farmers are the most poverty stricken and deprived in Ghana. Due to their ignorance of the causes of the guinea worm disease, it becomes difficult for the residents of guinea worm endemic areas to accept and adapt to changes especially from drinking pond/dam water to that of the borehole water provided.

There are also a few health workers assigned to the Guinea Worm Eradication Programme in the region. The five-man member District Health Management Team (DHMT) is really under pressure to deliver. They have over-worked and fatigue has set in. As such the DHMT members are unable to cover all the areas for case search, surveillance, case containment, supervision of the zonal and village volunteers, abating of dams/ponds and writing of district reports to regional office. The Wa district has recently been split into three separate districts: Wa East, Wa West, and Wa Municipal. Very limited health personnel and resources are actually available to fulfil all the responsibilities of the new districts. The District Disease Control Officers has now been designated as the Acting District Guinea Worm Coordinators. With such a wide range of duties, they obviously will be unable to live up to expectation.

6.4: CONCLUSION

Eradication of dracunculiasis was seen by scientist to be in sight by the end of 2005. It was believed that guinea worm would soon be eradicated just as small pox. This dream
has been a mirage because 2005 ended with 3,974 reported cases in Ghana alone. The resurgence of the disease could be attributed to complacency on the part of programme implementers, inadequate health workers, tribal conflicts and civil wars in some endemic areas, and dwindling resources due to the costly nature of the eradication programme.

Notwithstanding, it is the desire of the Government of Ghana, the Ghana Health Service and all well-meaning people to completely eradicate the guinea worm disease in the country. Success is in sight, it is achievable, but it must be a sustained effort of all stakeholders to address these challenges in order to completely eradicate the disease in the Wa area and Ghana as a whole.
CHAPTER SEVEN: SUMMARY, CONCLUSION, POLICY IMPLICATION AND RECOMMENDATIONS

7.1 SUMMARY

This study sought to examine the problems of the Guinea Worm Disease in the Wa area. Several findings emerged, these are summarised in this chapter.

The personal characteristics of respondents in this study have a significant implication in the guinea worm incidence and prevalence in the Wa area. The fact that majority of the respondents are illiterate makes them ignorant of the infection of divers disease including dracunculiasis. The level of formal education amongst both men and women is very low. It is only the younger generation that seems to be in the Primary, Junior and the Senior Secondary bracket/level of formal education. Dracunculiasis does not discriminate in age structure in afflicting people; it was observe that both children and adults suffer from dracunculiasis affliction. The only difference is the level of exposure to contaminated guinea worm water, the attitude in accepting health education on the disease and the belief system of the people.

The analysis of the disease burden indicates that men have the highest guinea worm disease burden than women. Discussion with respondents especially the Chakali ethnic group shows that men are engaged in the farm work, whiles women are expected to stay at home and care for the children. Amongst the other ethnic groups also, more men than women are engaged in farm work. Due to the thirst and hunger under the harsh weather conditions, they consume large volumes of untreated water on the farm, thus the men suffer more from the disease infection. It was also observed that children between the
ages of 5 and 15 swim in the ponds/dams in the various communities; exposing them to the risk of guinea worm infection than younger girls. Because, they most likely to drink the contaminated water in the process of swim.

The study has also found out a distinct spatial variation in the disease pattern in the study area. Bulenga and Holimuni Sub-districts in the Wa East are found to be the most endemic areas in the entire Upper West Region. Theses Sub-districts serve as the “hot spot” of dracunculiasis in the Upper West Region. The spatial analysis also shows Wa East area to have a difficult terrain, and a problem of accessibility to some of the communities.

The research also observed a strong association between population mobility and prevalence of the disease. The high short-term rapid interaction of persons in the area through the sharing of common facilities like markets, schools ponds/dams are some of the factors that promote the transmission and spread of the disease. Another issue is the participation of neighbouring communities in festivals and funeral celebration; this is where people are attracted from all walks of life to a convergence point for such occasions.

Individuals who suffered or are suffering from the disease are unable to carry on their farm work and other domestic activities. Farm work and crop harvest are abandoned due to the disease. This results in low crop yields, high post harvest loses and insufficient food for the household throughout the year. It also leads to lose of income to individuals
and households. At the community level, afflicted persons are unable to participate in community self-help projects and other social gatherings; such as funerals and festivals. Afflicted parents are unable to attend to their children, other children in school are either withdrawn to assist in the farm and household chores. School children afflicted with the disease absent themselves from school for a number of weeks, some eventually dropout due to incapacitation from the disease.

The environmental factors governing the spread of the disease include the physical environment (soils, forest, ecosystem, climate, and water bodies), socio-economic environments (agriculture, housing, health care, political system, and family system) and the biological environment (flora and fauna, pathogens and vectors). The vector is water fleas, which is ingested when contaminated water with guinea worm is taken. The intermediate host is the copepod, ingested by the host when contaminated water is taken. The environmental conditions prevailing in the study area is therefore suitable for Dracunculus medinesis to survive and spread. It is however clear that the disease is both a socio-economic and environmental problem. Neglecting the cultural factors in the disease eradication may amount to a failure.

Dracunculiasis affects agricultural activities negatively. It leads to poor yields, post-harvest losses, low income, and malnutrition. It also affects development of endemic communities, as afflicted individuals are unable to participate in communal labour, attended funerals and festival. It was also found out that persons afflicted by the diseases
more than once suffered from permanent weakness in the body, constant cold, unable to
withstand rain and an induced desire to sleep often.

The effort to eradicate the disease in the Wa area is yielding results. The health education
is on going, drilling of boreholes and provision of safe drinking water. Distribution of
pipe and clothes filters to filter unsafe water and the abating of dams/ponds has greatly
reduced the incidence of the disease in the Wa area. Many villages that were endemic
some few years ago are now being classified as non-endemic communities.

However, there are some challenges on the ground, which if not properly addressed may
derail the entire programme. The skeletal work force of the District Health Management
Team needs to be strengthened with more health staff. Motivation of the zonal
coordinators and villages volunteers to enable them give of their best may have to be
considered by management. There is also the need to employ multi-strategies in the
health education campaign in areas like Ducie, Gurembella, Holimuni, Sogla and
Mortigu. Residents of these communities are found to have a very apathetic attitude to
the guinea worm eradication programme. The attitudes of the people in these
communities show a strong attachment to superstition. They believe that unseen forces
are responsible for the disease in their villages.

What emerges from the survey is that provisions of adequate boreholes in these endemic
villages will not necessary eliminate guinea worm. Providing boreholes is one of the
solutions, but the belief systems of the people is the major challenge. Because, the simple
technology of filtering unsafe water with the pipe and clothe filter could effectively
eradicate the disease. As indicated in table 3.5, the endemic village Ducie is provided with six boreholes, Kulkpong has twelve bore holes. But in these communities the reported cases of the disease are still increasing. With the other communities that have fewer boreholes necessitating residents drinking from ponds and dams, they could still reduce the risk of infection if they constantly use the pipe and cloth filters to filter all unsafe water before drinking. It is the attitude and belief system of residents in guinea worm eradication areas that matters but not the inadequate boreholes provision.

Finally, in examining the propositions of the survey, it was established that the internal mobility and interaction of persons in guinea worm endemic areas couple with their belief systems are promoting the spread of the disease. The other proposition that provision of adequate boreholes in endemic villages will facilitate the early eradication of the disease could not be established. Because other factors like the cultural settings are equally a challenge to the disease eradication.

7.2 CONCLUSION

Dracunculiasis is a 3000-year-old parasitic disease endemic in remote regions of third world countries. Humans become infected with the disease by drinking contaminated water containing copepods (small crustaceans), which are infected with larvae of Dracunculus medinesis. The strongest signal of approaching distress is the raising of burning blisters followed by an ulcer caused by the gravid worm. General symptoms of the disease are skin wheals and eruptions, nausea, vomiting, asthma, and fainting. The disease is debilitating and often leaves its victim disabled for life. Though fatalities from
the disease are rare, usually, deaths resulting from secondary infections like tetanus are reported. Varying durations of the illness and disability is ranging between 3 to 14 weeks before recovery. The worms load per victim ranges from 1 worm to 15 multiple worms. There is no effective treatment or prophylaxis of dracunculiasis.

Guinea worm has a crippling effect on individual victims, the household, and the community as a whole. The disease has been blamed for much loss of agricultural productivity in endemic areas. In this study, it was found out that the disease seriously affected household food production, household income, and community self-help projects. Dracunculiasis and malnutrition has a positive correlation in endemic areas. The disease disrupts family life by increasing the household dependency ratios as infected person depend solely on other members of the household. This is not to suggest that dracunculiasis is the sole cause of increased dependency ratio in the household in endemic areas.

Prevention is the only effective means of eradicating dracunculiasis. It has been established that an inter-disciplinary approach is the effective means of eradicating the disease. These approaches include case containment, filtering all unsafe water before drinking, treating unsafe water sources with Abate Larvicide’s and construction of boreholes and deep wells to provide good drinking water in all endemic communities. The study found out that the survival and spread of dracunculiasis is facilitated by environmental factors like the physical environment, biological environment, and the socio-economic environment.
The contribution of this study to knowledge is the fact that providing boreholes in guinea worm endemic areas will not in all cases automatically lead to the eradication of the disease. The belief system or the cultural settings of the residents of endemic communities poses a challenge to the disease eradication. There is still therefore the need for further research into the belief systems of residents in the guinea worm endemic communities in the Wa area. Some of the unanswered questions by this survey are: Why are the inhabitants of these endemic communities holding unto their deep rooted belief system that the disease is either in their blood or is the cause of unseen forces? Is the absence of effective traditional leadership in some of the endemic villages a problem to eradicating the disease in such areas?

7.3 POLICY IMPLICATION

The implementation of the Guinea Worm Eradication Programme in the Wa area has brought to light certain critical issues to be considered. It is obvious that the provision of safe drinking water (boreholes) in these guinea worm endemic communities, in addition to the distribution of pipe/cloth filters to almost every household for treating unsafe water before drinking should have led to reduction or eradication of the disease in these endemic areas. On the contrary, increased reported cases are recorded. The disease continues to afflict the people. The prospect of controlling/eradicating the disease in the area may have to re-focus on the world-view of the people.

Eradicating dracunculiasis will lead to the improve well-being of the rural people, agricultural production will increase, and off-farm income earnings will also increase.
The rural areas will eventually develop as a result of reduced man-labour lost, and availability of manpower. Workers in the formal sector will eventually accept posting to work in these deprived rural areas.

7.4 RECOMMENDATIONS

The survey has established significant findings. First, it is not the provision of adequate boreholes that will lead to the eradication of guinea worm disease in the Wa area. The belief system of the residents and their attitude has a significant influence on the spread of the disease.

In view of the long-term effect of dracunculiasis on the rural dwellers, there is therefore the urgent need for pragmatic policies that may promote and completely eradicate the disease. The following recommendations are not in any way the most exhaustive, they are put forward to help promote the guinea worm eradication programme in the Wa area.

The guinea worm eradication programme implementation in the Wa area has been highly commendable. However, there is the need for inter-sectorial collaboration amongst all the stakeholders in the disease eradication. This is to ensure proper coordination of efforts and effective use of resources devoted to the project. For example, collaboration between the Guinea Worm Eradication Team, District Assemblies, Community Water Agency Project and other None Governmental Organisations (NGOs) would have prevented the serious neglect of some of the endemic communities in the provision of boreholes.
Future health education efforts should also include respect for observed perceptions of the people and their illness experiences. Field workers should be trained to understand the world-view of the people, so that they can use it as the basis for the health education. Field workers should also be sensitive to the many-faceted constraints on households to obtain safe drinking water. Seasonal water availability is a real problem to these rural people. The long term use of the pond/dam water has led to the perception that borehole water is tasteless and smelling.

Areas where the terrain is not suitable for bicycle use by zonal coordinates, management should consider giving the coordinators motor bikes, especially Wa East area. Action should also be taken to improve upon the incentives given to the zonal coordinators and village volunteers, because they are the pivot of the entire programme.

Greater involvement of political leaders in the health campaign will create lots of impact. The Regional Minister, the District Chief Executives, and the Parliamentary Members from Wa area should all get involve in the health campaign moving in the endemic communities. Community Durbars, radio talk shows on the disease, and regular interaction with the traditional authorities of the affected communities could promote a behaviour change in the villages.

Traditional authorities should also be roped into the health talk shows using the local languages. Let the people hear their chiefs and elders talk on the local FM Stations about
the disease. Traditional areas where there are authority vacuum, opinion leaders from these areas should be sought for and relied on in such communities for effective health education.

The number of health personnel assigned to the guinea worm eradication programme in the districts should be increased. Their work should be focus on the guinea worm disease alone. The programme should be well resourced at the district and regional level. Reliable transportation should also be made available to the Regional and District Guinea Worm Eradication Team.

Finally, but not the least, proper record keeping of all reported cases at the district and regional level of the disease should be improved. The data should be categorized in relation to their basic demographic characteristics of the victims for easy reference.
REFERENCES:


District Data and Implication for Planning Upper West Region, pp. 24-37.


Manson-Bahr and Bell (1987): Manson’s Tropical Disease (19th ed). Printed in Great Britain by William


315. Danish Bilhaziasis Laboratory, Jaegersborg Alle ID, DK -2920 Charlottenland, Denmark.


Wa District Assembly, (2004): Wa District Profile.


APPENDICES

Appendix 1a

Household Survey Questionnaire

1.0 Background information

1.1 Date (Day and Month)

1.2 Time: -------

1.3 Name of respondent

1.4 Name of settlement

1.5 Household address

1.6 District

1.7 Region
<table>
<thead>
<tr>
<th>ID CODE</th>
<th>2.1 List of household members (Respondent first)</th>
<th>2.2 Sex: Male = 1 Female = 2</th>
<th>2.3 Relation to hh head</th>
<th>2.4 Age</th>
<th>2.5 Marital status</th>
<th>2.6 Religion</th>
<th>2.7 Ethnicity</th>
<th>2.8 Education level</th>
<th>2.9 Primary Occupation</th>
<th>2.10 Secondary occupation</th>
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</table>

2.0 SOCIO DEMOGRAPHIC DATA

2.4: 10-20, 21-30, 31-40, 41-50 >50

2.6: 1 = Married, 2 = Single, 3 = Divorce, 4 = Widow

2.6: 1 = Moslem, 2 = Christian, 3 = Traditional, 4 = Other

2.7: I = Wala, 2 = Dagaati, 3 = Lobi, Chakali

2.8: 1 = None, 2 = Primary, 3 = JSS/Middle, 4 = SSS/Tech.
      5 = Tertiary

2.9: Farming, 2 = Charcoal burning, 3 = Pupil/Student
      4 = Cattle herder, 5 = Professional, 6 = Other

2.10:
3.0 KNOWLEDGE OF THE DISEASES

3.1 Which of the water born diseases do you know?
   - Diarrhoea..............1
   - Malaria....................2
   - Guinea worm...............3
   - Bilharzias..................4
   - Typhoid.....................5
   - Cholera......................6
   - Other (specify)..............7

3.2 Do you know about guinea worm?
    Yes..................1    No..................2    If yes,

3.3 What do you know about it?

3.4 Do you think guinea worm is a health problem in your community?
    Yes..................1    No..................2
    If yes, how?

4.0 PERCEPTION AND MANAGEMENT OF THE DISEASE

4.1 How does one get infected with the disease?
   - By drinking contaminated water with guinea worm....1
   - By drinking any dirty water.......................2
   - By entering dirty water.........................3
   - Don’t know........................................4

4.2 What is the cause(s) of the disease?
   - Witch/juju...............1
   - Hereditary...............2
   - God sent....................3
   - Punishment from the gods for breaking taboos........4
   - Guinea worm..................5
   - Don’t know.....................99

4.3 At what season (month) of the year is the disease common?

4.4 Is the disease preventable?
    Yes..................1    No..............2

4.5 If yes, how? And If no, why?

5.0 TREATMENT OF THE DISEASE

www.udsspace.udsa.edu.gh
5.1 Has any member of the household suffered from Guinea worm during the past six years?
   Yes..................1
   No.......................2

5.2 How many suffered (Name and year)

<table>
<thead>
<tr>
<th>Name</th>
<th>2003</th>
<th>2004</th>
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</table>

5.3 What is your main mode of treatment of the disease?
   Self-Medication..............1
   Orthodox health care ..............2
   Traditional health care.........3
   Other (specify).....................4

5.4 How much did you spend or have spent so far on the disease?
   Amount..................Cedis (estimate)

6.0 WATER USAGE

6.1a. Which water sources do you usually use for drinking and cooking?
   Mark the respondent answer in the first column of the table below: Several answers can choose

6.1b. Which water sources do you always use for bathing?
   Mark the respondent answer in the second column of the table below: Several answers can choose

6.1c. Which water source do you usually use for laundry and other household purposes
   Mark the respondent answer in the fourth column of the table below: Several answers can choose

6.1d Which water source do you usually use for business purposes.
   Mark the respondent answer in the fourth column of the table below: Several answers can choose
6.2 What are the sources of your farm drinking water?
- Pond/Dam........................................1
- Stream/River......................................2
- Well (hand dug).................................3
- Pipe/Borehole....................................4
- Other (specify).................................5

6.3 Do you treat your farm water before drinking if it is unsafe water source?
- Yes......................1
- No......................2. If yes, how do you treat it?

7.0 INTRA-HOUSEHOLD DECISION MAKING

7.1 Who in the household decides on the water source the household uses
- Household head..............1
- Spouse.................................2
- Both.................................3
- Other (specify).........................4

7.2 Who in the household fetches the water?
- Household head...............1
- Spouse.................................2
- Daughter.............................3
- Other (specify).........................4

9.0 WATER TREATMENT
9.1 Do you treat the water before using it for drinking and cooking purpose?
- Yes.........1
- No.........2, if no skip to 10.0
9.2 Water from which source did you always treat?  
Please differentiate between rainy and dry season

<table>
<thead>
<tr>
<th>Source</th>
<th>Dry season</th>
<th>Rainy season</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.2.4 Hand dug well</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>9.2.5 River, streams and ponds</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>9.2.6 Collected rain water</td>
<td>Yes</td>
<td>No</td>
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</table>

9.3 How do you treat the water?  
Boil it..................1  
Filter it................2  
Boil and filter..........3  
Add chlorine or Abate....4  
Other (specify)...........5

9.5 Who in the household mainly takes care of treating the water?  
Head of household....1  
Spouse...............2  
Daughter............3  
Son..................4  
Other (Specify).......5

10.0 THE DISEASE IMPACT ON HOUSEHOLD

10.1 To what extent has this illness affected household food production?  
To a large extent.......1  
To some extent.........2  
To no extent...........3

10.2 Could you please give reasons for your answer in q. 10.1?  
a..............................................................  
b..............................................................  
c..............................................................

10.3 To what extent has this illness affected household income?  
To a large extent.......1  
To some extent.........2  
To no extent............3
10.4 Could you please give reasons for your answer in q. 10.3?

a. .................................................................
b. ......................................................................
c. ......................................................................

11.0 DISEASE DIFFUSION

11.1 Do you share these common facilities with neighbouring communities?
River.............1
Ponds............3
None..............5
Stream...........2
Dams.............4

11.2 Do you organize festivals in this locality?
Yes..............1
No...............2

11.3 If yes, how often?

11.4 Do people from other communities attend?
Yes..............1
No...............2

11.5 How long do they normally stay?

12.0 CASE CONTAINMENT

12.1 When a person has guinea worm coming out from the skin what must he/she do within the first 24 hours?
Inform village volunteer..........1
Go to health centre...............2
Apply herbs.........................3
Other (Specify)......................4

13.0 HEALTH EDUCATION

13.1 Has the health community personnel visited your community this year?
Yes................1
No..................2

13.2 What activities do they carry out are given to the people any time they visit the community?
1.................................................................
2.................................................................
3.................................................................
13.3 Has the education help you in any way?
   Yes ..................1  No ..................2

13.4 If yes how? And if no, why?

14.0 MIGRATION

14.1 Do some of the some people in this household leave during certain times of the year to look for work elsewhere?
   Yes ..................1  No ..................2

14.1 Where do they go?
   Village in Ghana ...............1
   Town in Ghana ...............2
   Outside Ghana ...............3

14.3 What type of work do they do during those times of the year?
   Agriculture ...............1
   Government employment ....2
   Private employment .......3

14.4 How long do they stay away from home before returning?
   Less than 6 month .............1
   Between 6 months and 1 year ...2
   Greater than 1 year ............3
   Permanent ...............4

14.5 What are the ages of most of the people who travel?
   15-30 ..................1
   21-25 ..................2
   31-45 ..................3
   41-45 ..................5
   > 46 ..................4

14.6 Do they migrate with the complete household or with some part of the household?
   Alone ..................1  with complete household ...............2
   With some of the house hold members ............3

14.7 Why do you think they left the village for other places?
   To get education ...............1
   To join spouse ...............2
To farm in the other village........3
To take up a job..................4
Others (specify)...................5

14.8 When they leave where do they most often go?
  Farming areas in within the district.........1
  Farming areas in the Upper West region.......2
  Farming areas in BA/ER/AR....................3
  Farming areas in the Northern Region.........4
  Other (specify)............................5

14.9 What was the relationship of the person who migrated to you?
  Son..................................1
  Wife..................................2
  Brother/sister.........................3
  Daughter...............................4
  Father/mother..........................5
  Other (specify).........................6

14.10 Have you ever Lived in another village, or town for ten or more months at one time?
  Yes..................1
  No...................2

Enumerator: If yes, proceed further, if no, stop

Temporal migration

14.11 How long is it since you came to stay in this place?
  ________ Years _________ Months

14.12 Have you migrated with complete household, alone or with some part of the household?
  Alone..................................1
  With complete household..................2
  With some members of the household......3

14.13 How long are you planning to stay in this place?
  Between 6 month and 1 year................1
  Greater than 1 year (>>5)..................2
  Permanent................................3
  I don't know...........................4

14.14 In what region were you living before you moved to your current place of residence?
14.15 What is the district/community name of the place you lived before you moved here?
District: ________________________________ Community: ________________________________

14.16 During the time you lived in that community was there guinea disease cases there?
Yes..........1 No.................2

Appendix b

QUESTIONNAIRE GUIDE FOR PEOPLE SUFFERING FROM VICTIMS OF THE DISEASE

1.0 Sex: Male..................1 Female..............2

2.0 Age: ...........................................

3.0 Education background
  None.............1 Primary.............2 Middle/JSS..............3
  Technical/SSS....4 Post Sec............5 University..............6

4.0 Ethnicity
  Wala.............1 Dagaati.............2
  Sissala.........3 Chakali.............4 Lobi.................5

5.0 Major occupation
  Farmer............1 Artisan.............2 Cattle herder.............3
  Student/Pupil....4 Others (specify).....5

6.0 Which year did you contract the guinea worm disease?
  2000........1 2001...........2 2002.............3
  2003........4 2004............5 2005.............6

7.0 Within the six year period did you suffer from the disease more than once?
  Yes.............1 No.....................2

8.0 If yes how many times?
  Twice.........1 Thrice.............2 Four times........3

9.0 What are the symptoms of the disease?
  Fever.............1 Body pains............2 Itching spots....3
  Blister........4 Lost appetite........5 Others .............6
10. How many weeks were you down with the disease?
   One week.............1
   Two weeks............2
   Three weeks..........3
   Four weeks...........4

11. How is/was the disease treated?
   Attended health centre/hospital......................1
   Used traditional treatment............................2
   Others (specify)........................................3

12. What is the cause(s) of the disease?
   Witch/juju..............1
   Hereditary..............2
   God sent................3
   Punishment from the gods for breaking taboos........4
   Guinea worm...............5
   Don’t know...............99

13. How does one get infected with the disease?
   By drinking contaminated water with guinea worm....1
   By drinking any dirty water.............................2
   By entering dirty water................................3
   Don’t know.............................................99

14. At what season (month) of the year is the disease common?
   Raining season...........1
   Dry season...................2

16. What are the sources of water used for drinking/cooking
   Pipe water.................1
   Hand dug well...............2
   River/Stream/pond...........3
   Borehole....................4
Appendix c 1

INTERVIEW GUIDE: REGIONAL PUBLIC HEALTH DIRECTOR

1. What is the pattern of the guinea worm disease in the Wa area?

2. What accounts for the differences in the pattern of the disease in the Wa area?

3. What are some of the challenges of implementing the GWEP in the Wa area?

4. What are you doing to effectively control or eradicate the disease despite the challenges you mentioned?

5. Is there any other information you may want to give in addition to what is provided?

Appendix c 2

INTERVIEW GUIDE: REGIONAL GUINEA WORM COORDINATOR AND TECHNICAL ADVISOR GWEP.

A. Surveillance
1. How do you carry out surveillance in the Wa area? (Promptness in case detection, case search, during immunisation exercise etc)
2. When was the last case search operation conducted?
3. Were all the villages (endemic and non-endemic) searched?
   If no, why?

B. Case containment
4. How many cases of Guinea worm disease were recorded last year?
5. How many were contained?
6. How many were imported?
7. What was the source of importation?

C. Health education
8. What method of health education did you use in your outreach programmes?

D. Supply of filters and distribution
9. How do you obtain your filters?
10. Do you run short of supply of filters in the cause of the year? Explain
11. How do you distribute your filters?

E. Vector control
12. What action is taken for the conversion of unsafe water sources into safe ones?
18. How many did you carry out?
19. Do you have a checklist for supervision?
20. How do you check and document your guinea worm eradication activities?
21. How often do you meet the Zonal Coordinators and Village volunteers to discuss issues pertaining to the programme?
22. Are your Zonal coordinators and the Village volunteers happy with their work? If yes, explain.
23. Do the guinea worm affected villages communicate regularly to your secretariat? If no, why?

G. Training
24. How many training workshops do you organized for the zonal coordinators and the village volunteers?
25. What is the content?

H. Inter-sectorial collaborations
26. Is there a co-ordination between your secretariat and the various stake holders (GWSC, NGO'S, DA) concerning the GWEP?
28. Have you had any meetings with them?
29. What role do they play in the GWEP?
30. What are the types of safe water supply provided in the villages in the Wa area?

I. Disease control
31. List guinea worm affected villages provided with safe drinking water from 2000 to 2005.

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32. List the number of newly affected communities in the Wa area from 2000 to 2005.

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33. List the number of re-infected the Wa area from 2000 to 2005.

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34. List the number of communities deleted from the list of affected communities in the Wa area from 2000 to 2005.

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35. What specific problems do you face in implementing the GWEP in the Wa Area?

36. Do you have any comment to make?

Appendix c 3

INTERVIEW GUIDE FOR DISTRICT COORDINATORS

1. With your interaction with the people in the endemic areas, what is their perception of the guinea worm disease?

2. As a member of the District Guinea Worm Eradication programme what are some of the challenges to the eradication of the disease?

3. What do you consider to be the cause of the high incidence of the disease in some of the communities than others?

4. As a health worker do you think the disease is affecting the wellbeing of the people living in the endemic areas?

5. Do you have any general comment to make in line with the discussion.
Appendix c 4

INTERVIEW GUIDE FOR ZONAL COORDINATORS

1. As a health worker living in the community with the people, what do you perceive to be their belief or perception of the guinea worm disease?

2. What are the challenges you are facing in the communities in relations to your work as the coordinator of the GWEP on the ground?

3. What do you think can be done to solve or reduced the challenges you mentioned?

4. Do you have any other information to add to what you have given?

Appendix c 5

CHECK LIST FOR FOCUS GROUP DISCUSSIONS (FGDs).

1. Why do you think the guinea worm is still prevalent in your community?.

2. What do you think is the cause of the guinea worm disease?

3. How do people who contract the disease get treatment here?

4. What are some of the difficulties you face in treating the disease?

5. What contribution is the community making to prevent/control the disease?

6. Is the disease-affecting households in any way in your community?

7. What are the sources of drinking water in your community?

8. Do you have any other contribution you want to make towards the discussion?