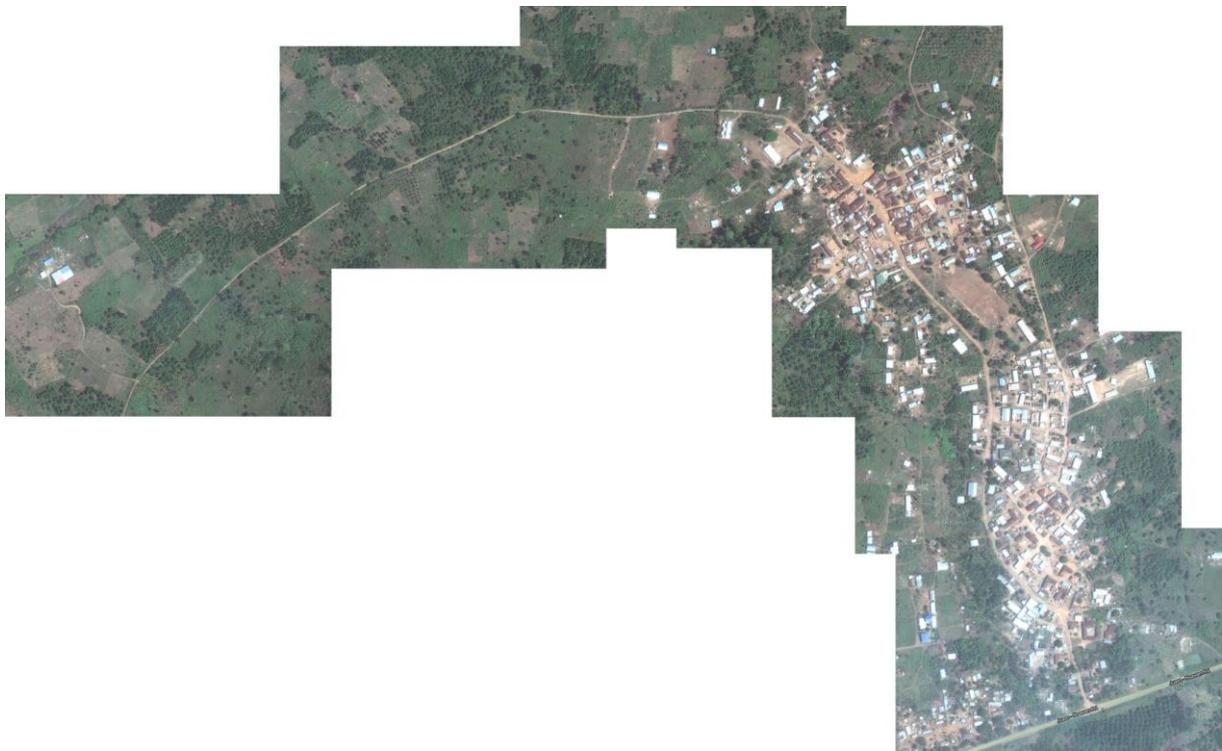




# KNOWLEDGE, TREATMENT AND PREVENTION OF MALARIA IN RURAL GHANA: A CASE STUDY OF DARMANG

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# Abstract

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## *Objective*

This report attempts to identify knowledge, methods of prevention and treatment of malaria in rural Ghana through a case study of the village of Darmang. The object is to assess anti-vector interventions taken by the National Malaria Control Program (NMCP), as well as availability of treatment and means of protection in rural communities.

## *Method*

The data was collected through qualitative interviews with local people of Darmang which were transcribed into texts and analyzed for themes, differences and indicative numbers. An additional interview was made with a data manager from the NMCP. Scientific studies and official reports such as the World Health Organization's guidelines and 2010 Malaria Report have been used as a foundation for information and analysis

## *Results*

Findings revealed a low level of knowledge on malaria transmission, prevention and treatment by the respondents. Even though most respondents knew malaria was caused by mosquitoes, several additional causes were stated. Basic prevention measures are inaccessible to many of the poor in rural communities who carry the heaviest malaria burden. Also, the two core anti-vector strategies undertaken in Ghana (Insecticide Treated Nets (ITNs) and Indoor Residual Spraying (IRS)) might not have the desired or anticipated effect according to studies observing changes in vector behavior subsequent to the introduction of the strategies. A majority of people in Ghana, especially the poor, do not have access to qualified health care due to a lack of geographical and financial accessibility, and self-medication or undiagnosed treatment with herbs or drugs from chemists as first response treatment proved to be extremely common.

## *Conclusion*

There is an urgent need for improved knowledge and access to means of prevention, as well as an upscale of community based malaria case management to provide qualified health care to rural communities. Funding and research on additional anti-vector measures and environmental control will be essential to achieve the NMCPs goals for malaria reduction.

## Definitions

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*Antropophilic*: preference to feed on humans

*Endophagy*: indoor biting

*Endophilic*: associated with humans and their domestic environment

*Excito-repellent*: properties that irritate and disturb mosquitoes after contact, preventing them from biting.

*Exophagy*: outdoor biting

*Exophilic*: independent of humans and their domestic environment

*Insecticidal effect*: properties that kill or paralyze the mosquito

## Abbreviations

ACT	Artemisinin-based Combination Therapy:
CCM	Country Coordinating Mechanism
ITN	Insecticide Treated mosquito Net
IRS	Indoor Residual Spraying
LLIN	Long-lasting Insecticide-treated mosquito Nets
MDG	Millennium Development Goals
NMCP	National Malaria Control Program
RDT	Rapid Diagnostics Test
WHO	World Health Organization

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# 1. Introduction

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## *Objective of the study*

Successful government or organizational initiatives and efforts to mitigate the transmission of malaria will be difficult to achieve without the inclusion of a country's citizens and an assessment of local malaria problems, the focus of this study is therefore on the local peoples of Darmang and their perceptions of and experiences with the disease. *How is the cause of malaria understood; what are the symptoms; what actions are taken when individuals suspect that they or any member of their family are infected with malaria; and what actions are taken to prevent malaria?* Furthermore the study will examine the anti-vector interventions implemented in rural Ghana.

The objective of the study is to:

- (i) identify local peoples' understanding of cause and symptoms
- (ii) identify local peoples' first response treatment; and availability of qualified treatment
- (iii) identify local peoples' access to and attitudes towards preventive measures
- (iv) assess nationally implemented NMCP anti-vector strategies
- (v) give suggestions for further actions

## *Material and Method*

The main part of the report is based on data collected from May-July 2011 through 48 qualitative interviews of local people in the village of Darmang. The respondents were of both sexes and ranged in age from 16-90 years with varying sources of income, backgrounds and family structures. The interviews were transcribed into texts which were analyzed for themes, differences and indicative numbers. Additional interviews were made with the three local chemists (A, B and C) for assessments of their knowledge on malaria symptoms; which drugs were normally prescribed for suspected malaria; availability of nets, sprays and repellents for purchase. Furthermore, a Data Manager from the NMCP was interviewed. Finally, scientific studies and official reports such as the World Health Organization's guidelines and 2010 Malaria Report have been used as a foundation for information and analysis.

### *Study site description*

The village of Darmang Anhuntem is located in the Akuapim South Municipality of the Eastern Region, close to the border of the greater Accra region in the tropical rainforest zone. It was chosen for the case study since it is a good representation of a Ghanaian rural community: a small village with no clinic or hospital (the nearest accessible facility about 7km away); predominantly a farming community; and a high literacy rate.

## 2. Background

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According to the WHO the world is seeing a mass reduction in the global prevalence of malaria and the statistics are impressive. The number of countries endemic with malaria is declining with 43 countries having managed to cut their malaria burden by more than half over the past decade; in 2009 the WHO European Region celebrated their first year without a single reported case of locally acquired falciparum malaria; and Morocco and Turkmenistan are now joining the rank of countries that have been declared Malaria free.<sup>1</sup> In Sub-Saharan Africa however, the disease remains endemic with the region experiencing 85-90% of the world's deaths due to malaria.<sup>2</sup>

### *Malaria in Ghana*

The countries of West Africa have the highest number of casualties from malaria in the world. In Ghana the disease is hyper endemic and malaria transmission is high with the entire population at risk from contracting the infection. In 2009, 3.7 million cases of malaria were reported (26% confirmed), an increase of almost 0.5 million from the previous year.<sup>3</sup> The WHO notes that the increase in numbers might not be due to an increase in the transmission of malaria, but rather due to a higher rate of detection. Either way, the numbers reveal that there has been no measured evidence of a decline in the prevalence of malaria in Ghana and that the disease remains a major threat to human health and well-being.

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<sup>1</sup> WHO 2010

<sup>2</sup> Okoli et al. 2010: 1

<sup>3</sup> WHO 2010 Ghana country profile

**Fig. 1 Admissions**

Year	All ages		<5 years	
	All cause admissions	Malaria Admissions	All-cause admissions	Malaria admissions
2002	310 793	116 600	100 895	38 340
2003	517 566	115 401	120 126	45 648
2004	844 091	132 566	123 384	46 886
2005	483 038	118 449	174 522	31 644
2006	356 000	122 928	97 860	51 407
2007	556 036	157 628	113 952	22 019
2008	900 242	277 802	181 427	99 217
2009	772 603	277 047	250 796	122 575
2010	852 994	298 372	-	137 319

Figures taken from WHO World Malaria Report 2010 and the NMCP 2010 Annual report

**Fig. 2 Deaths**

Year	All ages		<5 years	
	All-cause deaths	Malaria deaths	All-cause deaths	Malaria deaths
2002	8714	2376	5913	2376
2003	7637	2103	5983	2103
2004	5727	1575	5887	1575
2005	6610	2037	4532	2037
2006	15 102	3125	4988	3125
2007	18 395	4622	5263	1241
2008	21 246	3889	4907	1697
2009	19 939	3378	6106	1505
2010	19 764	3859	-	1812

Figures taken from WHO World Malaria Report 2010 and the NMCP 2010 Annual report

**Fig. 3 Suspected cases**

Year	All ages	
	All-cause outpatient consultations	Suspected malaria cases (tested + probable)
2002	7 253 794	3 140 893
2003	8 129 510	3 552 89
2004	7 540 470	3 416 033
2005	7 753 845	3 452 969
2006	9 114 401	3 511 452
2007	9 259 343	3 123 147
2008	10 323 853	3 200 147
2009	11 368 218	3 694 671

Figures taken from WHO World Malaria Report 2010

### *The human cost of malaria*

Illness due to malaria is the leading cause of out-patient morbidity in the country and one of the major causes of adult mortality. Pregnant women and young children under the age of five are especially at risk. In Ghana more than one in ten children die before reaching the age of five, malaria being the number one cause. A third of <5 years mortality in 2008 was due to malaria, respectively a quarter in 2009, representing 44% in 2008 and 45% in 2009 of the total number of deaths due to the disease in that year.<sup>4</sup> The infection causes a serious health risk for younger children since they have not yet developed immunity against the severe forms e.g. cerebral malaria; and even if a child survives, consequences such as anemia, convulsions or brain dysfunction can impede growth, long-term development and schooling.<sup>5</sup> For pregnant mothers the infection can lead to anemia and placental parasitemia, causing miscarriage (up to 60% in *P. falciparum* infection), stillbirth, infants born underweight and maternal mortality. Furthermore, the negative impact of reoccurring sickness on the quality of life; stress, anxiety and grief from sickness or the death of loved ones; as well as the continual threat of falling ill must be accounted for when assessing the human cost of malaria.

### *The economic cost of malaria*

Besides its intrinsic negative impact on human health and quality of life, malaria is a major obstacle for economic development in Ghana and hinders the country in its strive towards achieving the Millennium Development Goals. According to the Ministry of Health it is estimated that 10.6% of the loss of Disability Adjusted Life Years (DALYs) in Ghana are due to malaria, costing an equivalent of up to 6% of GDP annually in economic burden.<sup>6</sup> In addition to the direct costs of treatment and human resources in public health care, malaria has far-reaching consequences for Ghana's productivity and prospects of development. For instance, malaria negatively impacts educational accomplishments in school children through absenteeism and weakness, with negative implications for the accumulation of human capital. The formal and informal market suffers from loss of labor and productivity due to illness and excess mortality; especially in a country such as Ghana where agriculture is a significant economic sector and human labor constitutes a crucial component for production. Malaria has additional consequences on the microeconomic level of the individual and the household due to direct costs of prevention and treatment, or indirect costs such as workdays lost. Illness due

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<sup>4</sup> Ministry of Health Strategic Plan: 5 + WHO 2010 Ghana country profile

<sup>5</sup> UNICEF 2007

<sup>6</sup> Ministry of health 2009: 1

to malaria is the leading cause of lost workdays in Ghana with an average loss of 3 days by the patient and 2 days by the caretaker per episode;<sup>7</sup> and a malaria affected family harvests an estimated 40% less crops than a healthy family would under otherwise similar circumstances.<sup>8</sup>

### 3. Anti-vector strategies of malaria control

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The objectives of malaria vector control according to the WHO are two-fold:

1. To protect people against infective malaria mosquito bites by reducing vector longevity, vector density and human-vector contact.
2. To reduce the intensity of local malaria transmission at community level, and hence the incidence and prevalence of infection and disease.<sup>9</sup>

Stately run interventions on malaria in Ghana are carried out by the National Malaria Control Program (NMCP) who formulates policies, strategies and interventions which they coordinate, supervise and monitor.<sup>10</sup> In 1999, the government of Ghana committed itself to the Roll Back Malaria initiative with the goal of reducing malaria specific morbidity and mortality by 50% at the end of 2010. However, when not all of the plan's targets were being achieved the program was revised and new strategies were adopted; the program is now aiming at reducing the number of death and illness due to malaria by 75% at the end of 2015 in accordance with the MDGs, a goal which according to the NMCP is to be achieved through "overall health sector development, improved strategic investments in malaria control, and increased coverage towards universal access to malaria treatment and prevention interventions."<sup>11</sup> The NMCP works closely in regard to the WHO guidelines and the two core interventions used for malaria control are insecticide treated nets (ITNs/LLINs) and indoor residual spraying (IRS).

#### *ITNs*

Nets treated with insecticide are one of the main strategies employed globally in the fight against malaria; since 2009, about 289 million nets have been distributed throughout Sub-

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<sup>7</sup>Asante 2003:34-38

<sup>8</sup>[The Malaria Research Programme of the Medical Research Council, South Africa](#)

<sup>9</sup>WHO 2010: 36

<sup>10</sup>Ministry of Health Strategic plan : 24

<sup>11</sup>NMCP [http://www.ghanahealthservice.org/malaria\\_control.php](http://www.ghanahealthservice.org/malaria_control.php)

Saharan Africa (sufficient to cover 76% of population at risk).<sup>12</sup> A high coverage rate is required in order to achieve the full potential of insecticide-treated nets and WHO has set a goal of universal coverage at 80%, assuming that two people sleep under each net. The WHO ITN guidelines state that costs and financial reasons should not hinder persons at risk from accessing nets, which therefore should be delivered free of charge or highly subsidized. In Ghana 3.7 million LLINs were distributed free of charge by the NMCP between 2007-2009, enough to cover 40% of the population at risk, and in 2010 47% of households at risk are estimated to own at least one ITN.<sup>13</sup>

Long-lasting insecticide-treated mosquito nets (LLINs) are the only types of net that have been distributed by the NMCP since 2006 and therefore make up the majority of ITNs currently in use in Ghana. These will, however, require a continuous re-distribution since (depending on decay functions used in the model calculating coverage) the LLIN is assumed to last for 3-5 years before needing to be replaced.<sup>14</sup> The main distribution batch of ITNs taking place in 2006 (10 412 33 nets) is consequently due for replacement.<sup>15</sup> There is currently an ongoing campaign for an universal distribution of LLINs in all 10 districts except the Great Accra and Ashanti area (a gap of over 4 million nets); any plan for how replacements of old nets are to be done is however yet to be methodized.<sup>16</sup> The average commercial price for ITNs ranges between GHc 10-18 depending on size and place of purchase.

### *Indoor residual spraying*

Spraying of residential interior walls with WHO-approved insecticide chemicals (including DDT) is the second core prevention method of vector control. IRS aims at targeting mosquitoes resting on walls, killing *Anopheles* mosquitoes before they transmit the parasite. In recent evaluating studies IRS has shown to be an effective method for rapidly controlling malaria transmissions in a variety of epidemiological settings, on the condition that most houses and animal shelters (e.g. > 80%) in targeted communities are treated.<sup>17</sup> IRS implemented by AngloGold Ashanti in selected urban and rural communities in southern

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<sup>12</sup> Roll Back Malaria <http://www.rollbackmalaria.org/worldmaliaday/llins.html>

<sup>13</sup> WHO 2010 Ghana country profile

<sup>14</sup> WHO 2010: 21

<sup>15</sup> WHO 2010 Ghana country profile

<sup>16</sup> Data manager NMCP "NMCP work on malaria in Ghana" interview (19/7/2011)

<sup>17</sup> WHO 2010: 4

Ghana showed results of a >74% reduction of malaria cases in the area within a 2 year period.<sup>18</sup>

In 2006, WHO issued a position statement supporting the scaling up of IRS as one of the primary vector control interventions;<sup>19</sup> consequently the use of IRS has rapidly increased. In 2009, 168 million (5%) globally, and 73 million (10%) in the WHO Africa region, of people at risk from contracting malaria were protected by IRS. In Ghana, however, the use of IRS still remains low and was only used in selected areas which protected 665,000 (3%) in 2009, and 849,620 (3,5%) in 2010, of the population at risk. An upscale of IRS in selected areas in the Northern, Upper West, Upper East regions and some parts of the Ashanti region is planned to start in 2011. An estimation of how many people this will protect is, however, not revealed in the NMCP strategic plan.<sup>20</sup>

### *Implementation*

For any malaria vector control to be effective, high coverage must be continuous, requiring monitoring, evaluation and education; all which require substantial human and financial resources. One of the issues determining the width of implementation of currently used anti-vector strategies as well as strategies that will be implemented in the future is funding. Financial funding and technical support for the interventions performed by the NMCP is mainly derived not from the government but from international organizations such as Global Fund, WHO, USAID/PMI and UNICEF through grants which exclusively encourage the evidence based interventions acknowledged within the international scientific community. Any NMCP method of intervention permitted by the CCM first has to be approved by the WHO. Hence, alternative interventions not encouraged or funded by WHO or other partners, such as aerial spraying, will not be implemented unless the government provides necessary research and funding;<sup>21</sup> however, there was no reported government expenditure for malaria between 2005-2009 (with the exception of 2006).<sup>22</sup>

The work of the NMCP could be considered deficient as there are no dedicated personnel for malaria control below the National level, and no dedicated NMCP malaria staff at the regional

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<sup>18</sup> Ministry of Health Strategic plan: 35

<sup>19</sup> Ministry of Health Strategic plan: 35

<sup>20</sup> NMCP Annual report 2010: 30

<sup>21</sup> Data manager NMCP "NMCP work on malaria in Ghana" interview (19/7/2011)

<sup>22</sup> WHO 2010 Ghana country profile

and district levels, making the supervision of implementation and data collection challenging. Moreover, even though NMCP provides health staff working with malaria with recommended guidelines and advocacy, it is ultimately up to the regional and district health teams to carry out the programs in question, leaving a significant gap between strategy planning and implementation.<sup>23</sup>

## 4. Vectors

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Malaria transmission in Ghana can be divided and monitored in three epidemiological areas: Northern Savannah, Tropical rainforest, Coastal Savannah/mangrove swamps. The main parasite species causing malaria are *P. falciparum* (80-90%), *P. malariae* (20-36%), and *P. ovale* (0.15%). Four types of malaria transmitting mosquitoes are present in the country: *Anopheles gambiae* ss, *Anopheles melas*, *Anopheles funestus* and *Anopheles arabiensis*; the first three being the malaria vectors found in the Greater Accra which is situated in the third epidemiological area. *An. gambiae* is the most efficient vector and is more profound in the rainy season, however even a relatively small number of *Anopheles* mosquitoes are able to sustain any high levels of malaria endemicity;<sup>24</sup> *An.funestus* is also a very efficient vector and can be found throughout the year; *An.melas* being the less efficient vector out of the three.<sup>25</sup>

All three vectors are highly antropophilic and generally considered to be endophilic, biting and resting indoors; however studies have shown that depending on season (dry or wet), location, and the human factor, their behavior may vary. A study by Tuno et al on *An. gambiae* and *An. Melas* blood-feeding behavior in Ghana showed that the inland dominant *An. gambiae* is much more prevalent outdoors in the rainy season than in the dry season, with an indoor/outdoor ratio of 0.85 in the dry season compared to 0.77 in the rainy season. In contrast, *An. Melas* which is the main vector in the more humid western coastal regions, where people generally slept more outside, showed to be highly exophilic all year with an indoor/outdoor ratio of 0.50 in the dry season and 0.56 in the rainy season; reflecting either higher humidity in the area, and/or people sleeping more frequently outdoors.<sup>26</sup> A similar study from Equatorial Guinea showed that both *An. gambiae* and *An. melas* would frequently seek hosts outdoors in the Punta Europa region, and that vector behavior may alter due to

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<sup>23</sup> Ministry of Health Strategic plan: 24-25

<sup>24</sup> Opoku 2007: 4

<sup>25</sup> Ministry of Health IVCM policy: 5-6

<sup>26</sup> Tuno et al. 2010: 28-30

external influences. The study found that there had been an increase in outdoor host seeking behavior in the region and that peak time for biting had changed from midnight to early hours of the night, overlapping with outdoor human activity. These changes seemed to have coincided with the introduction of IRS and LLINs indicating that exophagy behaviors may be influenced by insecticides with excito-repellent properties i.e. increasing outdoor biting.<sup>27</sup>

The findings are consistent with the NMCP's own monitoring of *An.gambiae* and *An.funestus* in Ghana which indicated that mosquitoes will alter their behavior according to external influences and human behavior. Research from the Northern region, where the difference in climate between the dry and the rainy season is more distinct than in the south, showed that mosquitoes would readily seek hosts outdoors in the dry season when people slept outside more frequently due to the higher temperatures. Comparable research showed that because people in Ghana in general will go to sleep under the net at 10 pm (i.e. be protected from vector contact) the peak time for biting activity had changed to earlier hours in the evening (8-9pm) since the introduction of nets. Further changes in behavior were observed after spraying with IRS. In the initial months after spraying walls the insecticide used could be strong enough for the mosquito to sense it, causing an excito-repellent effect and consequently increasing outdoor biting. Additional adaptive shift observed due to IRS was mosquitoes avoiding to land on the walls, opting instead to rest on clothes, curtains or other objects in the room: hence not being killed by the insecticide.<sup>28</sup>

## 5. Local knowledge, treatment and prevention of malaria

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When asked, all respondents except four reported being worried and concerned about contracting malaria and all except four had contracted malaria at least once. Several of the respondents however reported themselves and/or family members repeatedly suffering from malaria and felt that the disease had a negative impact on their lives.

### *Cause and symptoms*

Most of the respondents (92%) knew that malaria is caused by mosquitoes, although whether this included the knowledge of transmission of a parasite through the bite was unclear in most

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<sup>27</sup> Reddy et al. 2011

<sup>28</sup> Data manager NMCP "NMCP work on malaria in Ghana" interview (19/7/2011)

cases. However, more than half (52%) of the respondents gave additional sources for the disease which included working close to a heat source like fire or in the sun, eating too much oil or starch, contaminated houseflies on food, cold temperatures or airborne particles.

One of the goals in the Ministry of Health's revised strategic plan to control malaria in Ghana is to ensure that caretakers/parents will be able to recognize symptoms and signs of malaria and respond appropriately and promptly within twenty-four hours after onset of fever. When asked about the symptoms many of the respondents described some of the most common such as head-ache, nausea, feeling weak, vomiting and flu-like symptoms. Other symptoms that were given as signs of malaria were yellow eyes, dark urine, blood in urine, pale skin and dizziness. Fourteen percent of the respondents did not know any of the symptoms of malaria. More than half felt that malaria and fever is the same thing.

All but five of the respondents had heard of anemia; 24% recognizing it as shortage of blood with symptoms of paleness and fatigue. Only 20% of the respondents related anemia to malaria and fever; while diet was the most frequently cited cause, while others cited overload of work and exposure to hot or cold temperatures. Seventy percent of the respondents stated that they had heard of or come in contact with convulsions. However, only two connected convulsions with malaria, one of whom cited it as "extreme malaria." 38% of the respondents that named a cause believed that convulsions are caused by phlegm; while other causes mentioned were spirits (juju magic), diet, sun and worms.

Chemist A and C stated that malaria is caused by mosquitoes and nothing else; while chemist B cited mosquitoes and diet. When asked about what symptoms they would treat with anti-malarias, chemist A cited hot body, no appetite, dizziness and vomiting; chemist B cited pain cold, loss of appetite, vomiting, weakness; and chemist C cited cold, vomiting, pain in the body, fever, shivering, heat. Chemist A and C stated that fever is different from malaria; while chemist B cited that they are the same thing.

### *Treatment*

Out of those surveyed, only 17% of the respondents claimed that their immediate response when suspecting a malaria infection would be to seek treatment at the hospital. The number one source (47%) of first response treatment was the use of traditional herbs, cooked either at

home or by an herbalist; these results indicate conformance with the Ministry of Health's data that estimates that over 70% of the population rely on traditional medicine.<sup>29</sup> Of the remaining respondents, 26% reported buying drugs from a chemist, without a qualified diagnosis as a first response treatment.

Despite the low numbers seeking first response treatment at a hospital, when asked the majority of the respondents (64%) believed that being diagnosed and receiving care at a hospital is the best way to treat malaria. Reasons for not seeking such care were in all cases financial reasons, the main obstacle being a lack of financial means to pay for a diagnosis and treatment by a doctor at the hospital, as well as buying the prescription medications. 17% of the respondents cited having health insurance, however this did not indicate a higher tendency towards using the hospital as first response treatment in every case since the cost of transportation was an issue that hindered patients from seeking care there; instead, respondents chose to opt for the locally accessible drugstore or herb treatment. Further reasons for not seeking hospital care were the belief that herbs and traditional medicine was more efficient in curing malaria, and the easy access to herbs or drugs from the chemist.

Sixty-six percent of those who knew about anemia stated that they would go to hospital immediately, while 33% cited that herbs would be the most appropriate first treatment. Fifty-eight percent of the respondents that knew about convulsions cited herbs and traditional specialists as the appropriate first response treatment, 33% stated the hospital, and 8% stated that they would first turn to the chemist. The higher tendency for seeking hospital care as first response treatment for anemia compared to convulsions could indicate either that anemia is perceived as more serious, or the belief that convulsions are a symptom that a doctor can not cure; the later a response which corresponds with the belief that convulsions are a traditional or spiritual ailment.

Immediate qualified care is crucial when children under the age of five are infected with malaria since the majority of children who die from malaria do so within 48 hours of onset of illness.<sup>30</sup> The tendency for hospital as first response treatment was slightly higher when children were sick with 36% of respondents that had children stating that they would take the child to a hospital very soon or immediately after outbreak of fever. Fifty percent of the

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<sup>29</sup> Ministry of Health Strategic plan: 20

<sup>30</sup> Ministry of Health Strategic Plan: 43

respondents would use drugs from the drugstore as first treatment for their child, while only 13% would use herbs. The majority stated that they would take their children to the hospital if the illness got worse; however, many reported having to take loans in order to finance such treatments. Only one of the respondents was pregnant (note: respondents were not asked about IPTp in pregnancies previous to the study), and she had not received intermittent preventive therapy.

It was evident from the interviews with the local chemists that the first medication all three would prescribe for any fever or flu like symptoms is anti-malarias. The drugs available to purchase were; Dihydroartemisinin, Amodiaquine, Artesunate, Artemether, Sulphadoxine-Pyrimethamine and Malafan. Hospital or additional drugs would be prescribed if the anti-malarias proved ineffective. A number of people reported remembering what medication they had received as treatment on a previous occasion and would use the same for themselves as well as for their children and other family members whenever suspecting malaria.

### *Prevention*

All but five of the respondents believed that malaria could be prevented and claimed to actively take at least one measure of protection. The majority of the respondents that had given mosquitoes as the cause (or one of the causes) of malaria also cited mosquito nets as a means of malaria prevention. However, in a surprisingly large amount of cases the net was not an obvious or prioritized source of protection, but were brought up only when suggested by the interviewer. The main strategies for protection against mosquitoes that were initially given by the respondents were to weed and clean the surrounding environment, get rid of stagnant water and taking preventive drugs (note: what drugs was not specified). Other suggestions of prevention included eating well, drinking from clean sources and regulating the body temperature through clothing. Only one respondent mentioned the use of mosquito repellent.

The majority of the respondents (68%) owned at least one net, 31% reported not owning a net. However, no more than 22% of the respondents who owned a net cited that every member in their family slept under one; while 45% stated owning only one net, which was not sufficient to protect all members of their household. A number of the respondents reported a shortage of nets due to not receiving enough to cover all family members during previous distribution campaigns, or due to deteriorating broken nets. Financial issues were a main concern in all

cases and the lack of funding prevented many from buying a new or needed additional nets. Further reasons for the shortage of nets appeared to be lack of availability. Out of the three chemists in the Darmang area none sold nets. When asked why chemist B claimed that he did not know because the shop did not originally belong to him, while the remaining two both claimed no profitable market for selling nets. They stated that the nets are too expensive for the people in Darmang and that nobody would purchase them.

A majority of the respondents that owned nets also reported sleeping under them every night (>60%); results which are consistent with the WHO survey indicating that the main reason for persons at risk of malaria not sleeping under an ITN is the lack of access to nets.<sup>31</sup> However, some owned a net but did not choose to sleep under it every night due to the heat and feeling uncomfortable; while others expressed not believing that the net was necessary. While 58% of the respondents stated that they felt the nets were effective in preventing malaria, 35% of the respondents did not feel that the mosquito nets were very effective. Reasons given were mainly the excessive prevalence of malaria in the community despite the large number of individuals sleeping under nets, and the nets' limited protection which was restricted to the bed. The respondents knew that the net protected them against mosquitoes during the night but felt that it only protected them when they were in bed lying under the net and therefore did not give a sufficient cover in their everyday lives.

When being asked about IRS about half of the respondents had heard of it but never seen it; the other half had never heard of it at all. Only one respondent had come in contact with IRS when visiting with relatives in Accra. All except three respondents were very positive when asked about their opinion on such a strategy, believing that it would be very helpful in reducing mosquitoes and consequently preventing malaria. None of the respondents reported using any alternative measures to protect against mosquitoes e.g. repellents or sprays. This was consistent with the data gathered from the interviews with the local chemists; none of which sold any mosquito repellent to be used on the body; only one of the chemists had a single can of repellent for the room (Raid) for sale but said that since it cost GHc 4.20 it was too expensive and nobody ever bought it.

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<sup>31</sup> WHO 2010: 23

## 6. National Health Insurance

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When asked about the WHO recommended policy of ACT free of charge for all age groups in the public sector that Ghana adopted in 2009, the NMCP Data Manager referred to the National Health Insurance Scheme (NHIS).<sup>32</sup> The Government of Ghana introduced the NHIS in 2003 with the purpose of securing free basic health care services to all residents of Ghana through mutual and private health insurance. According to Ghana's National Health Insurance Authority the scheme is a great success with a coverage rate increasing beyond expectations, with a total of 62% of the estimated population registered at the end of 2009.<sup>33</sup> These statistics have, however, been revealed as hugely exaggerated by a recent report from Oxfam which states that coverage could in reality be as low as 18% (less than a third of the coverage suggested), excluding 82% of the population; results which are consistent with the data gathered in Darmang. Those excluded are still forced to pay out of pocket user fees, even though every Ghanaian citizen is financing the program through a 2.5% VAT levy on goods and services. Additionally, the scheme is regarded as highly unfair and correlated to wealth as twice as many rich people are signed up compared to poor people: 64% of the rich, and just 29% of the poorest being registered. In theory, in addition to older people (>70), children whose parents are registered and pregnant women, the poorest of Ghana who cannot afford to pay for health care (indigents) are exempt from paying for the registration and annual premium fee. The practical reality is however somewhat different; the 2010 June figures indicate that 2.3% of the population is registered (as indigents) free of charge, admittedly more than the 0.5% originally provisioned for, however still leaving a significant gap between the 28% of the population living in extreme poverty on less than a dollar a day. According to Oxfam the main reason for not joining the scheme is inability to pay the NHIS fees. This is the case for 77% of individuals across the country, 85% of people in rural areas, and 91 % in poor households.<sup>34</sup>

In 2010 the NMCP implemented the Global Fund set up "Affordable Medicines Facility for malaria" (AMFm) which is a financial mechanism where national first-line buyers can purchase heavily subsidized ACTs in order to increase access and affordability of anti-malarial medication in the public and private health care sector. However, the campaign is

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<sup>32</sup> Data manager NMCP "NMCP work on malaria in Ghana" interview (19/7/2011)

<sup>33</sup> NHIS Annual report 2009: 26

<sup>34</sup> Oxfam 2011:7-26

new and due to lack of monitoring of distribution and trading in the private sector, the medicines are frequently sold overpriced and its final results are yet to be seen.<sup>35</sup>

## 7. Discussion

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It is apparent from the data gathered in the interviews that there is a considerable lack of knowledge regarding malaria. While most respondents (>70%) could identify at least three of the most common malaria signs e.g. fever, vomiting or diarrhea, symptoms described credited a broad range of ailments ranging from a general feeling of being unwell to blood in urine to the disease. Even though most of the respondents were aware that mosquitoes are a source of malaria, several additional sources were stated. Misconceptions of malaria transmission have consequences not only for recognition and treatment of symptoms, but also for personal and community prevention of the disease. For prevention and anti-vector strategies to be accepted, successful and sustainable, the communities at risk need to know the accurate prevalence, the human and financial costs of malaria in the area, as well as being able to see and monitor the results of prevention efforts. A lack of education and knowledge of how the disease is transmitted undermines anti-vector strategies by not seeking immediate care or influencing attitudes that the nets are neither necessary nor efficient, directly affecting transmissions. Most of the study respondents regarded bush clearing, diet restriction and taking preventative drugs as effective malaria prevention methods. Behavior change mediations with education and information are therefore a prerequisite to ensure the success and sustainability of anti-vector interventions.

However, the WHO goals of universal (80%) coverage are not being met in Ghana as many of the respondents questioned for this report had no access to nets either for themselves or for all of the members of their households. The failure of the NMCP and the government to provide all of its citizens with free or low cost basic protection against malaria, according to the NMCP's own objectives and WHO guidelines, can be considered a shortcoming. There has not yet been a sufficient amount of ITNs delivered for a universal cover, in addition to most people in rural areas not being able to purchase their own nets due to lack of availability and financial means, with no other alternative preventive measures available.<sup>36</sup>

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<sup>35</sup> Data manager NMCP "NMCP work on malaria in Ghana" interview (19/7/2011)

<sup>36</sup> NMCP [http://www.ghanahelthservice.org/malaria\\_control.php](http://www.ghanahelthservice.org/malaria_control.php)

It is nevertheless clear that even a universal coverage of ITNs will not be an adequate sole intervention against malaria transmission as it will only give protection during the night when lying in bed under the net. The limited ability of the net to protect is evident when considering that mosquito activity starts from dusk (6.30pm), peaking sometime between early hours of the night to early hours of the morning (9pm – 2am), and continuing until dawn (5 am). Any human activity that takes place outside the net during these times will be at risk of malaria transmission. Furthermore, the studies previously quoted show that *An. gambiae*, *An. funestus* and *An. melas* will readily seek hosts outdoors. This means that indoor-based anti-vector interventions such as ITNs/LLINs will not be effective to provide sufficient protection for any outdoor human activity during times when vector host-seeking is taking place outside of the house. The studies also indicate that vector behavior can be influenced and may change according to geographic location, dry or wet season and human behavior e.g. sleeping outside or use of insecticides. Hence, factors such as type of vector dominant in the area, vector responses to anti-vector interventions and current season will have great importance for the type of strategies required for malaria elimination. This further emphasizes why principally relying on a main anti-vector strategy of universal coverage of ITNs will not be adequate. While exito-repellents such as ITNs solely limit vector-host contact, insecticidal measures such as IRS kill indoor resting mosquitoes providing a more rapid impact. However, the results in the studies quoted above indicate that ITN and IRS might not always have the desired or anticipated effect; instead of mitigating contact or killing the vector, these strategies merely influence it to adapt its behavior. Consequently there is an arguable need for further research on alternate measures for lasting solutions of anti-vector control in order to be able to achieve elimination of malaria in Ghana and the rest of Sub-Saharan Africa.

The struggle to eliminate malaria is a battle that needs to be fought on several fronts and in the triangle of *host-vector-parasite* there are three possible links to disrupt. INTs and IRS can reduce the number of malaria cases but at some point there will need to be a focus on detecting the parasite and killing it before transmission is possible. Taking a stronger approach on rapid diagnosis and appropriate treatment is therefore an essential measure. Here the NMCP's implementation of AMFm is needed and commendable. However, for such a strategy to be effective and sustainable in Ghana, several factors must be improved. Growing resistance to anti-malarial medicines has spread very rapidly undermining malaria control efforts, and treatment solely on the basis of symptoms should, according to the WHO, only be considered when a parasitological diagnosis is not possible. Self-medicating

with either traditional herbs or easy accessed drugs from chemists is however (as reflected in the Darmang data) a reoccurring feature in the treatment of malaria in Ghana. This has consequences not only for drug resistance in malaria parasites, but also for maltreatment and hidden statistics obstructing the monitoring of the disease. To prevent resistance and ensure appropriate care, distribution of ATCs/AMFm therefore needs to be under a stricter control. However, since ACTs needs to be accessible to all persons at risk, and one quarter of the population live over 60km from a health facility where a doctor can be consulted,<sup>37</sup> restricting access to ACT in the private sector is not appropriate. Hence, an increased number of health facilities assuring accurate diagnosis through RDTs (which can provide fast and accurate diagnosis in hospital laboratories or medical clinics, as well as in areas where microscopy is not available) or microscopy are required within the reach of every patient's home. The numerous stores selling drugs in Ghana constitute the frontline of health care accessible to rural poor and should be utilized, however government regulation and enforcement are weak and the majority of chemists have inadequate knowledge of malaria and the drugs they are selling. It was clear from the interviews with the local chemist of Darmang that a malaria diagnosis for all feverish or common flu-like symptoms is praxis; especially alarming was that when asked about training to make this diagnosis, chemist B had received no training at all, while chemist A and C had received only 1-2 days training. Community based malaria case management needs to be scaled up and developed in order to reach and benefit all marginalized people in rural areas which carry the heaviest impact of the malaria burden. Free and readily available RDTs together with a stricter control of the standard of service provided should be made mandatory for all chemists and drug sellers. Information about the importance, benefits and correct pricing of RDT's and ACTs also needs to be easily accessed by the public. However, it needs to be recognized that even when seeking treatment at a medical facility, diagnosis by RDT or microscopy before receiving treatment for malaria is not a certainty; a problem due to both attitudes and a lack of resources (Ghana having just one doctor per 11,500 people in 2009).<sup>38</sup> It seems, however, that the NMCP's revised strategies of overall health sector development and increased coverage towards universal access to malaria treatment are currently not being effectively implemented; the 2015 goal stating that 90% of all patents with uncomplicated malaria will be correctly managed at public and private health facilities using ACTs is currently far from being met.

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<sup>37</sup> Oxfam 2011: 10

<sup>38</sup> Ibid.: 10

The final conclusion that can be made from the data is that poverty, and being poor, greatly increases an individual's risk of being infected with malaria due to low availability as well as lack of financial means to purchase nets, repellents or other preventive measures. Likewise, it is concerning that more than two thirds of the respondents reported not seeking hospital care for treatment of malaria due to lack of financial means and geographical access. These results are consistent with the Oxfam analysis indicating that the number of people seeking facility based health care is directly related to cost, with utilization dropping dramatically as user fees increase.<sup>39</sup> The NHIS generously covers over 95% of disease conditions that afflict citizens in Ghana: outpatient attendance and inpatient care; deliveries; diagnostics; medicines, including ACT drugs (as according to the WHO policy accepted in 2009); and emergencies.<sup>40</sup> This development is essential, however as long as this free health care remains inaccessible to the majority of the citizens of Ghana, especially to the poorest who need it the most, it is inherently meaningless. Lacking the ability to pay annual premiums, poor people in Ghana are indirectly being excluded from the public health care, the only alternative left being undiagnosed self-medication through herbs or drugs from chemical sellers. Not seeking immediate and appropriate care at a medical facility greatly increases the risk of further complications (e.g. miscarriage, anemia, convulsions), mistreatment and mortality due to malaria, especially for children under the age of five. Hence, failure to provide free *at the point of use* health care that benefits all citizens of Ghana (even though they all are contributing to the health budget) can be regarded a failure on behalf of the government and the Ministry of Health to deliver its promise of a universal health insurance scheme. The goal of the government should be to promote human and economic development ensuring a healthy and productive population. Since malaria is both a consequence and a cause of underdevelopment, the importance of elimination of the disease needs to be reflected in dedicated political support and financial reconsiderations. An estimated 36% of health spending is wasted due to inefficiencies and poor investment according to the Oxfam report, and a much needed 200% increase in spending on health could be afforded by 2015 through savings and better taxation on resources such as oil.<sup>41</sup> In view of the NMCP statistics, as well as the data collected from Darmang, the current prospects of achieving the revised goals for 2015 set out by the NMCP are, however, looking less than promising.

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<sup>39</sup> Oxfam 2011: 17-18

<sup>40</sup> Ibid: 21

<sup>41</sup> Ibid.: 7

## 8. Suggestions

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- The government of Ghana needs to allocate more financial support for malaria research (which continues to be scarce in many countries endemic with malaria) instead of solely relying on external actors.
- The government of Ghana needs to assess and review strategies and procedures currently being undertaken. Resources must be allocated more efficiently to ensure correct implementation and management of malaria interventions.
- Better education on the cause, symptoms, treatment and prevention of malaria is needed.
- The NHIS should be revised to guarantee the right to free public health care for every citizen of Ghana.
- An upscale of community based malaria case management to provide qualified health care within the reach of every patient's home is urgently needed.
- Implement an appropriate higher standard of training for chemists.
- Stricter control of service provided by chemists.
- The danger of parasite resistance should be taken seriously with mandatory RDTs both at health clinics and chemists.
- Major improvements in physical and financial access to basic prevention methods such as repellents and sprays for rural communities.
- A research into the use of aerial spraying must be conducted.

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