Prevalence and Management of Malaria in Ghana: A Case Study of Volta Region

Chuks J. Mba[1] and Irene K. Aboh[2]

Abstract

Volta Region, one of Ghana's ten administrative regions, has the highest prevalence of malaria in the country. The present paper assesses the patterns, levels, and trends of malaria prevalence among inhabitants in the 12 districts of the region, and examines whether those at risk of malaria have assess to protective measures and have effective treatment for malaria in Volta Region. The study focused on secondary analysis of data from the Volta Regional bio-statistical office, Ho, the region's capital, supplemented by the 2003 Ghana Demographic and Health Survey. The results show that malaria cases are prevalent in the Jasikan, Hohoe, Kpando, Ho and Keta Districts. Districts that lie within the middle and southern belts enjoy two rainy seasons that are conducive to the vector that causes malaria. Overwhelming majority of the in-patients (41.5%) are children aged 0 – 4 years, while the number of the in-patient cases generally decreases with advancing age. The majority of children who had fever in the last two weeks (34.8%) were aged 12 – 23 months, followed by 34.4% for age group 0 – 11 months. The highest malaria cases in the region are from the Hohoe district (24.2%) in year 2003, followed by Ho 20.1% in 2000 and 2002, and Keta (17.2%) also in 2003. The least recorded is the North Tongu with 0.9% for 2 different years (2000 and 2002). It is anticipated that with a considerable reduction in poverty levels, households and communities would become increasingly responsible for the improvement of their health status and quality of life.

Key Words: District, fever, health, malaria, Ghana, Volta Region.

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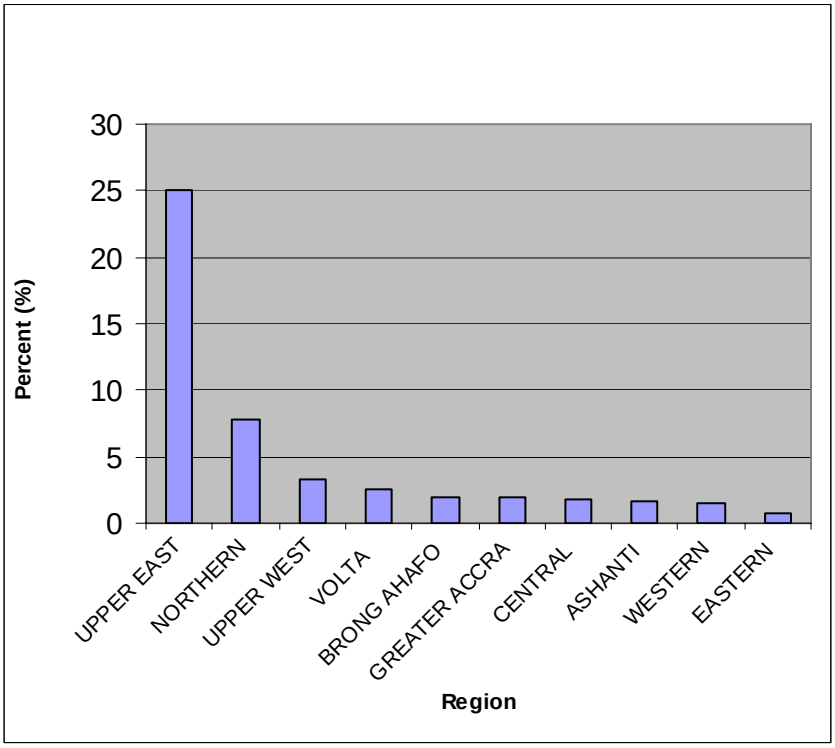
1.1 INTRODUCTION

Despite considerable efforts throughout the century to eradicate or control malaria it is still the most prevalent and most devastating disease in the tropics. The disease has a crippling effect on the economic growth and perpetuates vicious cycles of poverty. It costs Africa US$10 – 12 billion every year in lost domestic product even though it could be controlled for a fraction of that sum (UNICEF 2004). In Africa, malaria causes approximately 20% of cerebral conditions leading to coma and death. One important strategy to prevent people from the risk of malaria infection is the use of insecticide treated mosquito net (ITNs). Recent studies have shown that the use of bed nets, especially the ITNs can reduce both transmission and mortality by at least 25% when used properly (Sagoe-Moses 2005).

The 2003 Ghana Demographic Health Survey (GDHS) revealed that among the 6,251 households surveyed 17.6% had a bed net and only 3.2% had ITNs. Figure 1 shows the proportion of households with at least one ITNs in the 10 region of Ghana. The figure suggests that, a vast majority of households in the country do not have this simple but effective way of avoiding malaria. The ownership distribution is not uniform; the highest ownership was recorded in the Upper East Region (25.1%), this may be attributable to the fact that UNICEF has since 2002 been distributing ITNs at highly subsidised cost to pregnant women and children under five in the Northern and Upper East Regions as part of its Child Survival and Reproductive Health programmes.

Figure 1: Percentage Distribution of Household with at Least One ITNs by Region in Ghana, 2003.



Source: 2003 GDHS

1.2 STATEMENT OF THE PROBLEM

Malaria presents a serious health problem in Ghana; it is hyper-endemic with a crude parasite rate ranging from 10 – 70% and plasmodium falciparum the major malaria parasite, dominating[3]. Although numerous efforts have been made to fight malaria in the country as in many endemic countries, achievements have been minimal. It is the number one cause of morbidity accounting for 40% of outpatient attendance with annual reported cases of 2.2 million between 1995 -2001, and over 10% ending up on admission (Kusi 2003). From the UN classification of childhood diseases it ranks third in Africa (Ministry of Health 2002).

[3] Ministry of Health, (MOH); Roll Back Malaria Strategic Plan 2001 – 2010. MOH Accra, 2000.

It is known that initial management and treatment of the disease often takes place outside formal service without consulting trained professionals largely because of transportation, finance, and time, social and physical distance, among others. Treatment received from these sources is often inappropriate leading to clinical complications such as severe anaemia, cerebral malaria, which may lead to coma and/or other parasitological complication such as the development of drug resistant parasites, whose emergence in the country in 1986 has been a major obstacle to the control strategy of prompt recognition and adequate treatment. It is also the leading cause of workday loss due to illness in the country. For instance, it accounts for 3.6 ill days in a month, 1.3 workdays absent and 6.4% of potential income loss to Ghana for 1998/99. The disease is again responsible for 10.2% of all healthy life lost from other diseases making it the chief cause of lost days of healthy life in Ghana it concluded.

As part of measures to eradicate the disease, WHO initiated a ``Roll Back Malaria`` project, of which Ghana is benefiting, to expand availability and coverage of insecticide-treated mosquito nets which includes forecasting and procurement of these nets by Non Governmental Organisations (NGOs). As a result of this effort, the Ministry of Health has drafted a policy on insecticide treated bed nets, and is adopting these nets as an additional control measure to back the RBM project (Chinbuah 1999). The Volta Region, a beneficiary of the project, has so far shown no significant improvement in combating malaria. This is reflected in the 2003 GDHS report, which shows that Volta Region has the highest prevalent cases of malaria in the country. It is therefore important to find out why Volta Region is the hardest hit in the prevalence of malaria in Ghana for possible policy interventions.

1.3 RATIONALE OF THE STUDY

Almost everybody in Ghana is vulnerable to the disease and about 50% of Ghanaians spend money on mosquito control products such as coils, sprays, fly proof nets, mosquito repellent etc, while almost every household spend money on the curative treatment of malaria (Ghana Social Marketing Foundation 1999). Since the cost of treatment of the disease is directly proportional to the size of the potential benefits to be derived for the country, for a successful malaria control programme, this study will try to identify areas of high prevalence of malaria in the region. Without a continuous assessment or provision of baseline data, the Region will not be able to effectively plan, implement and evaluate programmes. If the RBM initiative is to succeed in Volta Region, some empirical information on the location of the disease is needed and since no specific study has been done in this direction, the present study is timely.

Indeed, very few research studies have been carried out on the prevalence of malaria in the Ghanaian context to date. In particular, very little is known in the Volta Region concerning this very important subject. On the basis of available empirical evidence, it is necessary to furnish decision makers and other stakeholders with vital information regarding the prevalence of malaria in the region for possible policy interventions. Additionally, it is important to contribute to knowledge on the prevalence of malaria with a view to, among other things, stimulate further research. Against this background, the general objective of this study is to assess the patterns of malaria prevalence and to acertain whether those at risk of malaria have access to protective measures and have effective treatment for malaria in the Volta Region.

1.4 LITERATURE REVIEW

1.4.1 *Pathogenesis of Malaria*

In humans, malaria is caused by four species of the plasmodium protozoa (single celled parasites) – plasmodium falciparum, plasmodium vivax, plasmodium ovale and plasmodium malariae. Of these species plasmodium falciparum accounts for the majority of infections and is the most lethal.

Several studies have been done on different aspects of the disease, from parasitology to finding a cure with drugs (chemotherapy) and to eradication of the disease by the use of insecticide treated net and insecticides. Rashed[4] conducted a study which was aimed at determining the effect of Permethrin insecticide treated nets (PITN) use on the incidence of febrile episodes and non household malaria expenses in Benin. The study found out that, the use of PITNs decreased the risk of developing malaria by 34% in children in the rural areas; meanwhile, PITN use did not reduce prevention and treatment expenses. In a parasitology laboratory, malaria was found to be the major killer of paediatric illness and death in Kinshasa (Coene 1991). In view of this, the treatment of fevers as malaria with chloroquine is no longer acceptable because the plasmodium falciparum had a resistance to chloroquine. According to the study, the differences in endemicity of malaria that existed between the various parts of town had to be taken into consideration alongside the ecological and socio-economic

[4] Rashed, S. et al. 2000, "Economic Impact of Febrile Morbidity and Use of Permethrin- Treated Bed Nets in a Malarious Area II" in Social Science and Medicine, pp49, Toronto, Canada.

factors that underlie when planning for estimation of potential control methods.

The behavioural risk for malaria in the Machodinho resettlement area in the Amazonian forests of Brazil was examined (Castilla and Sawyer 1993). Analysis of the study suggested that economic status and knowledge of the importance and behavoiur of the mosquito in transmitting malaria are significant factors in determining prevalence risk irrespective of whether preventive precautions, for example, dichlorodiphenyl trichloroethane (DDT) spraying of houses and cleaning of vector breeding sites are to be undertaken in the endemic areas. However, the researchers found out that a higher economic status combined with better knowledge of the vector and DDT spraying of houses decreased the risk of infection. They suggested that a more positive implication is that control programmes must work harder and more intensively on behalf of poorer people especially migrants in order to diminish the disease burden for them.

Sharma and colleagues (2001) carried out a study on the socio-economic factors as well as on the human behaviour towards malaria on cross section of the Sundargarh district in India. They argued that poor socioeconomic status and socio-cultural factors play an important role in maintaining high degree of malaria transmission. They found that human behaviours such as location of hamlets, type of malaria transmitted, sleeping habits, and outdoor activities after dusk, poor knowledge about the disease and treatment seeking behaviour are of great significance as determinants of malaria transmission.

Malaria is also a major problem in Papua New Guinea as it accounts for a high proportion of sickness and death. This is because in addition to human suffering, it also put severe stress on the health facilities and directly hinders economic growth. It has been suggested that a malaria vaccine would be best, most cost effective and safe public health measure to reduce the burden of malaria (Reeder 2001).

Whitty and Allan (2004) contend that the serious threat posed by the spread of drug-resistant malaria in Africa has been widely acknowledged. Chloroquine resistant malaria is now almost universal and resistant to successor drug, sulfadoxine-pyrimethamine (SP) is growing rapidly. If the question of cost of treatment is not successfully addressed this could lead to adverse result from the deployment of combination therapy as a first-line treatment. Adverse effect of costly treatment ranges from increase in delays in infected individuals presenting themselves to the health care facilities for treatment to exclusion of the poorest malaria sufferers from receiving treatment altogether.

1.4.2 *Prevalence, Incidence and Determinants of Malaria*

It should be noted that epidemic malaria is derived from interactions of vectors, parasites and various environmental and anthropogenic determinants. Malaria epidemic afflict immunological vulnerable populations, straining the capacity of health facilities and causing case fatality rates to increase five-fold or more during outbreaks. The demographic profile may translate into larger economic consequences, although the full economic impact of epidemic malaria remains undefined.

A study was conducted in Benin on how to conceive and establish the importance of economic factors that contributed to malaria transmission (Mensah and Kumaranayake 2004). According to the study, despite the endemic malaria situations, there was still little understanding of the relative importance of economic factors that contribute to people acquiring the disease in communities where malaria was endemic. The researchers contended that, predisposing characteristics of households heads such as age, knowledge of malaria, education and size of household significantly affect the incidence of malaria as anticipated by economic theory.

A study by Asenso – Okyere (1994) on malaria in 4 districts namely Kojo Ashong, Barekese, Barekuma and Oyereko all from the Greater Accra Region of Ghana revealed that factors that were perceived as causing malaria are malnutrition, mosquitoes, excessive heat, excessive drinking, flies, fatigue, dirty surroundings, unsafe water, bad air and poor hygiene. Almost all the adolescents at that time had no idea how the disease was spread from person to person, while the symptoms of clinical malaria was also frequently considered to be yellowish eyeball, chills and shivering, headache, a bitter taste, body weakness and yellowish urine, the study added.

1.4.3 *Management of Malaria*

Yeboah-Antwi and colleagues (1997) examined the extent to which district health teams in Kintampo in the Brong Ahafo Region of Ghana could reduce the burden of malaria, which is a major cause of mortality and morbidity in a situation where severe resource constraints existed. It was found out that, compliance improve by approximately 20% in both adults and children but there was improvement to care about 50% for example in cost to patients, waisting time at dispensaries and drug wastage at facilities.

Another case study in Ghana sought to compare households data on acute morbidity and treatment seeking behaviour in two districts with the use of health facility data (Agyepong and Kangeya-Kayonda 2004). For every

case of febrile illness seen in the health facilities there were approximately 4-5 cases in the community, hence they concluded that every febrile episodes especially in children be treated with an anti-malarial drug. Since several countries extend malaria treatment to include the community and the home through public and private, formal and informal sectors, the need for more comprehensive estimates becomes urgent.

Appawu and colleagues (2004) studied malaria transmission dynamics in the Kassena Nankana District, a site in northern Ghana proposed for testing malaria vaccines. Intensive mosquitoes sampling was done for one year using human landing catches in three micro-ecological sites that is irrigated, lowland and rocky highlands. Transmission was highly seasonal and the heaviest transmission occurred from June to October. The intensity of transmission was higher for people in the irrigated communities than the non-irrigated ones. Approximately 60% of malaria transmission in KND occurred indoors during the second half of the night, peaking at daybreak between 04.00 to 06.00 hours.

1.5 CONCEPTUAL FRAMEWORK

Authors' Own Framework, 2006.

On the conceptual framework, the socio-economic activities are grouped into occupation, life style and domestic activities. Occupations of the people such as farming, fishing, animal rearing, stone quarrying, and petty trading, have an impact on the transmission of the disease due to the exposure to the bite of the infective species. The life style of the people such as sleeping outside, watching television or visiting the video centres, cinema centre, and drinking bars get them exposed to the exophilic species. The housing condition in the Volta Region is largely swish (*atakpame*), which includes a situation where the kitchen and toilet facilities are not attached to the bedrooms (Songsore 2003). They are normally detached from the main house. Most of these houses do not have protective gadgets like mosquito proof netting and proper drainage systems, so almost all the people depend more on mosquito coils. Domestic activities of the people refer to situations where, for example, drying of farm produce, cooking and washing are normally done outside the rooms.

Climatic condition may influence mosquito breeding and hence transmission of malaria. Anopheles gambiae breed in temporary pools such as roadside ditches and drains, burrow pits, hoof prints, wheel nuts, and puddles and highly depend on the rains for their numbers. The rainy season actually favours the prolific breeding in the sites, which in fact are numerous. These species have the highest population density during the rainy season and these accounts for the high incidence of malaria at this period of the year. In the hot dry seasons, substantial number of people may sleep outside in the open air, as a consequence of being bitten more frequently by exophagic species of mosquitoes. During the wet and cold season the species multiply rapidly thus increase their population and biting frequency.

The immunity in this framework is divided into two, that of the insect and man's natural resistance. Sometimes the vectors develop resistance to some of the control measures notably in the insecticides because of how these insecticides are used (Service 1979). Recently, the plasmodium has become resistant to the anti-malarial drugs in most black people because their red blood cells (RBCs) lack the duffy coating, which results in the easy invasion and multiplication of plasmodium to cause malaria (Beers and Rerkow 1997). One's nutritional status one way or the other also has direct influence in determining the resistance level of the individual; in such a case the disease depend on the individual's parasitic load.

The activities of the society either domestic or industrial pollute the environment by either creating choked drainage systems, poor waste disposal sites that is the wet and dry refuse. Location of health centres from the people in terms of distance encourages self-medication. This situation prolongs the existence of the plasmodium falciparum, which are picked up by uninfected vectors to become infected. In this way the vicious cycle begins.

Man and the mosquitoes interact through the above factors leading to persistence of the vector which get infected by biting an infected person and later transmitting this infection to healthy individuals leading to malaria.

1.6 METHODOLOGY

1.6.1 *Study Area*

1.6.1.1 *Geographic Location and Physical Environment*

The Volta Region is one of the ten administrative regions of Ghana. It is the longest region in the country, and stretches from the Gulf of Guinea through nearly all the vegetational zones found in the country; that is the coastal strands and mangrove swamps, the interior forest zones and the northern savannah grassland and lies on a longitudinal layout extending from latitude 5 degrees 45 North to 8 degrees 45 North[5]. It however shares common boundaries with four major Regions of Ghana namely, Greater Accra, Eastern, Brong Ahafo and Northern Regions (Amedoe 1998). For effective administration Volta Region is divided into twelve administrative districts, namely Krachi, Nkwanta, Kadjebi, Jasikan, Hohoe, Kpando, Ho, North Tongu, South Tongu, Akatsi, Ketu and Keta districts with Ho as the regional capital. The twelve districts constituting the region are shown in Figure 2.

[1] Agbenaza, C., "Ministry of Economic and Development Planning Regional Report" in Meet the Press Document, 1998, p2.

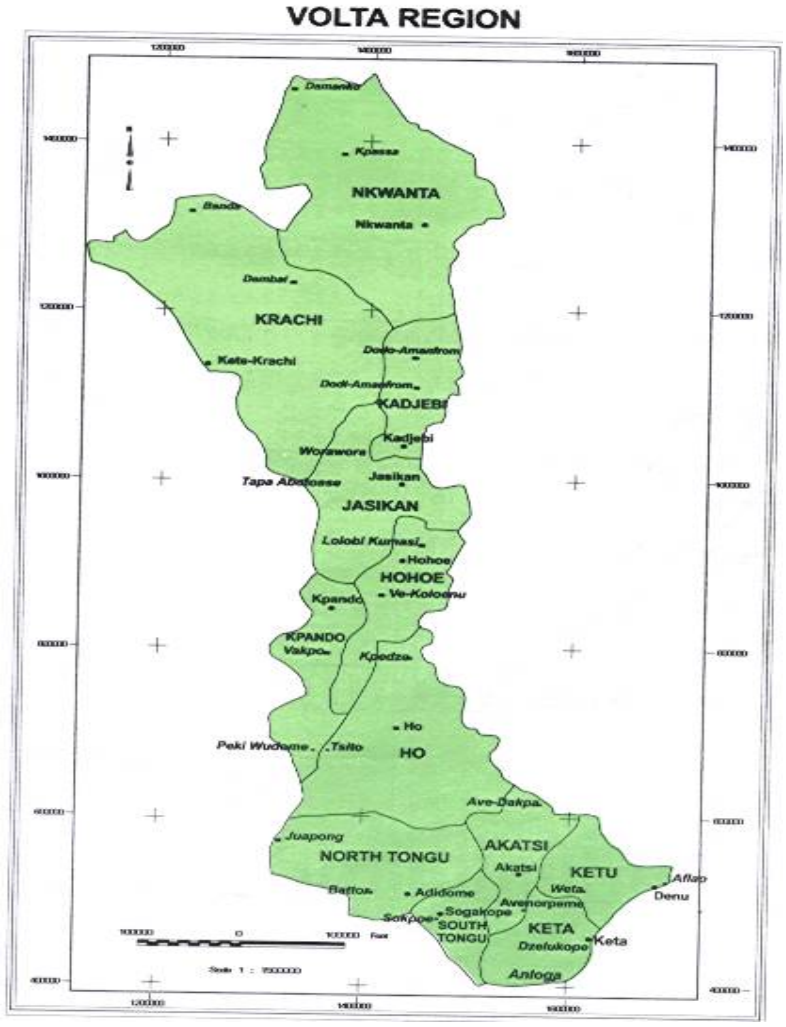


Figure 2: Map Showing the Twelve Districts of the Volta Region
Source: Population and Housing Census 2000

The principal vector identified in the transmission of malaria in Volta Region is the anopheles mosquito, which breeds well near lagoons and in mangrove swamps (Agyapong 2005). Data from the regional bio-statistical office in Ho show that the number of cases of clinical malaria identified for year 2003 was 131,103 (Ghana Health Service 2004). However, the evidence added that malaria cases identified in 2004 at the health facilities irrespective of the cases treated at homes and at the shrines already exceeds that of 2003 with a margin of 485.

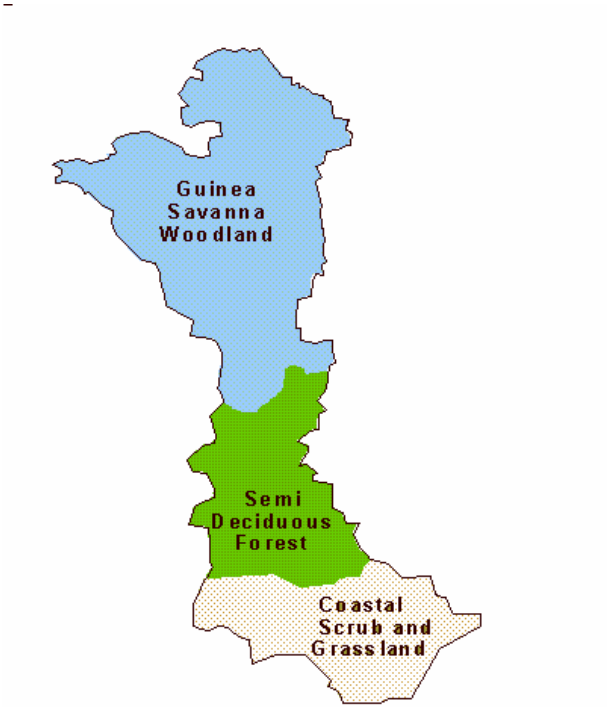
1.6.1.2 Health Facilities and Basic Demography

Volta Region has a total of 284 health institutions out of which 205 are Ministry of Health administered ones. Fifteen are Mission owned and one is a quasi-government facility, which is owned by the military hospital at the medium Mortar Regiment Section (MRS) in Ho, and 63 privately owned health facilities. It is worth noting that many of the MOH run health centres were community initiated. Every district except Akatsi now has a hospital either government or mission owned. The three health centres at Nkwanta, Aflao and Sogakope were upgraded to full District Hospital status and are operating as full budget management centres (BMC) by the government of Ghana (Ghana Health Service 2004).

The estimated population of the region as at October 2004 is 1,635,421, with a growth rate of 2.9% (Ghana Health Service 2004). It occupies a land area of 20,570 sq km making up 8.6% of the land of Ghana and consists of 27% urban and 73% of rural population, implying that the region is mainly rural and a density of 79.5 per sq km (Amedoe 1998).

The Volta Region is divided into three natural geographical belts namely the southern, middle and the northern belts. The middle and northern belts are mainly mountainous, spotting the highest point in the country i.e. Mountain Afadzato at a height of 885metres above sea level. The South is relatively flat with wetlands and sandy portions at Keta, Ketu, and South Tongu districts. The Middle and Northern belts are drained by rivers Oti, Asukawkaw, Menu, Dayi all of which stream into the Volta Lake. The rivers Alabo and Tordzi drain the Southern belt. The region falls under three major ecological zones; namely the coastal savannah with patches of strand and mangrove in the south, semi-deciduous forest in the middle zone, and semi-savannah woodland in the northern zone. The zonal distribution the Volta Region is depicted in Figure 3.

Figure 3: Zonal Distribution of Volta Region



Source: Unimax Macmillan Senior Secondary Atlas 2001

Climatic conditions differ between the northern and the southern sectors. Two rainfall regimes occur in the middle and coastal belts as follows: major season is in April/July with a peak in June and the minor season is in September/November with a peak in October. The north has one season from May to October with a peak in August. The area however is composed of short branching trees, many less than 15 meters high, which do not usually form a closed canopy but widely scattered (Adjei 1989). The annual rainfall is between 74 – 89 centimetres. A higher humidity is however experienced throughout the year, thus compensating for the scanty annual rainfall. The mean monthly temperatures are low, ranging from about 18^0 C in March to about 35^0 C in August (Adu and Mensah-Ansah 1995). Its relative humidity is higher, varying from about 90% to 95% in the rainy seasons to 75% to 80% in the dry seasons**.**

1.6.1.3 *Socio-economic Activities*

Weaving of Kente cloth and mat is generally practised in the southern parts of the Volta Region. Pottery and woodcarving is widespread in the middle portions of the region. The predominant economic activity of the people of the region is agriculture (about 60% of total occupation) and consists of farming, fishing, animal rearing and stone quarrying the major crops grown are cassava, maize, yam, tobacco, shallots and cocoa; fishing is done along the coast and the Volta Lake with cattle rearing in the savannah belts of the south and north (Ghana Health Service 1998). Fishing is another economic activity in the Volta Region. Those around the coastal plane and those living near the Volta Lake carry out this vocation. It involves leaving home at dusk and coming back in the night or the next day. Animal rearing in the Volta Region constitutes about 10% of national production. With this proportion though not as large as else where care for this animals are the same irrespective of their size or number. The animals are released from their pen and the shepherds take them to graze in the bush.

1.6.2 *Sources of Data*

The data sources for this study are essentially secondary and retrospective. In general, two sets of data are used for this study. The primary source of empirical information relates to the statistical returns of the bio-statistical office of the Volta Regional Health Directorate, Ho. The choice of these data is predicated on the fact that representative information from all the districts of the region on the subject matter is available over time. Mode of gathering empirical information from the Volta Regional Health Directorate is the regular submission of quarterly reports from all the 12 districts throughout the various health care services that is Level A-Community-Based Health Planning and Services (CHPS), Traditional Birth Attendants (TBAs); Level B- Health Post, Clinics, Maternity Homes; and Level C- District hospitals.

The statistics from the Volta Regional Health Directorate will be complemented by the 2003 Ghana Demographic Health Survey (GDHS) data. The 2003 GDHS was a nationally representative survey of 5,691 women aged 15- -49 and 5,015 men aged 15 – 59 from 6,251 household, covering 412 sample points or clusters throughout Ghana (Ghana Statistical Service et al., 2004). Information on malaria is one of the new features covered in 2003 GDHS. Questions on malaria included: (i) Ownership of mosquito net; (ii) Use of mosquito nets by children; (iii) Use of mosquito nets by pregnant women; and (iv) Prevalence and management of childhood malaria.

1.6.3 *Method of Analysis*

Cross tabulation is used to examine the relationship between the ownership of mosquito nets irrespective of its treatment and the prevalence of malaria according to age and sex compositions. Because the study aims to identify the district(s) with the highest prevalence of malaria as well as the characteristics of the people who frequently report to the facilities for treatment of the disease, and persons that used the treated or untreated mosquito nets prior to the night of survey, simple percentages are used.

1.6.4 *Limitations of the Study*

Data collection in Ghana as any sub-Saharan African country is still fraught with deficiencies (Mba 2004; Sembajwe 1993; Ewbank 1981). Therefore, the annual reports from the bio-statistics office of the Ministry of Health and data from the 2003 GDHS may contain some errors, although data evaluation is not attempted here to ascertain the extent of errors in the data. Possible errors that could arise from bio-statistical data may be from late reporting or absence of presentation data since information is from the respective districts, which are sometimes difficult to reach even with canoes and boats because of frequent accidents on the Volta Lake. Records technicians might add other diseases or doctors could misdiagnose or misclassify the disease, which could swell up or under-estimate malaria cases.

Errors from the GDHS may also arise from coverage, where errors could affect the completeness and quantitative accuracy of investigation and content error, which affect the qualitative characteristic such as the quality of age and sex data. A major drawback of clinical data from the hospitals, clinics, health centres, etc. is that no information is available concerning those who do not seek medical attention from the health facilities (those on self-medication, attend prayer camps and visit fetish shrines for healing). Inadequate logistical arrangement to facilitate collection and storing information constitutes yet another problem.

Finally, due to few number of cases and difficulty in accessing the malaria related variables from the GDHS 2003, it was not possible to carry out multivariate and other analyses to find out the demographic and socio-economic determinants of prevalence of malaria in the Volta Region.

2.1 RESULTS

2.1.1 *Prevalence of Malaria*

Table 1 presents the percentage distribution of children under five with fever and households with mosquito nets by region in Ghana. As fever is a major indicator of malaria, it can be deduced that children in Volta Region have the highest prevalence of malaria in the country (30.5%), closely followed by those children living in Upper West Region (30.1%). As a result, majority of households with at least one mosquito net reside in Volta Region (46.1%). Overwhelming proportion of households with at least one ITN live in Upper East Region (25.1%), followed by Northern Region (7.8%). This development is likely due to the fact that UNICEF has been distributing ITNs to pregnant women and mothers of children under age five at highly subsidized rates in the two regions as part of its reproductive health and maternal and child survival initiative.

Table 1: Percentage Distribution of Fever Prevalence and Ownership of Mosquito Nets in Ghana by Region

Region	Percentage of Children with Fever	Percentage of Households with at least One Net	Percentage of Households with at least One ITN[6]	Number of Households
Western	23.2	14.3	1.5	612
Central	24.3	8.7	1.8	587
Greater Accra	20.9	14.2	1.9	890
Volta	30.5	46.1	2.5	538
Eastern	19.8	10.3	0.7	732
Ashanti	20.4	10.1	1.6	1,313
Brong Ahafo	18.3	20.3	1.9	665
Northern	15.5	20.9	7.8	487
Upper East	21.3	35.9	25.1	280
Upper West	30.1	30.2	3.3	147
Total	21.3	17.6	3.2	6,251

Source: The 2003 Ghana Demographic and Health Survey.

[6] ITN = Insecticide treated net, which is a long lasting net that does not require frequent treatment. The ITN is a pretreated net obtained within the last six months or a net that has been soaked with insecticide within the past six months.

Table 2: shows the prevalence of malaria among males by districts and age group in the Volta Region. The table suggests that the highest of malaria cases in the region admitted for malaria treatment. The number of malaria cases in absolute figures is more in the Ho district (16.5%), followed by Kpando (13.5%), and Hohoe (10.9%). In all the districts, ages 1 – 4 have more reported malaria cases as compared to other ages (21.2%). This reflects the immunity level of the children. At this age any individual is bound to be prone to a lot of parasitic infections (worm infestation), malnutrition hence the decreased immunity and the more likelihood for opportunistic infections to be manifested in them. As postulated by Mosley and Chen in an analytical framework for the study of child survival in developing countries.

According to them, social and economic factors must operate through some variables to affect child survival[7]. These factors are grouped into five categories namely maternal factors (age, parity, and birth interval), Environmental contaminations (air; food/water/fingers; skin/soil/inanimate objects; insect vectors), and Nutrient deficiency: calories; protein; micronutrients (vitamins and minerals), Injury: accidents; intentional and Personal illness control: Personal preventive measures; medical treatment. These factors tell a lot on the children's immunity. Children aged 1 – 4 years are more vulnerable to some of these factors because it is a characteristic of women in rural communities, including those from Volta Region, to have high parities and short birth intervals. Such a condition is likely to affect the health of the children. Moreover, the mother is likely to focus more attention on the lactating child than on the older but still young children thereby making them more vulnerable to environmental contamination. All these factors interact to, among other things, affect the immunity of the children resulting in malaria infection.

It is striking that to observe that in seven out of the twelve districts in the region (Nkwanta, Jasikan, Hohoe, Ho, Akatsi, Ketu and Keta Districts), the next highest prevalence of malaria is among men aged 60 and above. This could be partly due to normal physiological change in man in which one's immunity reduces with advancing age.

[7] Mosley. H. W. and Chen L. C., "Child Survival Strategies for Research", in Population and Development Review, 1983, pp 27-28.

Table 3 also shows the prevalence of malaria among females by districts and age group in the Volta Region. The results indicate that the highest prevalence of malaria among females can be found at ages 1 – 4 years in Krachi (22.4%), Kadjebi(15.4%), Jasikan (16.6%), Kpando (14.7%) and North Tongu (17.6%), while women age 60 years and over have the highest prevalence of malaria in Hohoe (20.7%), Ho (16.6%), Akatsi (17.8%), Ketu (23.45%) and Keta (18.7%). In this respect, what has said above in the case of male population regarding child vulnerability and immunity, as well as degenerative physiological changes at older ages also applies here. Overall, the table indicates that females 60 years and over have the highest prevalence of malaria (16.4%) followed by those aged 1 – 4 years (15.9%), and 25 – 34 years (14.3%) in Volta Region. The table suggests that more cases are reported from districts which lie in middle and lower belt of the region. These districts are Ho, Kpando, Hohoe, Keta, North Tongu and Ketu which enjoy the two seasons that is the wet and dry seasons. Since the vector anopheles breeds well in the rainy seasons, favourable climatic conditions coupled with human activities of littering the environment with empty cans that could store clean water thus degrading the environment, just to mention a few, creating the continuous exposure to the vector thus making malaria a more prevalent disease in those areas. The results therfore comfirms the hypothesis that the prevalence of malaria is positively correlated with the physiographic characteristics of the environment.

2.1.2 ***Malaria In-Patients by Age***

Table 4 indicates the age distribution of in-patients with malaria in Volta Region[8]. The table shows that overwhelming majority of the in-patients (41.5%) are children aged 0 – 4 years, while the number of the in-patient cases generally decreases with advancing age.

Table 4: **AGE DISTRIBUTION OF IN-PATIENTS WITH MALARIA**

AGE GROUPS	FREQUENCY	PERCENTAGE
0 – 4	1493	41.5
5 – 9	255	7.1
10 – 14	143	4.0
15 – 19	291	8.1
20 – 24	229	6.4
25 – 29	187	5.2
30 – 34	151	4.2

[8] In-patients are people who are admitted to any health facility on the account of being very ill and to be monitored by the health professionals for the cure of any disease which will require the payment of monies for services rendered. These monies can either be paid in cash by the individual, by his/her work place in the form of health insurances.

35 – 39	138	3.8
40 – 44	108	3.0
45 – 49	101	2.8
50 – 54	84	2.3
55 – 59	51	1.4
60 – 64	74	2.1
65 – 69	66	1.8
70 – 74	78	2.2
75 – 79	64	1.8
80 – 84	37	1.0
85 +	50	1.4
TOTAL	3600	100.0

Source: Volta Regional Health Directorate, 2004.

2.1.3 *Marital Status of In-Patients*

Malaria affects any body irrespective of one's marital status. Table 5 presents the marital status of the malaria in-patients in Volta Region.

Table 5: Percentage Distribution Of Marital Status Of Malaria In-Patients

MARITAL STATUS	FREQUENCY	PERCENT
NEVER MARRIED	2427	67.4
MARRIED	865	24.0
WIDOWED	7	0.2
UNSPECIFIED	301	8.4
TOTAL	3600	100.0

Source: Volta Regional Health Directorate, 2004.

Because a significant proportion of the in-patients are children aged 0 – 4 years, majority of them (67.4%) are never married. This is followed by those who are married (24.0%), while 8.4% of the in-patients never specified their marital status.

2.1.4 *Occupation of In-Patients*

Employment status is one of the important variables that have been associated with effective treatment of any disease or proper health seeking behaviour.

Table 6 shows the distribution of in-patients by occupation admitted for treatment in the health facilities of Volta Region.

Table 6:: Distribution Of Malaria Of In-Patients By Occupation, Ho 2004

OCCUPATION	FREQUENCY	PERCENTAGE
BUSINESSMAN	61	1.7
CLERICAL WORKER	7	0.2
FARMER/FISHERMAN	427	11.9
HOUSEWIFE	50	1.4
PARA PROFESSIONAL	95	2.6
PROFESSIONAL	86	2.4
PUPIL/CHILD	1899	52.8
RETIRED	6	0.2
STUDENT	299	8.3
TRADER/SHOP ASSISTANT	291	8.1
UNEMPLOYMENT	1	0.0
UNSKILLED LABOUR	3	0.1
UNSPECIFIED	255	7.1
OTHERS	119	3.3
TOTAL	3600	100.0

Source: Volta Regional Health Directorate, 2004.

More than 50% of patients were children, implying that their immunity, nutritional status and playing outdoors after 18:00 hours could be possible determinants of the disease. This is followed by farmers and fishers (11.9%) because of the nature of their occupation, which gets them exposed to the vector. Clerical workers constitute 0.2% of in-patients. It should be noted that the clerical workers get exposed to the vector but seek early treatment at Out-Patient's Department (OPD) bases to avoid being admitted. The unemployed, unskilled labourers and the retirees were the least recorded cases; this may be due to the fact that they may be self-medicating or seeking early treatment. Information presented in tables 2.9 and 2.10 indicates that a sizeable number of the people reported for treatment at the various health facilities in the region. Granted that it is not everybody who has malaria gets admitted for treatment, yet it is common knowledge that people often choose to visit quack doctors where they pay less money, healing camps where they will be given herbs for treatment, and shrines where concoctions will be made for them to pacify the gods as it is superstitiously believed that the disease is a punishment from the gods.

2.1.5 *Prevalence And Management Of Childhood Malaria*

Malaria is one of the five childhood killer diseases whose common manifestation is fever. In the 2003 GDHS, mothers were asked whether their children under age five had a fever in the two weeks preceding the survey. If

a fever was reported, mothers were asked whether treatment was sought at a health facility and whether the child was given any medication. The results are presented in Tables 7 and 8.

Table 7: Percentage Distribution of Children Who Had Fever in the Last Two Weeks by Age in Volta Region

BACKGROUND CHARACTERISTICS	HAD FEVER IN THE LAST TWO WEEKS RESPONSE			TOTAL	NUMBER
AGE IN MONTHS	NO	YES	DON'T KNOW		
0 – 11	65.6	34.4	-	100.0	61
12 – 23	65.2	34.8	-	100.0	66
24 – 35	75.6	22.0	2.4	100.0	41
36 – 47	65.3	32.7	2.0	100.0	49
48 – 59	70.0	24.0	6.0	100.0	50
TOTAL	67.8	30.3	1.9	100.0	
NUMBER	181	81	5		267

Source: Computed From the 2003 GDHS Raw Data file

Table 7, which presents the distribution of children who had fever in the last two weeks, indicates that 67.8% of the children did not have fever, while 75.6% of children between ages 24 – 35 months did not suffer any fever in the specified period, followed by those of 48 – 59 month age group with 70.0%. The majority of children who had fever in the last two weeks (34.8%) were aged 12 – 23 months, followed by 34.4% for age group 0 – 11 months. The least reported of children who had fever in the last two weeks belongs to the 24 – 35 age group with 22.0%. Table 8 shows the distribution of children who took anti-malarial drugs for treatment of fever by age.

Table 8: Percentage Distribution Of Children Who Took Anti-Malarial Drugs For Fever By Age in Volta Region

AGE OF CHILDREN (IN MONTHS)	RESPONSE TO THOSE WHO TOOK							
	CHLOROQUINE		FANSIDAR		AMODIAQUINE		QUININE	
	NO	YES	NO	YES	NO	YES	NO	YES
0 – 11	23.8	76.2	100.0	0.0	100.0	0.0	100.0	0.0
12 – 23	27.3	72.7	100.0	0.0	100.0	0.0	100.0	0.0
24 – 35	60.0	40.0	100.0	0.0	100.0	0.0	100.0	0.0
36 – 47	6.3	93.8	100.0	0.0	100.0	0.0	100.0	0.0
48 – 59	60.0	40.0	100.0	0.0	100.0	0.0	100.0	0.0
TOTAL	30.4	69.6	100.0	0.0	100.0	0.0	100.0	0.0
NUMBER	24	55	77	0.0	71	0.0	71	0.0

Source: Computed From the 2003 GDHS Raw Data file

About 93.8% of children between 36 – 47 months were given chloroquine for fever, followed by those aged 0 – 11 months with 76.2%, the least is among those aged 48 – 59 months (40.0%). This clearly shows that although amodiaquine is on the market, it is very expensive. This medicine is not the type mothers would readily go for. Quinine is no more in use in Ghana in its pure state, may be because of its bitterness and adverse reactions but it is added to other compounds, which comes out in the form of chloroquine, camoquine, amodiaquine etc. Fansidar in one-way or the other has no pediatric dosage.

2.1.6 *Length of Stay at Health Facility*

Malaria is endemic in Ghana in general and in the Volta Region in particular. Fortunately, this disease is curable when proper, early and prompt treatment is sought. When the correct chemotherapy, diet and adequate rest are given to a patient, the maximum length for recovery should be seven days[9], three days for detention in the hospital and four for rest at home depending on the protocol of the health facility. Table 9 depicts the distribution of length of stay of patient at health facility.

Table 9: Distribution Of Length Of Stay Of Patient At Health Facility

DAY	FREQUENCY	PERCENTAGE
1 – 4	2512	69.8
5 – 10	916	25.4
11 – 14	108	3.0
14^{+}	64	1.8
TOTAL	3600	100.0

Source: Volta Regional Health Directorate, 2004.

It shows clearly that the maximum length of stay at a health facility was 1-4 days with 69.8%, followed by 5-10 days (25.4%), the least being 14+ days with 1.8%. This finding is in line with what Smelters and Bare suggested about the expected length of the disease.

2.1.7 *Type and Ownership of Health Facility*

The type of health facility attended has significance to the category of health workers and to the kind of care to receive. The health facilities are divided into three levels, levels A, B and C. Level A consists of the Traditional Birth Attendants (TBAs) and Community-Based Health Planning and Services (CHPS). The workers at this level are allowed to handle certain kind of cases and some limited procedures because of the caliber of health

[9] Smelters, S. and Bare, C., "Brunner and Suddarth's Textbook for Medical and Surgical Nursing" 7th Ed McGraw-Hill publishers, Philadelphia, USA, 1997.

personnel available. Cases beyond these people are referred to level B, which is made up of the health Post and Centers; clinics (private and public), just to mention a few. This facility goes with some kind of gadgets available as well as the companying responsibilities and usually has one or two doctors per center or post. When cases are beyond the performance of level B, they refer such cases to level C, the district hospitals and polyclinics. A level C facility has a lot of experts in all the specialty areas, namely physicians, surgeons of different fields, gynecologist, pediatricians, etc. Care in this type of setting is comprehensive with a great display of great team work. Table 10 shows the distribution of type and ownership of health facility visited by malaria sufferers in Volta Region.

Table 10: Distribution of Type and Ownership of Health Facility

TYPE OF HEALTH FACILITY	FREQUENCY	PERCENTAGE
CLINIC	505	14.0
HEALTH CENTRE	741	20.6
HOSPITAL	2354	65.4
TOTAL	3600	100.0
OWNERSHIP OF HEALTH FACILITY		
GOVERNMENT	2226	61.8
MISSION	1374	38.2
TOTAL	3600	100.0

Source: Volta Regional Health Directorate, 2004.

The table indicates that 65.4% of malaria cases were reported by the hospitals, followed by health centers with 20.6%. Majority (61.8%) of the hospitals are owned by the government, 38.2% are owned by the missions especially the Catholic Church. The Quasi hospitals had not submitted their reports as at time of data collection for this study.

2.1.8: *Cost Incurred in Malaria Treatment*

The cost of treatment of malaria varies from the type of drugs given to the length of stay in the hospital. The more one stays in the hospital the more one is likely to pay higher hospital bills. The distribution of cost incurred by in-patients in malaria treatment in Volta Region is presented Table 11.

Table 11: Distribution of Cost Incurred By In-Patient in Malaria Treatment

COST INCURRED	FREQUENCY	PERCENTAGE
< ¢ 20,000	65	1.8
¢ 21,000 – 40,000	274	7.6
¢ 41,000 – 60,000	536	14.9
¢ 61,000 – 80,000	355	9.9
¢ 81,000 – 100,000	259	7.2
¢101, 000 – 120,000	153	4.3
¢ 121,000+	580	16.1
MISSING	1378	38.3
TOTAL	3600	100.0

Source: Volta Regional Health Directorate, 2004.
Note: ¢ = cedi ; ¢9,100=US $1

The results show that majority of the in-patients paid more than ¢121.000 (16.1%), followed by an amount in the range of ¢41,000 - 60,000 (14.9%) and ¢61,000 - 80,000 (9.9%).

2.1.9 *Trends in Malaria Cases*

Table 12 presents the percentage distribution of malaria cases reported at the OPDs of the district health facilities by sex in the Volta Region for the period 1999 – 2003.

The results indicates that 24.7% of cases reported at the health facilities was by women in the Hohoe District in year 2003, this was again followed by women from the Ho District with 21.5% in 2000 and 2002. The male population in the Hohoe District for year 2003 also showed a significantly high proportion of reported cases of malaria. The least reported cases (0.9%) each are from the North Tongu District for years 2000 and 2002. This clearly confirms the hypothesis that areas with favourable geographical characteristics to the anopheles mosquito, the vector that transmist malaria, shows predominant transmission of the disease. Keta District, from the table, shows a persistently high level of malaria throughout the years under study. The kind of mosquitoes prevailing in that district bites round the clock and there is a myth or belief surrounding the continous existence of these exceptionally huge mosquitoes. According to the people, the mosquitoes were sent to them as a punishment for cutting a sacred tree by one of their gods. Akatsi District also showed a predominantly low cases of malaria throughout the years and it could be due to the fact that the district has a perennial water problem hence the breeding places of mosquitoes are scarce.

Table 13 shows the percentage distribution of total malaria cases reported in the health facilities in the twelve districts of the Volta Region for the period of 1999 – 2004.

Table 13: Percentage Distribution of the Total Malaria Cases Reported in the Health Facilities in the Volta Region by Districts, 1999 – 2004.

DISTRICTS	1999	2000	2001	2002	2003	2004
KRACHI	4.7	6.6	4.3	6.6	NA	3.6
NWANTA	6.7	7.0	11.4	7.0	NA	5.1
KADJEBI	2.8	3.7	2.7	3.9	7.3	3.8
JASIKAN	6.9	7.9	6.5	7.9	6.5	8.1
HOHOE	10.2	12.2	9.7	12.2	24.2	11.8
KPANDO	8.7	14.8	8.3	14.8	6.4	14.2
HO	16.0	20.1	15.2	20.1	3.5	15.8
N-TONGU	13.7	0.9	13.0	0.9	13.1	9.0
S-TONGU	8.3	6.9	7.9	6.9	10.6	5.3
AKATSI	2.6	4.7	2.5	4.7	3.4	2.3
KETU	7.2	4.6	6.8	4.6	10.9	9.5
KETA	12.3	10.4	11.7	10.4	17.2	11.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
NUMBER	121,904	212,413	128,068	212,411	36,401	238,666

Source: Computed From the Raw Data From Bio-Statistic Office, Ho, 2004.

The table suggests that the highest malaria cases in the region are from the Hohoe district (24.2%) in year 2003, followed by Ho 20.1% in 2000 and 2002, and Keta (17.2%) also in 2003. The least recorded is the North Tongu with 0.9% for 2 different years (2000 and 2002). The foregoing reasons bordering on the physiography of those districts that favour or discourage breeding of mosquitoes apply here also.

3. CONCLUSION AND THE WAY FORWARD

It can be concluded that the Volta Region has conditions that favour the breeding of mosquitoes, the vector that causes malaria. The prevalence of malaria is more pronounced among certain population subgroups.

Malaria presents significant costs to the affected households since it is possible to experience multiple and repeated attacks in a year. Districts with the two rainy seasons are the hardest hit by these vectors because of the weather. Districts that lie in the middle and lower belt for example Jasikan, Hohoe, Kpando, Ho and Keta districts must be given priority attention in annual budgets to enable them combat the disease.

In particular, there is the need for a strong collaboration among major stakeholders including the Government, District Assemblies, Non-Governmental Organisations and the community to devise holistic, effective, and cost-saving methods for prevention, control and treatment of the disease.

Though the use of insecticides for example coils, sprays are identified as the major method of protection due to their availability and affordability for many households, the efficacy of some of these numerous brands on the market may be questionable. In the short-term, the efficacy of these products needs to be assessed by concerned authorities in order not to endanger the health of the people.

While advocating continuation of education on the use of the ITNs, it is recommended that efforts must be seriously made by the major players in the health sector to make the net readily available in the communities at low prices to enable the ordinary Ghanaian to purchase it.

The decision to seek medical care from a health provider is influenced by several factors but the perceived quality of the provider and the proximity of the health facility are major determinants of health seeking behaviours. The proximity of the facility affects the cost of transportation and

more importantly the cost of time. In order to improve timeliness of treatment, the service consequently would have to be closer to patients especially those in the remote and malarious endemic areas like the Hohoe, Kpando, Ho and Keta districts. The mobile outreach programme of the Ghana Health Service must be well equipped so that difficulty could be minimised at the service.

Malaria reduction strategies should be incorporated into Ghana's Poverty Reduction Strategy. It is anticipated that with a considerable reduction in poverty levels, households and communities would become increasingly responsible for the improvement of their health status and quality of life.

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Figure 4: <u>Factors Contributing To The Existence Of Malaria In The Community</u>

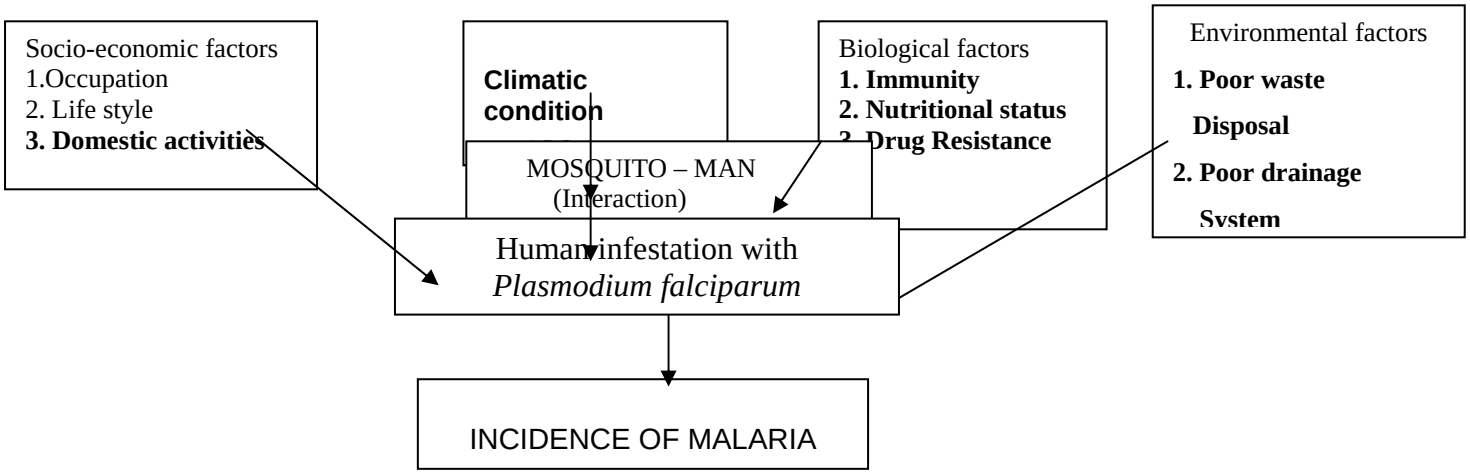

Table 2: Percentage Distribution of Prevalence of Malaria among Males by Districts and Age Group, Volta Region, 2004

DISTRICTS	AGE GROUP										TOTAL	NUMBER
	<1	1-4	5-9	10-14	15-19	20-24	25-34	35-44	45-59	60^{+}		
KRACHI	16.4	28.9	9.6	3.7	6.8	7.8	9.3	6.3	4.4	4.4	100.0	3,981
NKWANTA	12.3	18.7	6.5	3.0	8.5	8.9	10.1	7.0	5.1	17.3	100.0	3,204
KADJEBI	10.2	19.2	8.3	3.9	8.5	6.8	11.3	10.6	9.8	9.0	100.0	4,128
JASIKAN	9.6	15.3	6.6	10.7	6.1	5.4	7.6	6.4	15.5	22.8	100.0	11,379
HOHOE	9.7	23.1	9.3	10.9	6.1	5.9	7.9	7.1	7.8	16.6	100.0	11,575
KPANDO	10.0	21.3	9.8	13.4	9.9	7.2	9.7	8.2	8.4	8.8	100.0	14,360
HO	9.0	21.1	9.9	16.9	6.5	5.5	8.2	7.0	8.1	17.8	100.0	17,569
N-TONGU	10.2	26.7	11.3	8.4	5.9	6.5	10.8	7.9	7.9	6.4	100.0	8,971
S-TONGU	11.0	21.1	13.3	5.6	7.5	8.3	10.2	7.5	7.2	6.6	100.0	5,943
AKATSI	11.5	19.0	10.7	3.0	8.4	7.4	9.3	6.2	6.8	18.7	100.0	3,193
KETU	7.7	21.9	10.8	9.9	6.6	6.2	7.6	6.1	6.2	19.9	100.0	10,540
KETA	5.3	19.5	12.8	10.3	9.3	6.3	10.2	8.5	6.9	13.3	100.0	10,906
V.R. HOSP	12.2	16.3	10.0	0.7	9.5	6.8	13.9	10.7	7.9	4.9	100.0	748
TOTAL	9.5	21.1	10.0	6.6	7.4	6.5	9.1	7.4	8.3	14.1	100.0	
NUMBER	10,122	22,51 4	10,673	6,996	7,888	6,891	9,685	7,880	8,857	14,991		106,497

Source: Volta Regional Health Directorate.
Note: V. R. Hosp. = Volta Regional Hospital.

Table 3: Percentage Distribution of Prevalence of Malaria among Females by Districts and Age Group, Volta Region, 2004

DISTRICTS	AGE GROUP										TOTAL	NUMBER.
	<1	1-4	5-9	10-14	15-19	20-24	25-34	35-44	45-59	60+		
KRACHI	12.5	22.4	6.8	4.4	7.3	9.2	13.3	7.3	5.8	11.0	100.0	4,833
NKWANTA	9.4	11.9	6.0	5.2	6.9	13.8	22.6	8.6	5.3	10.1	100.0	8,896
KADJEBI	7.8	15.4	6.5	6.7	9.6	9.0	13.2	10.3	11.2	10.3	100.0	5,068
JASIKAN	9.3	16.6	7.4	4.7	6.5	8.4	13.0	11.9	11.4	10.9	100.0	8,176
HOHOE	6.0	14.2	6.6	4.8	5.9	7.7	11.8	11.2	11.0	20.7	100.0	16,595
KPANDO	7.5	14.7	7.1	5.7	7.8	8.2	13.2	11.7	11.5	12.6	100.0	19,349
HO	6.6	15.4	7.9	6.3	7.0	7.1	11.7	10.7	10.7	16.6	100.0	20,101
N-TONGU	6.7	17.6	7.6	4.9	5.6	7.3	13.9	13.2	12.6	10.5	100.0	12,478
S-TONGU	7.2	13.0	9.7	6.7	7.4	8.5	14.5	12.2	11.7	9.2	100.0	6,586
AKATSI	8.5	13.5	8.5	6.5	7.9	9.3	11.1	8.4	8.5	17.8	100.0	2,322
KETU	5.1	13.8	8.2	5.8	5.6	7.4	12.1	9.3	9.2	23.4	100.0	11,985
KETA	3.9	13.2	8.3	5.5	7.7	7.1	12.7	12.3	10.5	18.7	100.0	16,528
V.R. HOSP	7.0	10.5	7.2	5.2	16.7	9.3	15.3	12.0	9.4	7.2	100.0	996
TOTAL	7.9	15.9	8.1	6.0	7.4	8.9	14.3	11.9	11.2	16.4	100.0	
NUMBER	10,122	22,514	10,673	6,996	7,888	6,891	9,685	7,880	8,857	14,991		126,548

Source: Volta Regional Health Directorate.
Note: V. R. Hosp. = Volta Regional Hospital.

Table 12: Percentage Distribution of Malaria Cases Reported to the Health Facilities in the Volta Region

DISTRICTS	1999		2000		2001		2002		2003	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
KRACHI	4.8	4.6	7.2	6.2	4.6	4.4	7.4	6.2	NA	NA
NKWANTA	7.2	6.3	7.5	6.7	11.2	11.5	7.7	6.7	NA	NA
KADJEBI	2.9	2.8	3.7	3.7	2.8	2.6	3.8	3.7	5.8	7.7
JASIKAN	6.8	6.9	8.5	7.5	6.5	6.5	8.8	7.5	8.0	5.7
HOHOE	9.9	10.3	12.1	12.4	9.6	9.8	12.5	12.4	20.1	24.7
KPANDO	8.7	8.7	15.4	14.5	8.3	8.2	15.8	14.5	6.1	6.2
HO	16.1	15.9	19.0	21.5	15.4	15.4	19.5	21.5	5.8	2.4
N- TONGU	14.3	13.2	0.9	0.9	13.7	12.5	0.9	0.9	15.0	11.8
S- TONGU	8.2	8.4	6.7	7.1	7.9	7.9	6.9	7.1	12.7	9.4
AKATSI	2.5	2.6	4.5	5.0	2.4	2.5	4.6	5.0	3.7	3.1
KETU	7.2	7.2	4.3	4.8	6.9	6.8	4.4	4.8	9.6	10.9
KETA	11.1	13.1	10.4	10.4	10.7	12.4	10.7	10.4	13.3	17.9
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
NUMBER	51,763	70,141	92,921	119,492	54,076	74,335	90,203	119,492	10,281	27,220

Source: Computed From the Raw Data From Bio-Statistic Office, Ho, 2004.