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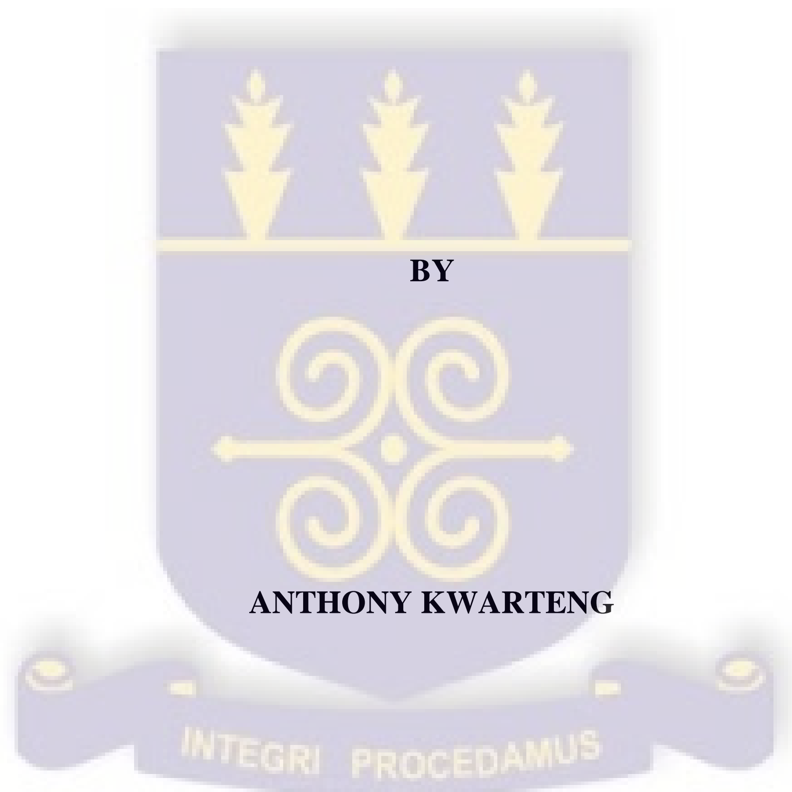
SCHOOL OF PUBLIC HEALTH, COLLEGE OF HEALTH SCIENCE, UNIVERSITY OF GHANA

AN ASSESSMENT OF THE INTEGRATED MALARIA CONTROL PROGRAMME IN THE OBUASI MUNICIPALITY



BY

ANTHONY KWARTENG

A DISSERTATION SUBMITTED IN PART FULFILLMENT FOR THE AWARD OF THE MASTER OF PUBLIC HEALTH (MPH) DEGREE.

OCTOBER, 2008.

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DECLARATION

I, Anthony Kwarteng, do hereby declare that except for references of other people's work which have been duly acknowledged, this dissertation titled "An Assessment of the Integrated Malaria Control Programme in the Obuasi Municipality" is the result of my own original research, and that this dissertation has neither in whole or in part been presented anywhere for another degree.

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DEDICATION

*To the souls of the many **innocent lives** mostly, children under five and pregnant women who lost the battle to malaria, I dedicate this work as my little contribution to the realization of the dream that one day, on our beloved continent and beyond, malaria will be eradicated to the liberation of mankind.*

And also to my late dad, lovely mum and all members of the Kwarteng family without whose prayers, encouragement and support I will not have been able to come this far.

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ABSTRACT

BACKGROUND: Malaria is a major public health threat to AngloGold Ashanti's operations, largely responsible for lower productivity and high expenditure on treatments. Morbidity and mortality is also known to be high in young children and pregnant women in the locality. In an effort to lessen the malaria burden on its operations, the company in 2005 introduced a 3-year malaria control programme that uses multiple approaches in what has now become known as the 'Obuasi Model'. The aim of this study is to assess the programme by examining the tools and processes being employed. **METHODS:** In a community-based survey, data were collected from 241 mothers/care-givers of children under five and 103 pregnant women from 30 selected communities in the Obuasi Municipality on malaria-related knowledge and practices of malaria prevention and control. Focus Group Discussions for mothers/care-givers of children under and In-depth interviews were also conducted. **RESULTS:** The results revealed significantly high level of malaria-related knowledge and practices of malaria prevention and control in the municipality. Indoor Residual Spraying was the main focus of the programme with a high coverage of 85.7% of targeted structures. The system of operations followed with due diligence the WHO recommended procedures and guidelines. However, great disparity was found to exist between ITN ownership (78.5%) and use (43.5%) by the population most at risk of the infection. The community has embraced the programme and there are calls for its long term sustainability. **CONCLUSION:** Appropriate case management practices in the light of the new drug policy of Artemisinin-based Combination Therapy necessary to compliment an effective integrated vector management for effective suppression of malaria transmission is highly required. There is therefore the need for further deepening of the existing collaboration between the NMCP and AGAMCP to improve on case management practices.

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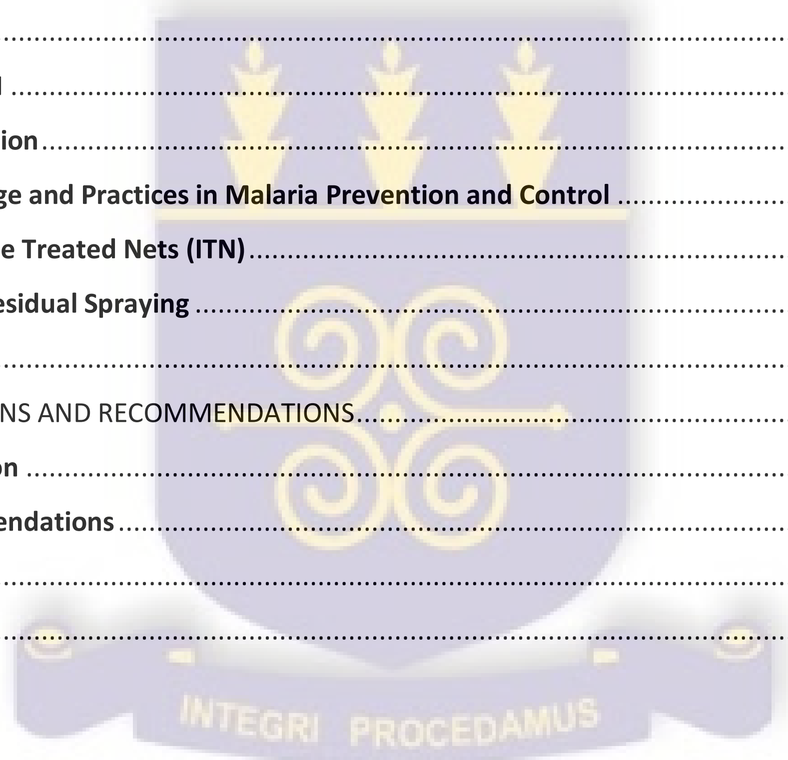

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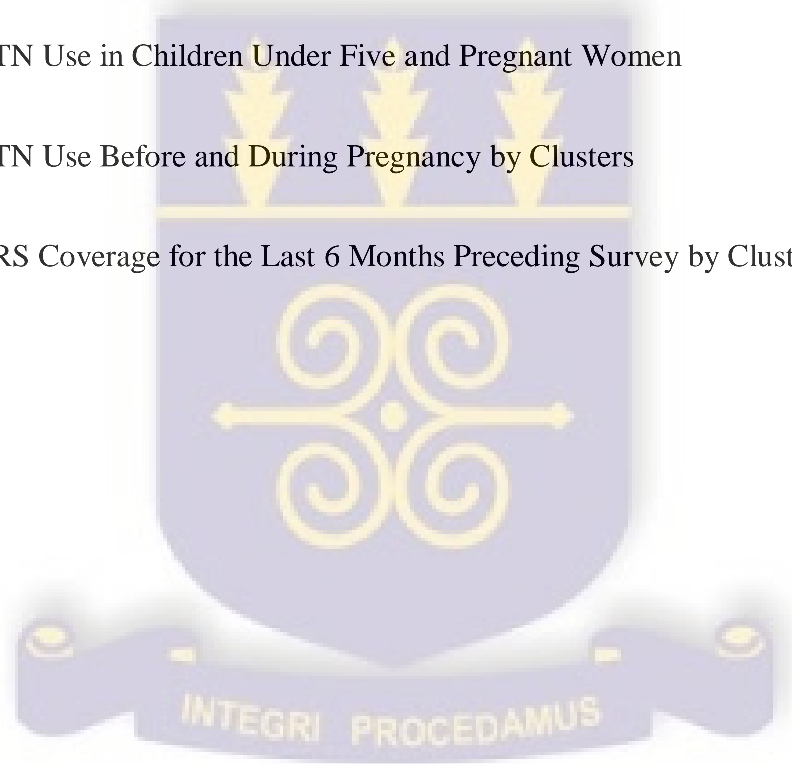

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LIST OF ABBREVIATIONS

ACT Artemisinin Combination Therapy

AD *Anno Domini*

AGA AngloGold Ashanti

AGAMCP AngloGold Ashanti Malaria Control Programme

AIDS Acquired Immune Deficiency Syndrome

AQ Amodiaquine

AS Artesunate

BC Before Christ

CDC Centre for Disease Control

CHPS Community-based Health Planning and Services

CI Confidence Interval

DDT Dichloro-Diphenyl-Trichloroethane

FBO Farmer Based Organization

FGD Focused Group Discussion

GDHS Ghana Demographic Health Survey

GHS Ghana Health Service

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GIS Geographical Information Systems

HH Household

HSES High Socio-economic Status

IDI In-depth Interview

IEC Information Education and Communication

IPT Intermittent Preventive Treatment

IRS Indoor Residual Spraying

ITN Insecticide Treated Net

IVM Integrated Vector Management

JHS Junior High School

JSS Junior Secondary School

LLIN Long Lasting Insecticide-treated Net

LSES Low Socio-economic Status

MHMT Municipal Health Management Team

MOH Ministry of Health

MS Microsoft

NGO Non-Governmental Organization

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NMCP National Malaria Control Programme

NMIMR Noguchi Memorial Institute for Medical Research

OMA Obuasi Municipal Assembly

PI Principal Investigator

POP Persistent Organic Pollutants

RBM Roll Back Malaria

SHS Senior High School

SP Sulphadoxine-Pyrimethamine

SSS Senior Secondary School

UDHS Uganda Demographic Health Survey

UNESCO United Nations Educational, Scientific and Cultural Organization

WHO World Health Organization

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information:

Malaria remains the world's most important tropical parasitic disease threatening approximately 40% of the world's population, mostly those living in the world's poorest countries (WHO, 2007). It is a parasitic infection caused by the *Plasmodium* species and transmitted to humans through the bite of a female anopheline mosquito. The disease affects between 350 and 500 million people and kills over 1 million people each year (World Health Report, 2004). About 90% of the world's malaria deaths are estimated to occur in tropical Africa south of the Sahara, where majority of infections are caused by the most dangerous species, *Plasmodium falciparum* predominantly transmitted by the highly efficient vector, *Anopheles gambiae* which is also widespread and difficult to control (RBM, 2005). Other areas significantly affected by malaria include Southeast Asia, the Eastern Mediterranean and the Western Pacific (UNESCO, 2006).

Morbidity and mortality is high among pregnant women, children and persons lacking immunity due to non-exposure. Malaria infection during pregnancy causes maternal anaemia and placental parasitemia both of which pose heightened risks to the mother, the foetus (National Malaria Control Programme, 2004) and the new born. This could also result in low infant birth weight, the single greatest risk factor for death during an infant's earliest weeks of life. Children who survive an episode of severe malaria can suffer from learning impairments and brain damage (UNESCO, 2006). Malaria, therefore, presents serious demographic consequences for the continent and causes considerable loss of income placing a heavy burden on families, health systems and society as a whole.

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Although successes in malaria control in the last 40 years have been few, experience indicates that where there is a political will, sufficient financial and human resources supported by a good health infrastructure, malaria can be controlled with the currently available tools. Regrettably, these are not the case in the majority of malaria endemic countries including Ghana, where health care systems are weak and resources scarce. Many malaria control efforts particularly in Africa, are carried out as small projects with limited coverage and often not sustainable. The first comprehensive effort to present available information on progress in fighting malaria in all affected countries shows appalling status of malaria control efforts including control policies, service delivery and coverage of key interventions (The World Malaria Report, 2005).

In Ghana, malaria is endemic and remains a major public health problem accounting for more than 44% of reported outpatient visits and an estimated 25% of under-five mortality (National Malaria Control Programme, 2004). Crude parasite rates range from 10-70% with *Plasmodium falciparum* accounting for 80-90% (National Malaria Control Programme, 2002). According to the 2004 Anti-Malaria Drug Policy for Ghana, 13.8% of pregnant women are affected and 10.6% go on admission with as much as 9.4% mortality (National Malaria Control Programme, 2004).

The total cost of Malaria Control in Ghana for 2002 was estimated as GHc 50.05 million in direct and indirect cost (Asante and Asenso-Okyere, 2003). Malaria care can cost up to 34% of poor household's income (WHO, 2003). The burden of the disease in Ghana is very similar to world statistics.

In the Obuasi Municipal Area, malaria is first on the list of priority diseases due to its geographical location and occupational activities suitable for vector habitation. In 2005, the

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Municipal Health Directorate recorded an estimated average of 11,000 cases per month (Health Director's Report, 2007). The estimated cost suffered by AngloGold Ashanti (AGA), a mining company for 2004-5, in terms of treatment, absenteeism and loss of productivity associated with its mine workers contracting malaria was approximately $2.2 million per year, with $55,000 alone being spent on treatment. Malaria is therefore the most significant public health threat to AGA's operations in Obuasi (AGA Annual Report, 2007). In the Company's effort to lessen the malaria burden on its operations and as a social responsibility for the people of Obuasi, a 3-year Integrated Community Malaria Control Programme have been embarked upon in the whole of the Obuasi Municipal Area.

1.1.1 An Overview of the Obuasi Malaria Control Initiative: It is an integrated malaria control programme spearheaded by AGA in collaboration with the Obuasi Municipal Assembly, the Ghana Health Services/Ministry of Health (GHS/MOH), the National Malaria Control Programme (NMCP), Noguchi Memorial Institute for Medical Research (NMIMR) and some health institutions in South Africa. The programme was inaugurated by His Excellency, President J. A. Kufuor and AGA Chief Executive Officer, Bobby Godsell in April 2006. There was an initial investment of $1.7 million for the first year, with an annual budget of $1.3m thereafter. It has the ultimate goal of reducing malaria incidence by 50 percent by 2009 in the Municipality. A malaria control centre has been established at Sansu, a suburb of Obuasi, to serve primarily as the headquarters for the Obuasi programme. It also functions as a training centre for malaria control interventions at other AGA operations, as well as a satellite research centre for use by academics, and government agencies. The Centre has insectarium and satellite mosquito stations have been established.

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The programme is now hailed as the "Obuasi Model" and being used as the basis for a $160 million Ghana Global Fund proposal for up scaling of IRS to 45 districts. It has won the prestigious Global Business Coalition award for malaria and 3 Pan African awards. The core interventions of the programme at its commencement are as follows:

***Vector Control*:** The programme began with the training of a team of 125 spray men from the local communities and villages. Entomological baseline studies performed by the South African National Institute for Communicable Diseases, based in Johannesburg showed significant resistance by resident mosquitoes to the standard insecticides recommended by the World Health Organization (WHO) for malaria control, with the exception of the organophosphate group. As a result, the use of organophosphate for two rounds, followed by a pyrethroid-based insecticide was recommended. Due to the high toxicity of organophosphate chemicals in high concentrations, the Centre has developed a code of practice to ensure that adequate medical surveillance are carried out regularly on this group of employees (AGA Annual Report, 2006). Two rounds of house spraying of 134,000 structures were completed using organophosphates in 2006 with a shift to standard pyrethroid insecticides in 2007.

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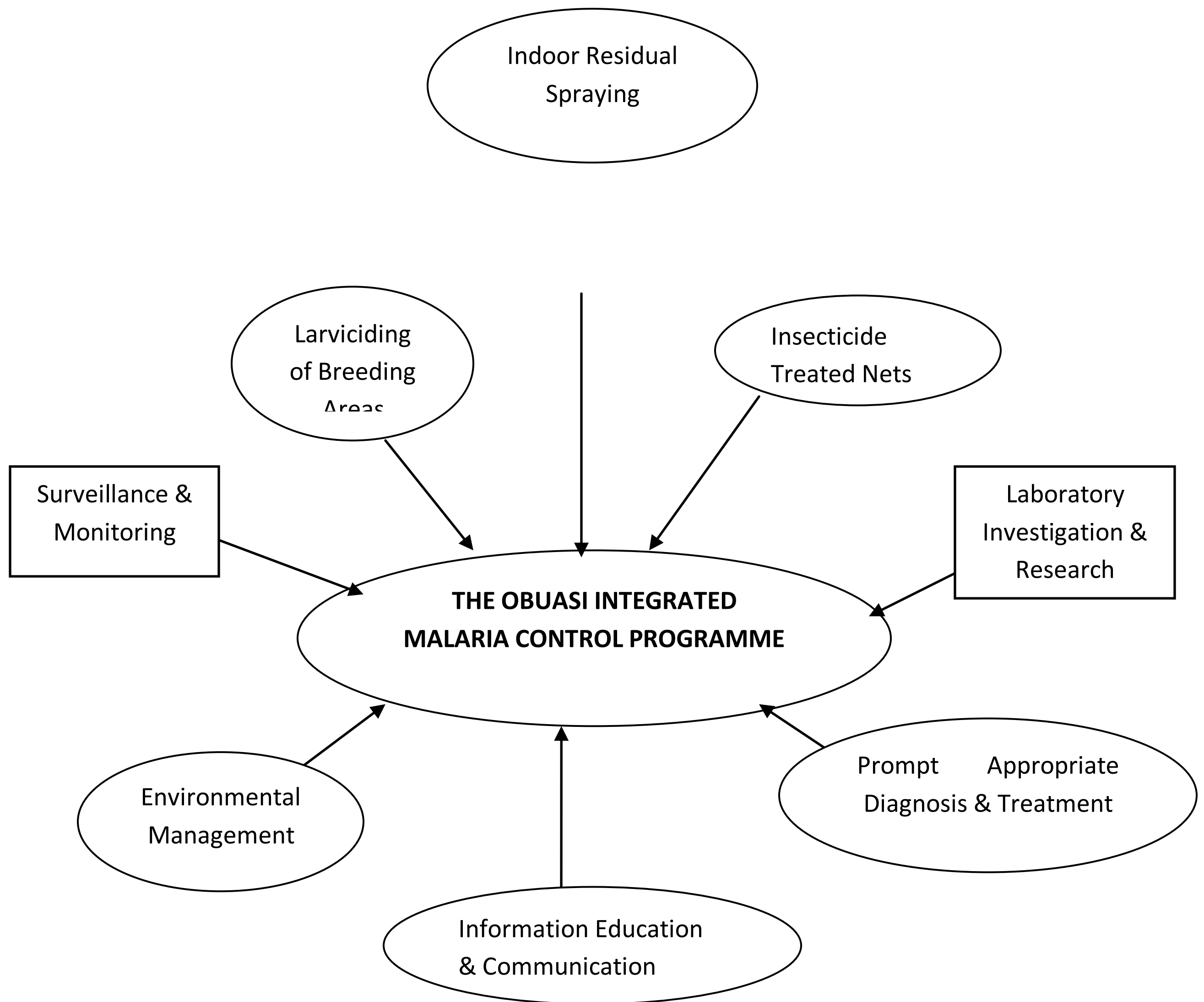
Figure 1.1 A Flow Chart of the various Components under Obuasi Integrated Malaria Control Programme



According to the Manager of the programme, Mr Steve Knowles, 5 spray rounds have now been completed with coverage ranging between 93 to 95 percent of targeted structures. IRS rounds

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are twice per year in a 5-monthly cycle. The annual spray round starts in mid-January or early February.

Distribution of insecticide treated nets to the Obuasi populace is not the main focus of the programme, however focus is on the most susceptible groups. About 3,000 long lasting insecticide treated nets (LLIN) have been distributed free of charge to the high-risk areas such as orphanages, maternity wards and hospitals for pregnant women and children under five. Nets are also given as prizes in school competitions and football tournaments. No re-treatment plans are however in place. Additionally, temporary and permanent water bodies where mosquitoes breed are being treated with larvicides.

Case Management: The Noguchi Memorial Institute for Medical Research at the University of Ghana completed a baseline study on parasite prevalence of *P. falciparum* infection among school children in Obuasi Municipality (Unpublished, 2006). Standard treatment protocols for rapid and early detection and diagnosis of malaria were put in place at the Mine's Edwin Cade hospital and its other health facilities. The use of drug treatment regimen coherent with the national treatment protocol including the mandatory use of the new Artemisinin Combination Therapy (ACT) has also been instituted at Mine's Edwin Cade hospital and its other health facilities. However, it is not a requirement for individuals and hospitals outside the establishments of the company to be supported with this new anti-malaria drug. Standard case management is being advocated and recommended for individuals and health facilities for malaria treatment.

Information, Education and Communication (IEC): One-hundred and fifty (150) volunteer community advocates have been trained to present health information on malaria symptoms, prevention and treatment, and to dispense educational materials in the form of pamphlets and

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posters. In an interview with the manager of the programme, he indicated that "partnership with Obuasi Municipal Assembly engenders support and seconding of personnel to assist and facilitate meetings with the community leaders and other principal community workers such as the Assemblymen and women as well as traditional heads". Community interactions through regular committee meetings, social gatherings, media articles, a weekly slot on the local radio programme and one-on-one interaction with community leaders to obtain feedbacks have also been established. A Community Volunteer Advocate corps was formed in 2007 to provide a vital community link during the house to house spraying exercise. Volunteers receive regular training on the causes and prevention of malaria, as well as updates on new developments, from staff of AGA Malaria Control Programme. They are given a quarterly allowance to motivate them.

***Surveillance and Monitoring*:** A comprehensive malaria information system backed with Geographical Information Surveillance (GIS) has been installed to monitor and evaluate the programme for consistent high performance according to WHO standards. The Centre has put in place measures to monitor diagnosis and treatment of malaria for consistency and effectiveness with emphasis on laboratory confirmed diagnosis and treatment coherent with the new national anti-malaria drug policy (AGA Annual Report, 2007). In furtherance to this, a case management reporting form has been developed for all laboratories and health facilities in the Municipality. There is a continuous ongoing monitoring and surveillance to detect areas of new incidence of malaria, investigate the underlying causes and also advice defaulters of the new policy of prompt and appropriate case management.

Environmental Management: This falls under the purview of OMA precisely the Assembly's Health and Environmental Unit under the existing collaboration between the AGA Malaria Control Centre and the OMA. They are to ensure environmental sanitation and hygiene by

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getting rid of breeding places through evacuation of refuse, empty tins, cans and tyres which collect water and serve as breeding places for mosquitoes.

Laboratory Investigation and Research: The Centre boasts of a modern fully equipped laboratory with an insectarium for monitoring insecticide resistance. It conducts routine bioassay and susceptibility tests using larvae regularly collected from the programme's control sites and reared at the insectarium to monitor developing resistance to insecticides used for the residual spraying. Quality control and assurance tests to monitor the effectiveness of the spraying exercise are regularly being conducted. There is also an ongoing year round human landing catches of adult mosquitoes to identify the kinds of species predominate in each community, as well as determine their seasonality and biting habits in the Obuasi Municipal Area.

1.2 Statement of Research Problem: A 2004 Bulletin of Health Information on outpatient attendance from 1985 to 2003 shows an increasing burden of malaria in Ghana (Adams et al, 2004). While there have been significant improvement following intensification of malaria control activities especially in the Kassena-Nankana district of the Northern Ghana (Owusu-Agyei *et* al, 2006), the same cannot be said of Obuasi for lack of assessment of independent nature. The estimated average of 11,000 cases per month in the Obuasi Municipal Area in 2005, prior to the take off of the control programme shows malaria as a major public health problem although the disease is preventable and curable.

The start of the first spraying exercise was greeted with initial rejection by a section of the community. This necessitated AGA to issue a directive enforcing the compulsory spraying of all company residential facilities. Notwithstanding this hostile "coronation", records at the Mine's

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Edwin Cade Hospital which offers free medical services primarily for the company's workers and dependants mostly urban dwellers shows a 74% case reduction from 2005 to 2007 (AGA Annual Report, 2007). However, similar record of case reduction at other health facilities serving majority of urban and outlying rural communities is lacking.

The knowledge gaps this study seeks to address are as follows:

- Is the 74% reduction in incidence of malaria cases widespread in other health facilities or is it attributable to other factors such as climate; change in the care seeking behaviour of patients in managing cases at home or a resort to other services elsewhere?
- Is the 74% reduction of cases at the Mine's Edwin Cade Hospital as a result of the compulsory spraying for residents of the company's housing facilities, majority of who are Urban High Socio-economic Status (HSES) dwellers and seek free medical services at the Edwin Cade Hospital?
- Is coverage for the various malaria control tools high and processes efficient enough to bring about reduction not only in incidence but also rate of malaria cases at all health facilities in the municipality?
- Lastly, are efforts aimed at reducing malaria cases equitably directed to all clusters- Rural, Urban Low Socio-economic Status (LSES) and Urban HSES especially among the vulnerable groups?

1.3 Justification: Malaria is a major public health threat to operations in Obuasi (AGA Annual Report, 2007). The disease is largely responsible for absenteeism at workplaces and a major cause of death in young children and pregnant women. Malaria, apart from being a health problem is also a serious developmental challenge, one of the three priority disease of the Millennium Development Goal.

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There have been many efforts at the national and local levels to control the disease such that it is of no public health significance. Many of such interventions in Ghana have relied on a single tool approach. The use of multiple approaches like the AGA programme in Obuasi which employs integrated vector and case management backed by scientific investigation and research is unknown of in Ghana. While many studies have been conducted and findings made on the suitability/effectiveness or otherwise of single-tooled programmes such as Insecticide Treated Nets (ITN), Indoor Residual Spraying (IRS), Intermittent Preventive Treatments (IPT) for pregnant women as well as Information Education and Communication, there are very few publications that have reported on findings from assessing an integrated programme in Ghana and none like the 'Obuasi model'.

Rolling up of the programme to other AGA's operations in the Geita Mine, Tanzania and growing participation of similar control programmes from other private companies such as Newmont, Gold Fields, Gold Star and Ghana Manganese in their areas of operations is a clarion call for research to optimize such investment.

There is therefore the need for an independent assessment of the programme, however noble its intentions to report progress and lessons learnt so as to identify areas where improvements could be made. This will help fine tune strategies and ensure judicious allocation of resources in subsequent stages of the programme. It will also contribute to the body of knowledge in the prevention and control of malaria. Finally, it will be useful information for the NMCP and companies wishing to undertake any intervention programmes similar to this in other areas.

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1.4. Objectives

1.4.1 General Objective:

To assess the integrated malaria control programme with respect to the different socio-economic settings in the Obuasi Municipal Area.

1.4.2 Specific Objectives:

1. To assess community's knowledge and practices in malaria prevention and control.
2. To determine the proportion of children under five who slept under insecticide treated nets the night before the survey.
3. To determine the proportion of pregnant women who slept under insecticide treated nets the night before the survey.
4. To determine the proportion of household structures sprayed with the residual indoor insecticide within the last 6 months preceding survey.

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CHAPTER TWO

2.0: LITERATURE REVIEW

2.1. Introduction: Malaria from time immemorial has been a subject of medical research and a problem for many governments the world over. Many efforts from laboratory research to interventional implementation across countries and continents have been mounted towards its eradication (Alilio et al, 2004). There have been many innovative research and breakthroughs in the prevention and control of malaria. However, a lot more based on current and existing knowledge and practices are required. In assessing the effectiveness of one such programme, Integrated Malaria Control spearheaded by a private organization; a comprehensive literature review of the AngloGold Ashanti malaria control programme in terms of the tools employed in its malaria prevention and control activities will manifest any lapses and guide policy and programme direction in malarious areas.

2.2. Landmark Discoveries: The malaria parasite, *Plasmodium species* has probably been with us since the dawn of time and man in his bid to deal with its manifestations, first attributed the fevers to supernatural influences (Kakkilaya, 2008). Hippocrates, probably the first malariologist, in 400 B.C first distinguished the intermittent malarial fever from the continuous fevers of other infections and related them to the time of year and to where the patients lived. The first recorded treatment by Morton in 1696 AD detailed description of the clinical picture of malaria and its treatment with cinchona (Kakkilaya, 2008).

However, an important observation at the microscopic level was made by Charles Louis Alphonse Laveran; a French physician working in Algeria identified the malaria parasite in

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1888. Ronald Ross in 1897 demonstrated oocysts in the gut of anopheline mosquito at Secunderabad, India, proving that mosquito was the vector for malaria. Ross's discoveries into malaria were immediately followed by a series of important works. Giovanni Battista Grassi, Robert Koch - the Nobel Prize Laureate in Physiology or Medicine in 1905 (Kakkilaya, 2008) and many others issued many valuable works which not only enlarged the understanding of malaria, but also supplied useful knowledge, understanding and prevention of the malaria disease which has now culminated in the development of many candidate vaccines against *P. falciparum* parasite.

In 2002, the genome of *Anopheles gambiae* and *Plasmodium falciparum* were sequenced deepening our understanding of research and keeping alive our hopes especially with the high prospects of an effective vaccine against malaria that one day malaria will pose no threat of public health importance.

2.3. History of Malaria Control: Many efforts towards malaria control and elimination have taken many forms and been characterized by eras of ingenuity and discovery; optimism and hope to proliferation of multilateral activities (Alilio et al, 2004). While considerable gains have been achieved in Latin America and Asia in lessening the burden of the disease, the already intolerable number of deaths began to increase as the primary means of defence, Chloroquine, increasingly failed (Feachem et al, 2007). With the resurgence of focus on the burden of malaria and introduction of new tools such as long-lasting mosquito nets and Artemisinin-based combination therapies (Mutabingwa, 2005) together with tried and tested processes; a renewed opportunity for its eradication now exists.

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Initial efforts were closely knitted and balanced between malaria control and research such that the same people who were active in research were also directing the control efforts. Ronald Ross, the scientist who discovered the malaria parasite in wild-caught mosquito in Sierra Leone, was a public health administrator whose main area of interest was in sanitation and human health (Bradley, 1999). This approach of Ross led to the introduction of larviciding, the first time used for malaria control in the British army barracks in Freetown, Sierra Leone (Bockarie et al, 1999)

This period gave way to the era of optimism and hope when there was so much political will and impressive showing of DDT spraying in many parts of the world (Dobson et al, 2000). This optimism led to astronomical increases in spending in malaria from the mid 1950s to the early 1970 unprecedented in the history of medicine and public health (Alilio et al, 2004). However, most hyper-endemic areas such as tropical Africa, Papua New Guinea were left out. The many encouraging successes initially convinced many that, eradication was in sight such that support for malaria control virtually weaned. This dead hope never resurrected until late in the 1990s when malaria control programmes proliferated injecting substantial funds and expertise in its activities (Alilio et al, 2004).

Since the 1990s, there have been many multilateral activities underscoring the need for a holistic effort to tackle funding, research coordination as well as promotion of private public partnership. Notable among them are the following:

- Multilateral Initiative on Malaria
- Roll Back Malaria
- Medicines for Malaria Ventures
- Bill & Belinda Gates Foundation for Malaria Control

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- Global Fund to fight AIDS, Tuberculosis and Malaria

2.3.1. History of Malaria Control in Ghana: Ghana, like many nations has endured this chequered pathway in the history of Malaria Control activities. The Global Malaria Eradication programme (1955-1969) introduced IRS, aerial spraying and promoted the consumption of 'Chloroquinated' salts. This was followed in by the Malaria Action and Control (1970-1980) which had case management as its main focus. The short-lived Accelerated Malaria Control (1996-1997) piloted in 30 districts across the country added on Malaria Action and Control capacity building to prompt treatment. Since 1999, the RBM has been in the driving seat with the objective of reducing by 50% malaria morbidity and mortality by 2010.

2.4. Knowledge and Practices in Malaria Prevention and Control: According to the 2003 Ghana Demographic Health Survey (GDHS), majority of household respondents (84.4%) have at least heard a message on a radio. Knowledge of malaria in urban (88.0%) was slightly higher than in the rural (81.3%). However, review of knowledge and practices of malaria prevention and control showed high malaria awareness of 99.0% in a survey in all five Districts in Uganda between 2001 and 2003 (Batega, 2004). Reports of knowledge of respondents who have heard of malaria in Nepal was 86.0%; only 50% reported fever with chills as the sign and symptoms of malaria and 76.0% mosquito bites as the cause of the disease (Joshi and Banjara, 2008).

2.5. Malaria Case Management: RBM baseline survey by WHO in 2001 in Uganda showed that the percentage of under-five year old children whose caretakers sought treatment within 24 hours was as low as 7.3%. And for those that did so; the first action was self medication (47.6%), while only 24.9% went to the health unit (Lutalo et al, 2001). (Matta et al,

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2004) reports of as high as 83% of fever cases in a New Delhi hospital did not approach the doctor even after three days of onset of fever, 25.5% tried self medication and 20.5% approached the chemist for treatment. These, no doubt are serious impediments towards effective case management because early diagnosis and appropriate treatments are key elements of managing all infections.

Clinical signs and symptoms of febrile illness are suggestive of malaria, but in areas of high endemicity, this could be misleading and often inaccurate. Studies in Zimbabwe of 104,000 cases over a 12-month period showed that fewer than 30% of diagnoses made by trained nursing staff in rural clinics were slide positive (Taylor et al, 1988). Similar results were observed in Madagascar, where only 12% of 6,884 presumptive diagnoses carried out in hospitals between 1997 and 1998 were found to be slide positive (Albonico, 1999). However, malaria diagnosis at health facilities in Ghana has shown to be 62% slide positive (Dunyo et al, 2000). Home diagnosis often besets with inaccuracies results in high proportions of unnecessary and inappropriate treatments (Shiff, 2002). The unavailability of drugs in instances where proper diagnoses have been made compounds the issue further. Mufubenga in 2004 among others noted that frequent drug stock outs at health facilities were one of the challenges affecting prompt case management. A 2001 WHO/MOH collaborative monitoring and evaluation study in Uganda on stock levels reveals only 13.3% of the surveyed health facilities had no stock outs of nationally recommended anti-malarial drugs (Mufubenga, 2004). This means that, the majority of health facilities surveyed had significant periods when they did not have a full complement of recommended anti-malarial drugs.

Globally, malaria control programmes are threatened by increasing resistance of *Plasmodium falciparum* to conventional monotherapies such as Amodiaquine, Chloroquine and

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Sulphadoxine-Pyrimethamine (NMCP, 2004). Malaria treatment failure using Chloroquine as shown in a report of a study in 6 district hospitals across the length and breath of Ghana shows conservative figure between 6% and 25% among different demographic cohorts (NMCP, 2004). Against the 25% 'Change Period' under WHO Global Response to Anti-malarial Drug Resistance guidelines, Ghana reviewed it's policy of Chloroquine as a first line drug for management of uncomplicated malaria. Since 2005, the new policy of Artemisinin Combination Therapy (ACT) as the first line drugs for uncomplicated falciparum (NMCP, 2004) has been in place and proving very effective. Ghana is among 42 malaria endemic countries where ACTs are now deployed (Bosman and Mendis, 2007). In a comparative study of the efficacy and safety of three ACT drugs, Artesunate plus Amodiaquine (AS + AQ), Artemeter-lumefantrine and Artesunate plus chlorproguanil-dapsone, AS+AQ has been found to be appropriate as a first line treatment for uncomplicated malaria in Ghana (Owusu-Agyei et al, 2008; Dorsey et al, 2007). However, its implementation has not been without problems resulting from incorrect dosing and associated side effects.

2.6. Insecticide Treated Nets: The effectiveness of ITNs in reducing all cause malaria mortality and morbidity by more than 15% in children under-five years has been documented by many findings (Binka and Akweongo, 2006; NMCP, 2002). It also provides protection to pregnant women who are most susceptible to malaria (Binka and Akweongo, 2006). It is the prominent and most known preventive measure for large scale deployment in highly endemic areas (Lengeler, 2004). There has been significant improvement in the use of ITNs among children under five and pregnant women in the Kassena-Nankana district of Northern Ghana since 2000, when the RBM initiative was launched (Owusu-Agyei et al, 2006). The culture of bed nets use however differs within and across nations due to many factors. According to Uganda Demographic Health

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Survey (UDHS), net ownership in urban areas is 32.9%, 9.2% in rural with of 13.0% (UDHS, 2000-2001), while a similar source GDHS, indicates a slightly better overall national average ownership of 17.6%. Interestingly, Ghana's urban 9.9% is dwarfed by Uganda but has superior rural ownership of 24.2%. Only 3% of households own at least one currently treated net (GDHS, 2003). While net use in Ghana is limited, there is no tradition of net re-treatment (NMCP, 2002). In 2001, it was observed in a nationwide survey that net use in Ghana was as low as 12% in households in the preceding 12 months (NMCP, 2002).

In a study to examine the determinant of ITN purchasing among households in Nangarhar Province, Eastern Afghanistan, ITN were 4.5 times more likely to be purchased by families from the richest quartile and 2.3 times likely to be purchased from the upper-middle than from the two lower quartile (Howard et al, 2003). According to the GDHS, the government of Ghana in an effort to make mosquito nets more affordable has since 2002 waived taxes on the importation of nets into the country. Developmental partners have also contributed in many ways by supplying ITNs for distribution at subsidized cost to pregnant women and children under five in deprived areas of the country.

2.7. Indoor Residual Spraying: Indoor Residual Spraying (IRS) with DDT and Dieldrin was the primary malaria control method used in the Global Malaria Eradication Campaign (1955-1969) (CDC, 2008). An efficient indoor residual spraying strategy is characterized by application of the correct volumes of appropriate insecticide on all surfaces suitable for mosquito resting (WHO, 2006). Whilst the (CDC,2008) quotes a

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70% coverage as the minimum threshold of IRS within targeted communities for effective transmission control to reduce malaria related burden of morbidity and mortality, other scientific evidence acknowledged by WHO has it at 80%. This should be achieved before the onset of peak malaria transmission with a high coverage of targeted structures (WHO, 2006). Entomological monitoring at Bioko Island Malaria Control Programme (Sharp et al, 2007) and the Lubombo Spatial Development Initiative in Mozambique, Swaziland and South Africa (Streat, 2007) has shown the effectiveness of IRS in controlling the anopheline vectors. Targeted vector control is known to have a major impact on malaria in high risk areas (Githeko et al, 2006). There is the need for choice of an appropriate insecticide of residual life that is also effective as demonstrated in the Bioko programme (Table 2.1).

Table 2.1 WHO Recommended Insecticides for IRS against Malaria Vectors

Insecticide Compounds and Formulations (1)	**Class Group (2)**	**Dosage (g/m^2)**	**Mode of Action**	**Duration of Effective Action (months)**
DDT WP	OC	1-2	Contact	>6
Malathion WP	OP	2	Contact	2-3
Fenitrothion WP	OP	2	Contact &airborne	3-6
Pirimiphos-methyl WP& EC	OP	1-2	Contact & airborne	2-3
Bendiocarb WP	C	0.1-0.4	Contact & airborne	2-6

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Propoxur WP	C	1-2	Contact & airborne	3-6
Alpha-cypermethrin WP&SC	P	0.02-0.03	Contact	4-6
Cyfluthrin WP	P	0.02-0.05	Contact	3-6
Deltamethrin WP	P	0.01-0.025	Contact	2-3
Etofenprox WP	P	0.1-0.3	Contact	3-6
Lambda-cyhalothrin WP	P	0.02-0.03	Contact	3-6

(1) EC = Emulsifiable Concentrate; WP = Wettable Powder.2) OC= Organochlorines; OP=Organophosphates; C= Carbamates; P= Pyrethroids.
Source: www.who.int/whopes.

While the application of Pyrethroid selectively reduced the populations of *Anopheles funestus* and *An. melas* from 23.5 to 3.1 and 5.3 to 0.8 per trap per 100 nights respectively at round one, the introduction of a carbamate insecticide in the second round reduced *An. gambiae* from 25.5 to 1.9 per trap per 100 nights and *An. funestus* and *An. melas* remained at very low levels (Sharp et al, 2007).

2.8. Environmental Management: The effectiveness of Environmental Management as a preventive measure in malaria control before the advent of DDT or Chloroquine is evident in the copper mining regions of Zambia (Utzinger, 2002) and Dar es Salaam in Tanzania (Bang et al, 1975). Little is seen, however of its application in Africa for more than half a century now (Killeen et al, 2004). It requires specialist skills that are currently lacking in sub-Saharan Africa where they are needed most.

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2.9. Integrated Vector Management Strategies: Parasites are transmitted by vectors from one host to the other. The successes of this change over and timing is crucial to their survival and for that matter their disease causing capabilities (Webber, 1996). The use of insecticide is therefore essential to interrupt and control this change over. However, there are challenges associated with insecticide use. The development of resistant strains, high cost of insecticides and environmental concerns resulted in reduced reliance on insecticide especially for IRS. There is emphasis on the need for other vector control measures involving environmental management, biological control and personal protection (WHO, 2005).

The Stockholm Convention on Persistent Organic Pollutant (POP) adopted in 2001 therefore required a reduced reliance with the goal to eliminate DDT and other intentionally produced POPs. It therefore advocated the promotion of research and development of safe alternative products, methods and strategies (Stockholm Convention, 2001). Integrated Vector Management (IVM) is a viable strategy for eliminating the use of POPs and reducing reliance on pesticides in general. It calls for an evidence-based, multi-disease control approach that rationalizes the judicious use of effective insecticides, use of alternative approaches ranging from the provision and promoting the use of ITNs, environmental management and biological controls and actions aimed at personal protection (WHO, 2005). This strategy achieved remarkable success in the elimination of *Anopheles gambiae* from Upper Egypt (Alilio et al, 2004) during the first half of the 20th century. In entomological and parasitological surveys of a case control study in Burundi after the introduction of an emergency vector control interventions that combined IRS with deltamethrin and insecticide-treated nets, while *Anopheles* indoor resting density was significantly reduced, malaria prevalence was comparatively lower in people sleeping under a net (Protopopoff, 2007).

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In Zambia, the use of an integrated control involving extensive water management, larviciding, housing improvement and bed net complemented by clinical management of human infections made possible by huge sustainable industrial investment resulted in a remarkable success (Killeen et al, 2004).

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CHAPTER THREE

3.0. METHODOLOGY

3.1. Type of Study: This is a community-based cross-sectional study that utilized both quantitative and qualitative methods in the data collection. The Obuasi Municipal Area was stratified into rural, urban LSES and urban HSES communities.

- **Quantitative:**
  - a) A survey of mothers/care-givers with children less than 5-years of age in the Municipality.
  - b) A survey of pregnant women in the Obuasi Municipal Area.
- **Qualitative:**
  - a) Three (3) Focus group discussions (FGD) of 6-8 mothers/care-givers with children less than five years, one each from the defined clusters.
  - b) In-depth interviews with
    - i. The Manager of the National Malaria Control Programme (NMCP), Middle Zone.
    - ii. The Manager of AngloGold Malaria Control Programme.
    - iii. The Municipal Health Director.
    - iv. An Assemblywoman from any of the sub-district.
- **Record Review**:

  Of the Integrated Malaria Control Programme with special attention to field reports of IRS exercise to familiarize with their procedures.

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3.2 The Study Location: The Obuasi Municipal Area is located in the southern part of the Ashanti Region of Ghana; it is about 64km drive from Kumasi, the regional capital. It lies between latitudes 5º35'N and 5 º65N, and longitudes 6º35'W and 6º90'W over a total land area of 828 square km with a population of 234,000 according to the 2000 population census report (Coulombe, 2005). It is bounded on the south by Adansi South District, east by Adansi North, and west by Amansie Central. The Municipality is made up of 54 communities categorized into 14 sub-districts with 30 Electoral areas. It lies 500 metres above sea level and has undulating topography.

The Municipality experiences semi-equatorial climatic conditions with a double maximum rainfall regime; mean annual rainfall range of 125 to 175 cm. The vegetation can be described as mostly semi-deciduous forest. Temperatures are uniformly high all year with the hottest month being March (30^{oC}) and average annual temperature is 25.5^{oC}. Relative humidity is higher (75 - 80%) in the wet season. The main occupation is mining, an activity by the indigenes that dates back as early as the 17th Century.

The Municipality is blessed with four hospitals including the Mine's Edwin Cade which offers free medical services mostly for the mine staff and their dependents. Also are nine clinics, seven maternity homes and seven herbal clinics. Nevertheless, malaria remains an important public health issue in the Obuasi municipality due to its geographical location and occupational activities which serve as suitable habitation for the vector. The populations of those most at risk are children under 5 years, pregnant women and the expatriate community.

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3.3. Variables: The variables in the study have been grouped into maternal/caregivers, pregnancy related and households characteristics. The response variables are ITN use, IRS, larviciding, IPT and Case Management (refer to appendices II and III).

3.4. Sampling

3.4.1. The Study Population: The study population was made up of mothers/caregivers in the Municipality with at least one child under the age of five years in the selected household and pregnant women who have been residents of the community for at least six months. Others involved were opinion leaders, community members and top management of the National Malaria Control Programme (NMCP) and the AngloGold Malaria Control Centre.

3.4.2. Sample Size: According to Ghana Demographic Health Survey (GDHS 2003), the overall national household knowledge of any control method for malaria is 84.4%. Using a worst acceptable level of 79.6% at a confidence level of 95%, a sample size of 219 households was determined by Epi Info version 6. This was scaled up to 241 with 10% to adjust for non-response and non-eligibility.

100 pregnant women were purposively chosen to get information on knowledge and practices of malaria prevention and control among the pregnant cohort.

3.4.3 Sampling Procedure: Stratified proportionate random sampling was used. A 2008 CHPS Zonal list of all the 54 communities in the Obuasi Municipal area with their respective populations was collected from the Municipal Health Directorate.

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The communities were initially stratified into three pre-defined clusters based on the socio-economic criteria – education; occupation, housing and access to healthcare which are highly related to the mining activities. Mindful of the cluster weights, thirty (30) communities were then selected and proportionate numbers of households from each of these weighted communities were assigned to exhaust the total sample size of 241 households. The same sampling process was replicated for the pregnant women, with proportional representation for the sample size of 100 pregnant women. With the pregnant cohorts, one pregnant woman was selected from communities that weighted approximately zero because of the small sample size increasing their number to 103 (Refer Appendix IX). This was done to ensure knowledge and practices of malaria prevention and control all among communities are also captured and assessed.

The community selection was followed by visiting the central location of each of the communities and spinning a bottle. A coke bottle was spun on an even ground and the first house in the direction of where the spout pointed was noted. All the houses on imaginary lines extending outwards to the boundary were counted and numbered. By a process of random selection, the required number of houses pre-determined by the proportionate allocation was selected.

Finally, one household with a child less than 5 years was selected through balloting from all eligible mothers in the house. Mothers and pregnant women who have not lived in the community at the start of the malaria intervention programme were excluded to ensure that subjects are uniformly exposed to equal measure of intervention. Where a house selected had no eligible participant, an extra one from the already numbered pool was again selected randomly.

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These were done for each cluster until all households of the 241 mothers/care-givers and 103 pregnant women were selected.

Study participants in each of these selected households were interviewed using the structured questionnaires (Appendix II and III).

3.5. Data Collection

3.5.1. Data Collection Techniques/Tools

- Structured pre-tested questionnaires were used to interview both mothers with children under five and pregnant women in Twi or English languages.
- Review of IRS field records using checklist.
- In-depth Interview (IDI) with guides for the identified groups.
- Focus Group Discussion (FGD) with guides for identified groups.

3.5.2. Community Entry Processes: This study, though un-intrusive in design involves sensitive questions to be responded to. Permission was therefore sought at the institutional, community and individual levels prior to interviewing any individual. Approval was first sought from Ghana Health Services Ethical Review Committee on research involving human subjects. At the Municipal Assembly, the study was presented to the Obuasi Municipal Health Management Team (MHMT) for their approval and support and permission was sought through the MHMT from the following

- Municipal Chief Executive
- Respective Traditional Chiefs and Opinion Leaders in all Clusters
- Assemblymen and Women of all Electoral Areas

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- AngloGold Malaria Control Centre, Obuasi.

Informed written consents were then sought from all study participants after the study had thoroughly been explained to them. They were assured of maximum confidentiality and the right to opt out at any point during data collection after being briefed of the objectives and rationale of the study.

3.5.3 Recruitment and Training of Interviewers: A two day training workshop was organized for 6 undergraduates and graduates residents in the Municipality who could communicate in at least English and the local language, Twi. They were also taken through the FGD and IDI note taking techniques as well as the proper handling of tape recorder.

3.5.4. Pre-testing and Quality Control: One day was dedicated for pre-testing the questionnaire and instruments at Wawasi (Urban LSES) and Ayiase (Rural). These are communities in the Municipality not selected in the actual study survey. All the corrections and necessary adjustments realised during pre-testing were noted and changes effected. The FGD, IDI and questionnaires in the English Language were translated into Twi, the popularly spoken language in the area and back to the English language by the trainer and trainees during training of the data collectors to ensure that there was consistency in the interpretation and translation of tools. At the end of data collection each day, the completed survey questionnaires were transcribed among the data collectors and manually checked for completeness and consistency. The Principal Investigator (PI) thoroughly reviewed each form to ensure that every field was correct. Questions with ambiguous responses were re-administered to the respondents. Supervision was carried out by Principal Investigator periodically to ensure high quality of work by the data collectors.

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3.5.5 Data Processing and Analysis: The coded questionnaires were independently and doubly entered into MS Access designed screens. All data captured in the field for data processing and analysis were verified and thoroughly cleaned to ensure high accuracy. They were then imported into the statistical package, Stata (version 9.0) for analysis. MS Excel was used to develop graphs and outputs. Test of proportions and logistic regression were the statistical tools employed in the analysis.

3.6 Limitations of the Study: This study was conducted in a relatively short period of three (3) months under resource-constraint environment. In the light of the limited time and resources, a purposive sample of 103 pregnant women was surveyed. It therefore has inherent statistical errors.

Moreover, the relatively short span of two and half years since the implementation of the programme renders impossible a more in-depth impact assessment which measures morbidity and mortality indicators. The dynamics of these indicators require longer period of at least 5 years to mature. The study therefore assesses the knowledge and practices of malaria prevention and control as well as coverage and processes employed in the tools of malaria intervention programmes which are very essential and primary to any reduction in morbidity and mortality.

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CHAPTER FOUR

4.0: RESULTS

4.1. Introduction: Data collection was over a 3-week period, starting from the 12th of June, 2008. A total of 344 respondents comprising of 241 mothers with children less than 5 years and 103 pregnant women from the 30 selected communities in the Obuasi Municipal Area were interviewed in a community-based survey. Focus group discussions (FGDs) of mothers with children less than 5 years old and in-depth interviews with key informants in the community and personalities involved in malaria prevention and control were also conducted. Four mothers with children over fives and one pregnant woman who have not lived in the community for six months preceding the survey were excluded from the analysis.

4.2. Background Characteristics of Study Participants: The age ranges of the mothers and pregnant women in this study were 15-49 and 15-44 years old respectively (Table 4.1). Majority of these women were between the ages of 20 and 39 years old.

The mean age groups of both participants are the same, 25-29 years. This age group, 25-29 years also constitutes the highest proportion of respondents 33.3 percent in their respective categories with the least age group for mothers', 45-49 years (2.9%) and pregnant women, 40-44 years (1.9%).

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Table 4.1 Background Demographics of Study Participants

Characteristics	Mothers' of < 5 n (%)	Pregnant Women n (%)
Age		
15-19	16 (6.8)	9 (8.8)
20-24	36 (15.2)	25 (24.5)
25-29	79 (33.3)	34 (33.3)
30-34	52 (21.9)	14 (13.7)
35-39	35 (14.8)	18 (17.7)
40-44	12 (5.1)	2 (2.0)
45-49	7 (3.0)	-
Location		
Rural	50 (21.1)	23 (22.6)
Urban LSES	158 (66.7)	66 (64.7)
Urban HSES	29 (12.2)	13 (12.8)
Marital status		
Single	31 (13.1)	13 (12.8)
Married	194 (81.9)	89 (87.3)
Divorced/Separated/Widowed	12 (5.1)	0 (0.0)
Ethnicity		
Akan	165 (69.6)	69 (67.7)
Ga/Adamgbe/Ewe	10 (4.2)	5 (4.90)
Sisala/Wala	10 (4.2)	6 (5.9)
Dagarti/Frafra/Kusasi	19 (8.0)	7 (6.9)

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Others	33 (13.9)	15 (14.7)
Religion		
Christianity	186 (78.5)	82 (80.4)
Islam	42 (17.7)	17 (16.7)
Others	9 (3.8)	3 (2.9)
Education		
None	34 (14.4)	19 (18.6)
Primary	42 (17.7)	21 (20.6)
JHS/JSS/Mid School	109 (46.0)	37 (36.3)
SHS/SSS/Sec	37 (15.6)	15 (14.7)
Tech/Vocational	4 (1.7)	3 (2.9)
Tertiary	11 (4.6)	7 (6.9)
Occupation		
Housewife	52 (21.9)	13 (12.8)
Farmer	12 (5.1)	5 (4.9)
Civil Servant	4 (1.7)	4 (3.9)
Trader/Businessperson	122 (51.5)	49 (48.0)
Unemployed	21 (8.9)	19 (18.6)
Other	26 (11.0)	12 (11.8)
	N = 237	N = 102

Urban dwellers of low socio-economic status (66.7; 64.7%) constitute the largest group followed by the rural dwellers (21.1; 22.6%) and lastly urban of high socio-economic status of (12.2; 12.8%) for mothers and pregnant women respectively (Table 4.1).

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Most participants were educated to the JSS/JHS level (46.0; 36.3%) followed by Primary (17.7; 16.7%) and SSS/SHS (15.6; 14.7%). However, respondents in the Tech/vocational and Tertiary categories were in the minority, (1.7; 2.9%) and (4.6; 6.9%) for mothers and pregnant respectively (Table 4.1).

Traders (51.5, 48.0%) constituted the largest occupational group with only one mother (0.42 %) working at AGA or any of its affiliates (Table 4.1).

4.3 Knowledge and Practices in Malaria Control: Over 97% of mothers with children five years and below knew about malaria; with knowledge among the urban HSES being 100%, urban LSES 98% and rural 96%.

4.3.1. Malaria Control: Mosquito bites and dirty environment are highly known to be the causes of malaria infection with more than 90% of mothers interviewed. A significant number of the rural folks think eating sweet foods (44.0%); standing in the sun (82.0%); cold weather (72.0%) and evil spirit (40%) could cause malaria (Table 4.2). Many of Urban HSES thought likewise. In a discussion with mothers at PTP, a HSES community, it also came out that, poor eating habits can undermine our health and contribute for that matter to the incidence of malaria.

Table 4.2: General Knowledge of Respondents on Malaria Control

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Malaria-related Knowledge	Rural n (%)	Urban LSES n (%)	Urban HSES n (%)
Causes			
Dirty Environment	46 (92.0)	139 (88.0)	27 (93.1)
Eating Sweet Foods	22 (44.0)	57 (36.1)	2 (6.9)
Standing in the Sun	41 (82.0)	93 (58.9)	11 (37.9)
Cold Weather	36 (72.0)	75 (47.5)	11 (37.9)
Evil Spirit	20 (40.0)	39 (24.7)	4 (13.8)
Blood Transfusion	26 (52.0)	69 (43.7)	17 (56.6)
From Birth	29 (58.0)	78 (49.4)	15 (51.7)
Mosquito Bites	47 (94.0)	141 (89.2)	28 (96.6)
Signs /Symptoms			
Fever/Hot body	48 (96.0)	150 (95.0)	29 (100.0)
Headache	44 (88.0)	144 (91.1)	29 (100.0)
Vomiting	41 (82.0)	131 (82.9)	27 (93.1)
Loss of Appetite	47 (94.0)	138 (87.3)	28 (96.6)
Shivering	43 (86.0)	130 (82.3)	27 (93.1)
Convulsion	21 (42.0)	57 (36.1)	17 (56.6)
Yellow Eye/Urine	46 (92.0)	136 (86.1)	26 (89.7)
Inactivity	45 (90.0)	144 (91.1)	29 (100.0)
Vulnerable Groups			
Children < 5 years	49 (98.0)	153 (96.8)	29 (100.0)

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Pregnant Women	47 (94.0)	150 (94.9)	22 (75.9)
Adults Only	24 (48.0)	75 (47.5)	18 (62.1)
Foreigners	42 (84.0)	91(57.6)	22 (75.9)
Everybody	45 (90.0)	129 (81.6)	29 (100.0)
Don't know	1 (2.0)	3 (1.9)	2 (6.9)

N = 237

Respondents' knowledge of the signs and symptoms of malaria are also generally high especially among urban HSES; all interviewed knew fever or hot body, headache and general body weakness as signs/symptoms of malaria infection (Table 4.2). Convulsion is the least known of the symptoms of malaria among respondents of all clusters rural (42.0%), urban LSES (36.1%) and urban HSES (56.6%).

About 90% of respondents know everyone to be at risk of the disease, however knowledge of under fives' vulnerability were particularly high; rural (98.0%), urban LSES (96.8%) and urban HSES (100.0%) followed by pregnant women. Less than 3.0% of respondents do not know that any group of individuals is particularly at risk of the disease (Table 4.2).

4.3.2 Prevention Methods: Knowledge of mothers with children less than five years about preventive methods against getting malaria was high in all clusters; knowledge about sleeping under ITN and keeping clean environment were 96% for rural; 92.4% for urban LSES and 100% for the Urban HSES (Table 4.2). Over 80% of those interviewed knew of the methods in place for malaria. However, 50% perceived avoiding harsh weathers of cold and sunshine as a practice of avoiding malaria infections (Table 4.2).

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Over 80% of mothers interviewed knew of IRS, use of mosquito aerosols and larviciding as methods of malaria prevention. Of the 68% of pregnant women who have heard of Intermittent Preventive Treatment (IPT) as a prophylaxis during pregnancy, urban HSES is the highest, 84.6%t followed by their LSES counterparts (71.2%) and lastly 47.8 % among the rural dwellers (Table 4.3).

Table 4.3: Knowledge of Respondents on Malaria Prevention

	Rural	**Urban LSES**	**Urban HSES**
Prevention Methods	**n (%)**	**n (%)**	**n (%)**
Avoiding Sunshine	31 (62.0)	77 (48.7)	12 (41.4)
Use of Mosquito Spray/Aerosols	43 (86.0)	125 (79.1)	23 (79.3)
Use of Mosquito Repellents	39 (78.0)	100 (63.3)	21 (72.4)
Sleeping under ITN	48 (96.0)	146 (92.4)	29 (100.0)
Avoiding Cold Weather	28 (56.0)	73 (46.2)	15 (51.7)
Indoor Residual Spraying	44 (88.0)	127 (80.4)	23 (79.3)
Larviciding of Breeding Water	42 (84.0)	126 (79.7)	24 (82.8)
Keeping Clean Environment	46 (93.7)	148 (92.4)	29 (100.0)
Intermittent Preventive Treatment*	11 (47.8)	47 (71.2)	11 (84.6)
Other	4 (8.0)	17 (10.8)	3 (10.3)

Mothers of <5 N=237;

* Pregnant Women N = 102

In a focus group discussion at Sansu, a rural neighbourhood, a 35 year old mother of two children all under five years hinted that education for a behavioural change in

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environmental sanitation and personal hygiene is as equally important as the use of all the prevention tools enumerated above.

4.3.3: Case Management Practices

Time Treat from Onset: Table 4.4 illustrates behaviour of respondents in their attempts to manage malaria with regard to time from onset and facility of care where treatment is sought. Attempt to treat within the first 24 hours from onset was generally high but highest among the rural clusters of both mothers (80%) and pregnant women (73.9%). All urban HSES pregnant women said they seek treatment at least by the second day on onset as compared to 13.0% of rural pregnant who did not seek any treatment after the third day.

Table 4.4 Time Lapse from Onset to Treatment of Malaria Cases.

	Mothers' of <5 n (%)			Pregnant Women n (%)		
Time Lapse	Rural	Urban LSES	Urban HSES	Rural	Urban LSES	Urban HSES
Within 24 hrs	40 (80.0)	110(69.6)	22(75.9)	17 (73.9)	46 (69.7)	9(69.2)
2 days	3 (6.0)	25 (15.8)	2 (6.9)	2 (8.7)	8 (12.1)	3(23.1)
After 3 days	4 (8.0)	16(10.1)	3 (10.0)	1 (4.3)	6 (9.1)	0(0)
1 Week or more	2 (4.0)	6(3.8)	0 (0.0)	2 (8.7)	3 (4.5)	0(0)

Mothers' of <5 (N) = 237
Pregnant women (N) = 102

Treatment Attempts: The use of herbal medicine for management of malaria in all attempts is widespread in the rural communities in both pregnant women and mothers, at least 20% of respondents. The patronage of anti-malarial from peddlers was generally very low among

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mothers of under fives and never at all with pregnant women interviewed even at the rural communities; however anti-malarial from the chemical/drug store in the first attempt were the most patronized in both pregnant women and mothers than in the subsequent attempts. On the average, 20% of respondents seek anti-malarial treatment at the health facility on the first attempt; however, this practice is very frequent in subsequent attempts, about 80% among pregnant women of urban HSES (92.3 %).

Table 4.5 Facilities Sought for Malaria Treatment.

Facility	Pregnant women n (%)			Mothers' of <5 n (%)		
	Rural	Urban LSES	Urban HSES	Rural	Urban LSES	Urban HSES
1st Treatment Attempt						
Herbal Medicine	7 (30.4)	9 (13.6)	0 (0.0)	15 (30.0)	21 (13.3)	1 (3.4)
Drug Peddler	0 (0.0)	0 (0.0)	0 (0.0)	6 (12.0)	5 (3.2)	1 (3.4)
Chemical Shop	12(52.2)	23 (34.8)	5 (38.5)	25 (50.0)	85 (53.8)	17 (58.6)
Pharmacy Shop	6 (26.1)	19 (28.8)	8 (61.5)	15 (30.0)	61 (38.6)	16 (55.2)
Health Facility	7 (30.4)	27 (40.9)	2 (15.4)	14 (28.0)	44 (27.8)	3 (10.3)
2nd Treatment Attempt						
Herbal Medicine	6 (26.1)	3 (4.5)	0 (0.0)	8 (16.0)	3 (1.9)	1 (3.4)
Drug Peddler	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.9)	0 (0.0)
Chemical Shop	2 (8.7)	5 (7.6)	0 (0.0)	9 (18.0)	19 (12.0)	3 (10.3)
Pharmacy Shop	0 (0.0)	4 (6.1)	1 (7.7)	4 (8.0)	19 (12.0)	3 (10.3)
Health Facility	19 (82.6)	54 (81.8)	12 (92.3)	39 (78.0)	133 (84.2)	25 (86.2)

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3rd Treatment Attempt						
Herbal Medicine	5 (21.7)	4 (6.1)	0 (0.0)	12 (24.0)	18 (11.4)	2 (6.9)
Drug Peddler	0 (0.0)	0 (0.0)	0 (0.0)	48 (96.0)	146 (92.4)	27 (93.1)
Chemical Shop	3 (13.0)	3 (4.5)	0 (0.0)	4 (8.0)	11 (7.0)	1 (3.4)
Pharmacy Shop	0 (0.0)	2 (3.0)	1 (7.7)	1 (2.0)	13 (8.2)	2 (6.9)
Health Facility	19 (82.6)	57 (86.4))	12 (92.3)	43 (86.0)	143 (90.5)	26 (89.7)

Pregnant Women (N) = 102
Mothers' of <5 (N) = 237
* Multiple Responses, Sum may not approximate to 100%

Anti-malarial Use: The use of anti-malarial for home management is generally unpopular among pregnant women of all clusters interviewed but particularly low in the rural, 13.0% among the ninety-nine interviewed who reported ever getting malaria (Table 4.7).

Table 4.6 Mothers' Attempts at Managing Malaria in Children of Under 5

Background Characteristic	**Sponge Child to Reduce Body Temp n (%)**	**Treat at Home n (%)**	**Send Child to Health Facility n (%)**
Location			
Rural	44 (88.8)	35 (70.0)	43 (86.0)
Urban LSES	110 (69.6)	90 (57.0)	141 (89.2)
Urban HSES	23 (79.3)	25 (86.2)	24 (82.8)

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Education			
None	17 (50.0)	24 (70.6)	28 (82.4)
Primary	37 (88.1)	27 (64.3)	35 (83.3)
JHS/JSS/Mid Sch	82 (75.2)	70 (64.2)	101 (92.7)
SHS/SSS/Sec	28 (75.7)	19 (51.4)	30 (81.1)
Tech/Vocational	4 (100.0)	3 (75.0)	4 (100.0)
Tertiary	9 (81.8)	7 (63.6)	10 (90.9)

N = 237

Table 4.7 Anti-malarial Use for Case Management

	Pregnant Women n (%)*			**Mothers' of < 5 n (%)***		
Anti-malarial	**Rural**	**Urban LSES**	**Urban HSES**	**Rural**	**Urban LSES**	**Urban HSES**
Drug for Home Treatment						
Chloroquine	2 (8.7)	6 (3.8)	1 (7.7)	14 (28.0)	37 (23.4)	8 (27.6)
Fansidar/Malafan	1 (4.3)	3 (1.9)	0 (0.0)	7 (14.0)	28 (17.7)	4 (13.8)
Amodiaquine	0 (0.0)	5 (3.2)	0 (0.0)	6 (12.0)	24 (15.2)	8 (27.6)
Artesunate/Artemos	0 (0.0)	8 (5.1)	1 (7.7)	3 (6.0)	14 (8.9)	4 (13.8)
ACT	0 (0.0)	9 (5.7)	1 (7.7)	2 (4.0)	32 (20.3)	7 (24.1)
Quinine	0 (0.0)	0 (0.0)	0 (0.0)	39 (78.0)	123 (77.8)	23 (79.3)
Drug for Heath Facility Treatment						
Chloroquine	3 (13.0)	4 (2.5)	0 (0.0)	6 (12.0)	28 (17.7)	2 (6.9)
Fansidar/Malafan	2 (8.7)	6 (3.8)	0 (0.0)	2 (4.0)	16 (10.1)	3 (10.3)
Amodiaquine	5 (21.7)	25 (15.8)	2 (15.4)	10 (20.0)	27 (17.1)	8 (27.6)
Artesunate/Artemos	1 (4.3)	6 (3.8)	2 (15.4)	3 (6.0)	15 (9.5)	2 (6.9)

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ACT	1 (4.3)	5 (3.2)	1 (7.7)	5 (10.0)	58 (36.7)	13 (44.8)
Quinine	0 (0.0)	20 (12.7)	5 (38.5)	35 (70.0)	121 (76.6)	21 (13.3)

Pregnant Women (N) = 102; Mothers' of <5 (N) = 237
* Multiple Responses, Sum may not approximate to 100%

Comparatively, this was not the case with mothers' as mirrored in the high and rampant use of Quinine – 78.0, 77.8 and 79.3 percent among rural, urban LSES and HSES respectively. Artemisinin Combination Therapy (ACT) for management of malaria at home is very thin in pregnant women and mothers. However, their use in both respondents particularly in mothers gets better from rural (4.0%), urban LSES (20.3%) and urban (24.1%).

At the health facilities, use of ACT among the pregnant was still low but increased slightly in and among mothers; rural (10.0 %), urban (LSES 36.7%) and 44.0 % for urban HSES (Table 4.7).

4.3.4: <u>Malaria Prophylaxis during Pregnancy</u>

The use of IPT as a prophylaxis increased from 33.3% in previous pregnancy to 55.9% in current pregnancy. As can be seen in Fig 4.1, urban HSES fares better and rural least in both instances. The improvement in IPT use is however not significant (p-value = 0.451).

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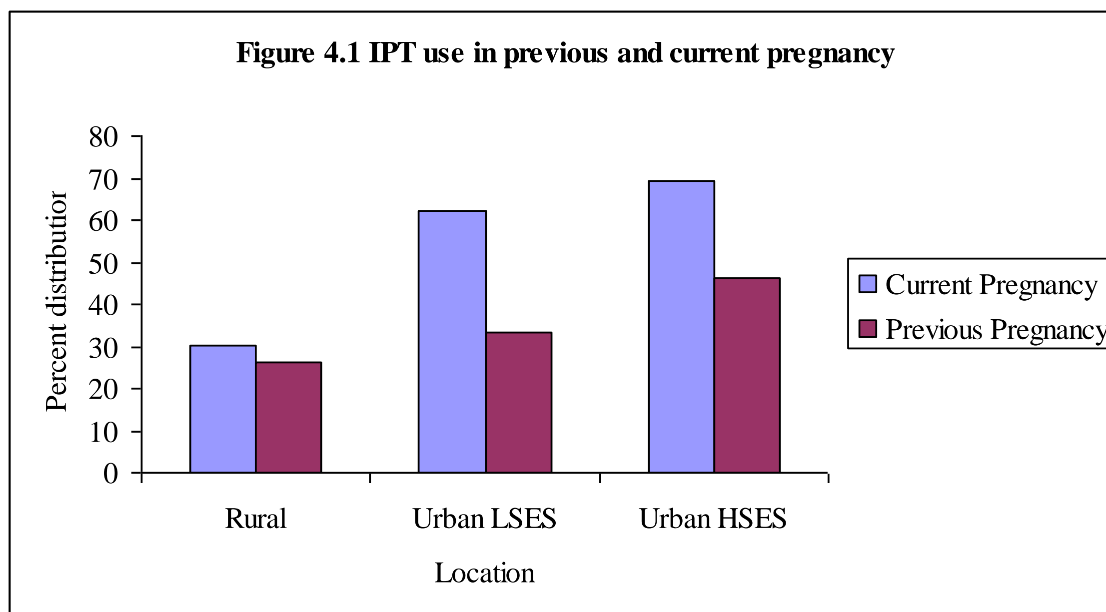

Figure 4.1 IPT use in previous and current pregnancy

Table 4.8 presents factors that may influence IPT uptake in pregnant women. Pregnant women with primary education were 80% less likely to receive IPT than for pregnant women who did not attend school (OR =0.2, 95% CI [0.06 – 0.85], p=0.028). This is statistically significant. Likewise with other educational levels, IPT uptake shows negative association for those interviewed.

Pregnant women of urban LSES were about 3.7 times more likely to receive IPT as compared to those in the rural (OR = 3.7, 95% CI (1.35 – 10.37, p = 0.011). This was significant. Again, pregnant women of urban HSES were about five times more likely to receive IPT as compared to those in the rural (OR = 5.1, 95% CI (1.18 – 22.48, p = 0.030). This was also statistically significant.

Table 4.8 Factors Affecting IPT Uptake in Pregnant Women

Background Characteristics	Univariate(Unadjusted) OR (95% CI)	p-value	Multivariate(Adjusted) OR (95% CI)	p-value

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Education				
None	1		1	
Primary	0.2 (0.06 – 0.85)	0.028	0.3 (0.06 – 1.01)	0.052
JHS/ JSS/Mid Sch	0.3 (0.09 – 1.02)	0.053	0.3 (0.08 – 0.98)	0.046
SHS/SSS/Sec	0.7 (0.16 – 3.14)	0.656	0.7 (0.15 – 3.30)	0.661
Tech/Vocational	-	-	-	-
Tertiary	0.9 (0.13 – 6.16)	0.908	0.8 (0.09 – 6.78)	0.832
Location				
Rural	1		1	
Urban HSES	5.1 (1.18 – 22.48)	0.030	2.5 (0.42 – 14.43)	0.320
Urban LSES	3.7 (1.35 – 10.37)	0.011	3.6 (1.24 – 10.55)	0.019

After controlling for educational level and location, pregnant women in the urban high social economic status(HSES) area were 2.5 times more likely to receive IPT than pregnant women in rural area (OR =2.5, 95% CI [0.42 – 14.43], p=0.320). However, this was not statistically significant.

4.4 Insecticide Treated Nets (ITN)

4.4.1 <u>Ownership and Re-treatment</u>

ITN ownership is all time higher in mothers of under five, 78.5% [74.0–93.1%] than pregnant women 39.6% [33.3–61.5%].

Urban HSES tops ownership in both mothers (93.1%) and pregnant women, 61.5%. However, re-treatment of nets with insecticides were frequently ignored among the urban HSES, 14.8% and 37.5% respectively as compared with counterparts in LSES

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with 4 out of every 10 people who owns nets either mother or pregnant re-treat nets with insecticides (Table 4.9).

Table 4.9: ITN Ownership and Re-treatment by Clusters

Background Characteristic	Mothers' of < 5 n (%)		Pregnant Women n (%)	
	Own ITN	**Retreat ITN**	**Own ITN**	**Retreat ITN**
Location				
Rural	37(74.0)	13 (35.1)	8(34.8)	3 (37.5)
Urban LSES	121(76.6)	50 (41.3)	22(33.3)	9 (40.9)
Urban HSES	27 (93.1)	4 (14.8)	8 (61.5)	3 (37.5)

4.4.2 ITN Use in Children

Fig 4.2 presents information on the use of ITNs among the most vulnerable groups, children under five and pregnant women. Overall, 43.5% of children under five slept under ITN; this is nearly twofold, the proportion of pregnant women (23.5%) the night before the survey (Fig 4.2).

The overall proportion of ITN use in the under fives was 43.5%, highest in urban LSES (46.2%) but lowest in urban HSES 27.6%. Among the clusters, urban HSES was the only to have reported lower ITN use in children than in pregnant women.

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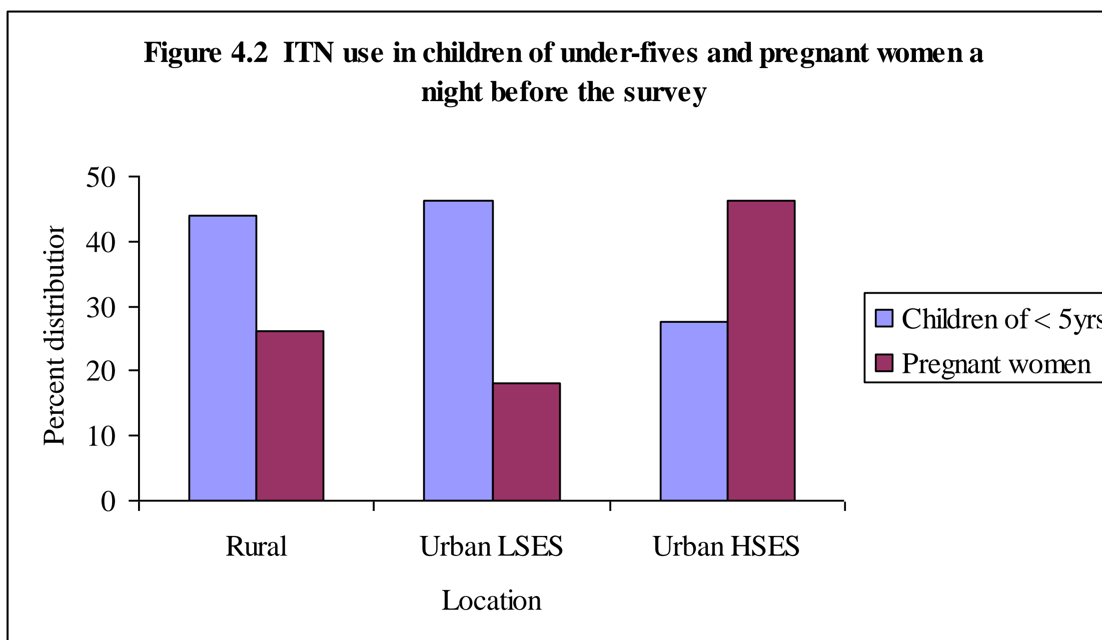

4.4.3 ITN Use in Pregnant Women:

ITN use in pregnant women, 23.5% was generally lower than in under fives', 43.5%. The highest proportion of ITN users the night before survey was recorded among urban HSES while urban LSES which recorded highest in children had the lowest of 18.2%. The use of ITN as a preventive measure during pregnancy increased from 14.7% to 23.5%. Again as seen in IPT, urban HSES recorded the highest leap from 23.1 to 46.2%. The improvement in ITN use was however, not significant (p-value = 0.109). (Fig 4.3)

4.4.4 Factors that may Affect the Use of ITN by Mothers.

Table 4.12 summarizes the results of three factors that may influence the decision of mothers to sleep under ITN. This was the viewpoint of an urban LSES mother of a 2-year old and a

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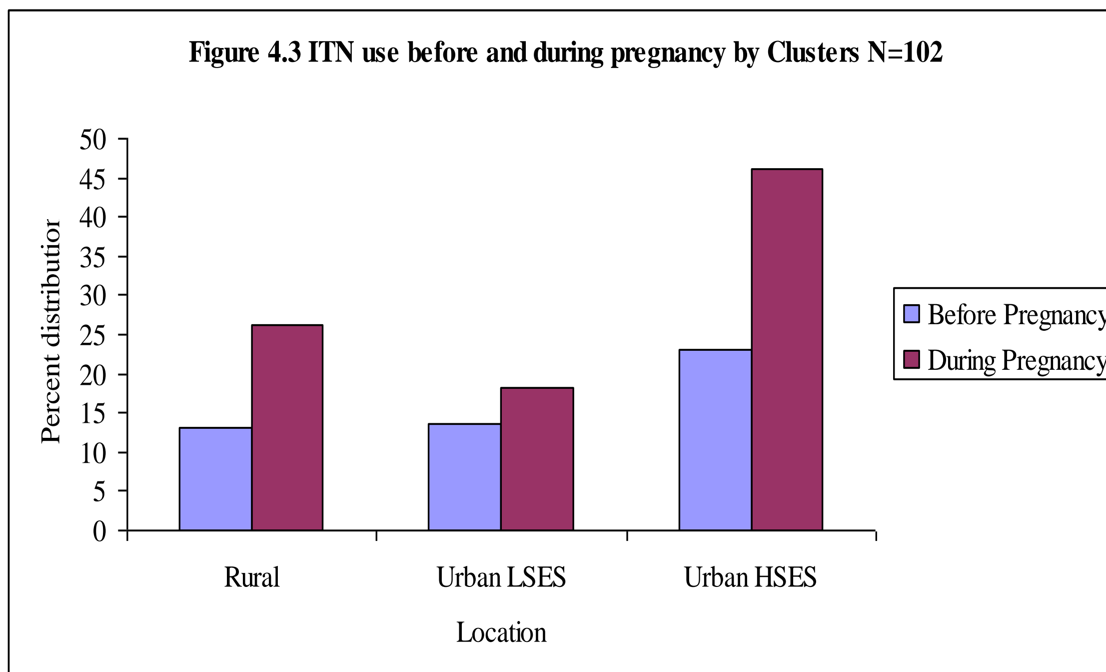
primary 6 teacher who said *"…with IRS, I and my family do no worry about mosquitoes let alone think of other ways of preventing them"*.



Mothers of under-fives children whose educational level are from Primary to High/Secondary level show positive association with some level of significance for ITN use. For instance, High/Secondary School levellers were 3.6 times more likely to use ITN than those with no education (Table 4.12). No association was seen among the two highest educational levels of Technical/Vocational and Tertiary. There is however a different picture after controlling for IRS and location, High/Secondary School levellers were about 4 times more likely to use ITN than those who never attended school (OR = 4.1 95% CI [1.49 – 11.45], p=0.007). This was statistically significant.

There were no associations seen in ITN use and whether respondents allowed IRS or not. The same observation was made on location even if education is controlled for.

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Table 4.10: Factors of ITN Use in Mothers of Under Five

Background	Univariate (Unadjusted)		Multivariate(Adjusted)	
Characteristics	OR(95%CI)	p-value	OR(95% CI)	p-value
Education				
None	1.0		1.0	
Primary	1.5 (0.57 – 4.15)	0.390	1.6 (0.58 – 4.36)	0.363
JHS/ JSS/M Sch	2.7 (1.17 – 6.38)	0.021	2.8 (1.20 – 6.60)	0.018
SHS/SSS/Sec	3.6 (1.34 – 9.93)	0.011	4.1 (1.49 – 11.45)	0.007
Tech/Vocational	0.9 (0.09 – 10.08)	0.950	1.3 (0.11 – 15.41)	0.820
Tertiary	1.0 (0.22 – 4.81)	0.958	1.8 (0.35 – 9.71)	0.477
IRS				
Yes	1.0		1.0	
No	1.3 (0.18 – 9.44)	0.791	1.4 (0.18 – 10.40)	0.760
Location				
Rural	1.0		1.0	
Urban HSES	0.5 (0.18 – 1.30)	0.151	0.4 (0.14 – 1.27)	0.124
Urban LSES	1.1 (0.58 – 2.07)	0.785	1.0 (0.49 – 1.89)	0.907

4.5 Indoor Residual Spraying (IRS): IRS as illustrated below indicates 85.7% overall coverage of households' structures surveyed in the Obuasi Municipal Area within a 6 month period preceding survey (Fig 4.4). The proportion of sprayed

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structures was highest in the rural communities (91.6%) followed by urban LSES (84.7%) and lastly urban HSES (83.3%).

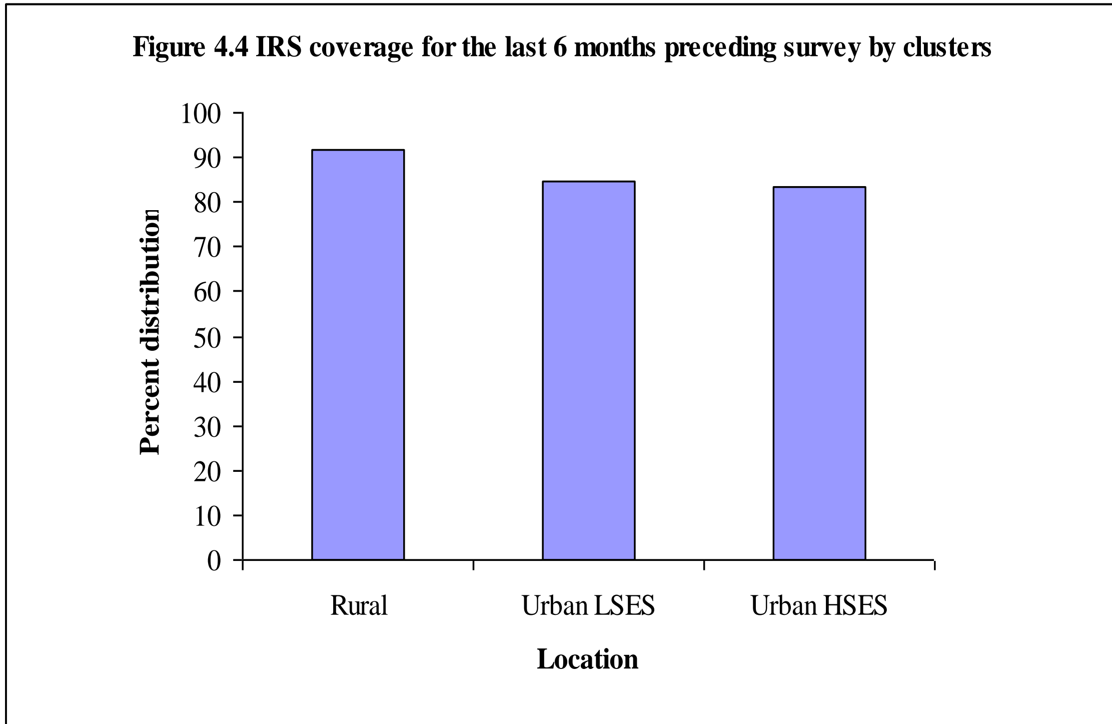

Figure 4.4 IRS coverage for the last 6 months preceding survey by clusters

4.6 In-depth Interviews

4.6.1 <u>Manager, NMCP (Middle Zone):</u> To begin with, the Obuasi Malaria Control Programme is a private initiative by AGA to primarily address the high cost of treatment, absenteeism and low productivity associated with malaria infections, the most significant public health threat to its operations in Obuasi. The programme enjoyed close collaboration with the NMCP right from its conception to implementation. A presentation of the programme was made to NMCP when the idea was first conceived and we contributed by way of technical guidelines and advice. In line with our principle of building and sustaining partnership especially with private organizations, the NMCP is happy to be associated with the Obuasi programme.

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NMCP is very much involved and abreast with current developments. My outfit assisted in the training and capacity building of staff of the programme at the initial stages. The programme is now in its 5th spraying round.

It is important to mention here that, DDT is not being used due to its damaging effect on the environment and resistance associated with its past use. However, WHO recommenced organophosphate and pyrethroid-based insecticides are being used. As a result of the high standard of operations at Obuasi, the manager has been co-opted into malaria control activities in Ghana and the Centre was responsible for the training of staff of the Presidential Special Initiative programme taking place in northern Ghana. In fact, records at Edwin Cade Hospital shows reduction of malaria cases after the first spraying round.

The activities of the programme are coherent with the national policy of malaria control. The method supports our 4 key interventions namely.

- Improved case management
- Multiple prevention
- Focused Research
- And improved partnership.

However, the focus is on vector control, and case management is also receiving attention. The use of ACT rather than monotherapies like SP, Chloroquine is a national policy. Its implementation notwithstanding initial preparatory works such as training of health workers suffered some setbacks due to widespread use of monotherapies in Ghana. We are aware of this and admit the need for more education in this area.

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An independent assessment of this programme is yet to be done. An important indicator for evaluation of interventional programme is case fatality rates especially of children under five which will be undertaken in the near future.

Obuasi Integrated Malaria Control Programme is a noble corporate initiative that has benefited the communities and Ghana as a whole. It has relieved us of the cost that would otherwise have been spent on malaria control in Obuasi. Additionally they have shown the way for other companies to take up initiatives to control malaria.

I do not see any negatives with this intervention except that it is difficult to replicate this intervention in other districts in Ghana because of the high cost involved.

4.6.2 Municipal Health Director, OMA: It is a collaborative effort spearheaded by AGA with the OMA, GHS and other health institutions to primarily cut down on the high cost lost to productivity and expenditure from malaria treatment suffered by AGA's operations. It is also to show the company's commitment to its social responsibility to the whole of the Obuasi Municipality. The components under this intervention are as follows:

- Integrated vector management which involves IRS, distribution of LLINs to the vulnerable and larviciding of breeding sites
- Community advocacy through information, education and communication
- Environmental management under the auspices of the Municipal environmental and Health Unit supported by
- Monitoring, surveillance and laboratory research.

The role of the Health Directorate in addition to its core mandate of health promotion and delivery is to support and facilitate participatory efforts of all development partners. It is important to mention here that, the programme has not fully utilised this opportunity with the non-involvement of health professionals in its community advocacy through information,

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education and communication. There have been very few dissenting voices from sections of the populace but it has been widely accepted and knowledge of the programme is very high.

The new drug policy apart from its initial drawback is now doing quite well. The ACTs which are highly subsidized by the Government of Ghana (GOG) are available at the regional medical stores to be sourced through the Municipal Pharmacist. Unfortunately, 3 excluding AGA, out the 16 health facilities in the Municipality comply with this directive.

About 5,000 mosquito nets apart from the 3,000 by AGA have in all been distributed since 2006 by well meaning non-governmental organizations (NGO). The voucher system for sales of nets has now expired. There are many outlets where ITNs are now sold. Coverage of the IRS component of the programme according to the manager of the programme has been very high. Acceptability of this component is high. The programme has been well embraced by the community with neighbouring districts calling for IRS to be replicated in their districts.

The malaria control programme, overall, has been successful. In terms of reported cases of malaria, some figures are actually going up. This may be due to the fact that most clinical cases of malaria are not confirmed and any febrile illness is hastily diagnosed as malaria infection. It is, however, heart-warming to note that, records from hospitals in the municipality show gradual declines in impact indicators rates such as low birth weight, still birth and anaemia in pregnancy.

4.6.3 Manager, Obuasi Malaria Control Programme: The components of the programme as stated by the manager (refer figure 1.1). IRS is the focus of the programme. WHO records show that of all the interventions available for malaria control, IRS is the method that has the biggest impact in reducing the incidence of malaria.

The OMA are partners in that they support the programme by seconding personnel to assist and facilitate meeting with community leaders and other principal community leaders such as

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the assemblymen and women. The community has fully embraced the programme, the success of which has been as a result of this acceptance. They are totally kept up to date with the programme through community committees, volunteer community malaria advocates and regular media coverage, newspapers and regular weekly broadcast on the local FM station. At the planning stage, various stakeholder meetings were held and presentations made to officials of

- The National Malaria Control Programme
- The GHS in the Ashanti Region
- Assemblymen and Women of OMA
- Non-governmental Organizations, FBOs and the local medical fraternity both in the private and public sectors.

Distribution of ITNs is not the focus of the programme as numerous other organizations distribute nets to the communities. However, approximately 3000 LLINs have been distributed free of charge to orphanages, maternity clinics and children's ward. LLINs are also used as prizes for school competitions and football tournaments. No net re-treatments plans have therefore been established.

IRS rounds are twice per year on a 5 monthly cycle with a month break in between spray rounds. The annual spray round starts in mid January or early February. 5 spray rounds have been completed and coverage averages between 93 – 95% of targeted structures. The programme has so far not encountered any major problems due to emphasis that were placed on informing, educating the community of the programme and what it entails, and the benefits to them. The only challenge in the rural areas was the non-availability of water for the pumps which has been overcome by taking water in containers with the spray team.

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We do not supply the community with the new anti-malarial drugs for case management. We are of preventative and not curative.

The overall reduction of malaria cases by 74% is indicative of the success of the programme. The Obuasi model has been used as a basis for the Ghana Global Fund proposal to scale IRS to 45 districts in the country. The proposal if successful will inject a whopping amount of $160 million into malaria control in Ghana. The programme is now internationally recognized as a model IRS programme and has won the prestigious Global Business Coalition award for malaria and 3 Pan African Health awards. The fact that the Government of Ghana has used the Obuasi programme as a model for future up scaling of IRS is another indication of its success. This initiative of malaria control is a programme that will forever be sustained.

One only have to speak to the sisters in charge of the children's ward to get a graphic indication of the success of the programme- the wards which are now empty three years ago had to call for extra beds to accommodate the many cases of malaria of children under five.

4.6.4 Assemblywoman, Bedieso Electoral Area: The most common diseases that affect children in this area are malaria and typhoid fevers. Malaria according to the assemblywoman poses a problem to mothers who are care-givers and pregnant women.

The disease is mainly prevented by general environmental cleanliness and avoiding breeding places for the mosquito vector. Fortunately for the Municipality, AGA is undertaking malaria control programme which involves indoor residual spraying. Households are given prior notice and the communities are cooperating very well. There have been 5 rounds of spraying which have helped to drastically reduce malaria infections. The exercise has the added benefits of killing other insects such as cockroaches, ants and many more.

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There have been calls from my electorate for the need to expand larviciding to gutters which is perceived as a breeding place for mosquitoes.

The Assemblywoman, however, was not aware of the distribution of nets by the programme and the new anti-malarial policy. She was appreciative of the gesture from AGA citing low attendance at hospitals as some indicator of success and the need to sustain the programme.

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CHAPTER FIVE

5.0 DISCUSSION

5.1 Introduction:
The success or otherwise of any interventional programme of public health nature hinges fundamentally on the care for the population most at risk of the disease or infirmities. It is therefore important that efforts of any intervention are targeted at these groups of people and ensure equitable provision of services to all. It is equally important that such a programme is coherent with the national policy and complimentary to what has already been done and current efforts.

In any Malaria Control Programme, the primary measure of indicator is on the scale of reduction in morbidity and mortality of the category most at risk which is children under five and pregnant women. Such reductions are also dependent on the implementation of appropriate tools with adequate coverage and well-defined timelines and processes. Impact assessment of a control programme requires time for the maturation of implemented tools.

This study to assess AGA's Integrated Malaria Control Programme will therefore be limited in the measurement of the morbidity and mortality which requires a little longer time to be fully realized and a relatively longer study period. A three (3) month period is woefully inadequate for any such comprehensive assessment of an integrated programme that was planned to use many tools (Refer Fig 1.1).

The inadequacy in comprehensively assessing the programme is not only due to the limited time but also lack of resources to undertake this study.

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The level of malaria related knowledge and coverage of tested tools known in malaria prevention and control among the vulnerable groups are important primary indicators for measuring the performance of any intervention programme. These indicators will therefore be used in this study.

5.2 Knowledge and Practices in Malaria Prevention and Control

5.2.1 <u>Prevention and Control</u>: Knowledge, practices and behaviour of people about malaria in any endemic area are important information that indicates the concerns of communities about the disease burden. This is essential if any impact on their behavioural change in the prevention and control of the disease is to be realised.

The high level of awareness of malaria in the Obuasi Municipal Area among respondents independent of where they reside is very encouraging. It is an indication that most of the control activities deployed are likely to be employed by the people for a successful control activity. However, the many misconceptions about the causes and prevention methods necessary to reduce and control the disease are worrying. Knowledge of the bites of mosquito as the possible cause of malaria was also high.

Similarly, knowledge about sign and symptoms such as a rise in body temperature followed by headache and body weakness as common things to look out for among children at risk was high in all the clusters. Convulsion is the least known sign/symptom of malaria suggestive of the fact that most mothers do not know the signs/symptoms of severe malaria. The fact that more than 50% of the rural community on the average associate malaria to evil spirits; extremes of temperatures and sweet food are clear indications of the gap in knowledge among people living in the municipality. This surely could impact negatively on communities'

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preventive behaviour and practices. These observations however compare favourably with the 2003 GDHS of lower 84.4% knowledge of malaria; 86.6% in Nepal, 50% of who could recognize fevers with chills as malaria (Joshi and Banjara, 2008).

The high level of knowledge of vector control measures especially ITN use as a preventive tool for malaria cannot be solely associated with the programme but also to development partners such as NGOs, FBOs and the Health Directorate who actively distribute mosquito nets to the communities.

The low level of knowledge and uptake of IPT as a prophylaxis during pregnancy in the rural communities is indicative of low access to antenatal services. As illustrated (fig 4.1), IPT uptake dwindles towards the periphery. After masking the influence of education, pregnant women in the urban (HSES) were more than two times likely to receive IPT than their counterparts in rural area, though this was found to be statistically insignificant (p=0.320). This brings into sharp focus over-concentration of efforts to increase IPT uptake at the town centres to the detriments of the rural poor, who have limited access to healthcare.

5.2.2 Case Management Practices: The appropriateness of malaria management practice primarily lies in the ability to identify or diagnose correctly the signs of infection early enough. It is encouraging to note that, high proportion of mothers of children under five and pregnant mothers (69.6-80%) confirmed that they seek treatment within 24 hours from onset. Prompt and appropriate treatment could then ensue within 24 hours from onset with the recommended anti-malarial, coherent with the new national drug policy. This is particularly important due to the

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high cost of ACTs. In order not to engender the development of resistance as evidenced in monotherapies to the *P. falciparum,* the need to correctly identify and treat appropriately cannot be over-emphasized.

However, management of malaria cases are often based on presumptive treatment especially at home; and clinical settings except in cases of severe and recurrent infections. An impediment to this is the association of any febrile illness to malaria which could be very misleading especially in highly endemic areas. Lack of access and/non availability of the appropriate anti-malarial even at the health facilities further compounds the problems of case management. The revelation by the Health Director that 3 out of 16 health facilities in the Municipality comply with the right channel of drug procurements paints a vivid picture of the scenarios on the ground. Studies of inappropriate treatment due to stock out of anti-malarial are also reported in Uganda (Mufubenga, 2004).

The high patronage of herbal medicines (at least 20%) for home management and adherence to old practice of Chloroquine in the treatment of malaria in the light of the new drug policy of ACT especially in the rural communities deepens further the problems of case managements. The high dependence of anti-malarial from the Chemical Store in the first attempt of treatments against the backdrop of low ACT use raises questions as to whether dispensers are abreast with the new drug policy. Many studies in Uganda (Lutalo et al, 2001), India (Matta et al, 2004), and Zimbabwe (Taylor et al, 1988) have shown similar impediments towards appropriate case management practices.

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5.3 Insecticide Treated Nets (ITN): The use of ITN is a primary health intervention for reducing malaria transmission and mortality in communities prone to the malaria vectors (GHDS, 2003). Its use is highly recommended to children under five and pregnant women, the most vulnerable. There is also the need to re-treat mosquito nets if its total benefits are to be achieved. However, the high overall ownership of ITNs by mothers of under five 78.5% and pregnant women 39.6% saw a marked reduction of the proportion that slept under the nets the night before the survey and a further lower proportion of net re-treatment (Table 4.9). This hammers home the need that, distribution of ITNs should come with it the needed education to change behavioural attitudes so that the high knowledge of ITN use translates into preventive practice. The introduction of 3000 long lasting insecticide nets (LLIN) to the communities in the Obuasi Municipality has gone a long way to offset challenges with re-treatment. Nevertheless, the distribution of LLINs by the programme to complement ITNs which requires re-treatment every 6 months without any provision for re-treatment could send wrong signals to those who ought to re-treat renege on such important responsibility. What will be left is how compliant community members will continue to be, in utilising the nets as prescribed by the donors.

The improvement in the use of ITN as a preventive measure during pregnancy increased from 14.7% to 23.5%. However, this is not significant (p-value = 0.109). Table 4.12 summarizes the results of factors that may influence the decision of mothers to sleep under ITN. The decision to sleep under ITN is highly associated to a large extent on whether the person allowed IRS to be sprayed in his household or not.

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5.4 Indoor Residual Spraying: IRS, the cornerstone of the Global Malaria Eradication Campaign in the 1950s and 60s is fast gaining grounds. This method is the main focus of the activities being embarked upon by the Obuasi malaria control programme. The huge financial and technical knowledge that it requires calls for careful planning and implementation as well as huge community acceptance if the desired outcome is to be achieved.

The use of persistent organic pollutant for mass pest and vector control has always been an issue of concern to many environmental conservationists because of the damaging effect on our environment and the development of resistant strains that makes future control efforts more difficult. The Stockholm Convention therefore developed a framework for the use and disposal of such compounds.

Principally the Obuasi Programme is an Integrated Vector Management with focal attention to effective IRS implementation backed by huge financial resource and technical knowledge. The high coverage of 85.7% as recorded by the survey of household respondents in all clusters is not consistent with what has been documented by the programme, 93 – 95%. This might be attributed to the fact that the survey coincided with period when mopping up of structures not sprayed was being carried out. Nevertheless, this coverage is well above the 70% of targeted structures required for an impact. Participation was highest in the rural communities (91.6%) followed by urban LSES (84.7%) and urban HSES (83.3%). This might be ascribed to choice of methods of prevention depending on preference and cost such as better screening of houses, mosquito aerosols eg Raid, and ITN. These are relatively inaccessible to the rural communities whose source of livelihood is mainly subsistence farming. This revelation re-echoes (Binka & Akweongo, 2006) findings of inequity in ITN use among various socio-economic groups with the poorest being the least to benefit from ITN use even where they are highly subsidized.

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It is important to note here that, the reported reduction of malaria cases at Edwin Cade Hospital by 74% supposedly linked to the AGA directive of compulsory spraying of residential facilities in the urban HSES is not actually the case. As illustrated in figure 4.4, urban HSES though above 80% of optimal coverage threshold (WHO, 2006) of targeted structures was the least among all the three clusters. This directive was not adhered to and could therefore not be accountable for reduction of malaria cases at Edwin Cade Hospital.

Processes were duly followed as outlined in WHO Position Statement (WHO, 2006) for effective IRS implementation. The choice of specially formulated organophosphate and pyrethroid-derived insecticides as well as correct timing of spraying activities beginning in mid January/February and July/August, (in a short period of time before the onset of the two major transmission seasons) shows effective planning and organization.

The application of the correct volumes of appropriate insecticide on all surfaces suitable for mosquito resting according to the Manager of the Programme was ensured with the rigorous screening, recruitment and training of spray men by skilled professionals. The routine monitoring and surveillance of spraying activities by bioassay and susceptibility tests and mapping of malaria cases ably supported by a computerised GIS network to detect areas of new incidence of cases needing further intensification of measures is highly commendable. This computerized management system adopted was the hallmark of IRS implementation in the Mpumalanga Province of South Africa in 1998 according to Booman et al assured correct insecticide application and spraying completion according to schedule.

The dire need to map up to save cost has also been highlighted by Booman in another publication (Booman et al, 2006).

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The development of resistant strains of the vectors and environmental concerns were largely responsible for decline in IRS for control activities in the 1950s and 60s. Routine quality control analysis and monitoring to determine the efficacy and developing resistance to insecticides used for the residual spraying should be an integral part of any vector control strategies. The need for this has been published in the Journal of Medical Entomology by Coleman et al. This is also catered for in the Obuasi Programme through the ongoing monitoring and surveillance by the laboratory and research by the malaria control centre.

Finally, the maintenance of high level of community acceptance of the house spraying and cooperation through the establishment of the Obuasi Community Advocate Corps provided a vital community-link. The one-on-one interaction with community leaders to obtain feedback accounted for the high coverage notwithstanding initial rejection by a section of the community with the use of awful smelling Vectoguard, an organophosphate.

In summary, the involvement of the NMCP in the planning and implementation of the programme ensured tools and processes employed were coherent with the national policy of malaria prevention and control. The anecdotal evidence observed by the Municipal Health Director of gradual decline in impact indicators rates such as low birth weight, still birth and anaemia in pregnancy has also been confirmed by the Assemblywoman of low hospital attendance.

The 74% reduction at Edwin Cade Hospital of malaria incidence can therefore be positively linked to the ongoing malaria control programme. The high community acceptance of the programme with calls for its sustainability supports the success song being sung by the implementers and growing international recognition of the success of the programme.

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The poor case management practices such as the continual use of monotherapies- Chloroquine, Artesunate, Fansidar (SP) and others appears to have a national outlook than just being a local problem. The use of Chloroquine was not only widespread but a practice that is ancient and across generations. The introduction of the new drug policy of ACT as the recommended drug should have taken this into consideration by the NMCP and acted more proactively than it did. The poor implementation suffered a further jolt with the accompanying adverse reactions as a result of inappropriate dosing according to body weight. The recognition of this as hinted by the NMCP manager is indicative of the fact that this is not a problem only peculiar to Obuasi but nationally.

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CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion:

The Integrated Malaria Control Programme which sets itself to reduce malaria incidence by 50% within a three year period in the Obuasi Municipality has made some significant achievements. This is evident by the high knowledge of malaria prevention and control among household respondents. For example, 94.2% [92.4-100%] and 82% [79.3-88%] knew ITN and IRS as methods malaria prevention respectively. Knowledge of the interventions in place in the Municipality is very high in all three socio-economic settings. The high community acceptability and unanimous calls by all segments of the community for long term sustainability of the programme is an indication of this achievement.

The programme is an Integrated Vector Management with Indoor Residual Spraying as its main focus. IRS is comprehensively being implemented according to WHO standards and guidelines. The overall high IRS coverage of 85.7% as recorded in the survey of household respondents over the 80% threshold (WHO, 2006) scientifically evident for effective transmission control to reduce the related burden of morbidity and mortality is commendable.

ITN distribution, though is not a focus of the programme, 78.5% ITN ownership among mothers of under five and 39.6% in pregnant women indicates the complimentary role of government and development partners in the distribution of ITN to the vulnerable, mostly children under five and pregnant women. However, the unimpressively low ITN use of 43.5% in children under five and 23.5% in pregnant women the night before the survey is a challenge that needs to be addressed.

Case management as shown by respondents are generally fraught with many inappropriate practices such as the use of unapproved herbal medicine and non adherence to the recommended

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anti-malarial. This is worst in the rural communities. Appropriate case management practices in the light of the new drug policy of Artemisinin-based Combination Therapy necessary to compliment an effective Integrated Vector Management for effective suppression of malaria transmission is highly required.

6.2 Recommendations

AGA Malaria Control Programme, Obuasi

1. The programme is focally IRS and continuous success is dependent on high IRS coverage. There should therefore be intensification of advocacy through information, education and communication with the involvement of health professionals to ensure continual community support and acceptability of the Indoor Residual Spraying. This should aim at improving knowledge and changing attitudes towards IRS to avoid spraying fatigue.
2. AGA Malaria Control Programme should liaise with the NMCP to improve on case management practices both at home and health facilities
   i. There should be intensification of public education campaigns especially for care-givers of children under five and pregnant women on the treatment regimen of the new drug policy and the need to comply with treatment.
   ii. There should also be improvement on clinical diagnosis and laboratory confirmation of suspected malaria infections by provision of rapid diagnostic test kits for appropriate case detection at the periphery and augment laboratories capabilities in microscopy use at health centres.

These are critical in the light of the new anti-malarial drug policy of the much expensive ACT and development of drug resistance.

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3. A future follow up impact study that looks at malaria and other related disease incidence and death trends is highly recommended. This will make possible the justification or otherwise of the Mine's main objective in institutionalizing the Malaria Control Programme as a means of addressing lower productivity and high expenditure on malaria treatment.

The Municipal Health Management Team (MHMT)

1. The MHMT should liaise with AGA Malaria Control Programme to create awareness, improve knowledge and change attitudes towards ITN use and re-treatment especially among care-givers of children under five, pregnant women and the non-immune expatriate community.

The National Malaria Control Programme (NMCP)

1. It is recommended that a comparative study of another district with similar characteristics and interventions (apart from IRS) will be useful in attributing any differences in results to IRS before any national scaling up programme is undertaken.
2. The NMCP should as a matter of urgency liaise with the Municipal Health Management Team and Pharmacy Council
    i. To organize regular training programs such as workshops and one-on-one interactions for prescribers including Licensed Chemical Sellers, Community Pharmacists Assistants as well as Community Leaders to understand the new policy and comply accordingly.

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ii. Streamline and regulate the anti-malarial (ACT) procurement process to ensure all health facilities have these drugs in stock and punish offending health facilities accordingly.

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APPENDICES

APPENDIX I: CONSENT FORM

PROJECT TITLE: AN ASSESSMENT OF THE INTEGRATED MALARIA CONTROL PROGRAMME IN THE OBUASI MUNICIPALITY.

Institutional Affiliation:

School of Public Health

College of Health Sciences

University of Ghana

Legon

Background: The Principal Investigator is Mr Anthony Kwarteng, a student of the School of Public Health, University of Ghana. He is undertaking an assessment of the on-going integrated malaria control programme in the Obuasi Municipality as a partial requirement for the award of Master of Public Health (MPH) degree.

Procedure: The information to be collected includes personal demographic data, knowledge of malaria control and prevention as well as households' data.

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Benefits and Risks: The objective of this research is to assess the efficiency of the ongoing integrated malaria control programme in the Municipality to identify the strengths and shortcomings for modifications if necessary to be made in subsequent phases of programme. There is no known human risk attached to this study protocol.

Right to Refuse: Though, there are no known risks associated with this research, nevertheless, should you feel at any point in time to withdraw your participation, you will be at liberty to do so. You are selected on accounts of your eligibility and your inclusion into this study is absolutely voluntary and under no obligation.

Anonymity and Confidentiality: You are assured that the information collected will be handled with strict confidentiality and will be used purely for academic purposes. Also be assured that all your information will not be shared with any third parties not directly involved in the research.

Before taking Consent

Do you have any questions that you wish to ask? If yes, please state ………………………………………………………………………………………………

…………………………………………………………………………………………………
………………………………………………………………………………………

If you have questions you wish to ask later, or if there is anything you wish to seek clarification on regarding this research, please don't hesitate to contact the principal investigator.

Anthony Kwarteng

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Consent

I……………………………………………………. understood this study, after having the consent form thoroughly explained to me in a dialect I clearly understand (English/Twi/Dagbani/Hausa etc.) l do hereby agree to enrol for this study.

Signature/Thumbprint of Respondent…………………………………………………… Date……………………..

Witness Signature……………………………..

Name of Witness………………………………………………………………………… Date………………………

Interviewer's Statement:

I have explained the procedure to be followed in this study and the risks and benefits involved to the client in the language that he/she understands best and he/she has agreed to participate in the study.

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Signature of interviewer ……………………………………………………………………

Date ………………………

APPENDIX II

AN ASSESSMENT OF THE INTEGRATED MALARIA CONTROL PROGRAMME IN THE OBUASI MUNICIPALITY **Mothers of under fives Form**	**Form No.**

1.0 IDENTIFICATION AND DEMOGRAPHIC DATA

1.1 Name of Respondent ……… [ ] **MNAME**

1.2 Age	1. 15-19	2. 20-24	3. 25-29	4. 30-34	5. 35-39	6.40-44	7.45-49	**MAGE**

1.3 Questionnaire ID………………………………………… [ ][ ][ ][ ][ ] **MQID**

1.4 Date of Interview…………………………………... [ ][ ][ ][ ][ ][ ] **MIDATE**

1.5 Name of Interviewer…………… [ ] **MINAME**

1.6 House Number…………………………………….... [ ][ ][ ][ ][ ][ ] **MHNO**

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1.7 Place of Residence…………			MRES

1.8 Location……………………..	1. Rural	2. Urban HSES	3. Urban LSES	MLOC

1.9Ethnicity	1. Akan(Twi/Fante/Akwapim)	2. Ga/Adangbe/Ewe	3. Sisala/Wala	METH
	4. Gonja/Dagomba/Mamprusi	5. Dagarti/Frafra/Kusasi	99.Other, (specify)	

1.10 Religion	1. Christianity	2.Islam	3. Traditional	99. Other, (Specify)……….	MREL

1.11 Marital Status…	1.Single	2.Married	3.Divorced	4. Separated	5. Widowed	MMARS

1.12 What is the highest level of education you have attained?	1. None	2. Primary	3. JHS/JSS/Middle Sch	MEDU
	4. SHS/SSS/Sec	5. Tech/Vocational	6. Tertiary	

1.13 What is your occupation?	1. Housewife	2. AGA worker/ Affiliates	3. Farmer	4. Civil servant	MOCC
	5.Trader/ Business person		6.Unemployed	99.Other,(Specify)… …………..	

1.14 No of Children…..	1. None	2. 1 - 2	3. 3 - 4	4. 5 - 6	5. 7 or More	MNCHN

1.15 Age of last child	1. <1	2. 1 -2	3. 3 - 4	4. 5 – 6	5. 6 or more	MLAGE

2.0 KNOWLEDGE OF MALARIA PREVENTION AND CONTROL

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2.1 Have you ever heard of malaria?	1. Yes	2.No	MHMAL

If Question 2.1 is No choose NA in Question 2.2

(Multiple choices allowed)

2.2 If yes, from whom/where did you first hear about malaria?	1.Friends/Relations	2. Posters	3. Newspaper/Magazines	MMWHD
	4.Radio/FM	5.TV	6. Health Worker	
	7.AGA Malaria staff	9. NA	99. Other, (specify ……………	

2.3 Do you know what causes malaria?	1. Yes	2. No	MMCAUSE

If Question 2.3 is No choose NA in Question 2.4

(Multiple choices allowed)

2.4 If yes, what do you think causes malaria?	Spontaneous	Prompted			
2.4.1. Dirty environment	1. Yes	2. Yes	3. No	9.NA	MCAUSE
2.4.2 Eating sweet foods	1. Yes	2. Yes	3. No	9.NA	
2.4.3 Standing in the sun	1. Yes	2 Yes	3. No	9.NA	
2.4.4 Cold weather	1. Yes	2 Yes	3. No	9.NA	
2.4.5. Evil Spirit	1. Yes	2 Yes	3. No	9.NA	
2.4.6. Blood Transfusion	1. Yes	2 Yes	3. No	9.NA	
2.4.7. Some people are born with it	1. Yes	2 Yes	3. No	9.NA	
2.4.8. Mosquito bites	1. Yes	2 Yes	3. No	9.NA	
2.4.99 Other (Specify) ………………	1. Yes	2 Yes	3. No	9.NA	

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(Multiple choices allowed)

2.5 What are the signs/symptoms you observe in a person who gets malaria?	Spontaneous	Prompted			
2.5.1. Fever/Hot body	1. Yes	2. Yes	3. No	9.NA	**MMSIGNS**
2.5.2 Headache	1. Yes	2. Yes	3. No	9.NA	
2.5.3 Vomiting	1. Yes	2 Yes	3. No	9.NA	
2.5.4 Loss of appetite	1. Yes	2 Yes	3. No	9.NA	
2.5.5. Shivering	1. Yes	2 Yes	3. No	9.NA	
2.5.6. Convulsion	1. Yes	2 Yes	3. No	9.NA	
2.5.7. Yellow urine/eye	1. Yes	2 Yes	3. No	9.NA	
2.5.8. Inactivity	1. Yes	2 Yes	3. No	9.NA	
2.5.99 Other (Specify) …………………..	1. Yes	2 Yes	3. No	9.NA	

(Multiple choices allowed)

2.6. What category of individuals are most at risk of malaria?	Spontaneous	Prompted			
2.6.1. Children under 5 years	1. Yes	2. Yes	3. No	9.NA	**MRISKGPS**
2.6.2 Foreigners	1. Yes	2. Yes	3. No	9.NA	
2.6.3 Adults Only	1. Yes	2 Yes	3. No	9.NA	

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2.6.4 Pregnant women	1. Yes	2 Yes	3. No	9.NA
2.6.5. Everybody	1. Yes	2 Yes	3. No	9.NA
2.6.6. Don't know	1. Yes	2 Yes	3. No	9.NA
2.6.99. Other (Specify) ………………	1. Yes	2 Yes	3. No	9.NA

(Multiple choices allowed)

2.7. What do you do when a child gets malaria?	Spontaneous	Prompted			
2.7.1. Sponge child to reduce body temp	1. Yes	2. Yes	3. No	9.NA	**MDOCHD**
2.7.2. Treat at home	1. Yes	2 Yes	3. No	9.NA	
2.7.3. Send child to the health facility	1. Yes	2 Yes	3. No	9.NA	
2.7.99 Other (Specify) …………………..	1. Yes	2 Yes	3. No	9.NA	

(Multiple choices allowed)

2.8. In what ways do you think malaria can be prevented?	Spontaneous	Prompted			
2.8.1. Avoiding sunshine	1. Yes	2. Yes	3. No	9.NA	**MPREVENT**
2.8.2 Using mosquito spray	1. Yes	2. Yes	3. No	9.NA	
2.8.3 Burning mosquito coil	1. Yes	2 Yes	3. No	9.NA	
2.8.4 Sleeping under mosquito nets	1. Yes	2 Yes	3. No	9.NA	
2.8.5. Avoiding cold weather	1. Yes	2 Yes	3. No	9.NA	
2.8.6. Spraying chemicals on walls &ceilings	1. Yes	2 Yes	3. No	9.NA	
2.8.7. Spraying chemical/oils on standing Waters	1. Yes	2 Yes	3. No	9.NA	
2.8.8. Keeping the environment clean	1. Yes	2 Yes	3. No	9.NA	
2.8.99. Other (Specify) …………..............	1. Yes	2 Yes	3. No	9.NA	

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2.9. Within what time from onset of malaria do you take/seek anti-malarial treatment for fever/malaria?	1. Within 24 hrs	2. After 2 days	MTIME
	3. After 3 days	4. After 1 week	

2.10. What do you on your 1st attempt do to manage malaria?	Spontaneous	Prompted			
2.10.1. Herbal treatment	1. Yes	2. Yes	3.No	9.NA	**MATTEMPT1**
2.10.2.Get drugs from a drug peddler	1. Yes	2. Yes	3.No	9.NA	
2.10.3. Get drugs from a chemical shop	1. Yes	2. Yes	3.No	9.NA	
2.10.4.Treatment from a pharmacy shop	1. Yes	2. Yes	3.No	9.NA	
2.10.5. Treatment from a health facility	1. Yes	2. Yes	3.No	9.NA	
2.10.99. Other (Specify) ……………..	1. Yes	2. Yes	3.No	9.NA	

2.11. What do you on your 2nd attempt do to manage malaria?	Spontaneous	Prompted			
2.11.1. Herbal treatment	1. Yes	2. Yes	3.No	9.NA	**MATTEMPT2**
2.11.2. Get drugs from a drug peddler	1. Yes	2. Yes	3.No	9.NA	
2.11.3. Get drugs from a chemical shop	1. Yes	2. Yes	3.No	9.NA	
2.11.4. Treatment from a pharmacy shop	1. Yes	2. Yes	3.No	9.NA	
2.11.5. Treatment from a health facility	1. Yes	2. Yes	3.No	9.NA	
2.11.99. Other (Specify) ……………..	1. Yes	2. Yes	3.No	9.NA	

2.12.What do you on your 3rd attempt do to manage malaria?	Spontaneous	Prompted	

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2.12.1. Herbal treatment	1. Yes	2. Yes	3.No	9.NA	**MATTEM PT3**
2.12.2. Get drugs from a drug peddler	1. Yes	2. Yes	3.No	9.NA	
2.12.3. Get drugs from a chemical shop	1. Yes	2. Yes	3.No	9.NA	
2.12.4. Treatment from a pharmacy shop	1. Yes	2. Yes	3.No	9.NA	
2.12.5. Treatment from a health facility	1. Yes	2. Yes	3.No	9.NA	
2.12.99. Other (Specify)……………	1. Yes	2. Yes	3.No	9.NA	

(Multiple choices allowed)

2.13 What drug do you take to treat malaria at home currently?	Spontaneous	Prompted			
2.13.1. Chloroquine	1. Yes	2. Yes	3.No	9.NA	**MANTI1**
2.13.2. Fansidar	1. Yes	2. Yes	3.No	9.NA	
2.13.3. Paracetamol	1. Yes	2. Yes	3.No	9.NA	
2.13.4. Artesunate(AS)	1. Yes	2. Yes	3.No	9.NA	
2.13.5. Amodiaquine (AQ)	1. Yes	2. Yes	3.No	9.NA	
2.13.6. AS + AQ	1. Yes	2. Yes	3.No	9.NA	
2.13.7. Quinine	1. Yes	2. Yes	3.No	9.NA	
2.13.99. Other (Specify)………	1. Yes	2. Yes	3.No	9.NA	

2.14 What anti-malarial drug was given to you in the most current treatment at the health facility?	Spontaneous	Prompted			
2.14.1. Chloroquine	1. Yes	2. Yes	3.No	9.NA	**MANTI2**
2.14.2. Fansidar	1. Yes	2. Yes	3.No	9.NA	
2.14.3. Malafan	1. Yes	2. Yes	3.No	9.NA	

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2.14.4. Artesunate (AS)	1. Yes	2. Yes	3.No	9.NA
2.14.5. Amodiaquine (AQ)	1. Yes	2. Yes	3.No	9.NA
2.14.6. AS + AQ	1. Yes	2. Yes	3.No	9.NA
2.14.7. Quinine	1. Yes	2. Yes	3.No	9.NA
2.14.99. Other (Specify) …………	1. Yes	2. Yes	3.No	9.NA

3.0 INSECTICIDE TREATED NETS (ITN)

3.1 Have you ever heard of ITN?	1. Yes	2. No	**MHRDITN**

If Question 3.1 is No choose NA in Question 3.2

(Multiple choices allowed)

3.2 If yes, from whom/where did you first hear about malaria?	1.Friends/Relations	2. Posters	3. Newspaper/Magazines	**MITNWHD**
	4.Radio/FM	5.TV	6. Health Worker	
	7.AGA Malaria staff	9. NA	99. Other, (specify………	

3.3 Do you own ITN(s)?	1. Yes	2. No	**MOWNITN**

3.4 Did your child(ren) under 5 years sleep under ITN last night?	1. Yes	2.No	**MCHNITE**

3.5 Did you sleep under ITN last night?	1. Yes	2.No	**MMNITE**

If Question 3.5 is Yes choose NA in Question 3.6

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(Multiple choices allowed)

3.6 Why did you not sleep under ITN last night?	Spontaneous	Prompted			
3.7.1. It feels too hot/warm sleeping under it	1. Yes	2. Yes	3. No	9.NA	**MREFITN**
3.7.2. Mosquitoes still bite even when under ITN	1. Yes	2. Yes	3. No	9.NA	
3.7.3. I can't afford the cost of ITN at GHc 3.00.	1. Yes	2 Yes	3. No	9.NA	
3.7.4. I feel lazy to mount it.	1. Yes	2 Yes	3. No	9.NA	
3.7.5. I don't sleep well under ITN	1. Yes	2 Yes	3. No	9.NA	
3.7.6. It makes my room clumsy	1. Yes	2 Yes	3. No	9.NA	
3.7.99. Other (Specify) …………………	1. Yes	2 Yes	3. No	9.NA	

(Multiple choices allowed)

3.8 Why do you think people sleep under ITN?	Spontaneous	Prompted			
3.8.1. To keep themselves warm	1. Yes	2. Yes	3. No	9.NA	**MWHYITN**
3.8.2. To avoid mosquito bites	1. Yes	2. Yes	3. No	9.NA	
3.8.3. To avoid other insects and small animals	1. Yes	2 Yes	3. No	9.NA	
3.8.4. For privacy	1. Yes	2 Yes	3. No	9.NA	
3.8.5. To get sound sleep	1. Yes	2 Yes	3. No	9.NA	
3.8.99. Other (Specify) …………………	1. Yes	2 Yes	3. No	9.NA	

3.9 Did you think it is more important for children < 5yrs to sleep under ITN?	1.Yes	2.No	**MCHNIMP**

If Question 3.9 is No choose NA in Question 3.10

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(Multiple choices allowed)

3.10 Why is it so important for children less than 5 years to sleep under ITN?	Spontaneous	Prompted			
3.10.1. Their body can't fight well against malaria.	1. Yes	2. Yes	3. No	9.NA	**MCWHY**
3.10.2. They have weak body	1. Yes	2. Yes	3. No	9.NA	
3.10.3. For good health	1. Yes	2 Yes	3. No	9.NA	
3.10.4. So that they don't get anaemic	1. Yes	2 Yes	3. No	9.NA	
3.10.99. Other (Specify) ……………….	1. Yes	2 Yes	3. No	9.NA	

3.11 Will you for any reason not allow children less than 5yrs to sleep under ITN?	1.Yes	2.No	**MNOITN**

If Question 3.11 is No choose NA in Question 3.12

(Multiple choices allowed)

3. 12 Why will you not allow a child less than 5 yrs to sleep under ITN?	Spontaneous	Prompted			
3.12.1. Child may tear the net	1. Yes	2. Yes	3. No	9.NA	**MWHYNO**
3.12.2 Child may suffocate	1. Yes	2. Yes	3. No	9.NA	
3.12.3 Child may feel too warm	1. Yes	2 Yes	3. No	9.NA	
3.12.4 Chemical in the net may be dangerous to the child	1. Yes	2 Yes	3. No	9.NA	
3.12.5. I haven't outdoor baby as customs demand	1. Yes	2 Yes	3. No	9.NA	
3.12.6. I cannot afford the cost of 3 a net	1. Yes	2 Yes	3. No	9.NA	
3.12.99. Other (Specify) ……………………..	1. Yes	2 Yes	3. No	9.NA	

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(Multiple choices allowed)

3.13 Which categories of people will you recommend ITN for?	Spontaneous	Prompted			
3.13.1. Children under 5 years	1. Yes	2. Yes	3. No	9.NA	**MITNCAT**
3.13.2. Foreigners	1. Yes	2. Yes	3. No	9.NA	
3.13.3. Adults Only	1. Yes	2 Yes	3. No	9.NA	
3.13.4. Pregnant women	1. Yes	2 Yes	3. No	9.NA	
3.13.5. Everybody	1. Yes	2 Yes	3. No	9.NA	
3.13.6. Don't know	1. Yes	2 Yes	3. No	9.NA	
3.13.99. Other (Specify) ……………	1. Yes	2 Yes	3. No	9.NA	

3.14 When was the last time you had your ITN treated?	1. Less than 6 months	4. Never	**MITNTRT**
	2. 6 – 12 months	9.NA	
	3. 1 year or more	99. Other, (Specify)	

4.0 INDOOR RESIDUAL SPRAY (IRS)

4.1 Have you ever heard of IRS?	1. Yes	2. No	**MHRDIRS**

If Question 4.1 is No choose NA in Question 4.2

(Multiple choices allowed)

4.2 If yes, from whom/where did you first hear about IRS?	1.Friends/Relations	2. Posters	3. Newspaper/Magazines	**MWHIRS**
	4.Radio/FM	5.TV	6. Health Worker	
	7.AGA Malaria staff	9. NA	99. Other, (specify ……	

(Count rooms, kitchen, toilet, bath, garage, store rooms etc)

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4.3 How many rooms/structures do this household share?	1. One	2. Two	3.Three	4.Four	5.Five	6. Six	MNOSTRS
	7.Seven	8. Eight	9. Nine	99. Other, (Specify) ……			

4.4 Did you allow IRS to be sprayed in your household? ………	1. Yes	2. No	MHRDIRS

(Count rooms, kitchen, toilet, bath, garage, store rooms etc)

4.5 How many of these rooms structures in this household have been sprayed with IRS in last six month?	1. None	2. One	3.Two	4.Three	5.Four	6. Five	MIRSTRS
	7.Six	8. Seven	9. Eight	10.Nine	99.Other(Specify)		

4.6 How long has it been since your household was last sprayed with IRS?	Less than 6 months	2. 6-12 months	3. Over 1 yr	MLONG

If Question 4.4 is No choose NA in Question 4.7

(Multiple choices allowed)

4.7 If yes, why do you like IRS to be sprayed for your household at least once every 6 months?	Spontaneous	Prompted			
4.7.1. It keeps mosquitoes away	1. Yes	2. Yes	3. No	9.NA	MWHYIRS
4.7.2. It kills other insect and small animals	1. Yes	2. Yes	3. No	9.NA	
4.7.3. It is free of charge	1. Yes	2 Yes	3. No	9.NA	
4.7.99. Other (Specify) ……………………	1. Yes	2 Yes	3. No	9.NA	

(Multiple choices allowed)

4.8 Why was your household not sprayed with	Spontaneous	Prompted

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IRS during the last spraying round?					
4.8.1. Doesn’t keep mosquitoes away as claimed	1. Yes	2. Yes	3. No	9.NA	**MNOIRS**
4.8.2. The chemical used has a foul smell	1. Yes	2. Yes	3. No	9.NA	
4.8.3. I was not in my house	1. Yes	2 Yes	3. No	9.NA	
4.8.4 Dirties my wall	1. Yes	2 Yes	3. No	9.NA	
4.8.5. My baby was < 6 months old	1. Yes	2 Yes	3. No	9.NA	
4.8.6. I was then pregnant	1. Yes	2 Yes	3. No	9.NA	
4.8.7. The exercise invades my privacy	1. Yes	2 Yes	3. No	9.NA	
4.8.99. Other (Specify) ………………………	1. Yes	2 Yes	3. No	9.NA	

4.9 Were you given prior notice before the day of spraying?	1. Yes	2. No	Don’t know	**MNOTICE**

4.10 Were your belongings covered with sheets before spraying?	1. Yes	2.No	**MBCOV**

4.11 Did you like the chemical last used to spray your household?	1. Yes	2.No	**MLKCHEM**

4.12 What do you not like about the chemical first used to spray your household?	Spontaneous	Prompted			
4.12.1. It irritates my eyes	1. Yes	2 Yes	3. No	9.NA	**MWHYCH**
4.12.2. It has a foul smell	1. Yes	2 Yes	3. No	9.NA	
4.12.3. It does not keep mosquitoes away	1. Yes	2 Yes	3. No	9.NA	
4.12.4. It is dangerous to people	1. Yes	2 Yes	3. No	9.NA	
4.12.5. It is dangerous to the environment.	1. Yes	2 Yes	3. No	9.NA	
4.12.99. Other (Specify) ………….	1. Yes	2 Yes	3. No	9.NA	

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5.0 LARVICIDING

5.1 Have you ever heard of larviciding?	1. Yes	2.No	**MHRDLVD**

If Question 5.1 is No choose NA in Question 5.2

(Multiple choices allowed)

5.2 If yes, from whom/where did you first hear about larviciding?	1.Friends/Relations	2. Posters	3. Newspaper/Magazines	**MWHLVD**
	4.Radio/FM	5.TV	6. Health Worker	
	7.AGA Malaria staff	9. NA	99. Other, (specify …	

5.3 Why do you think larviciding is done?	Spontaneous	Prompted			
5.3.1.To drive away water snakes	1. Yes	2. Yes	3. No	9.NA	**MWHYLVD**
5.3.2 To kill fishes	1. Yes	2. Yes	3. No	9.NA	
5.3.3 To kill mosquito larva (babies)	1. Yes	2 Yes	3. No	9.NA	
5.3.4. To make the water clean	1. Yes	2 Yes	3. No	9.NA	
5.3.99. Other (Specify) ………….	1. Yes	2 Yes	3. No	9.NA	

6.0 HOUSEHOLD CHARACTERISTICS

6.1 Are you the head of this household?	1. Yes	2. No	**MHEAD**

If Question 6.1 is yes, skip to Question 6.7

6.2 If no, who is the head of this household?	1. My husband	2. My father	3. My mother	99.Other,(specify) …………….	**MWHEAD**

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6.3 Religion of household head?	1. Christianity	2. Islam	3. Traditional	99. Other,(Specify) ……………….	MHREL

6.4 Ethnicity of head	1.Akan(Twi/Fante/Akwapim)	2.Ga/Adangbe/Ewe	3. Sisala/Wala	MHETH
	4.Gonja/Dagomba/Mamprusi	5.Dagarti/Frafra/Kusasi	99. Other, (specify)	

6.5 What is the highest level of education attained by the household head?	1. None	2. Primary	3. JHS/JSS/Mid Sch	MHEDU
	4. SHS/SSS/Sec	5. Tech/Vocational	6. Tertiary	

6.6 What is the occupation of household head?	1. Housewife	2. AGA worker/ Affiliates	3. Farmer	4. Civil servant	MHOCC
	5. Trader/Businessperson	6.Unemployed	99. Other,(Specify)		

6.7 On the average, how much does this households earn each month?	1.Less than GHc100	2. GHc100 - GHc499	3. GHc500 – GHc999	4. GHc1000 or more	MHEARN

6.8 How often are you involved in taking decisions of health in this households?	1. Never	2. Occasionally	3. Always	MDECIDE

6.9 Which of the following items do this household own?	1. Radio	2. Bicycle	3. TV		MHPTY
	4. Motor bike	5. Car/Lorry	6.Land/House	7. None	

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6.10 Do you use electricity in this household?	1. Yes	2. No	**MECITY**

6.11 What kind of cooking fuel do you use?	1.Firewood	2. Charcoal	3.Gas	4. Electricity	99.Other, (specify)…	**MCOOK**

6.12 Floor of sleeping room	1. Mud/Clay	2. Wood	3. Cement	**MFLOOR**
	4. Carpet	5. Floor tiles	99. Other, (specify) ……	

6.13. Wall material	1. Mud/clay	2. Wood	3. Cement	99. Other, (specify) …	**MWALL**

6.14 Roofing material	1. Thatched	2. Aluminum sheets	3.Tiles	99.Other, (specify)	**MROOF**

End of Questionnaire, check your form and thank Respondent.

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APPENDIX III

AN ASSESSMENT OF THE INTEGRATED MALARIA CONTROL PROGRAMME IN THE OBUASI MUNICIPALITY **Pregnant Woman Form**	**Form No.**

1.0 SECTION A: IDENTIFICATION AND DEMOGRAPHIC DATA

1.1 Name of Respondent …. [ ] **PNAME**

1.2 Age…

1. 15-19	2. 20-24	3. 25-29	4. 30-34	5. 35-39	6.40-44	7.45-49

PAGE

1.3 Questionnaire ID………………………………………………. [ ][ ][ ][ ][ ] **PQID**

1.4 Date of Interview……………………………………….. [ ][ ][ ][ ][ ][ ] **PIDATE**

1.5 Name of Interviewer…… [ ] **PINAME**

1.6 House Number…………………………………………... [ ][ ][ ][ ][ ][ ] **PHNO**

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1.7 Place of Residence……..			PRES

1.8 Location………………..	1. Rural	2. Urban HSES	3. Urban LSES	PLOC

1.9 Ethnicity	1. Akan(Twi/Fante/Akwapim)	2. Ga/Adangbe/Ewe	3. Sisala/Wala	PETH
	4. Gonja/Dagomba/Mamprusi	5. Dagarti/Frafra/Kusasi	99. Other, (specify) ...	

1.10 Religion....	1. Christianity	2. Islam	3. Traditional	99. Other, (Specify)……	PREL

1.11 Marital Status…	1.Single	2.Married	3.Divorced	4. Separated	5. Widowed	PMARS

1.12 Educational level	1.None	2.Primary	3. JHS/JSS/Middle Sch	PEDU
	4. SHS/SSS/Sec	5.Tech/Vocational	6. Tertiary	

1.13What is your occupation?	1. Housewife	2. AGA Worker/ Affiliates	3. Farmer	4. Civil servant	POCC
	5. Trader/ Business person	6. Unemployed	99.Other, (Specify) ………………		

1.14 No of Children…..	1. None	2. 1-2	3. 3-4	4. 5 - 6	5. 7 or more	PNCHN

1.15 Age of last child	1. <1	2. 1-2	3. 3-4	4. 5 - 6	5. 6 or more	9. NA	PLAGE

<u>2.0 SECTION B: INSECTICIDE TREATED NETS (ITN)</u>

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2.1 Do you own ITN(s)?	1. Yes	2. No	**POWNITN**

2.2 Did you sleep under ITN last night?	1. Yes	2.No	**PMNITE**

2.3 Were you sleeping under ITN before this pregnancy?	1. Yes	2. No	**PBPREG**

If Question 2.3 is No choose NA in Question 2.4

(Multiple choices allowed)

2.4 If yes, from whom/where were you influenced to take ITN?	1.Friends/Relations	2. Posters	3. Newspaper/Magazines	**PMWHD**
	4.Radio/FM	5.TV	6. Health Worker/Antenatal	
	7.AGA Malaria staff	9. NA	99. Other, (specify ……	

(Multiple choices allowed)

2.5 Why do you sleep under ITN now?	Spontaneous	Prompted			
2.5.1. To avoid mosquito bites	1. Yes	2. Yes	3.No	9.NA	**PITNOW**
2.5.2. To keep warm	1. Yes	2. Yes	3.No	9.NA	
2.5.3. For privacy	1. Yes	2. Yes	3.No	9.NA	
2.5.4. For safe delivery	1. Yes	2. Yes	3.No	9.NA	
2.5.5. To deliver a healthy baby	1. Yes	2. Yes	3.No	9.NA	
2.5.99. Other (Specify)………..	1. Yes	2. Yes	3.No	9.NA	

2.6 When was the last time you had	1. Less than 6 months	4. Never	**PITNTRT**

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Your ITN treated?	2. 6 – 12 months	9.NA	
	3. 1 year or more	99. Other, (Specify)…..	

3.0 SECTION C: IPT AND CASE MANAGEMENT

3.1 Do you attend antenatal clinics?	1.Yes	2.No	**PANC**

3.2 How long have you been pregnant?	1.Less than 16wks	2. 16-24wks	3. 25-36wks	**PDUR**

3.3 Have you heard of IPT for pregnant women?	1.Yes	2.No	**PHIPT**

If Question 3.3 is No choose NA in Question 3.4

(Multiple choices allowed)

3.4 If yes, from whom/ where were you influenced to take IPT	1.Friends/Relations	2. Posters	3. Newspaper/Magazines	**PWHIPT**
	4.Radio/FM	5.TV	6. Health Worker/Antenatal	
	7.AGA Malaria staff	9. NA	99. Other, (specify) ……	

3.5 Did you receive IPT in your previous pregnancy?	1.Yes	2.No	9. NA	**PIPTLAST**

3.6 Have you received IPT in this pregnancy?	1.Yes	2.No	9. NA	**PIPTREC**

3.7 Were they directly observed by a health worker?	1.Yes	2.No	9. NA	**PIPTDOT**

3.8 How many doses of IPT(s) have you received in this	1. 1	2. 2	3. 3	**PMANY**

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pregnancy?	4. 4	5. None	9. NA

(Multiple choices allowed)

3.9 When in this pregnancy was IPT received?	Spontaneous	Prompted			
3.9.1. < 16 weeks	1. Yes	2. Yes	3.No	9.NA	PWHNIPT
3.9.2. 16-20 weeks	1. Yes	2. Yes	3.No	9.NA	
3.9.3. 21–26 weeks	1. Yes	2. Yes	3.No	9.NA	
3.9.4. 27-36 weeks	1. Yes	2. Yes	3.No	9.NA	

3.10 Which of these drugs were You given for IPT?	Spontaneous	Prompted			
3.10.1. Chloroquine	1. Yes	2. Yes	3.No	9.NA	PDRUG
3.10.2. Fansidar/SP	1. Yes	2. Yes	3.No	9.NA	
3.10.3. Amodiaquine(AQ)	1. Yes	2. Yes	3.No	9.NA	
3.10.4. Artesunate (AS)	1. Yes	2. Yes	3.No	9.NA	
3.10.5. AS + AQ	1. Yes	2. Yes	3.No	9.NA	
3.10.6. Quinine	1. Yes	2. Yes	3.No	9.NA	
3.10.99. Other (Specify) …..	1. Yes	2. Yes	3.No	9.NA	

3.11. Within what time from onset of malaria do you take/seek anti-malarial treatment for fever/malaria?	1. Within 24 hrs	2. After 2 days	PTIME
	3. After 3 days	4. After 1 week	

3.12. What do you on your 1st attempt do			

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to manage malaria?	Spontaneous	Prompted			
3.12.1. Herbal treatment	1. Yes	2. Yes	3.No	9.NA	**PATTEMPT1**
3.12.2. Get drugs from a drug peddler	1. Yes	2. Yes	3.No	9.NA	
3.12.3. Get drugs from a chemical shop	1. Yes	2. Yes	3.No	9.NA	
3.12.4. Treatment from a pharmacy shop	1. Yes	2. Yes	3.No	9.NA	
3.12.5. Treatment from a health facility	1. Yes	2. Yes	3.No	9.NA	
3.12.99. Other (Specify) ……………..	1. Yes	2. Yes	3.No	9.NA	

3.13. What do you on your 2nd attempt do to manage malaria?	Spontaneous	Prompted			
3.13.1. Herbal treatment	1. Yes	2. Yes	3.No	9.NA	**PATTEMPT2**
3.13.2. Get drugs from a drug peddler	1. Yes	2. Yes	3.No	9.NA	
3.13.3. Get drugs from a chemical shop	1. Yes	2. Yes	3.No	9.NA	
3.13.4. Treatment from a pharmacy shop	1. Yes	2. Yes	3.No	9.NA	
3.13.5. Treatment from a health facility	1. Yes	2. Yes	3.No	9.NA	
3.13.99. Other (Specify) ……………..	1. Yes	2. Yes	3.No	9.NA	

3.14. What do you on your 3rd attempt do to manage malaria?	Spontaneous	Prompted			
3.14.1. Herbal treatment	1. Yes	2. Yes	3.No	9.NA	**PATTEMPT3**
3.14.2. Get drugs from a drug peddler	1. Yes	2. Yes	3.No	9.NA	
3.14.3. Get drugs from a chemical shop	1. Yes	2. Yes	3.No	9.NA	

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3.14.4. Treatment from a pharmacy shop	1. Yes	2. Yes	3.No	9.NA
3.14.5. Treatment from a health facility	1. Yes	2. Yes	3.No	9.NA
3.14.99. Other (Specify) ……………..	1. Yes	2. Yes	3.No	9.NA

3.15 What anti-malarial drug do you take to Treat malaria at home currently?	Spontaneous	Prompted		
3.15.1. Chloroquine	1. Yes	2. Yes	3.No	9.NA
3.15.2. Fansidar	1. Yes	2. Yes	3.No	9.NA
3.15.3. Paracetamol	1. Yes	2. Yes	3.No	9.NA
3.15.4. Artesunate(AS)	1. Yes	2. Yes	3.No	9.NA
3.15.5. Amodiaquine (AQ)	1. Yes	2. Yes	3.No	9.NA
3.15.6. AS + AQ	1. Yes	2. Yes	3.No	9.NA
3.15.7. Quinine	1. Yes	2. Yes	3.No	9.NA
3.15.99. Other (Specify)……………..	1. Yes	2. Yes	3.No	9.NA

PANTI1

3.16 What anti-malarial drug was given to you in the most current treatment at the health facility?	Spontaneous	Prompted		
3.16.1. Chloroquine	1. Yes	2. Yes	3.No	9.NA
3.16.2. Fansidar	1. Yes	2. Yes	3.No	9.NA
3.16.3. Malafan	1. Yes	2. Yes	3.No	9.NA
3.16.4. Artesunate (AS)	1. Yes	2. Yes	3.No	9.NA
3.16.5. Amodiaquine (AQ)	1. Yes	2. Yes	3.No	9.NA
3.16.6. AS + AQ	1. Yes	2. Yes	3.No	9.NA
3.16.7. Quinine	1. Yes	2. Yes	3.No	9.NA

PANTI2

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3.16.99. Other (Specify) …………	1. Yes	2. Yes	3.No	9.NA

4.0 HOUSEHOLD CHARACTERISTICS

4.1 Are you the head of this household?	1. Yes	2.No	PHEAD

If Question 4.1 is yes, skip to Question 4.7

4.2 If no, who is the head of this household?	1. My husband	2. My father	3. My mother	99.Other,(specify) …………….	PWHEAD

4.3 Ethnicity of head	1.Akan(Twi/Fante/Akwapim)	2. Ga/Adangbe/Ewe	3. Sisala/Wala	PHETH
	4. Gonja/Dagomba/Mamprusi	5.Dagarti/Frafra/Kusasi	99.Other,(specify)…	

4.4 Religion of household head?	1. Christianity	2. Islam	3. Traditional	99. Other,(Specify) …………………..	PHREL

4.5 What is the highest level of education attained by the household head?	1. None	2. Primary	3. JHS/JSS/Middle Sch	PHEDU
	4.SHS/SSS/Sec	5. Tech/Vocational	6. Tertiary	

4.6 What is the occupation of household head?	1. Housewife	2. AGA Worker/ Affiliates	3. Farmer	4. Civil servant	PHOCC
	5. Trader/ Business Person	6. Unemployed	99. Other, (Specify) ………………		

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4.7 On the average, how much do this household learn each month?	1.Less than GHc100	2. GHc100 - GHc499	3. GHc500 – GHc999	4. GHc1000 or more	**PHEARN**

4.8 How often are you involved in taking decisions of health in this household?	1. Never	2. Occasionally	3. Always	**PDECIDE**

4.9 Which of the following items do this household own?	1. Radio	2. Bicycle	3. TV		**PPROTY**
	4. Motor bike	5. Car/Lorry	6. Land/House	7. None	

4.10 Do you use electricity in this household?	1. Yes	2.No	**PECITY**

4.11 What kind of cooking fuel do you use?	1.Firewood	2.Charcoal	3.Gas	4.Electricity	99.Other, (specify)…….	**PCOOK**

4.12 Floor of sleeping Room	1. Mud/Clay	2. Wood	3. Cement	**PFLOOR**
	4. Carpet	5. Floor tiles	99. Other, (specify) ……	

4.13. Wall material	1. Mud/clay	2. Wood	3. Cement	99. Other, (specify) ……	**PWALL**

4.14 Roofing material	1. Thatched	2. Aluminum sheets	3.Tile	99. Other,(specify)…	**PROOF**

End of Questionnaire, check your form and thank Respondent.

APPENDIX IV: **FGD GUIDE FOR MOTHERS OF UNDER 5 CHILDREN**

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Introduction

Greet the group members and tell them the reasons for the gathering. Allow each member to introduce herself with particular reference to name, occupation and age of her child. Drive home the importance of this discourse for a meaningful assessment of the ongoing Malaria Control Programme and assure members of the confidentiality of their response.

Knowledge of Malaria Control and Prevention

1. What are the common diseases that affect the community? Which is the commonest and most severe (Probe for malaria).
2. How can a person get malaria? Are there any additional risks for children and pregnant women?
3. What signs do you notice in a person with malaria?
4. In what ways do you think malaria can be prevented and controlled? (Probe for all approaches of the integrated malaria control programme)
5. How effective are these measures?

Malaria Treatment

1. How many of you have heard of the new malaria drug for treatment?
2. What do you know about this new malaria drug?
3. What is your assessment of this new drug compared with the old one (Chloroquine)?

ITN use

1. Why do you think people sleep in insecticide treated nets?
2. What are your views about sleeping under ITNs generally?
3. How many of you and your children are currently sleeping under ITNs?
4. If offered limited quantities of ITNs, which group of people in your households will you give the first priority for using ITN and why?
5. How many of you are sleeping or slept under ITNs when pregnant?

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6. What are some of the problems in your opinion children and pregnant women may face when sleeping under ITNs?
7. Do any of you know about any cultural practices or beliefs that hinder sleeping under ITNs in general and children and/ or pregnant women in particular?
8. How and from where did you get your last /and current ITN?
9. Do any of you re-treat these ITNs? If so how often and where is this done?

Indoor Residual Spraying

1. What do you know about IRS?
2. How many of you have had your house sprayed in the last 6 months?
3. What are your opinions about the whole spraying exercise?
4. What are some of the reasons why people refuse IRS?

AngloGold Malaria Control Programme

1. What is your assessment of the AngloGold Malaria Control programme?
   - What are the positives?
   - And negatives?
2. Would you like the programme to be sustained or stopped?

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APPENDIX V: INTERVIEW GUIDE FOR THE MANAGER, NATIONAL MALARIA CONTROL PROGRAMME (NMCP)

1. What kind of collaboration exists between NMCP and AngloGold Malaria Control Centre (AGMCP) in the implementation of the integrated community malaria control programme in the Obuasi Municipality?
2. Are you conversant with progress of work on the AngloGold Malaria Control Programme in Obuasi?
3. How involved have you and your team been in this programme?
4. Does your outfit monitor and evaluate the Obuasi programme?
5. Is the Obuasi programme coherent with the national malaria control policy?
6. Has there been any independent assessment of the Obuasi programme by NMCP?
7. What is your assessment of the AngloGold Malaria Control Programme?
   - i. What are the positives and negatives?
   - ii. How beneficial has it been to
     - The Community members and
     - The NMCP.
8. In your opinion, is there anything in the Obuasi programme you expect to have been done differently?

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APPENDIX VI: INTERVIEW GUIDE FOR THE OBUASI MUNICIPAL HEALTH DIRECTOR

The Programme

1. In your opinion, what might have motivated AGA, an international mining company to initiate a community malaria control programme?
2. Do you know the components under the integrated malaria control programme?
3. What is the role of your Municipality and the Health Directorate in particular in this programme?
4. What is your assessment of the communities' knowledge and acceptability of this programme?
5. What percentage of your annual health budget for the past five years is spent on malaria prevention and control?

Malaria Treatment

1. What is your assessment of the new anti-malarial drug policy?
2. How available are the new drugs to all health facilities and for that matter patient?

ITN use

1. How many ITNs have your outfit distributed or sold since the beginning of this programme?
2. Apart from the health facilities, are there other outlets where ITNs are sold?
3. Has the voucher system for the sales of ITNs been introduced in your Municipality?
4. Has there been any initiative to increase ITN use among children under five and pregnant women in your Municipality?
5. Are nets re-treated and if so where and how often?
6. In your opinion, what do you think can be done to scale up ITN usage in this community?

IRS

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1. How successful in terms of coverage has the IRS component of the programme been?
2. What are the complaints from the community about this IRS exercise?
3. Have you received any complaints from any individual/organization about the IRS exercise?
4. What is your assessment of the communities' knowledge and perception of the IRS exercise?
5. What problems do you see with the IRS exercise being implemented by AGA?

Overall, what is your assessment of the AngloGold Malaria Control Programme?

- What are the positives?
- And the negatives?

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APPENDIX VII: INTERVIEW GUIDE FOR THE MANAGER, ANGLOGOLD MALARIA CONTROL PROGRAMME.

1. What are the components under the integrated malaria control programme being implemented by your company?
2. Which is your main focus? And why?
3. Are there any partners involved in this programme? If any, who are they and what role do they play?
4. What is your assessment of the communities' knowledge and acceptability of the programme?
5. How involved are the opinion leaders of the communities' in the programme?
6. How many ITNs have your programme distributed so far to the communities?
7. Are there any group of people you focally give the ITNs?
8. What arrangements have you put in place for re-treatment?
9. How often and when in a year do you do IRS?
10. How many rounds have you done since the programme took off? and what coverage are achieved in each of the rounds?
11. For how long will this programme be sustained?
12. What are some of the problems you encounter with IRS and other components? during implementation?
13. Do you support the community members on treatment with the new drugs?
14. What do you make of these new drugs in terms of its availability, affordability and acceptability?
15. Personally, what's your view about the progress of the programme?

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APPENDIX VIII: INTERVIEW GUIDE FOR ASSEMBLYMEN AND WOMEN IN THE MUNICIPALITY

1. What are the common diseases that affect children in your area?
2. Do you think malaria is a problem of concern to your community?
3. How is malaria prevented in your community?
4. Do you know of any malaria control and prevention programme being implemented in the Obuasi Municipality?
5. If so, what are the activities under such a programme? Please mention any that you know or have heard of.
6. Are your communities aware of any such programme and cooperating with the implementers of the programme?
7. Do children and pregnant women sleep under ITNs in your community?
8. What do you know of the IRS exercise being implemented?
9. What do you think of the communities' knowledge and acceptability of the IRS exercise by AGA?
10. How many of you have heard of the new malaria drug for treatment?
11. What do you know about this new drug recommended for malaria?
12. What is your assessment of the AngloGold Malaria Control programme?
    - **a.** What are the positives?
    - **b.** And negatives?
13. Would you like the programme to be sustained or stopped?

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APPENDIX IX: OBSERVATION AND REVIEW CHECKLIST

AN ASSESSMENT OF THE INTEGRATED MALARIA CONTROL PROGRAMME IN THE OBUASI MUNICIPALITY

Date: ________________________

Name of Observer: ________________________

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1. Are the following tools part of the Integrated Malaria Control Programme?

i. Indoor Residual Spraying **Yes** **No**
ii. Distribution of Insecticide Treated Nets **Yes** **No**
iii. Larviciding **Yes** **No**
iv. Environmental Management **Yes** **No**
v. Information Education & Communication **Yes** **No**
vi. Case Management **Yes** **No**

2. Were any entomological baseline study conducted before selection of insecticide for Indoor Residual Spraying? **Yes** **No**

3. Observe the number of spraying rounds per year and months of spraying.

Number…………………

Month…………………..

4. What are the coverage and insecticides used in each round for spraying?

ROUND	INSECTICIDE USED	COVERAGE (%)
1		

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2		
3		
4		
5		

5. Observed supervisory report or any evidence for appropriate review of surveillance practices? **Yes** **No**

APPENDIX X: Selected Communities in the Obuasi Municipal Area for the Survey

URBAN HSES No.	**Community**	**Population**	**# Mothers of < 5s**	**# Pregnant Women**	**# Forms**
1	Precious (Tiny Rowland Estate)	1116.67772	2	1	3
2	Bruno Estate	876.8771	2	1	3
3	Sam Jonah Estate	3536.58352	8	3	11

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4	Darkwah Estate	462.97466	1	0*	1
5	Mensakrom/Gauso Extension	4398.8993	10	4	14
6	Monsey Valley	2161.38362	5	2	7
7	Biney Estate (Onyenase)	850.614	2	1	3
8	Bill Hussey	725.288	2	1	3
	Sub-total	**14,129.30**	**32**	**13**	**45**
URBAN LSES					
9	Anyinam/Anyinamfie	5392.256	12	5	17
10	Gauso	6781.53772	15	6	21
11	Bediem	1433.12694	3	1	4
12	Abompekrom	2911.44492	6	3	9
13	Zongo	7088.11204	16	7	23
14	Obuasi Central	13024.89326	29	12	41
15	Anyimadukrom	2436.2236	6	2	8
16	Kwabrafoso	6254.41886	14	6	20
17	Tutuka	13093.84626	29	12	41
18	Ahansonyewodea	5666.4146	13	5	18
19	Brahabebome	7481.89144	17	7	24
	Sub-total	**71564.16564**	**159**	**66**	**225**
RURAL					
20	Nhyiaeso	1055.35884	2	1	3
21	Apitikooko	3061.3622	7	3	10
22	Binsere	1038.93414	2	1	3
23	Kwabenakwa	5152.90396	11	5	16

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24	Ntonsua	823.22308	2	1	3
25	Kwameduakrom(Okomfokrom)	492.12572	1	0*	1
26	Anwona	468.67216	1	0*	1
27	Jimiso	946.74	2	1	3
28	Pomposo	4960.1525	11	5	16
29	Diawuoso	3292.49796	7	3	10
30	Mampamhwe	1394.89762	3	1	4
	Sub-total	**22686.86818**	**49**	**21**	**70**
	GRAND TOTAL	**108380.3**	**241**	**100**	**341**

* One(1) respondent was each selected for communities that weighted zero (0) for the pregnant cohort increasing total study participants to 344