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Assessing the Influence of Socioeconomic Factors, Knowledge Level, Attitudes, and Practices on Malaria Prevention Among the Gusii People of Kenya

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2011

Abstract

Assessing the Influence of Socioeconomic Factors, Knowledge Level, Attitudes, and Practices on Malaria Prevention Among the Gusii People of Kenya

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Dissertation Submitted in Partial Fulfillment

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Abstract

Global morbidity and mortality associated with malaria is rampant, and most of the clinical malaria cases are found in sub Saharan Africa. Previous and current research show that malaria is both preventable and treatable and that socioeconomic variables have a profound influence on how persons in rural Africa respond to malaria infections and the associated preventive strategies. This study assessed two key research questions for malaria cases in the Gusii region of Kenya regarding: First, whether a community education program on malaria has an impact in changing malaria preventive behaviors; and, second, if a relationship exists between socioeconomic factors and participants' knowledge and associated behavioral change to control malaria cases. Participatory model and social cognitive theory were used in conjunction with a community intervention with pre-post-test approach. Ten trainees each interviewed 36 participants, for a total of 360 participants, using a structured questionnaire before and after providing a layperson health education program (LPHEP) related to malaria prevention. Repeated measures one-way ANOVA, Chi-square, and Cramer's *V* test were used for the test of significance. Results showed statistically significant differences between pre- and post-test scores on signs and symptoms of malaria. Participants were able to identify and stated > 2 signs and symptoms of malaria after exposure to the LPHEP. Implications for positive social change included evidence that a simple LPHEP can improve malaria knowledge level.

Dedication

This dissertation is dedicated to my lovely wife, Mary, my son, Brandon, and my daughter, Debra, whose understanding and support were phenomenal through the rigorous journey of my PhD program. In addition, I would not want to forget my late father Enosh Arori Machuki ,who had instilled in me, as a young boy, patience, and often times emphasized that "tough sacrifice was necessary before victory could be attained"… rest in peace Dad!

Acknowledgments

First and foremost, I thank God Almighty, because without His blessings, this PhD project would not have come to fruition and none of the findings in this study would have been presented through my weak cognitive process and hands. Yes, writings I wrote, but I had to be guided by the power which is beyond my human understanding.

Secondly, I want to thank my dissertation committee: Dr. Aimee Ferraro (chair), Dr. Hadi Danawi, and Dr. Mehdi Agha (URR) for their constructive guidance along the way.

Thirdly, I want to thank my wonderful, devoted wife, Mary Arori, who has been my support system for the last 15 years. In addition, I also extend a lot of appreciation to my son and daughter, Brandon and Debra, respectively who sacrificed a lot for me to follow my dream at the expense of their quality time. Son and Daughter, thank you for travelling with me to all my four residencies (Denver- Colorado; Los Angeles – California; Dallas – Texas; and Minneapolis – Minnesota.)

Fourthly, I want to thank my mother Sibia Arori, my parents' in-law Joseph and Sibia Onsomu for their prayers. I also want to extend my sincere thanks to Uncle Raphael Raini and family who gave me a bank statement to be cleared through the US embassy for student VISA approval back in 1986. And my brother in-law Abner, I want to thank you, for hosting us when I made trips to Kenya for data collection. Additionally, to all my brothers and sisters who have always wished me well. However, I would like to give special thanks to Charles Arori, my nephews (Newton and Hans) and their parents (Evans and Kwamboka Arori) for all the assistance you provided me to get this project completed.

Lastly, I thank all the individuals, workmates, families, churches, research assistants, 360 participants, and managers (Lisa Davilla-VA Hospital Denver, Colorado; Pam Ball -UNC Hospital System, Chapel Hill, North Carolina; Patty Henkel-Heifner with Healthways, Inc: who were flexible with my work schedule to assist me in carrying out the project). As said in the Ekegusii language-*"Tiga Omonene Abasesenie Mwensi"*.

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Chapter 1: Introduction

Background

Malaria is endemic to Africa and a cause of global morbidity and mortality (Smith, Dushoff, Snow, & Hay, 2005); however, malaria is both a preventable and treatable disease (Williams et al., 2009). Malaria kills 1 million people in the world and 90 % of that population is in Africa (CDC, 2010). In addition, the disease kills millions of young children (younger than 5 years) (CDC, 2010). Malaria is a major health problem that requires attention from many researchers internationally. Many schools of thought in literature have described the reasons for malaria endemic in sub Saharan Africa, namely: climate issues (Alonzo, 2006; Tol, 2008), drug resistance, utilizing health belief theory (Bjorkman, 2005; Kelly-Hope et al., 2008; Muehlenbachs et al., 2008), cultural predispositions, such as early teen marriage (Nour, 2006), false presentation of financial availability and malaria treatment malpractice (Attaran et al., 2006; Olliaro et al., 2008), and genetic predisposition (Sirugo et al., 2008). The present study concentrated on five major risk factors associated with malaria in Africa: socioeconomic status (Amuyunzu-Nyamongo, 2010), knowledge level (Dinho, Van der Merwe, & Ehlers, 2009), traditional beliefs and attitudes (Nsimba & Kayombo, 2008), environmental determinants (Yé, Hoshen, Kyobutungi, Louis, & Sauerborn, 2009), and lack of access to health care (Williams, Martina, Cumming, & Hall, 2009). The study assessed the relationships between socioeconomic status, knowledge level, attitudes, practices and malaria control measures in rural Kenya, Africa. The guiding premise in this study was that communities would welcome change if they see the need and would become engaged to create that change to the extent that it seems feasible and worthwhile.

Problem Statement

This research addressed a gap in literature regarding the impact of a community health promotion program on malaria control and prevention in Bondonya, in Gusii-Kenya, Africa. In addition, this study assessed the relationship between socioeconomic factors and knowledge-level and associated behavioral change in managing malaria cases among the participants in Gusii region in Kenya, Africa. No clear indication has yet been found of the level of awareness and knowledge of the indegenous populations regarding malaria prevention in the rural villages of Gusii region in Kenya, Africa . Addressed in this research are the preventive measures, such as the correct use of bed nets and household insecticide sprays, and access to health care services within 24 hours of malaria outbreaks in the Gusii region of Kenya, Africa. The effectiveness of such control programs needed evaluation.

Research evidence indicated that malaria is endemic in Africa, particularly in the sub Saharan region. The risk factors associated with such high malaria prevalence in south of the Sahara include poverty (Amuyunzu-Nyamongo, 2010); illiteracy (Dinho, Van der Merwe, & Ehlers, 2009); lack of health care facilities (Williams, Martina, Cumming, & Hall, 2009); lack of access to health care (Alonzo, 2006; Tol, 2008); climate (Alonzo, 2006); cultural and traditional beliefs (Tol, 2008); medication resistance (Nsimba & Kayombo, 2008; Bjorkman, 2005); and genetic predispositions (Nsimba & Kayombo, 2008; Bjorkman, 2005; Kelly-Hope et al., 2008; Muehlenbachs et al., 2008 Sirugo et al., 2008). Effective malaria control programs include information on correct use of insecticide-treated nets, household insecticide sprays, mosquito repellents, and ensure access to a hospital/community clinic within 24 hours when an individual is infected by malaria, as well as provide a supply of free bed nets, if the program efforts target persons who are most at risk.

Survey tools used in this study were modified and created by the researcher. The names of the survey instruments are malaria indicator survey (MIS) and knowledge assessment tool (KAT). Similar instruments have been used in previous studies with significant findings as detailed in the following discussion.

In a 2006 survey study conducted in Uganda, Africa, to evaluate a malaria prevention program, found an ongoing lack of community access to malaria prevention measures such as correct use of insecticide-treated nets, household insecticide sprays, mosquito repellents, and access to a hospital/community clinic within 24 hours when an individual is infected by malaria, and supply of free bed nets (Williams et al., 2009). However, Williams et al. (2009) concluded that with effective malaria preventive education lower rates of childhood malaria prevalence can be achieved. Therefore, this study assessed the relationship between socioeconomic status and individual knowledge and associated behavioral change as well as the impact of a community education program **(**Appendix A**)** on the prevention of malaria in the Gusii region of Kenya, Africa. The findings from this study provide data to the scientific community in order to assist public health decision makers in Kenya in planning an effective health promotion program for malaria prevention and control program in the Gusii region, which has never had such an investigation prior to this study. Addressing the problem of malaria from a community perspective could save, for example, millions of HIV-infected expectant mothers from opportunistic infections such as malaria (Mesnick, Mwapasa, & Rogerson, 2006), thus promoting positive outcomes, specifically the decreased rates of morbidity and mortality associated with malaria.

Nature of the Study

The quantitative, pre-post-test approach used in this study tested the impact of a layperson health education program (LPHEP) on malaria control and prevention in Bondonya sub-location, Gusii-Kenya. In addition, this study assessed the relationship between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among the participants in the Gusii region.

Research Questions and Hypotheses

This study addressed two major research questions:

Research Question #1

Does a community education program on malaria have an impact on knowledge and associated behavioral change in managing malaria cases among study participants in the Gusii region of Kenya, Africa?

Null hypothesis #1

There is no significant difference ($P > .05$) between pre- and post-test scores on KAT measures pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region as a result of a community education program on malaria. Repeated measures one-way analysis of variance (ANOVA) was performed on pre-and post- test scores on KAT measures pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in the Gusii region, Kenya, Africa after a community education program on malaria (LPHEP).

Alternative hypothesis #1

There is a significant difference ($P<.05$) between pre- and post-test scores on KAT measures pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region as a result of a community education program on malaria. Repeated measures one-way ANOVA was performed on pre- and post-test scores on KAT measures pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region following a community education program on malaria (LPHEP).

Research Question #2

Is there a relationship between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in the Gusii region, Kenya, Africa?

Null hypothesis #2

There is no significant ($P > .05$) difference between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in the Gusii region, Kenya, Africa

Alternative hypothesis #2

There is a significant difference ($P < .05$) between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in the Gusii region, Kenya, Africa.

Chi-square and Cramer's *V* tests on MIS and KAT scores were utilized to assess whether relationships exist between socioeconomic variables or not (sources of drinking water, toilet facilities, electronic ownership, type of fuel, house floors, and transport means) and knowledge and associated behavioral change (malaria preventive measures including signs and symptoms of malaria, remedies to treat malaria outbreak in households) in managing malaria cases among study participants in Gusii region (outcome measures such as reporting when to go to a community clinic for treatment, buying other medications over the counter versus getting actual anti-malaria medications and correctly stated at least two signs and symptoms of malaria).

Theoretical Constructs

The major theoretical basis in this study was two-fold; namely: participatory model and social cognitive theory (SCT).

Participatory Model

The basic tenets of participatory theory hold that research should contain an action agenda for reform to occur. Such an action may change the lives of participants, the institutions in which they live and work, or even the researchers' lives (Elden & Chisholm, 1993). Participatory approach is an umbrella term for interactive methods that assist communities in developing a plan of action based on their priorities for change, and its intended result is the creation of multi-sectoral projects that generate real benefits and that include diverse coalitions and partnerships (Fals-Borda, 1992). Participatory school of thought began appearing in the scientific community back in the 1970s and had originated in countries in Latin America, Africa and Asia. The premise for action came from shared concern with persistent inequalities and the distribution of power and resources, and the processes that helped to keep dependency and

domination in place. Awareness of the feeling of helplessness in addressing poverty and oppression came to the forefront (CDC, 2010).

The participatory theory used in the present study followed the suggested steps as adapted from Susman (1983) in Figure 1. SCT is continuous just as the participatory model. The stages of action are not discrete but interdependent (Creswell, 2009). For example, problems associated with malaria infections and prevention are continuously assessed, diagnosed (identified), planned, implemented (action), evaluated, and solved by asking questions. The questions were: - What are the signs and symptoms of malaria? (Participants were required to name at least two). What levels of formal education are in your household? (None, primary school, secondary school, and some college school levels); do you feel your community clinic or hospital is sufficient for your region? Yes or no; are your government officials involved? These two questions attempted to measure attitudes prevailing in the region as far as health access and support to control malaria is concerned; what remedies do you use to treat malaria outbreak in your household:-Goes to hospital/community clinic for treatment within 24 hours, uses over-the-counter (OTC) medications from a shopping center, uses traditional herbs, uses traditional herbs, consults a traditional healer, prays about it, or does nothing. The rationale of asking those questions was to assess malaria knowledge level and preventive measures based on formal education level of the participants and their prevailing attitudes toward the management of malaria infections in Bondonya, Kenya, Africa.

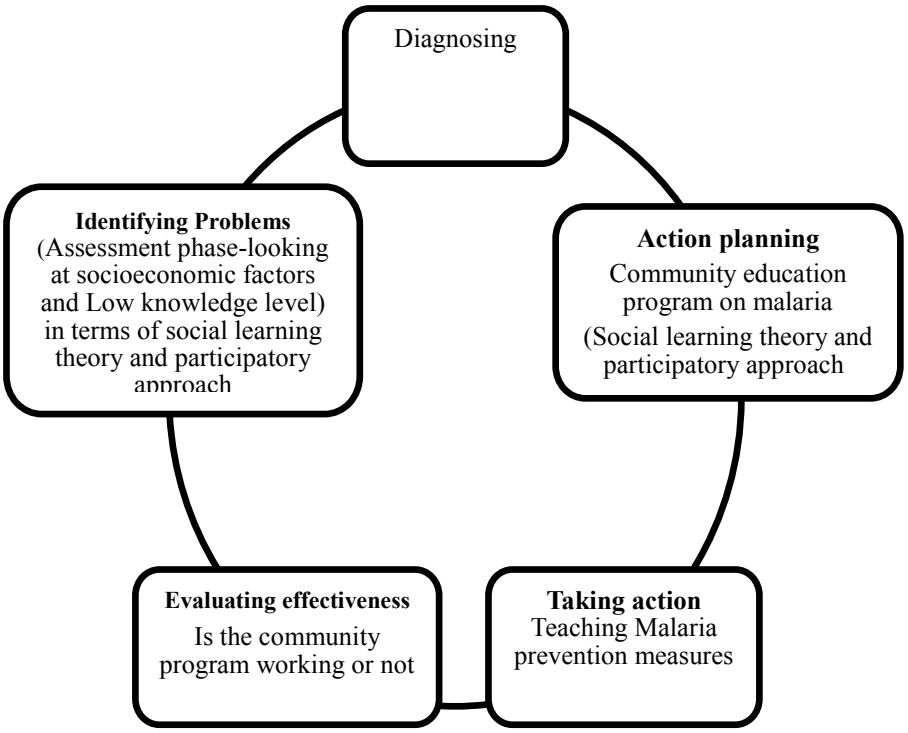

Figure 1. The role of socioeconomic status and knowledge levels on the participatory and social cognitive models (Arori, 2011, p. 8).

Social Cognitive Theory (SCT)

In the 1970s, Albert Bandura published a comprehensive framework for understanding human behavior, based on a cognitive formulation which he named the SCT. SCT construct postulated that people learn not only through their own experiences, but also by observing the actions of others and the results of those actions; and such actions followed a step-wise process according to Bandura, the proponent of the theory (Maibach & Parrott, 1995). The steps are pre-contemplation, contemplation, preparation, action, and maintenance (sustained change). In the pre-contemplation phase individuals assessed risk behaviors they were exposed to the associated outcomes; for example individuals knew that malaria is a problem but had not made a conscious

effort to address it. In order to tackle malaria in the present study, individuals needed to move to the contemplation stage where alternatives were assessed whether they needed to maintain the status quo or sought for alternatives to solve the problem. Seeking for the alternatives in solving malaria issue led the Gusii community participants to transition to the next stages of preparation and action. In the preparation and action stage, individuals were engaged in social reinforcement of new alternatives as were presented in the malaria training module, begun restructuring their environment, setting proximal goals to adapt to alternative behaviors which were to help in preventing and controlling malaria cases in the community. Finally, communities were geared to the last phase in SCT, which is maintenance, both entailing self-evaluative reinforcement of the new behaviors (taking anti-malaria medications, correctly hanging the bed nets, visiting a clinic within 24 hours when infected by malaria), and building self-efficacy to overcome setbacks, monitor progress, and extend goals. The theory was used in this study to show how malaria information was presented to participants; paying close attention to the stages of readiness (pre-contemplation, contemplation, preparation, action, and maintenance) to new ideas and how a community education program on malaria was implemented effectively. The paradigm in this study was continuous as depicted in Figure 2.

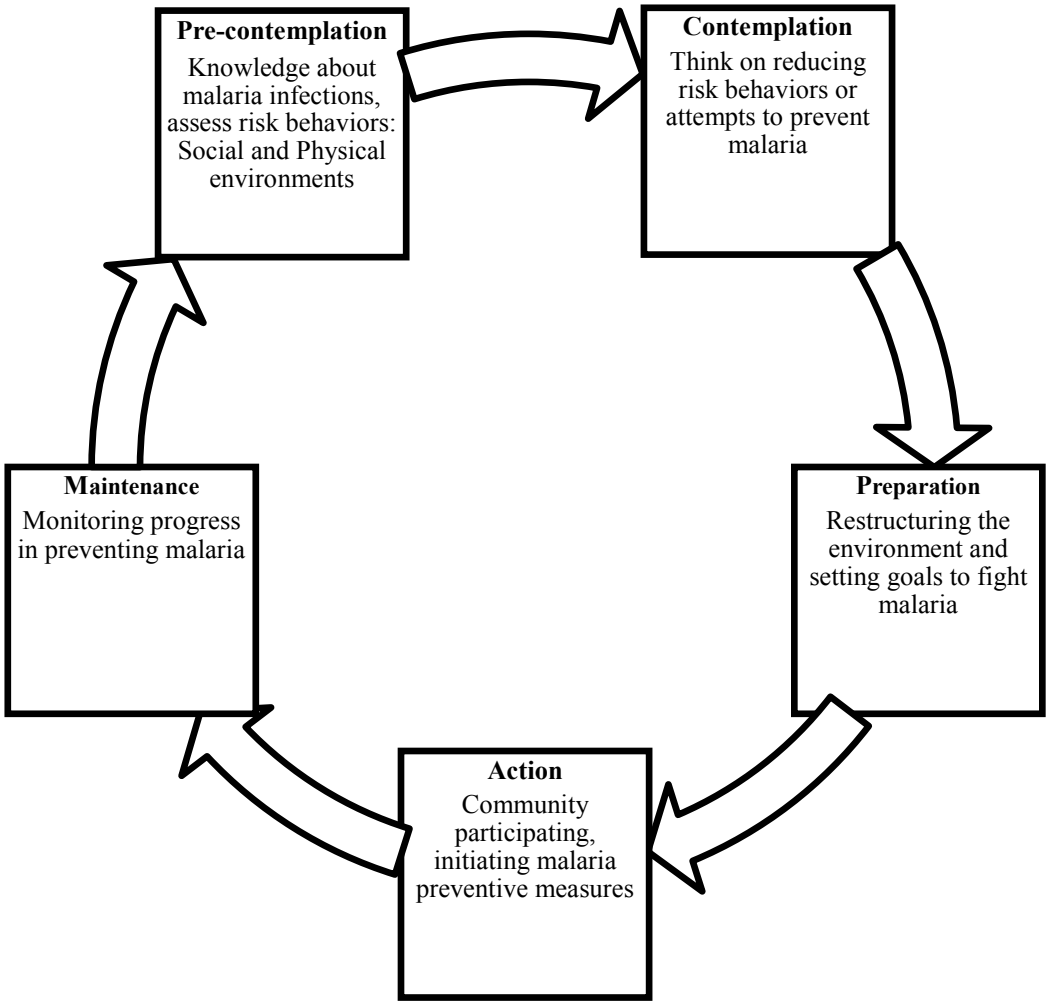

Figure 2. Behavior change occurs as a five stage process as shown in this diagram. The phases are stipulated in the transtheoretical construct which incorporates a cognitive approach (where the reciprocal determination of behavior, person and environment occurs) (Arori, 2011, p. 10).

SCT assumes that people and their environments interact continuously. It is important to recognize that SCT clearly addresses both the psychosocial (attitude, individual perceptions, social support, readiness, and SES) and cognitive variables that determine health behavior and strategies to promote behavior change (Abraham, Clifft, & Grabowski, 1999; Thuilliez et al., 2010). In social cognitive theory (SCT), human behavior is explained in terms of a three-way,

dynamic, reciprocal theory in which personal factors, environmental influences, and behavior continually interact (Abraham, Clifft, & Grabowski, 1999; Thuilliez et al., 2010). A basic premise of SCT is that people learn not only through their own experiences, but also by observing the actions of others as depicted in a participatory theoretical construct (Minkel, 2010) and the results of those actions.

Other schools of thought related to participatory approach and cognitive social theories are theory of planned behavior and health belief model. These theories were not used in this study, but were mentioned on how they could be used in future research to build on the current investigation. A study conducted in 1999 found that cognition measures specified by the theory of planned behavior and the health belief model could distinguish between participants who comply with malaria prevention measures and those who do not (Abraham et al., 1999). Based on the administration of a brief questionnaire on the day of departure from the malaria region and reports of adherence that were collected between 5 and 7 weeks later, indicated those participants who planned well before they travelled, had a positive outcome in terms of malaria infections (Abraham et al., 1999). Abraham et al. (1999) utilized longitudinal samples of UK tourists returning from the Gambia region in the cited study. The sample comprised of106 mefloquine users and 61 chloroquine and proguanil users. Finding showed that 22.5% of mefloquine users and 31% of chloroquine and proguanil users reported adherence for 3 weeks or less. By using the theory of planned behavior approximately 50% of the variance in reported adherence amongst mefloquine users and 40% amongst chloroquine and proguanil users, compared favorably with other published applications of the theory. Findings suggest that utilizing cognitive centered theories could shed lights on the reasons why there are higher cases of malaria in sub Saharan Africa. The community education program on malaria utilized in this study

incorporated SCT paradigm to capture individual independent variables (traditional beliefs and practices).

Definitions of Terms

The following terms and phrases are defined as used in this study.

Knowledge level is defined as not able or being in the position to name at least two causes of malaria, inability or ability to demonstrate the correct way of hanging bed nets, willingness to seek therapy in a hospital or a community clinic when infected by malaria, using traditional practices to treat malaria, and not able/or ability to read and write (Dinho, Van der Merwe, & Ehlers, 2009; Dike, Onwujekwe, Ojukwu, Ikeme, Uzochukwu, & Shu, 2006).

Socioeconomic status is defined as the person's work experience, or family's economic and social position relative to others based on education, income, occupation and wealth attainment in terms of age, marital status, family size, religion, and education, possession of bed nets, availability of running water, shower or flush toilet, ownership of radio, television, car, bicycle, refrigerator, freezer, and type of house, and size of land (Amuyunzu-Nyamongo, 2010; Castillo-Riquelme et al., 2008; WHO, 2009).

Attitudes is defined as a state of mind that exists within an individual only to be quantified in this study as making an effort to go to a clinic to seek therapy for malaria treatment which previously was not there or common in individuals under the present study ((Nsimba & Kayombo, 2008).

Traditional practices is defined as use of herbs, herbal materials, herbal preparations, and finished herbal products that contain parts of plants or other plant materials as active ingredients

to treat malaria and beliefs that malaria is associated with spiritual realm (Ahorlu, Koram, & Weiss, 2007; Nguta et al., 2010).

Community education program on malaria: This program is defined as teaching the indigenous populations on malaria diagnosis and effective treatment regimen as proven by scientific investigations. This includes dispelling myths on pseudo medicines whose efficacy is not well evaluated and documented in science (Williams et al., 2009).

Change of behavior is defined as the correct use of insecticide treated bed nets (ITNs), using the right medications for malaria, use of mosquito repellents, sanitation, anti-malaria drugs, anti-malaria community health programs and being able to seek therapy in clinics within 24 hours when an individual is infected with malaria, and attending anti-malaria community health programs (in schools, churches, mosques, ethnic meetings) (Suh, Kain, & Keystone, 2004; Abraham et al., 1999; Ahorlu, Koram, & Weiss, 2007).

Assumptions

Several assumptions were made in this study. First, I assumed that there is a common reality on which participants could agree on, irrespective of knowledge and socioeconomic levels. For example, the idea that healthy living is vital and individuals will strive at their best to improve and sustain it should be universal to all participants. Consequently, participants in this study sought treatment which protected them from malaria infections irrespective of their cultural, religious, and political affiliations, gender, Education, or socioeconomic status. I also assumed that data collection and observation in the rural area would result in an accurate assessment status on campaigns pertaining to malaria control and prevention in Gusii District. Overall, the

data could be translated into quantifiable diagrams or charts to warrant accuracy and project ability of the findings to the population under investigation; with the hope that public health professionals would utilize the information generated to advance evidence-based practice. It was assumed that participants answered questions truthfully and were willing to participate in the study through the end of it.

Limitations

Some limitations in this study were: A small sample participated in the investigation; there was the concept of human variation which had shallow differences and acted as mediating factors which were beyond control, for example subconscious reactions toward the study by participants and interviewers. Participants changed over time and affected the outcome of the study to some extent, particularly during the post-test time due to maturation factors. Lack of a control group was also a limitation in the sense that there was no comparison group to evaluate other environmental factors. Additionally, while other researchers in the past used only heads-of-households, in this dissertation, I used any member of the household because of the cultural context. This may have allowed better response rate but could also have affected the answers to research questions.

Delimitations

This study utilized a quantitative, cross-sectional, pre/post test design. The study was delimited to socioeconomic status, knowledge level, and a community education program as related to malaria in rural Africa. All variables, participants, and conditions not addressed in the present study were considered beyond the scope of investigation. As such, the ultimate impact

of the study, which includes reduced transmission, lower incidence, and lower mortality associated with malaria infections, were not assessed.

Significance of the Study

Research continues to show that malaria kills more that 1 million children around the world and 90% of those deaths are in Africa (Smith, Dushoff, snow, & Hay, 2005). Studies indicated that 35 countries (30 in sub Saharan Africa and 5 in Asia) account for 98% of global malaria deaths (CDC, 2010). However, malaria is treatable and preventable (Williams et al. 2009). The problem with such current malaria treatment and preventable measures methods is the way they are implemented to control malaria, particularly; in rural Africa. For example, traditional therapies used to treat malaria in Kenya are poorly documented or lack objective efficacy and safety evaluation protocols (Nguta et al., 2010). These are some of the gaps which this investigation attempted to fill. First, the study demonstrated that not knowing the right treatment modalities on malaria control and prevention could continue showing high mortality rates in sub Saharan Africa associated with malaria. The community education program on malaria dispelled several myths which exist about the causes and treatment of malaria across the continent of Africa (Okeke & Okafor, 2008). To address such unfounded fears the study attempted to understand the indigenous viewpoints about malaria while in their natural habitat through a structured questionnaire. To the local populations such perceptions about malaria are psychologically real and were to be recognized and addressed as such. At the same time, attitudes and perceptions were considered to look for ways to implement community education programs in a participatory approach, for example by offering treatment arms to change mythical

thinking about causes of malaria-evil spirit induced, sun, heat, fire, and witchcraft (Dike, Onwujekwe, Ojukwu, Ikeme, Uzochukwu, & Shu, 2006; Williams et al., 2009).

There was also a need for evidence-based interventions at reducing the inequities associated with access to effective malaria prevention and control in sub Saharan Africa. But low socioeconomic status impedes productive malaria prevention programs. Literature showed that malaria is the disease of the low socioeconomic status particularly; in the rural areas, sub Saharan Africa (Worral, Basu, & Hanson, 2002; Kaler, 2008). Consequently, many individuals within communities in rural Africa are in a low socioeconomic status level and not able in most cases to afford the necessities of life. Low socioeconomic status in this study was measured in terms of assets and education, income and expenditure, occupation, location and housing type, gender, and hospital facilities individuals attend. Although the concept of social burden cannot be quantified in the realm of biomedical model, it can be assessed on how the communities utilize their cultural beliefs, meager resources, education, and other socioeconomic indices to address and prevent malaria. Social variables had to be considered in this study to design a practical and effective sustainable health program which would be a better match with the local resources. Behavior of individuals is influenced by specific social identity. Social identity is proscribed by many factors such as sex, age, socioeconomic status, class, ethnicity, and even political affiliation (Breman, Alilio, & Mills, 2004). That said most communities in rural Africa lack the economic power to afford malaria prevention tools such as bed nets or anti-malaria medications.

Social Change Implications

The findings of this study will have important implications for many stakeholders including the indigenous people themselves, hospital institutions, local health clinics, and

District hospitals, the Ministry of Health, non-governmental international agencies, and policy-makers in Kenya. The malaria endemic claims a lot of young children's lives under the age of 5 and expectant mothers (CDC, 2010; Sharma, 2009). Such malaria related morbidity and mortality affects many innocent lives in rural Africa. Malaria is a major problem that deserves attention. The results of this study show that the efficacy of a community participatory approach could be used by public health professionals to advocate change in malaria prevention and control measures. The results of this study show the efficacy of the potential use by public health professionals of a community participatory approach to advocate change in malaria prevention and control measures. The results from this investigation will advocate for change to have an impact on intermediate effect; a result that will be utilized to reduce malaria transmission and lower incidence cases in the Gusii region of Kenya, Africa.

Summary

Chapter 1 introduced major components of the present study such as background, problem statement, nature of the study, assumptions, limitations, delimitations, significance of the study, and implications for positive social change.

Chapter 2 will present an extensive literature review of malaria in terms of its origins, causes, and pathophysiology, as well as the epidemiology of malaria globally, in sub Saharan Africa, and in Kenya, the site for this study. Risk factors associated with malaria infections will be discussed to demonstrate the dilemma present in rural continental Africa pertaining to the treatment and prevention of malaria. Additionally, community programs such as the treatment, control, and prevention of malaria are addressed, described, and evaluated as the foundational framework

After the literature review, chapter 3 will detail the research design and approach used in this investigation. Sample selection, instruments, data collection, and statistical analyses are addressed.

Chapter 4 will present the data and the results of the statistical analyses that were conducted and computed in this study. The chapter describes individuals and research tools utilized in the present study (MIS, KAT, and LPHEP). In addition, the chapter describes the background characteristics of participants. Research questions, hypotheses, data analyses, interpretation and explanations are presented in descriptive, analyses of variance, and contingency Tables. Findings are addressed and outcomes are logically and systematically summarized and interpreted as related to research questions and hypotheses posed.

Finally, chapter 5 will describe an overview of why and how this study was conducted by reviewing the questions and hypotheses that were addressed, in conjunction with the theoretical constructs used. A detailed interpretation of the findings will be addressed as well. Additionally, the implication for social change, recommendations for action and further studies, and concluding remarks are succinctly presented.

Chapter 2: Literature Review

Introduction

This study addressed gaps in literature regarding the relationship between socioeconomic factors, knowledge level, attitudes, traditional practices and malaria prevention in sub Saharan Africa. In addition, an understanding on the level of awareness and knowledge of the indegenous populations regarding malaria prevention in rural Africa is needed to effectively manage malaria in the region. There is another gap in literature about the evaluation of preventive measures used to control malaria in rural Africa. A participatory approach and the SCT provided a framework for understanding proactive strategies in combating malaria in sub Saharan Africa. The first part of this chapter describes what causes malaria. The section is followed by information on the research variables which were analyzed in the study. The main body of the review is organized in a discussion of research involving the pathophysiology of malaria, overview of malaria epidemiology globally, in sub Saharan Africa, and in Kenya, malaria treatment, control, and preventive measures. The review of vulnerable populations in rural sub Saharan Africa reveals a gap in the literature for the study population. Lastly, the use of cross-sectional and quantitative methodology from the studies reviewed is summarized.

The literature search was conducted using several databases: Walden University Data Base on CINAHL, MEDLINE, Health Sciences: A Sage Full-Text Collection, Nursing and Allied Health Source, CDC, World Health Organization, Kenya Medical Research Institute, and Pub Med for literature dating from 2000 to 2010, unless earlier studies were needed for clarity, or newer research was not available. The literature review conducted focused on authoritative databases and peer-reviewed journals. The search terms used were *history of malaria*,

pathophysiology of malaria, *malaria causative agent*, *overview of malaria epidemiology* (global, sub Saharan Africa, Kenya), malaria sub Saharan Africa, malaria in rural Africa, malaria risk factors, socioeconomic status and malaria, education and malaria, prevention and control of malaria in sub Saharan Africa, community education program on malaria in rural Africa, barriers to malaria prevention in sub Saharan Africa, malaria surveillance, Kenya. The most relevant articles from each of the specified terms utilized in the search were selected.

Causes of Malaria

Malaria is defined as

> "a mosquito-borne, climate sensitive disease caused by the parasite *Plasmodium*. It causes fever, chills and other flu-like symptoms and is responsible for over one million deaths worldwide each year, most of them children under 5 years old in sub Saharan Africa" (EPA,2010, p.1).

In another article reviewed, the word mal'aria with an apostrophe started appearing in the annals of Italian literature signifying mala "*bad*" and *aria* "*air*" (Cox, 2010). Consequently, the disease was understood during this time as bad air from stagnant water on the ground (Dutta, 2009). The word malaria without an apostrophe was first coined by Horace Walpole in 1740 (Ferreira et al., 2007) Even then, Horace associated the disease with bad air and called it "*horrid thing* called *mal'aria* that comes to Rome every summer and kills one" (Farrell, 1942, p. 345). By the 20th century *malaria* was often called "*Jungle fever*, *Marsh fever*, *Parudal fever*, or *swamp fever* (RBM, 2010). Evidently, *malaria* causative agent had not been understood and identified fully in the early parts of the 20th century (Zetterstrom, 2007).

Researchers such as Ghosh and Jacobs-Lorena (2003) have shown that malaria is a devastating disease that kills approximately 1 to 2 million people annually and 90% of those

mortality cases are in Africa. Brehelin et al. (2010) and Seixas et al. (2009) eluded that *Plasmodium falciparum species* among the many mosquito types is the causative agent of severe malaria. According to Merrick et al. (2010) and Diou et al. (2009 for malaria to occur, there must be a complete complex developmental cycle in its mosquito vector. Thus, the mosquito is a potential target for disease control. Dinglasan et al. (2009) reported that *Plasmodium ookinetes*, which develop within the mosquito midgut, must first cross the peritrophic matrix (PM) in the midgut, a thick extracellular sheath that completely, surrounds the blood meal. The PM poses a partial, natural barrier against parasite invasion of the midgut and it is speculated in scientific studies that modifications to the PM may lead to a complete barrier to infection. However, such strategies require thorough characterization of the structure of the PM.

Leiby, Nguyen and Notari (2008) reported different ways that humans can be exposed to malaria other than through the primary agent (mosquito bite). Blood from human donors who have been in endemic areas appear to be contaminated with the malaria parasite. Also, according to Sutherland et al. (2010), malaria in humans is caused by an *apicomplexan* parasites belonging to five species of the genus *Plasmodium*. Infections with *Plasmodium ovale* are widely distributed but rarely investigated, and the resulting burden of disease is not known. This type of dimorphism, based on research, in defined genes has led to *P. ovale* parasites being divided into classic and variant types. Sutherland et al. (2010) hypothesized in their study that these dimorphs represent distinct parasite species and in their multi-locus sequence analysis of six genetic characters to be among 55 isolates from 12 African and three Asia-Pacific countries.

Studies reviewed showed that malaria is widespread in sub Saharan Africa than in many other parts of the world and the disease continues to kill millions of children under 5 years old (CDC, 2010; Nsimba & Kayombo, 2008). Often times the indigenous populations in rural Africa

do not fully understand the deaths behind their young children. Malaria infections and associated mortalities are usually caused by a female mosquito (Carey, Wang, Su, Zwiebel & Carlson, 2010). But such information or knowledge about malaria infections and how it could be controlled and treated are poorly understood in sub Saharan Africa, particularly among people of low socioeconomic status (Bousema et al., 2010).

Sabbatani et al. (2010) reported four *Plasmodium* species identified as the cause of the deadly malaria: *P. vivax, P. falciparum, P. ovale* and *P. malariae*. Of these four *Plasmodium* species, *P. falciparum* is the most deadly. Researchers have shown that the species identified is very common in many parts of Africa. Although recent studies have identified *P. falciparum* as the species that causes deadly malaria in Africa, subsequent literature reviewed indicated that malaria has been around the world and particularly in Africa for many centuries (Nerlich, Schraut, Ditthigh, Jelinek, & Zink, 2008; Sabbatani, Manfredi, & Fiorino, 2010; Weiyuan, 2009).

With the advent of modern science, malaria had to be defined in scientific terms and myths about its causes had to be dispelled, such as the idea that the disease is linked with poisonous vapors of swamps or stagnant water on the ground (Cox, 2010). The disease has often been quoted in literature (RBM, 2010) as having had massive deadly destruction to war personnel than the weapons themselves. Economic wellbeing of nations around the world has been negatively affected due to malaria outbreaks.

Literature reviewed indicates different schools of thought as to why malaria remains an issue of concern that claims millions of lives of young children in Africa. Human growth and migrations, climate change, and agricultural changes appear and remain to have influenced the spread of the parasite across sub Saharan Africa according to past and present research reviewed.

However, in this study, population growth, climate issues, and agricultural changes were not addressed. But socioeconomic factors, knowledge level, traditional practices and beliefs were discussed extensively as the research foundations for this present study.

Pathophysiology

Although the principle of pathophysiology would be complex to be understood to some readers of this study, it is important to give an overview in this section in very simple and clear terms on how malaria is caused in humans. This section was followed by a detailed scientific explanation on how the infection process works. White et al. (2011) and Ototo et al. (2009) indicated that a mosquito bites and injects a foreign substance to a person; then the substance multiplies in the human body and interrupts the way the body works. As a result, the body sends signals to the brain to trigger bodily responses to fight the foreign or strange substance in the body. In the process, the person infected start experiencing chills, fevers, nausea and vomiting, and is not able to eat or drink. This infection process occurs in approximately 24 hours and follows what is called in literature the *chain of infection* (Schaffner, Drotman, & Ooi, 2005): (infectious agent-parasitic substance, reservoir-ponds, rivers, broken pots, human body, port of exit-a bite by the mosquito, mode of transmission- mosquito, human beings, port of entry-mosquito bites and breaks into the skin of an individual, susceptible host-human being.

Schaffner, Drotman, and Ooi (2005) reported that the mosquito bites an individual and injects the parasite into the blood stream called the single-celled *Plasmodium* parasite, which spends its life cycle both in humans and mosquitoes and the individual bitten is infected with the parasite. A female Anopheles mosquito bites and injects *sporozoites* into the bloodstream then the *Plasmodium* is transmitted to humans and circulates in the circulatory system until it reaches

the liver. While in the liver each *sporozoite* undergoes asexual reproduction, or pre-erythrocytic *schizogony*, maturing into *schizonts*, which rupture and release merozoites. The *merozoites* are released from the liver to the blood where they are taken up by the red blood cells (RBCs), in the so-called blood stage. The *Merozoites* are converted into *trophozoite* by the splitting process. The split form *erythrocytic schizonts.* The splitting causes the RBCs to burette, releasing more *merozoites.* This release coincides with the symptomatic steep fever of malaria. Some newly released *merozoites* go on to infect other RBCs, some reinfect the liver, and some develop into men and female gametocytes. When another Anopheles bites the infected human, it ingests the gametocytes. They mature in the mosquito's gut and undergo sporogony, or sexual reproduction, forming a zygote. After 10 to 18 days, the zygote multiplies into sporozoites, which travel to the mosquito's salivary glands.

In order for a program to be designed and implemented to address infectious diseases such as malaria the pathophysiology factor should be understood. According to McPhee & Hammer (2010) the term which describes the malfunction of animal physiology (function) is pathophysiology. Ever since eons of time, wise physicians and other experts concerned with the sick and their care have realized that most human diseases may be understood in a real sense as maladaptive physiology (pathophysiology). Such malfunctions come in the form of mutation in a gene or invasion by a virus, fungi, or bacterial organism and trigger an illness. The body would react with molecular, cellular, and systemic responses that are the symptoms and signs of the disease. Consequently, with proper knowledge of normal structure and function, and the ways in which these can become mutated, comes the ability to understand disease and to design rational and effective treatment. It is also important to note that of course, the relationship between pathophysiology and disease is a two-way street. With emergence of diseases program

designers are able to uncover the previously unknown or unappreciated bodily functional mechanisms, and the investigation of these physiologic mechanisms in normal individuals advances our fundamental public health care knowledge. What follows now, is a detailed discussion on how malaria has continued to spread worldwide.

Malaria Epidemiology

According to Friis and Sellers (2004) epidemiology is derived from epidemic, a term that provides immediate clue to its subject matter. Friis and Sellers (2004) postulated that epidemiology is concerned with the distribution and determinants of health and diseases, morbidity, mortality, injuries, and disability in populations. Literature reviewed reported global health disparities pertaining to malaria endemicity (Snow et al., 2010; Nonvignon et al., 2010). Most of malaria cases are concentrated within the tropics (CDC, 2010). That raises the questions about the prevalence rates of malaria around the globe.

Global and Africa

Several studies (Zetterstrom, 2007; Prothero, 2001) indicate that human slavery and migration made it possible for the mosquito parasite to be spread across the globe with deadly consequences. At the time of colonization of the so called new lands (South America, India, Africa to mention but a few) the parasite took advantage of the new visitors and killed thousands of them. The colonizers wives were even advised to marry different men after their husbands had left for fear that they would die in the new lands. According to Cirillo (2011), science was at its infancy stage and had not developed means of identifying the parasitic killer. Cirillo (2011) showed that it was not until the early parts of the 19th century that treatment of malaria had begun to have an impact on the disease process. Literature showed that by the 1950s malaria

almost disappeared from North America and from almost all of Europe whereas deaths due to malaria continued to be seen in Africa (CDC, 2010). This study is meant to identify and evaluate ways and means to treat and control this preventable disease in Africa. Malaria is one disease that is ripe for deliberate control. The notable Nobel Prize winner on malaria, Ronald Ross (Dutta, 2009) passionately believed that with determination, public understanding of science, and evidence-based practice, a disease like malaria could be prevented wherever it could be found.

Epidemiological evidence show that malaria has been in the world for millions of years. The World Malaria Report in 2005 (CDC, 2005), tallied the global incidence rate at between 350 million and 500 million new cases of malaria per year. Although the report downgrades that figure to 247 million, malaria continues to be a major problem. Likewise, where the report claimed that the disease kills "more than 1 million" people each year, the 2008 update, which was based on 2006 data, suggested that the figure was closer to 800,000 more than anticipated (WHO, 2008). Watts (2008) reported that malaria is a major public health threat that has plagued Africa since 1960s, irrespective of the efforts that have developed over time to prevent and treat it. Studies showed that the most vulnerable individuals are those with no or little immunity against the disease (Moxon et al., 2011; Nonvignon et al., 2010). Research reviewed showed that areas with high malaria transmission are in Africa, south of the Sahara (Midzi et al., 2011; CDC, 2010). CDC (2010) reported that young children younger than 5 years, who have not yet developed partial immunity to malaria, expectant mothers whose immunity is decreased due to pregnancy, especially during the first and second pregnancies, and lastly, travelers, displaced villagers or migrants coming from areas with little or no malaria transmission are subject to malaria infections due to lack of either natural immunity or artificial immunity to mosquito parasite.

Hay et al. (2010) reported 451 million clinical cases of malaria globally and that morbidity associated with malaria occurred in areas of stable transmission such as in India, Nigeria, Republic of Congo, and Burma. An estimated 1.405 billion people are at risk of malaria (Hay et al., 2010). The Centers for Disease Control and Prevention (CDC, 2010) reported that malaria occurs in low socioeconomic status, tropical and subtropical areas of the world more than in non-tropical areas. Figure 4 shows the areas where malaria is endemic.

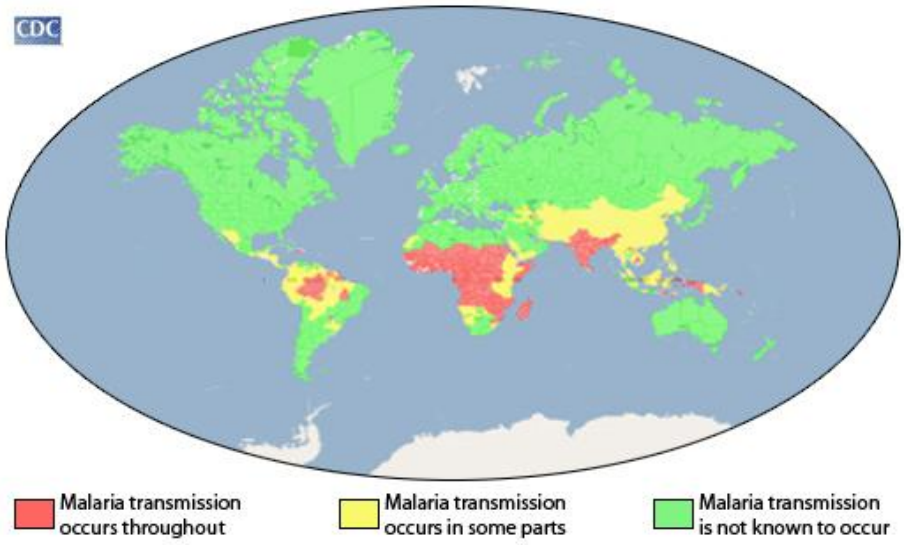

Figure 3. Global malaria transmission zones as shown by Centers for Disease Control and Prevention (CDC, 2010).

The most recent figures from the Centers for Disease Control and Prevention (CDC, 2010) are:

- 3.3 billion people (half the world's population) live in areas at risk of malaria transmission in 109 countries and territories.

- 35 countries (30 in sub Saharan Africa and 5 in Asia) account for 98% of global malaria deaths.
- In 2008, malaria caused an estimated 190 - 311 million clinical episodes, and 708,000 - 1,003,000 deaths.
- 89% of the malaria deaths worldwide occur in Africa.
- Malaria is the 5th cause of death from infectious diseases worldwide (after respiratory infections, HIV/AIDS, diarrheal diseases, and tuberculosis) in low-income countries.
- Malaria is the 2nd leading cause of death from infectious diseases in Africa, after HIV/AIDS.

As those numbers above depict, malaria is endemic in Africa. Schofield (2007) reported that malaria infects 5 – 10% of humanity and causes around 2 million deaths annually, mostly children. In some parts of East Africa it is almost impossible to tackle malaria endemic (Siringi 2002; Nature 2006). Even with the introduction of anti-malaria drugs, the parasite continues to be resistant to such treatment regimens according to Bjorkman (2005).

Climatic conditions have made the effort to fight malaria epidemic somehow difficult (Thomson, Doblas-Reyes, Mason, Hagedorn, Connor, Phindela, Morse, & Palmer, 2006). The high numbers on clinical malaria transmission have been reported to be due to global warming as reported by Gething et al. (2010) and Parham et al. (2010). In Kenya, for example, William (2010) reported that malaria is increasing at higher altitudes due to global warming. Researchers (Parham et al., 2010) have continued to show that malaria emergency, extinction, and transmission is directly proportional to global temperature changes. Paaijmans et al. (2010)

reported that compared with rates at equivalent constant mean temperatures, temperature fluctuation around low mean temperatures acts to speed up mosquito rate processes; whereas fluctuation around high mean temperatures acts to slow processes down; and at the extremes fluctuation, it makes transmission possible at lower mean temperatures than currently predicted and can potentially block transmission at higher mean temperatures. Woub (1997) reported on the issue of ethnic wars which forces many individuals in some parts of Africa to be resettled in new geographical locations thus exposing them to the dangerous mosquito.

The good news, however, is that the conditions of malaria in Africa are improving based on Malaria World Report (2006). But still the continent has a long way to go because most government agencies continue to fabricate false reports as in the case of Angola in 2009; the United States of America was involved to help in the eradication of malaria but to no avail (Somandjinga, Lluberas, & Jobin, 2009). In the Angolan case, faulty reports were submitted to coordinators in charge of the health promotion project at the end of the program. The reports were verified to be false. For example, mosquito insecticide sprays were not even given to communities to use; which would have benefited from the program. This study was conducted in a rural area in Kenya to investigate the efficacy of malaria programs which could possibly be in place but could somehow be ineffective. And at the same time a new program was designed and implemented to address malaria endemic in the region and then evaluated its efficacy after 1-2 months. Kenya is among the countries which use large multistage cluster sample surveys to monitor malaria outcome indicators on a national level. Research showed (Biedron et al., 2010) that these surveys often mask local-level variability important to effective anti-malaria program management. Conducting small local surveys could play a valuable role for local-level program on monitoring and evaluation strategies. If these small surveys like the one in this study could be

incorporated into these larger surveys, it would provide a comprehensive monitoring and evaluation plan at little, if any, extra cost.

Also important to note is the influence of cormorbid diseases. Human immunodeficiency virus (HIV) and malaria are among the leading causes of morbidity and mortality during pregnancy in sub Saharan Africa. Oyibo and Agomo (2009) postulates that HIV pandemic has been superimposed on the longstanding malaria pandemic, where *P. falciparum* malaria is consistently one of the major causes of infant and child mortality. In their study, Oyibo and Agomo (2009) showed that high prevalence of both HIV and malaria infection in Africa is an indication that interactions between the two could have substantial effects on populations (one million pregnancies per annum are thought to be complicated by co- infection with malaria and HIV in sub Saharan Africa).

Malaria in Kenya

In Kenya, particularly in the lake region (Lake Victoria), Wandiga (2006) reported that there are lower cases of malaria than in the western highlands which are in danger of malaria due to climate fluctuations. This study was conducted in the Gusii highlands which is a zone within a higher density of malaria cases. The Assessment of Impacts and Adaptations to Climate Change report (AIACC, 2006) shows that malaria deprives Africa of US$ 12 billion every year in lost Gross Domestic Product (GDP). In Kenya, 40,000 infants' deaths are attributed to malaria every year. In 2002 and 2003 in Uganda, there were 5.7 and 7.1 million cases of malaria cases resulting in 6,735 and 8,500 adult and children mortality and in Tanzania, malaria causes between 70,000 and 125,000 deaths annually, and accounts for 19% of the health expenditure as reported by De

Savigny et al. (2004). Thus in the East African countries malaria is ranked as the first cause of morbidity and mortality in both children and adults.

Malaria Risk Factors

Studies (Bousema et al., 2010) have shown that the risks of malaria within populations are frequently described in research, but it is poorly understood. In this study, five major risk factors associated with the spread of malaria are discussed; namely socioeconomic status (Amuyunzu-Nyamongo, 2010), knowledge level (Dinho, Van der Merwe, & Ehlers, 2009), traditional beliefs (Nsimba & Kayombo, 2008), environmental determinants (Yé, Hoshen, Kyobutungi, Louis, & Sauerborn, 2009), and lack of health access (Williams, Martina, Cumming, & Hall, 2009).

Literature reviewed showed that socioeconomic factors, knowledge level, traditional practices and beliefs variables influence prevalence and management of malaria in sub Saharan region (Okeke & Okafor, 2008). However, Mensah and Kumaranayake (2004) report that these variables are even less understood among people of low socioeconomic status. Dependent variables identified included behavioral indicators such as individuals seeking treatment in community clinics, stopping the use of traditional herbs, clearing bushes, accepting insecticide house sprays, engaging in community campaigns to control and prevent malaria, attending information sessions on malaria preventive measures, using bed nets correctly, and taking anti-malaria medications as recommended by their local authorities. Long-term indicators which studies identified were decreased mortality and morbidity rates, improved health, and economic outcomes. There is a need for evidence-based interventions at reducing the inequities in access to effective prevention and treatment of malaria in sub Saharan Africa. But low socioeconomic

status impedes communities to participate in malaria prevention programs. Worral, Basu, & Hanson (2002) and Kaler (2008) reported that malaria is the diseases of the poor, particularly, in the rural areas, sub Saharan Africa. Consequently, many individuals within communities in rural Africa are economically poor and not able in most cases to afford the necessities of life. Low socioeconomic status is measured in terms of assets and education, income and expenditure, occupation, location and housing type, gender, and hospital facilities individuals attend. Although the concept of social burden cannot be quantified in the realm of biomedical model, but it (social burden) can be assessed on how the communities utilize their cultural beliefs, meager resources, education, and other socioeconomic indices to address and prevent malaria. Once social variables are understood, maybe community health-based Education programs could be designed to yield positive social change. Breman, Alilio, and Mills (2004) showed that the behavior of individuals is influenced by particular social identity and social identity is proscribed by many factors such as sex, age, socioeconomic status, class, ethnicity, and even political affiliation. That said most communities in rural Africa lack the economic power to afford malaria prevention tools such as bed nets.

Knowledge level about malaria infections and prevention is yet another major risk factor in rural Africa. Most parents in sub Saharan Africa opt to buy over the counter medications, such as aspirin, to treat malaria and some of the parents buy anti-malaria drugs over the counter without verifying whether their loved ones are infected with malaria or not (Nsimba & Rimoy, 2005). There are even in some other cases where malaria infections are associated with voodoo or witchcraft, and that the sun rays cause malaria and hence indigenous populations seek traditional therapies for treatment (Okeke & Okafor, 2008). There is an association between education level and malaria prevalence in Africa (Dike, Onwujekwe, Ojukwu, Ikeme,

Uzochukwu, & Shu, 2006). Knowledge about malaria as a disease process can decrease morbidity and mortality rates in sub Saharan Africa (Dike et al., 2006). My research used a participatory research model to engage Gusii people in Kenya to be able to identify accurate information on the causes, signs, and symptoms of malaria and associated objective treatment regimen for the disease. My assumptions are that such informative choices about malaria will save time, money, and ultimately improve the quality of life in rural Africa. Next, research variables discussed are addressed in detail.

Research Variables

Literature reviewed showed that socioeconomic factors, knowledge level, traditional practices and beliefs variables influence prevalence and management of malaria in sub Saharan region.

Socioeconomic Factors

Livelihood of the human race depends on the availability of socioeconomic factors such as social support, education, financial/bartering resources, farming, shelter, clothing, knowledge and safety. Sharma (2009) showed that many persons around the world and particularly in Africa continue to struggle between the balance of providing their daily basic necessities and engaging in the management of malaria outbreaks. Political instabilities, ethnic clashes, and the most recent population growth, have made the meager resources much worse. Literature reviewed indicated a reciprocal relationship between socioeconomic well-being of individuals and the ability to pay for malaria preventive tools such as insecticide-treated nets (ITNS) (Snow et al., 2010 and Sicuri et al., 2010)

Mensah & Kumaranayake (2004) reported that there is little understanding of the relative importance of economic factors that contribute to people acquiring malaria. In their study (Mensah & Kumaranayake, 2004) it was found that predisposing characteristics of the household head such as age, knowledge of malaria, education, and the size of the household significantly have an impact on the incidence of malaria according to the economic theory. Reducing cases of clinical malaria in Gusii region and other parts of sub Saharan Africa may need public health and clinical educator professionals to incorporate socioeconomic factors in order to produce positive outcomes (decreased malaria mortality and morbidity rates). Malaria prevalence information in Gusii region was addressed via MIS and KAT survey instruments (see Appendix B and Appendix D, respectively) as investigated in this study, in order to provide current information on the level of need. Surveys have been instrumental in extracting data to assist in formulating policies to address malaria in continental Africa. Mustafa et al. (2007) reported how critical it is to pay attention to economic activities of people when malaria cases are addressed. In a study of a sample of 317 participants in rural Africa Mustafa et al. (2007) reported that individuals who were economically active in the public and private sectors reported the lowest incidences of malaria. For example of the 317 participants surveyed, findings showed fewer cases of clinical malaria for: government employees (4.3%), private employees (2.4%), public sector workers (1.2%), active farmers (0.6%), self employed (6.1%) and casual laborers (3.4%). For those who were economically inactive the following results were reported: housewives (24.2%), unemployed (11%), students (28.1%), and pre-school children (17.7%). The study indicated that 57.2% of malaria episodes occurred among women overall compared with 42.8 % among men. There seems to be a correlation between economic indicators and malaria prevalence. It

appeared that housewives and children were more affected by malaria due to economic reasons or unknown phenomena which the present study attempted to investigate.

Economic factors influenced health- seeking behaviors as well (Kamat, 2006). Individuals who do not have a job or source of income attempted to use different means to treat malaria. With meager resources financially, the indigenous populations of Africa are reluctant to buy anti-malaria drugs, bed nets, and go to the hospitals for treatments; instead, they stay home and engage in extended home-based treatment.

Knowledge Level

Knowledge level within indigenous populations in rural Africa is defined as not able or being in the position to name at least two causes of malaria, inability or ability to demonstrate the correct way of hanging bed nets, willingness to seek therapy in a hospital or a community clinic when infected by malaria, using traditional practices to treat malaria, and not able/or ability to read and write (Dinho, Van der Merwe, & Ehlers, 2009; Dike, Onwujekwe, Ojukwu, Ikeme, Uzochukwu, & Shu, 2006). However, having a good knowledge level about malaria is not an automatic guarantee that individuals would address malaria outbreaks. Research reviewed indicated that other factors were taken into consideration before the acquired knowledge about malaria could yield positive outcomes pertaining to malaria control and prevention. For example, individuals may have the knowledge about what to do when infected by malaria but they may not have the financial means of reaching out for assistance. Similarly, a low sense of self-efficacy (the ability to do something from within) may impede the effort to address malaria outbreaks in the region (Nyika, 2009; Ahmed et al., 2009; Simba et al., 2009). Consequently, there are many factors which control human action when faced with a problem, such as malaria.

Thus, knowledge level of individuals is but one of the variables which determines whether the individuals are able to act in an attempt to control and prevent malaria when all other factors are taken into consideration.

Studies reviewed indicated that parents in sub Saharan Africa opted to buy over the counter medications, such as aspirin, to treat malaria and some parents bought anti-malaria drugs over the counter without verifying whether their loved ones were infected with malaria or not (Nsimba & Rimoy, 2005; Simba et al., 2009; White et al., 2011). Okeke and Okafor (2008) showed that in some cases indigenous populations viewed malaria infections as being associated with voodoo or witchcraft, and that the sun rays caused malaria and hence these people sought traditional therapies for treatment. Mensah & Kumaranayake (2004); Dike, Onwujekwe, Ojukwu, Ikeme, Uzochukwu, & Shu (2006) showed an association between education level and malaria prevalence in Africa. Dike et al. (2006) reported that having objective knowledge about malaria as a disease process could decrease morbidity and mortality rates in sub Saharan Africa. This study used a participatory research model to engage Gusii people in Kenya to be able to identify accurate information on the causes, signs, and symptoms of malaria and associated objective treatment regimens for the disease. Assumptions in this study were that such informative choices about malaria saved time, money, and ultimately improved the quality of life in rural Africa.

Imbahale and colleagues (2010) conducted a cross-sectional malaria survey in 90 participants in western Kenya to assess knowledge level of the indigenous population in Kisii District. The surveys were similar to MIS and KAT utilized in the current study. A semi-structured questionnaire was administered. Imbahale et al. (2010) reported significantly higher rates of knowledge level. Participants in the study believed that malaria was their highest health

risk. However, 32% of the respondents reported that mosquito breeding sites could be found close to their homes but had low knowledge-level on habitat characteristics of the mosquito (pits, drainage channels, and pools as mosquito breeding sites were rarely mentioned). Over one third of the respondents indicated that immature mosquitoes develop in the vegetation; 56% of participants also reported that pools, drainage channels, and pits were important for their livelihoods. Consequently, the MIS and KAT tools used in this study examined and assessed whether the participants in Bondonya sub-location in Kisii District, Kenya had low knowledge on habitat characteristics of mosquito breeding sites as previous studies indicated. The findings from this study will be used to plan, intervene, implement, and evaluate a health promotion program to control and prevent higher cases of malaria in the region.

Nyika (2009) reported that knowledge about traditional healing practices in Africa must continue to be improved through research just like western medicine. Nyika (2009) argued any attempt not to improve traditional therapies through research, could be tantamount to some form of colonization and imperialism. Nyika further argued that without making concerted efforts to improve the efficacy and safety of African medicine is unethical since the disease burden affecting Africans may continue to rise irrespective of the availability of the existing therapies.

Lack of objective mosquito knowledge in rural areas could be the reason why malaria is rampant in rural Africa. But with community-based health education programs, rural inhabitants may identify objective ways of controlling and preventing clinical malaria (Imbahale et al., 2010). What follows now is the concept of traditional beliefs associated with malaria infections and prevention in rural Africa.

Traditional Practices and Beliefs

Sabin and colleagues (2010) showed that traditional practices and beliefs are complex traits of human beings and that they are often individually-based in interpretation as well as application to environmental phenomenon. Muthaura et al. (2007) reported that traditional practices and beliefs are often misunderstood when implementing malaria preventive measures in Africa. The practices and beliefs are better understood by the rural inhabitants themselves and consequently they (inhabitants) have a role to play in the management of malaria by incorporating their cultural norms and traits in the assessment, planning, implementation, and evaluation strategies.

Okeke & Okafor (2008) reported that malaria infections in Africa are linked to the African religion and traditional beliefs which are deeply rooted in the psychological realm of many ethnic groups in Africa. Okeke and Okafor (2008) further argued that such beliefs are rampant across the continent of Africa; and that such beliefs are often times unique and region specific. In order to appreciate and understand the problem investigated in this research study, the research questions raised were answered by reviewing related literature about African traditional beliefs on malaria and its prevention. In addition, such questions were somewhat answered in the current investigation. One of the examples is derived from a research study which was conducted in a rural community in Ghana, West Africa. In the Ghanaian study (Ahorlu, Koram, & Weiss, 2007), researchers found that the indigenous population viewed malaria as being caused by mosquito bites, heat, fire, sun, or induced by evil spirits. The treatments for malaria which were cited include: drinking, enemas, smearing on the body or squeezing herbal fluid into the nostrils, burning herbs to appease the evil spirits, covering malaria infected child with menstrual clothe pads (assumption that spirits hate unhygienic conditions,

thus will depart from the child), dripping water from the roof top and calling the name of the child to make him/her to cry out, which signals relief. Finally, participants in the Ghanaian study indicated that they were willing to seek modern medicine but financial burden was a major obstacle and still believed that they had to consult with local healers who had the expertise to drive away malaria causal spirit. In a similar example from Tanzania, East Africa Researchers (Nsimba & Kayombo, 2008) showed that patients and caretakers have tended to rely on traditional socio-cultural practices, such as consulting traditional healers, as a means of treating convulsions associated with severe malaria. In Kenya, Nguta et al. (2010) reported that alternative therapies include different plants used to treat malaria and other ailments which have not been documented in research. Subsequent studies (Kirira et al., 2006) have indicated that some of those plants are toxic with other side effects not evaluated or known. Consequently, the combination of such traditional remedies and modern medicine are not known whether they are effective or safe (Muthaura et al., 2007). Muthaura et al. (2007) also reported that there is a general consensus among malaria researchers in Kenya that alternative and affordable therapy in malaria endemic areas could be useful in the treatment of the disease. Based on these findings it is imperative for public health professional to investigate and isolate programs which are effective and minimize harm as per malaria treatment regimens. A community education program on malaria proposed in this study attempted to fill some of those gaps in literature pertaining to malaria therapy-associated programs.

The other two major risk factors entail environmental determinants which make the condition of malaria unmanageable sometimes. For example, if communities do not have access to health care facilities in many parts of Africa, communities' health workers will be useful, so long as they are trained. Meager personal financial resources make it difficult for individuals in

malaria endemic areas in Africa to buy or purchase malaria medication or insecticide treated bed nets for prophylactic purposes. The end results are higher cases of malaria during rainy seasons.

Malaria Treatment, Control, and Prevention

Conventional treatments and prevention programs for malaria discussed in the present research include use of insecticide treatment bed nets (ITNs), untreated bed nets, mosquito repellents, anti-malaria medications for prophylaxis and well as for treatment, insecticide sprays in houses, stagnant ponds and river basins, clearance of bushes, and community health intervention programs. The latter was addressed on its own, as a sub-topic (malaria preventive measures).

Insecticide and non-insecticide bed nets are usually the most recommended therapy campaign in Africa to prevent clinical cases of malaria. Researchers (Enato et al., 2006) reported findings conducted in two rural areas in Nigeria which showed some disturbing numbers as per the usage of bed nets. Enato and colleagues (2006) showed in their investigation that 37% of mothers said they had used anti-malarial prophylaxis (chloroquine, 50%) during pregnancy, while only 30% of them had bed net (untreated) at home, with 44% of the bed nets damaged. Over 59% of the respondents reported that their children had had fever/malaria in the forth night recall period, and a majority of them (44%) sought treatment in medicine shops. Of the 74% of children who were given treatment, there were delays of 2 or more days in seeking care for 25% of them. With the high prevalence of childhood malaria in the region only 21% of the mothers attributed malaria to bites from infected mosquitoes, an interesting finding which was addressed in the following community health intervention. Low coverage of anti-malarial intervention during pregnancy and inappropriate children's malaria care-seeking behavior were identified.

Contrary to the study cited above, another similar study (Suh, Kain, & Keystone, 2004) found that bed net usage has been successful and effective in many rural communities in Africa. However the key to effective bed net use in some places according to some researchers (Williams et al., 2009; Yamey, 2004) has been appropriate mechanisms for delivery of insecticide-treated bed nets in addition to Education interventions and if the donor nations can honor their pledges on the distribution of free bed nets. Another important measure for malaria control and prevention is the usage of repellents.

Mbonye, Neema, & Magnussen, (2006) reported that many persons in rural Africa fear chemical sprays used to prevent malaria infections. Individuals associate the use of such chemicals to treat malaria to contain dangerous effects on pregnancy and fetus. To alleviate such fears, Education programs need a different approach to encourage many people in Africa to use insecticide treated bed nets as well as mosquito repellent sprays.

Rutta et al. (2011) and Yusuff (2009) show that there have been numerous pharmaceutical products used to treat malaria including malarone, malarone paediatric Tablets, mefloquine doxycycline, chlorquine, proguanil, and proguanil plus chloroquine. It should be noted that this is not a comprehensive list for malaria medication. Ahorlu, Koram, and Weiss (2007) reported that the listed medications are often times expensive for the rural populations to afford. Researchers (Kuile & Steketee, 2006) have indicated that the benefits with the administration of anti-malarial drugs during pregnancy in the health care industry could produce a substantial reduction in rates of maternal anemia, placental parasite infection and the attendant risk of low birth weight as well as the overall reduction in infant/children mortality rates in Africa. Literature reviewed shows that rural populations lack the necessary knowledge to know when to buy and use anti-malaria medications according to some researchers' viewpoints (Dike,

Onwujekwe, Ojukwu, Ikeme, Uzochukwu, & Shu, 2006). But with appropriate health community programs, the situation could be changed. Indigenous populations would be able to make informed and objective choices to treat, control, and ultimately prevent Malaria. In addition, studies have shown that other ways malaria could be managed entail insecticide sprays in houses, stagnant ponds and river basins, and clearance of bushes.

According to World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), *Anopheles gambiae*, one of the primary vectors of malaria in Africa, breeds in numerous small pools of water that form due to rainfall. The larvae develop within a few days, escaping their aquatic environment before it dries out (CDC, 2010). It is imperative to clear, spray with insecticide/oils or drain stagnant pools of water immediately after the rains and clearing bushes to eliminate breeding sites for mosquito. However, that may not be practical due to time factors and knowledge levels about the causes of malaria and associated treatment modalities in rural Africa. Therefore in this study, I utilized a community-based participatory approach to educate participants about malaria preventive measures and at the same time tested the impact of such community-based health program in Gusii district, Kenya. It was also assumed in this study that community individuals learned from each other to make informed decisions as addressed in a SCT paradigm which was addressed in the theoretical foundations section.

Alternative treatment modalities, such as drinking enemas, smearing on the body or squeezing herbal fluid into the nostrils, were previously described (Okeke & Okafor, 2008; Ahorlu, Koram, & Weiss, 2007; Kirira et al., 2006 are beyond the scope of the present research. However, the practices are ripe for numerous topics for future research. What follows now is the concept of community health programs to control and prevent malaria; the impact of such an

approach in the present research was tested to demonstrate its efficacy on the management of malaria in rural Africa.

Community-Based Health Programs

Williams et al. (2009) reported that malaria is a preventable and treatable problem. But treatment modalities available for some unknown reason, are not reaching people who may need them. It is possible that the health belief model which advocates for individual treatments is not making in-roads to address malaria morbidity and mortality rates in rural Africa. Consequently, I proposed a different approach which advocates for community mobilization to effectively address malaria in rural Africa. In order to accomplish the proposed strategy, this study presents an extensive review of literature on community-based programs which have been used in the past to address similar infectious disease processes with positive outcomes. The underlying objective why such literature review was conducted was to demonstrate that community-based programs (participatory-based and socially learning paradigms) are more effective in addressing community-wide infectious diseases such as malaria than an individually-based approach (health belief models); which may be expensive and unsustainable at best.

The theory of community participation has been used extensively in research. Previous studies (Ahorlu, Koram, & Weiss, 2007; Amuyunzu-Nyamongo, 2010) have looked at sociocultural factors, community participation, meanings which communities attach to their illness condition and how such factors guide treatment regimens with positive outcomes.

In subsequent studies, researchers (Rhodes, Malow, & Jolly, 2010) have looked at how community participatory research programs are applied to confront diseases such as HIV and

AIDS. Rhodes et al. (2010) for example describes community participation in a research as being rigorous and time consuming. But the overall benefits are enormous. Community members learn how to address disease processes in the community and over time the program is able to sustain itself because the community becomes knowledgeable on what the causes are and what precautions to take to prevent the disease. In one of the community research studies (Rhodes, Hergenrather, Bloom, Leichliter, & Montaño, 2009) conducted in the State of North Carolina showed that soccer players can learn the importance of using condoms for the prevention of HIV and other sexually transmitted diseases.

A quasi-experimental study (Harper, Bangi, Sanchez, Doll, & Pedraza, 2009) was conducted on how community-based intervention on HIV infection prevention among Mexican American teenage girls in the U.S. works. The program, which had strategies in HIV transmission/prevention and skills in HIV risk reduction, was conducted to 378 teenage girls either for nine sessions or single session information-only intervention. The data were gathered at pretest, posttest, and follow ups after two months. The results showed that the sexual assertiveness and sexual decision making of the respondents yielded no significant intervention effects. However, the study revealed that the intervention improved self-esteem, condom use, beliefs on sexual assault and woman's sexuality control, and knowledge on HIV/AIDS and sexually transmitted infections.

Kaneko (2010) reported that in order for community-based malaria surveillance and control measures to reach communities at large, the program should transfer major intervention components from external donor-directed initiatives to members in the communities. Kaneko (2010) proposed that scaling up of community involvement from simple participation to social

participation is a necessary component for malaria control to malaria elimination. In a community randomized-trial conducted by Kweku et al. (2009), showed that options for the delivery of intermittent preventive treatment (IPTc) for malaria to children is more effective and slightly higher in the community based arm systems (90.5%; p = 0.059) as compared to facility-based treatments (86.6%; p = 0.059). In their (Kweku et al. 2009) study, two delivery systems of malaria treatments were investigated. IPTc were delivered by volunteers in six villages (community based arm) and by health workers at health centers or at expanded program immunization outreach clinics in May, June, September, and October 2006. A treatment of a three dose regimen of *amodiaquine* plus *sulphadoxine-pyrimethamine* was administered under the supervision to 3-59 month-old-children (n = 964) in the 12 study villages; doses for days 2 and 3 were given to parents/guardians to administer at home. The results in the study showed that there was a slightly higher outcome in the community based arm systems (90.5%; p = 0.059) as compared to facility-based treatments (86.6%; p = 0.059). But there were no significant differences between both delivery systems (91.6% and 91.7% respectively) in terms of completion of the three doses regimen.

In another study (Williams et al., 2009) reviewed to describe the impact of malaria on a small rural and to implement and evaluate a malaria community prevention program (subsidized insecticide treated nets with an accompanying education session) in Uganda, Africa, showed promising results in engaging communities. In the study reviewed, Williams et al. (2009) conducted a survey of 202 participants with 100% sample attrition in 2006. The study ensured that 34% of the household income was allocated to the burden of malaria; a malaria education and mosquito net distribution sessions were held in 2006. Five hundred participants (villagers) attended the sessions; 480 heavily-subsidized long lasting insecticide treated nets (LLINs) were

purchased. Home visits were conducted one week later to assess and answer questions which the participants had about the correct use of LLINs. In 2007, Williams et al. (2009) conducted a follow-up survey in the region and reported that there was a rise in net ownership following the community-based program (18% to 51%, $p = 0.0001$) and lower rates of childhood malaria prevalence (14%) than reported in Ugandan national statistics (40%). Other findings in Williams et al. (2009) study reported that only half of the nets owned were hung and used properly by those most vulnerable to the illness. The findings suggested mosquito nets must be provided to indigenous populations but with an effective community-based education program.

World Health Organization (WHO, 2010) reported that community-directed interventions (CDI) are more effective for priority health problems in Africa, such as malaria. In a three-year study in 35 health districts from 2005 to 2007 to evaluate CDI in seven research sites in Cameroon, Nigeria, and Uganda, World Health Organization (WHO, 2010) randomly selected four trial districts and one comparison district. Topics of interest were provision of vitamin A supplements, use of insecticide- treated bed nets, home management of malaria and short-course, directly observed treatment for tuberculosis patients. After the three years of study, World Health Organization reported that there were significantly higher coverage achieved in CDI approach to address malaria prevalence in the research sites than utilizing other methods (facility-based, for example), costs associated with CDI approach in the treatment of diseases were significantly lower than facility-based, participatory processes were found to be important, communities and community intervention implementers were committed and motivated to the idea of using a CDI approach to address their local community concerns. Based on the stated findings, World Health Organization proposed that CDI approach is an effective and efficient model for priority health problems in disease endemicity areas in sub Saharan Africa.

Consequently, in the present study, I tested and evaluated the impact of a community approach among the Gusii inhabitants of Kenya, Africa.

In another similar study, Kinung'hi et al. (2010) investigated determinants of malaria epidemics in Tanzania in relation to household knowledge, attitudes and practice on malaria. Kinung'hi et al. (2010) utilized a community-based cross-sectional survey which involved 504 participants. A structured household questionnaire was administered to participants. Structured questionnaire items focused on knowledge level, attitudes and practices of community members in epidemic and non-epidemic villages about malaria transmission, signs and symptoms, treatment, prevention and control. The data collected was analyzed through the use of a multivariate analysis and followed by logistic regression analysis. Results depicted that 90.1% respondents knew that malaria was a major health issue in their area, 92.1% or respondents reported that they knew that malaria is transmitted through mosquito bite, 86.7%, 60.8%, and 32.1% of the respondents knew and mentioned fever, vomiting, and loss of appetite as major symptoms of malaria, respectively. 58.7% of the respondents reported that their participants owned at least one mosquito net; of the 504 participants surveyed in the study (Kinung'hi et al. 2010) 87.2% respondents sought treatment from health care facilities, 8.5% obtained anti-malaria medications from the local shops, whereas 3.1% used local herbs; findings through logistic analysis showed that household location and level of knowledge of cause of malaria were significant predictors of household being affected by malaria. Kinung'hi et al. (2010) demonstrated that there are knowledge gaps on understanding the importance of household location, ineffective usage of insecticide treated nets and knowledge gaps on malaria signs and symptoms to prevention and control of malaria in sub Saharan Africa. In this study, knowledge

level, attitudes and traditional practices were assessed and a community education program on malaria was utilized to evaluate its efficacy through participatory and SCT paradigms.

Theoretical Foundations

The major theoretical basis in this study is the participatory viewpoint, followed by SCT. Basic tenet of participatory theory is that research should contain an action agenda for reform that may change the lives of participants, the institutions in which they live and work, or even the researchers' lives (Creswell, 2009). Participatory approach is an umbrella term for interactive methods that assist communities in developing a plan of action based on their priorities for change, and its intended result is the creation of multi-sectoral projects that generate real benefits and that include diverse coalitions and partnerships (Ozer & Schotland, 2011; Macaulay et al., 2011). Participatory school of thought begun appearing in the scientific community back in the 1970s and had originated in countries in Latin America, Africa and Asia. The premise for action came from shared concern with persistent inequalities and the distribution of power and resources, and the processes that helped to keep dependency and domination in place; whereas SCT describes human behavior as interplay between three determinants (personal factors, environmental factors, and behavior) (Tiemey et al., 2011; Nouwen et al., 2009; Omona, 2009). The basic assumption of cognitive social theory is reciprocal in nature; that human beings are shaped by the environments where they live in and also individuals alter or change their environments as well (Creswell, 2009).

Literature reviews are presented for both participatory and SCT constructs as related to the subject matter in this study.

Participatory Theory

Participatory framework provides means to solving societal problems for marginalized individuals in society who are often faced by forces in the environment. Participatory model has its origins in social psychology as pioneered by Kurt Lewin (1890-1947) (Phillips et al., 2010; Reininger et al., 2010). Lewin believed that conditions and forces which bring about change or resist change in groups are dynamic in that for change to take place, the total situation has to be taken into account. Societal problems, for example, could range from political, religious, and social to health issues. Kemmis and Wilkinson (1998) reported that participatory school of thought advocates for action which is focused in bringing about changes in practices, is focused in helping individuals free themselves from constraints found in society, it is emancipatory, in that it helps unshackle individuals from the constraints of irrational and unjust structures that limit self-development and self-determination, and finally it is practical and collaborative because it is inquiry completed "with" others rather than "on" or "to" others. In the present study malaria can be effectively and efficiently controlled and prevented in rural Africa by engaging indigenous populations in preventative measures irrespective of their economic, social, or knowledge level. It is also important to note that public health action is fundamentally a process of social and cultural exchange and the exchange is dynamic continually evolving.

King et al. (2010) conducted a study which described how to understand levels of knowledge on child health and treatment-seeking and preventative behaviors in southern Guinea Bissau in order to develop an effective health education component for enabling parents to increase child survival program (EPICS). The study also assessed the effect of gender and ethnicity on knowledge and behavior. Women and men were interviewed in their participants

using a structured questionnaire. Characteristics of the participants and of the interviewed women and men were noted and counted. The number of correct answers given to the health knowledge and practice questions and their percentage distribution were recorded by items and by gender. An overall health knowledge score was obtained. It was reported that there were low levels of appropriate knowledge on child health, some inappropriate practices and generally low vaccination coverage. Results from the study showed that health knowledge scores improved significantly amongst those who have accessed higher education and that differences in health knowledge between women and men become insignificant once age and education are accounted for. King et al. (2010) concluded that health education activities should be an integral part of a package to improve child survival in rural areas and that men as well as women should be involved in Education interventions. However, the researchers (King et al., 2010) suggested that prior to developing health education interventions in similar rural sites; studies to assess areas to be targeted should be conducted. Ultimately, participatory health education interventions and/or community-based primary health care in remote regions can improve child survival; particularly millions of children below 5 years of age who die due to malaria infections in Africa each year.

Another study conducted in Africa (Opiyo et al., 2010) demonstrated that participatory tools are urgently required in the form of partnerships in capacity strengthening of rural communities to improve individual self determination; that individuals are able to address their health concerns when engaged in interventional programs. Opiyo and colleagues (2010) assessed demographic of respondents and household characteristics, socioeconomic factors, knowledge level and beliefs about malaria, typical malaria control measures, treatment seeking behaviors, and the willingness of community individuals to participate in malaria intervention programs. The study (Opiyo et al., 2010) reported that respondents knew that malaria was a

major health problem, traditional beliefs and knowledge level led to ineffective malaria treatment, bush clearing and hygiene measures were the main strategies used by individuals to control malaria (which studies have shown to be ineffective in the management of malaria) and majority of individuals were willing to participate in community education program on malarias. Opiyo and colleagues (2010) concluded that it is imperative for community intervention Education programs to be culturally sensitive and grounded on evidence-based research to yield meaningful change.

Studies have consistently demonstrated the importance of understanding malaria experience in communities in Africa and the meaning individuals attach to it. Ahorlu et al. (2007) showed that there are a myriad of factors which influence malaria prevalence in Africa; namely: individual understanding of malaria, norms governing course of action to control the disease, socially legitimate status roles, power, relationships, interactions within members in the community, and nature of settings. Although the majority of individuals in Africa understand that malaria is a major health problem, Ahorlu et al. (2010) showed that traditional therapies mask objective efforts to manage the disease. It was also shown that there is lack of support, a treatment mismatch, and beliefs that malaria cannot be eradicated because it is God's creation. But with participatory approach, this study showed that individuals could be assisted to channel those preventative measures that works to control malaria and discard the ones which do not work. The ultimate assumption in participatory research is social action and practical results grounded on evidence-based research according to research reviewed (Wallerstein, & Duran, 2010). Such an approach improves healthy equity among populations.

There are some disadvantages of using participatory model as research indicates. It cannot be assumed that community individuals have all solutions to manage malaria. For example there is a technical aspect such as the development of anti-malaria pharmaceutical products evidence-based which communities may not have and also the belief that malaria is caused by evil spirits may need to be redirected to some objective information; however, without being disrespectful of such beliefs. Allen et al. (2010) reported that although there are advantages of participatory approach that applies collaborative research created through use of a committed community, there is disadvantages to participatory paradigm in that it often has no defined research leader, may be impractical to achieve consensus from the community and usually has no defined timeline or set end date as well. But in this research conducted, the investigation of malaria management in Gusii region provided a snap shot which could be followed by future research.

Social Cognitive Theory (SCT)

Bandura (1986) described human behavior as being reciprocally determined by internal personal factors and the environment a person lives. The basic principles in this school of thought (SCT) founded by Bandura (1986) defines human behavior as a triadic (environment, person and behavior), dynamic, and reciprocal interaction of personal factors, behavior, and the environment (Bandura, 1977a; 1986; 1989). The theory postulates that an individual's behavior is uniquely determined by each of these three factors. SCT upholds the behaviorist premise that response consequences mediate behavior; it also contends that behavior is largely regulated antecedently through cognitive processes. The response consequences of a behavior are used to form expectations of behavioral outcomes, according to this paradigm. Behavior outcomes could

be positive or with dire consequences; as would be investigated in this study. Nouwen et al. (2009) and Omona (2009) showed that SCT has been used to study a wide range of public health problems, from dietary self-care, medical therapy compliance, alcohol abuse, to immunizations. However, there are some limitations to SCT approach as studies have shown. SCT comprehensiveness and complexity make it difficult to operationalize many variables and that many applications of the SCT focus on one or two variables, such as self-efficacy, while ignoring others.

Omona (2009) showed that SCT is used to investigate clinical malaria cases in Africa and elsewhere around the globe. Amuyunzu-Nyamongo (2010); Dinho, Van der Merwe, & Ehlers (2009); Nsimba & Kayombo (2008); Yé, Hoshen, Kyobutungi, Louis, & Sauerborn (2009) and Williams, Martina, Cumming, & Hall (2009) reported that malaria continues to be a problem in Africa for several reasons. It is well known through research reviewed that environmental conditions such as heavy rains, warm climate, dense vegetation, population increase, inadequate health care access, financial restraints, ponds and rivers in sub Saharan Africa influence mosquito infestation. Indigenous populations in the region are relatively low socioeconomic status as compared to many developing and developed nations around the world. The condition of being low socioeconomic status and a favorable environment for mosquito breeding significantly increases malaria prevalence in the region. Individuals in the region weigh options whether to buy necessities of live (clothing, shelter, food) or purchase bed nets, for example, to prevent malaria. Such a cognitive discourse determines a course of action pertaining to prevention of malaria. Maibach & Parrott (1995, p. 44) showed that for behavior change to occur, people must have knowledge both about their risk factors and the ways in which their risk factors can be reduced (alternative behaviors) and without such knowledge people are unlikely

to engage in the process that can ultimately lead to behavior change. Behavior change sought in Africa as far as malaria prevalence is concerned is still debatable as is demonstrated in this research. However, SCT approach has been used to some extent to address malaria prevalence in Africa and elsewhere.

Although not many articles were found in the literature review describing the use of SCT and its application to address malaria incidences in Africa, but the few identified pointed out the importance of addressing perceptions attached to malaria by the local people across the continent of Africa. Nouwen et al. (2009) and Omona (2009) indicated that having or being equipped by knowledge about malaria preventive measures is not enough to yield an action against malaria; but the belief in one's ability to produce change is a good predictor of motivation and behavior change to produce positive social change. Smith et al. (2009) reported in a paper submitted at the annual meeting of the international communication association that SCT could be used to engage vulnerable populations in Africa to participate in mosquito-bite prevention activities in their environs to reduce malaria prevalence. Smith and colleagues (2009) reported that the majority of their respondents interviewed in Africa, 56% reported engagement in vector control activity; and 45% engaged in more than one activity. However, the study reviewed above showed that people who were willing to participate in one activity or more in the prevention of malaria had greater knowledge of malaria. The literature review also revealed important ideas that were used for the research design and methodology of this study.

Research Design Reviewed

A number of non-experimental research designs on the control and prevention of malaria were reviewed and used to inform in this study. The designs reviewed included case studies,

cross-sectional studies, content analysis, narrative analysis, participant observation, ethnography, and focus groups. I will not address all the designs listed but select the cross-sectional designs that were thought to be appropriate for the current study. Harrington et al. (2011); Kangwana et al. (2011); Creswell (2009); Einterz & Bates (2011); Iriemenam et al. (2011) and Das & Sandra (2011) showed that a cross-sectional design is where subjects are assessed at one point in time. The advantages of cross sectional studies are that they are fast and can study a large number of participants at little cost or effort. In addition, a researcher does not need to worry about individuals dropping out during the course of the study. And lastly, cross-sectional studies are efficient at identifying association or giving snap shots on a phenomenon. Webster et al. (2010) reported that a cross-sectional design is adaptable to natural experiments at scale, and can be applied using data from routine surveys such as the Demographic and Health Surveys, modified by the addition of one to two questions for each intervention. Webster and colleagues (2010) also concluded that the design has the potential to enable wider application of rigorous evaluations and thereby improve the evidence-base on which decisions about delivery systems for malaria control and other public health interventions could be put to practice. However, one of the major limitations of a cross-sectional design is trouble deciding cause and effect. With data at only one point in time, an investigator of a problem may not be able to isolate what factor came first to cause disequilibrium in the environment or entity.

Webster et al. (2010) reported that there has been an increase in resources and efforts through the international community to fight malaria endemicity in sub Saharan Africa and around the world. The challenge, however, has been to find the best ways to deliver interventions to the region. Such interventions are insecticide bed nets, anti-malaria medications, community health anti-malaria education programs, household insecticide sprays, preventive

treatment in pregnant women, and treatment for malaria in children. Hotez et al. (2004) and World Health Organization Bulletin (1996) reported that for the past few years there has been a debate about how to deliver interventions, the methods for evaluating the effectiveness of delivery systems. Webster and colleagues (2010) proposed a cross-sectional design to unravel the mystery of the delivery systems; for many studies have only shown varied and unreliable delivery systems in the implementation of malaria intervention programs in the continent of Africa. It is my opinion that it takes careful analysis to deliver those preventive measures to a continent that poses tough challenges (heavy rains, forests, other infectious diseases, and condition of infrastructural facilities, economic restraints, attitudes and perception of the local people, traditional practices, and knowledge level pertaining to malaria). And the most reliable and cost effective approach to tackle malaria is to utilize a cross-sectional design which is fast and can cover a broad area to yield a quick snap shot on how to plan, implement and evaluate malaria interventional programs in rural Africa.

Eriksen et al. (2005) conducted a cross-sectional study to assess diffusion of change of first line anti-malaria from *Chloroquine (CQ)* to *Sulphadoxine/Pyrimethamine (SP)* at household level in a rural district in Tanzania less than a year after the policy implementation. Seven hundred twenty nine household participants were interviewed on the knowledge of the new drug, home stocking of anti-malarial, home treatment practices of children younger than 5 years with fever health seeking behavior, and experience with SP. CQ and SP blood levels were examined from 328 children younger than five years in the participants the results indicated that 51% of population knew that SP was the new first line anti-malaria; 8% of mothers' stocked anti-malaria medications, and 4% of the respondents indicated self-treatment as first line of action. Eighty four percent sick children sought treatment at public health clinics. However, SP was detectable

in 18% of the total child population and 32% of those reported with fever and the study revealed negative perceptions of SP and fear of severe adverse reactions associated with the new medication as made public by the media. This study indicated that cross-sectional designs can extract information from individuals which otherwise is not identified through mere observation, for example. In addition there is an interesting finding which was noted in the reviewed study which dealt with fear. New intervention strategies to prevent malaria in rural Africa may benefit from a community health Education program to alleviate such fears which might contaminate health messages through the media.

Ototo et al. (2011); Imbahale et al. (2011) and Yakob et al. (2011) reported that there are malaria control tools available for individuals to use to prevent malaria. Although that is the case, there are some complex factors which may not make that possible. Socioeconomic status of individuals is one of those factors which pose a challenge in rural Africa. As mentioned earlier in this chapter, scarcity of financial resources makes it difficult for indigenous population to think of buying malaria preventive tools such as insecticide-treated nets (Omona, 2009). In another cross-sectional study conducted by Onwujekwe et al. (2005) reported that socioeconomic status (SES) was positively and statistically significantly related to willingness by villagers to pay across control measures. This research showed that there is a need for national governments in Africa and international communities to have policies in place which address financial issues to make it possible for vulnerable populations in Africa to be able to purchase the necessary tools to control and ultimately prevent malaria incidents in rural Africa.

Methodology

The methodology used in this study was quantitative, community intervention with pre-post-test approach research design. Creswell and Clark (2007) argue that quantitative inquiries are based on the assumption that social reality contains an objective ontological (reality is the total sum of the actors in the environment) structure and individuals respond to this objective environment in a predictive manner. The methodology involves predetermined closed-ended structured questions, counting and measuring of events and performing the statistical analysis of a body of numerical data. The assumption behind quantitative paradigm according to research methodologists is that there is an objective truth existing in the world that can be measured and explained scientifically (Creswell and Clark, 2007). And that the basic tenets of this approach are that measurement is reliable, valid, and generalizable in its clear prediction of cause and effect. The methodology formulates the research hypotheses and is verified empirically on a specific set of data (Frankfort-Nachmias & Nachmias, 1992). Creswell (2009) reported that in a quantitative approach scientific hypotheses are generated which are value-free. In addition, the researcher's own values, biases, and subjective preferences have no place in quantitative approach.

There are some limitations which were identified in studies reviewed about quantitative approach (Creswell,2009), namely: it fails to provide the researcher with information on the context of the situation where the studied phenomenon occurs; there is an inability to control the environment where the respondents provide the answers to the questions in the survey; the study outcomes are only applied to those outlined in the original research proposal due to closed type questions and the structured format; and it does not allow investigations to evolve as in grounded theories (qualitative approaches). Nonetheless, following an extensive literature review, I concluded that a cross-sectional pre-post-test design was the best option for this study.

Summary

Chapter 2 presented literature extensively around the subject matter of malaria epidemic and control in rural Africa. First and foremost, information described in the chapter was organized around the main themes of this study, including; the relationship between socioeconomic status and knowledge and associated behavioral change in rural Africa, traditional practices and beliefs and their intermediate and long-term impact on malaria preventive measures, community health programs and their efficacy in the management of malaria, malaria risk factors, and epidemiology of malaria. The gaps identified in the literature were explored and described as well. These included lack of effective evaluation and understanding of malaria preventive programs, lack of general consensus by researchers on how to manage malaria in rural Africa, and the impact traditional beliefs, knowledge levels and practices have in derailing or advancing evidence-based practice to control and prevent malaria in rural Africa. Finally, the research design and methodology utilized in the similar studies were reviewed. These helped to determine the appropriate methods to be utilized in the present study, which will be described further in chapter 3.

Chapter 3: Research Methods

Introduction

A quantitative research design with a pre-/post-test approach was used in this study for community intervention. This chapter includes descriptions of the research design and approach, the population and sample selection, the instruments and measurements, and the data management and statistical analysis. Lastly, ethical issues are addressed pertaining to the use of participants.

Rural indigenous populations in sub Saharan Africa die in greater numbers due to malaria infections than in any other parts of the world (CDC, 2010). Studies show that rural populations in Africa tend to use alternative/traditional anti-malaria therapies which are poorly understood, evaluated, and documented (Okeke & Okafor, 2008; Ahorlu, Koram, & Weiss, 2007; Kirira et al., 2006). Objective knowledge on risk factors, causes, treatment and prevention of malaria is necessary to reduce morbidity and mortality rates among rural populations in sub Saharan Africa (CDC, 2010). This study assessed and evaluated two issues; first, does a community education program on malaria have an impact on knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region? Second, is there a relationship between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region?

Research Design and Approach

A community intervention with pre-post-test approach analyzed whether a simple layperson health education program (LPHEP) on malaria had an impact in knowledge and associated

behavioral change in managing malaria cases among study participants in Gusii region. In addition, the surveys assessed the relationship between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region, Kenya. Specifically, the analyses focused on socioeconomic factors such as gender, household poverty, rural, knowledge level, attitudes and traditional practices as a broad overview and snap shot pertaining to malaria prevention and control. However, this study attempted to analyze the factors separately or singularly in this study; but could be covered in future related researches. To reduce the multidimensional character of the survey data, I divided variables into smaller coherent number of subsets; namely, socioeconomic variables (sources of drinking water, toilet facilities, electronics, type of fuel, floor material, and transport means), demographic characteristics (education level, residence, age, gender, pregnant, not pregnant) and malaria preventive measures (bed net use, sleeps under net, factory treated nets, soaked nets or not). The study design utilized cross-sectional, including pre- and post-tests.

A quantitative, community intervention with pre/post-test research design provided a snapshot of the variables (attitudes, traditional practices, knowledge level, household poverty, location and gender) included in this study, at one particular point in time. The design revealed how the interval variables were represented in a community setting of the Gusii region, through face–to-face standardized interview questionnaires. Advantages were that this design was inexpensive and the study required little time to conduct; it estimated knowledge-level/behavioral change in managing malaria cases in the region because the sample (360 participants) was taken from the population; and outcome and risk factors assessed could be used in public health planning, understanding disease etiology and for the generation of hypotheses for future research. However, there were weaknesses in using this design; namely: the study

provides only a snapshot, and there is be a possibility of knowledge-level/behavioral change-incidence bias (the common cognitive trap of allowing first impressions to exert undue influence on the behavioral changes) (Vakalopoulos, 2005) which was observed in this study due to participants being exposed to knowledge about malaria control and prevention program.

Setting and Sample

Participants were randomly selected from the Gusii community in Bondonya sub-location, Nyamache District, a population of about 55,000 people out of the current 1,152,282 million people in Kisii region (KNBS, 2010). According to Kenya National Bureau of Statistics (KNBS, 2010), the national population census recorded for the last 10 years did not categorize district populations in terms of participants or villages. Generalized characteristics of the region such as being the most densely populated areas of Kenya, and that it constitutes the country's sixth largest ethnic group, comprising around 6% of the national population were recorded. The Gusiis are the second largest ethnic group in Nyanza, after the Luo (KNBS, 2010). The Gusii community is agricultural, rural, and densely populated. Gusii community is situated in Nyanza, Kenya, its geographical coordinates are 0° 41' 0" South, 34° 46' 0" East and its original name is Kisii. The Kisii people are also called Gusii and speak Ekegusii language.

Sampling Method

The project was advertised through the local chiefs. Consent forms covering information such as protection of participant privacy, keeping all their identifiers such as names and identification numbers confidential, respecting their decisions on willing to participate in the study or withdraw from the research if participants so wished were signed by all persons who participated in this study (local chiefs, trained interviewers, participants to be interviewed). The

consent forms were translated to the Ekegusii language. One local chief assisted in identifying 10 high school graduates older than age 18 years who participated as trained interviewers. There were five women and five men individuals in this initial group. The rationale for selecting the first 10 individuals was to train them to assist in collecting data and teaching the basics about malaria control and prevention in Gusii region. Each of the 10 trainees collected and taught a total of 36 participants in order to have 360 participants in this study. The 10 trainees were trained in a layperson health education program (LPHEP) on malaria and how to assist in collecting research data utilizing the malaria indicator survey (MIS) and the knowledge assessment tool (KAT). The basic training about malaria control and prevention extracted from malaria facts and guide to malaria prevention as presented by World Health Organization (WHO, 2010), took one week. Upon completion of the module (Appendix A), these individuals trained to assist in the study were awarded certificates of completion and then were dispatched into the community to collect the first set of data (pre-test) and offer the basic training (health promotion program against malaria) to individuals who participated in the project.

In total, 360 participants were observed and tested in the first phase; however, the number decreased to 352 during the second phase. The participants met the following criteria: were between ages 18 and 45 years, men or women, and able to make independent decisions to participate in the study, parents with at least one child younger than five years. Children in this age range are the most affected with malaria infections because their natural immunity has not developed well enough to provide protection against mosquito bites (de Roode, Kochin, Yates, & Antia, 2010; Liljander et al., 2011). The participants lived in the area for at least the last 1year (able to experience a dry and rainy season) to get exposed to mosquito bites in the location under investigation.

After a month the trained laypersons went back to the community under investigation and collected the second set of data (post-test). Data collected from this study provided a quick snap shot on the number of accurate participant responses in MIS and KAT surveys reported in the pre- and post-test scores pertaining to malaria prevention. The key indicators assessed knowledge level and how the information provided through community education (Appendix A) enabled individuals in this study to make informed decisions to seek timely anti-malaria treatments, for example, going to the clinic or hospital within 24 hours on malaria infection. However, further evaluation on the impact of a community education program could benefit from future longitudinal studies, which may evolve from this study.

Cluster Sampling

Participants who engaged in this study were randomly selected through a cluster sampling approach. The first stage of cluster sampling involved the selection of 10 layperson trainees who underwent basic training on how to collect data as well as on how to teach malaria preventive measures. Each layperson collected data, taught LPHEP and re-collected data from 36 randomly selected participants. Thus, in the second stage of sampling, the research team was able to recruit 360 participants (10 layperson trainees x 36 participants). The random sampling ensured that all members of the community were given an equal chance of participation**.** Figure 4 provides a schematic of the sampling strategy.

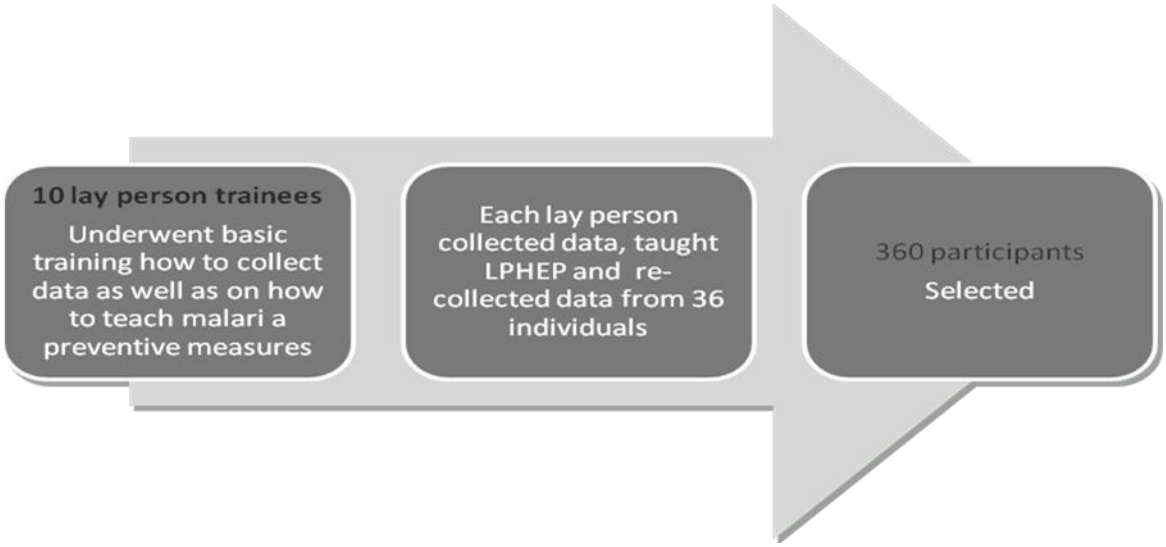

Figure 4**.** Schematic of sampling strategy

Sample Size

The formula used to select the sample in this study was: A 95% confidence interval (margin of error) which was an interval generated by a process that's right 95% of the time. Chien, Lin, Wang, Leung, Lai, & Chan (2010) and Ogungbenro & Aarons (2008) indicated that 95% confidence interval is universally utilized to conduct research studies. For a population of 55, 000 people, setting up an alpha level = 0.05, it was determined that a sample of 360 participants would result in 95% power. This indicated that plus or minus 5% of the time (90% to 100%) the findings from the proposed study could be true pertaining to malaria cases and prevention in Bondonya sub-location inhabitants in Gusii region, Kenya. An example for such power calculation was derived from the internet by inserting numbers in the appropriate spaces and executing the calculation (see: www.surveysystem.com/sscalc.htm#one):

$$ss = \frac{Z^2 * (p) * (1-p)}{c^2}$$

where:

z = Z value (e.g., 1.96 for 95% confidence level)

p = percentage picking a choice, expressed as decimal (0.5 used for sample size needed)

c = confidence interval, expressed as decimal (e.g., .05 = ±5)

Based on the formula and calculations ($1.96^2 * (.5) * (1-.5)/ .0025 = 384.816$) done, I needed a maximum of 385 individuals to participate in the study, but 360 individuals were within range of 95% of confidence interval.

Instrumentation and Materials

Basic information was collected using the malaria indicator survey (MIS) used previously by the World Health Organization (see Appendix B). However, blood samples were not collected to test hemoglobin levels on children in the community under investigation. Section B in MIS was not part of the present study. KAT (see Appendix C) was designed and created by the researcher and utilized to assess attitudes, traditional practices, and education levels of participants as related to malaria prevention and control measures.

The MIS instrument measured socioeconomic factors such as, ownership of property to assess socioeconomic status (questions 11, 12, 13, 14, 15), ability to spray houses with insecticides (questions 15a, 15b, 15c,), ability to have and maintain the recommended up-keep of

the bed nets (questions 16 to 25), and sources of drinking water and toilet facilities (question 10 and 11, respectively) (see Appendix B); whereas the KAT tool asked the following questions to assess and evaluate participant attitudes, traditional practices, and Education level as related to malaria preventive measures. What are the signs and symptoms of malaria? (Participants were required to name at least two). What are the levels of formal education in your household? (None, primary school, secondary school, and some college school levels). Do you feel your community clinic or hospital is sufficient for your region? (Yes or no). Do you feel that you health needs are met with your community elders, chiefs, councilors, and district officers? (yes or no). These last two questions attempted to measure attitudes prevailing in the region as far as health access and support to control malaria is concerned. The last question in the KAT measurement tool was: What remedies do you use to treat malaria outbreaks in your household? (Goes to hospital/community clinic for treatment within 24 hours, uses over-the-counter (OTC) medications from a shopping center, uses traditional herbs, consults a traditional healer, or prays about it). The instruments used in this study were translated to Ekegusii language so that those participants who do not know how to read and write in English or in the ethnic language had an equal chance to participate in the study. The questions were read in the vernacular and the responses noted accordingly.

Since the instruments used in this study were modified and created by the researcher for the first time, a pilot test was conducted. Pilot testing established content validity and improved the questions in the instruments in terms of format and scales.

Estimated Reliability and Validity

The first set of data was collected from 50 randomly selected participants for pilot testing. These 50 individuals were not part of the bigger study. The purpose was to build reliability and validity on the instruments (MIS & KAT). The 50 subjects were divided into two groups of 25 individuals. The instruments were administered to each group at different locations by the principal investigator. The results showed internal consistency reliability coefficients by scores ranging from 0.75 to 1.00, with a total sample alpha reliability of 0.95. No correlations with other tests were done due to lack of similar instruments of revised Malaria Indicator Survey (MIS) and Knowledge Assessment Tool (KAT).

The reliability data for MIS and KAT was based on a sample of 50 participants, aged between 18 to 49 years of age. The reliability estimate of 0.95 indicates that MIS and KAT are internally consistent, at least on a gross basis. No test-retest reliability or validity was developed.

Content and face validity were also assessed by asking the following questions: How were the questions worded? Did the respondents understand them? Did they feel comfortable answering them? Were the instruments too long? What were the potential barriers to getting good responses? Pilot testing sample comments and remarks on the aforementioned attributes were critical in developing questionnaires whose results are reproducible and that provide the researcher with a good measurement of the phenomena. The two-tailed Pearson correlation was $r(50) = 0.99$, which indicates that the MIS and KAT scales have good reliability. The result demonstrated that the instruments (MIS/KAT) could capture and yield meaningful data in research on malaria in Gusii region.

Data Collection

Once 360 individuals were randomly selected, instructions were read to them. The instructions entailed the following:

- Individuals were told the reason they were being tested; that their responses were to be used in a PhD dissertation, and that their personal identifiers were kept strictly confidential.
- Individuals were told that the MIS and KAT were easy and simple survey instruments, and that no grade was to be given.
- Individuals were told that there were no trick questions.
- Individuals were told that there were no penalties for misspelled words.
- Individuals were told to attempt to answer each item to the best of their ability.
- Individuals were told that with some answers, they may be allowed to describe their answer if they couldn't think of the appropriate name or words for the answer.
- Individuals were told that if they had any questions regarding the survey questions, they were free to ask for clarification, the researcher was to answer the question in a manner that was not to reveal the answer.
- The consent form (appendix A) was given to each participant and was told to read, ask questions, and voluntarily sign it, if they were willing to participate in the study.

The research interviewers were trained how to use the instruments in order to understand the questionnaires and to stick to the protocol in order to increase precision and accuracy in

conducting the study. The questions in the instruments were completed by pencil and paper in one sitting and took 30 minutes to finish. The forms used to collect data were assigned with random pseudo numbers to protect individual identifiers. Every end of the day the data was collected from all research assistants and was stored in a locked and safe location, in a local health clinic, for analysis at a later date as was specified by the principal investigator.

The community education program on malaria (Appendix A) entailed information such as the causes of malaria, how to identify signs and symptoms of malaria, how to treat, control and prevent malaria, and resources available for the management of malaria in the region as extracted from World Health Organization fact sheets, and current World Health Organization guidelines on the management of malaria (WHO, 2010). Information (Appendix A) was presented to 10 of the research interviewers who were trained how to present such content (malaria) to participants using basic language in Ekegusii as well as in English after collecting the initial assessment information during the pre-test.

Data Analysis

A quantitative, community intervention with pre-post-test approach was used in this study. There were 360 participants that consented to the study and were interviewed using the structured questionnaire. Data entry and analysis was done using IBM SPSS Statistics 19. Charts and frequency tables and tabulations of important variables such as the demographic factors, socioeconomic status, and Education level of participants were done. Repeated measures one-way analysis of variance (ANOVA) was used to analyze pre- and post-test mean scores on KAT tool. The KAT tool scores are interval variables; meaning that the data had an order and equal intervals. The interval scale allowed me to rank order the items that were measured but also

managed to quantify and compare the magnitudes of differences between them. Chi-square and Cramer's *V* tests were used to examine the relationship between MIS malaria preventive indicators and formal education level (none, primary, secondary, or college). Economic indicators were not inferentially analyzed in this present study due to inadequate data to compute levels of socioeconomic status (low, middle, and high) and malaria preventive measures. The data collected in this dissertation showed that the majority of participants were rural and showed similar economic attributes; which do not warrant computation in the present study.

Research Questions and Hypotheses

This study addressed two major research questions:

Research Question #1

Does a community education program on malaria have an impact in knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region, Kenya?

Null Hypothesis #1

There is no significant ($P > .05$) difference between pre-test and posttest scores on KAT measures pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region as a result of a community education program on malaria.

Alternative Hypothesis #1

There is a significant ($P < .05$) difference between pre-test and posttest on KAT measures pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region as a result of a community education program on malaria.

In this question repeated measures one-way ANOVA was utilized to assess the difference between mean KAT scores (pre-test and post test scores on the same group of participants). If a significant difference was noted in the mean scores, then, a conclusion could be made that a community education program on malaria could help in controlling and preventing malaria in Gusii region, Kenya. The goal in this question was to measure the impact of the community education program (Appendix A) on malaria in Gusii region in terms of inputs (trained personnel-research interviewers), process (train participants in the study), and outcomes (treatment seeking behaviors, correct use of bed nets, and improved knowledge). While the ultimate goal of the community education program is to reduce transmission, lower incidence, and lower mortality associated with malaria infections, this study did not measure these rates.

Research Question #2

Is there a relationship between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region, Kenya?

Null Hypothesis #2

There is no significant ($P > .05$) difference between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region.

Alternative Hypothesis #2

There is a significant ($P < .05$) difference between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region

Chi-square and Cramer's V tests on MIS and KAT scores was utilized to assess whether relationships exist between socioeconomic variables (sources of drinking water, toilet facilities, electronic ownership, type of fuel, house floors, and transport means) and knowledge and associated behavioral change (malaria preventive measures: signs and symptoms of malaria; remedies to treat malaria outbreak in households) in managing malaria cases among study participants in Gusii region (outcome measures such as reporting when to go to a community clinic for treatment, buying other medications over the counter versus getting actual anti-malaria medications and correctly stated at least two signs and symptoms of malaria). Specific statement and questions, for example, asked to measure outcome measures were: What participants do when there is a malaria outbreak in their households. Participants were asked to state at least two signs and symptoms of malaria infections as reported by World Health Organization guidelines and fact sheets (WHO, 2010). Participants' answers to questions 1 through 5 in KAT (see Appendix C) demonstrated outcome measures during the pre and post-test phases.

Protection of Human Subjects

Some potential risks were anticipated in this study, such as falsification of information on the questionnaires by research assistants, lack of confidentiality, emotional distress (asking participants painful questions), psychological trauma, invasion of privacy, disruption of participants lives', embarrassment, and loss of social status. These problems were addressed in

several ways. Participant observations were minimized by using questionnaires to elicit information, researcher and interviewers were cautious in collecting information tailored toward the condition (malaria) and asking personal questions. Safeguards were in place such as strictly using research forms to ask question s in verbatim, Walden University IRB application approval # 03-07-11-0121081 was given before going to the field to collect the data. Participants and related parties were given consent and partnership agreement forms to sign to protect their confidentiality. Participants were protected from psychological harm (for example not asking questions on the loss of children a household has experienced in the past due to malaria) and deception about the research was prevented, and participants' privacy was protected by using pseudonyms on the questionnaire. Completed surveys were collected and maintained by the principal investigator on a daily basis. Signed consent forms were honored; participants were at liberty to withdraw from the study if they so chose.

The benefits of the study were that it provided the community with evidence-based practice pertaining to the right way to prevent malaria; hence decreasing mortality rates of young children in the area. The ultimate goal was to generate beneficial knowledge to the general public. The activities within the intervention program were conducted with the following in mind: Do not harm the participants, actions were conducted fairly, respectful to all participants in terms privacy and confidentiality issues. In addition, participants were debriefed at the end of the study and offered coupons to buy bed nets.

Chapter 4: Results

This dissertation study was conducted to assess the following research questions: first, does a community education program on malaria have an impact in changing behaviors of participants on how to control malaria cases in Gusii region, Kenya? Second, is there a relationship between socioeconomic factors and participants' knowledge and associated behavioral change to control malaria cases in Gusii region, Kenya? A quantitative, community intervention with pre-post-test approach research design was utilized to assess the two questions. The following tools were used to conduct the study: layperson health education program (LPHEP) on malaria, malaria indicator survey questionnaire (MIS) and the knowledge assessment tool (KAT). The calculations in this chapter were computed using IBM SPSS 19.0

Sample Attrition

Table 1 describes surveys that were included and excluded in the study due to outliers noted, did not meet inclusion criteria, and incomplete surveys. A total of 352 (97.8%) individuals responded to the questionnaires (MIS and KAT). Five (1.4%) completed surveys had to be excluded from the study because the respondents did not meet all of the inclusion criteria. In addition, 3 (0.8%) surveys had to be excluded because they had extreme scores (outliers) and incomplete data.

Table 1

Sample Attrition

Total surveys	Frequency	Percent
Responses	360	100.0
Incomplete surveys	3	0.8
Criteria no met	5	1.4
Completed surveys	352	97.8

Participant Variables

Demographics

Table 2 shows descriptive statistics for 6 demographic variables in the MIS/KAT tool. There were 352 participants who participated in this research study. Descriptive results in Table 5 showed the following: the sample population had more men (70.3%) than women (29.7%) participants. A small percentage of participants were the head-of-household (1.4%), while the majority of participants were related to the head-of-household in the following way: spouses (8.1%), sons or daughters (12.5%), son in-law and daughter in-law (23.1%), grand children (24.2%), parents (18.6%), parent in-law (5.8%), brother or sister (5.6%), other relatives (.3%), adopted/foster/step child (.6%). As stated previously, the MIS and KAT are intended to be implemented among heads-of-households; however in this cultural context, it proved more successful to allow any member of the household to be included in the study. Those who lived in their residencies through most nights (62.2%) were more than those who did not stay in their villages at night, frequently (37.8%). More participants were between ages of 19 to 30 years (44.7%) than ages of 31 to 45 years (41.1%); participants between ages of 46 to 49 years were

the fewest (14.2%). Participants' education levels were: none (2.6%), primary (38.9%), secondary (45.5%), and college (13.1%).

Table 2

Descriptive Statistics for Six Demographic Variables in the Malaria Indicator Survey Tool (N =352)

Variables	Sample (N = 352)	Percent
Relationship to household		
Head	5	1.4
Wife or husband	29	8.1
Son or daughter	44	12.5
Son in-law or daughter in-law	81	23.1
Grand child	85	24.2
Parent	66	18.6
Parent In-law	20	5.8
Brother or sister	19	5.6
Other relatives	1	.3
Adopted/foster/step child	2	.6
Residence		
Lived in most nights	219	62.2
Did not stay in most nights	133	37.8
Age		
19 to 30 years	157	44.7
31 to 45 years	145	41.1
46 to 49 years	50	14.2
Gender		
Men	247	70.3
Women	105	29.7
Education level		
None	9	2.6
Primary	137	38.9
Secondary	160	45.52
College	46	13.1

Socioeconomic Variables

Table 3 shows that there were more protected springs (96.4%) than unprotected springs (3.6%) as sources of drinking water. Toilet facilities in villages who participated in the current study had pit latrines with slap (.3%), open pit (95.6%), no facility/bush field (1.7%), and others (2.5%). An overwhelming majority of participants owned electronics (78.9%), particularly cell phones; only a small percentage of participants who did not own electronics (21.1%). The types of fuel used were showed to be charcoal (17.2%) and firewood/straw (82.8%). The floors in most of the houses surveyed were earth/sand (88.6%) and cement (11.4%); whereas means of transportation were found to be bicycles (9.2%), motorcycles/scooters (8.6%), cars/trucks (.3%), and none (81.9%).

Table 3

Descriptive Statistics for Socioeconomic Variables in the Malaria Indicator Survey Tool (N =352)

Variables	Sample (N = 352)	Percent
Drinking water source		
Protected springs	339	96.4
Unprotected springs	13	3.6
Toilet facilities		
Pit latrines with slap	1	.3
Open pit	336	95.6
No facility/bush field	6	1.7
Others	9	2.5
Electronic ownership		
Yes	278	78.9
No	74	21.1
Type of fuel		
Charcoal	61	17.2
Firewood and straw	291	82.8
House floors		
Earth/sand	312	88.6
Cement	40	11.4

Transportation		
Bicycles	33	9.2
Motor cycles/scooters	30	8.6
Cars/trucks	1	.3
None	288	81.9

Malaria Preventive Measures

Results on how many houses surveyed had their interior walls sprayed with mosquito repellents are displayed in Table 4 which showed the following: sprayed (35.6%), not sprayed (26.7%), and not sure (37.8%). The question "sprayed how many months ago" showed less than a month ago (28.9%), less than 6 months ago (30.0%), and the rest of sprays were not known (41.1%). Additionally, the sprays were examined to see who did the task (spraying houses with mosquito repellents); results showed that it was done by government personnel/program (42.2%), private company (33.9%), household member (3.1%), other (1.7%), and not sure (19.2%). Participants' responses on ownership of bed nets showed that 56.1% of households had less than or equal to 2 bed nets (40.3%) and more than 2 bed nets (24.2%); whereas 43.9% of households indicated that they did not have bed nets. The bed nets which were reported to be present in the houses surveyed, only 50.6% were observed by research assistants and 49.4% were not observed. The results showed that some participants could not tell how long they had owned the bed nets (43.6%), those nets which were owned more than 3 years were 48.1%, less than or equal to 3 years were 8.3%. The majority of participants (63.3%) could not tell the type of bed net brands they had; "brand A" bed nets were .3%, other brands were not known (36.4%). Data analyzed showed that factory treated bed nets available in villages were 30%, not factory treated were 17.2%, and not sure whether factory treated were 52.8%. Participants' responses showed that 17.8 % of bed nets were soaked in mosquito repellents more than two years ago, 17.2% not soaked at all; and for 54.2% of nets it was not known whether they were soaked. Overall,

participants were not sure (99.7%) how long ago bed nets were soaked-treated in mosquito repellents. When participants were asked who slept under mosquito bed nets the responses were: slept under net (34.2%), not sure (49.2%), not at all (16.7%).

Table 4

Descriptive Statistics for Malaria Preventive Measures in the Malaria Indicator Survey Tool (N = 352)

Variables	Sample (N = 352)	Percent
Interior walls sprayed with repellents		
Sprayed	129	36.6
Not sprayed	90	25.6
Not sure	133	37.8
Sprayed how many months ago		
Less than 1 month ago	102	28.9
Less than 6 months ago	106	30
Not sure	144	41
Who sprayed the house		
Government worker/program	148	42.2
Private company	119	33.9
Household member	11	3.1
Other	6	1.7
Not sure	68	19.2
Ownership of mosquito bed nets		
At least 2 bed nets	197	56.1
More than 2 bed nets	142	40.3
No bed nets	13	3.6
Nets observed		
Yes	178	50.6
No	174	49.4
How long nets owned		
More than 3 years	169	48.1
Less than 3 years	29	8.3
Not sure	154	43.6
Net brands		
Not sure of brands	223	63.3
Brands Known	129	36.7
Factory treated bed nets		
Treated	106	30
Not treated	60	17.2
Not sure	186	52.8
Nets soaked -treated		
Soaked	63	17.8
Soaked more than two years ago	38	.3
Not soaked at all	60	17.2

Not sure	191	54.2
Sleeps under bed nets at night		
Yes	120	34.2
No	59	16.7
Not sure	173	49.2

Table 5 displays descriptive statistics for four categorical variables of the KAT tool, which were analyzed to assess attitudes and traditional practices of participants as related to malaria prevention and control measures. Participants who scored less than 50% on the KAT tool about malaria signs and symptoms were 47.4%; and 52.6% of participants scored greater than 50% during the pre-test phase. During the post testing phase, the majority of participants (77%) could state more than two signs and symptoms of malaria (statistical analysis discussed further in later section); where only 23% were still having problems to adequately state and identify signs and symptoms of malaria. Other observations showed the following: There were no changes noted about health service accessibility in the community, participants maintained positions in both pre-/post testing phases, that there was not enough facilities (66.8%) in the area to accommodate their health needs; 33.2% responded the opposite way-that there was sufficient health access facilities in Gusii region. Similarly, there was an overwhelming indication (68.2%) among study participants that community leaders did not meet or provide health services to the local people; only 31.8% participants responded positively about their leaders' ability to provide and meet community health demands. In addition, the results showed that before the layperson health education program (LPHEP) about malaria was presented to the participants, 35.8% go to the clinic; 59.1% buys over the counter medication (which are not meant for malaria); 3.7% uses traditional herbs; and 1.4% do nothing when infected by malaria. However, during the post testing phase the results showed that participants responded better than previously: 71.6% stated

they would go to the clinic within 24 hours, 24% stated they would still go and get medications over the counter, 2% would utilize traditional therapy, and 1.7% would not seek therapy (statistical analysis discussed further in later section).

Table 5

Descriptive Statistics for Five Categorical Variables in the Knowledge Assessment Tool

	Pre-Test Scores		Post-Test Scores	
Variables	Frequency	Percent	Frequency	Percent
Signs and Symptoms Scores				
50 percent and below	167	47.4	81	23
Greater than 50 percent	185	52.6	271	77
Health Access Sufficient				
Yes	117	33.2	117	33.2
No	235	66.8	235	66.8
Health Needs Met with Community Leaders				
Yes	112	31.8	112	31.8
No	240	68.2	240	68.2
Remedies to Treat Malaria in Households				
Goes to clinic within24 hrs	126	35.8	252	71.6
OTC medications	208	59.1	87	24.7
Uses traditional herbs	13	3.7	7	2
None	5	1.4	6	1.7

Note: OTC = over the counter medications; hrs = hours

Research Questions and Hypotheses

This study addressed two major research questions:

Research Question #1

Does a community education program on malaria have an impact on knowledge and associated behavioral change in managing malaria cases among study participants in the Gusii region of Kenya, Africa?

Null hypothesis #1

There is no significant difference ($P > .05$) between pre- and post-test scores on KAT measures pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region as a result of a community education program on malaria. Repeated measures one-way analysis of variance (ANOVA) was performed on pre-and post- test scores on KAT measures (ANOVA analysis discussed in later section) pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in the Gusii region, Kenya, Africa after a community education program on malaria (LPHEP).

Alternative hypothesis #1

There is a significant difference ($P<.05$) between pre- and post-test scores on KAT measures pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region as a result of a community education program on malaria. Repeated measures one-way ANOVA was performed on pre- and post-test scores on KAT measures (ANOVA analysis discussed in later section) pertaining to knowledge and associated

behavioral change in managing malaria cases among study participants in Gusii region following a community education program on malaria (LPHEP).

Comparisons of signs and symptoms of malaria statistics for KAT pre-/post test scores in Table 6 indicated that there is difference between KAT pre-test and post test mean scores. The pre-test mean score is (M = 2.35, SD = .912); whereas the post test mean score is (M = 3.16, SD = .844). The results reflected that lay person health education program (LPHEP) on malaria had an impact in the way participants responded to the items in the knowledge assessment tool (KAT) in the post-testing phase.

Table 6

Descriptive Statistics of Pre-Post-Test Scores for the Signs and Symptoms of Malaria

Signs and symptoms of malaria	*N*	Mean	Standard Deviation
Pre-test	352	2.35	.912
Post-test	352	3.16	.884

Table 7 displays the pre-post-test percentage scores for the Signs and Symptoms of Malaria. The post test percentage scores on signs and symptoms of malaria following the LPHEP teaching module on malaria prevention showed that a lot of participants in the study shifted from naming less than or equal to two signs and symptoms to greater than three or more signs and symptoms of malaria. Figure 5 shows graphical presentation on the pre-/post percentage scores reflected in Table 7.

Table 7

Pre-Post-Test Percentage Scores for the Signs and Symptoms of Malaria (N = 352)

Behavior	Sample	Pre-test scores	Sample	Post-test scores
Identified 0 s/sxs	3	.9	1	.3
Identified 1 s/sxs	52	14.8	10	2.8
Identified 2 s/sxs	161	45.7	65	18.5
Identified 3 s/sxs	91	25.9	131	37.2
Identified > 4 s/sxs	45	12.8	145	41.2
Total	352	100.0	352	100.0

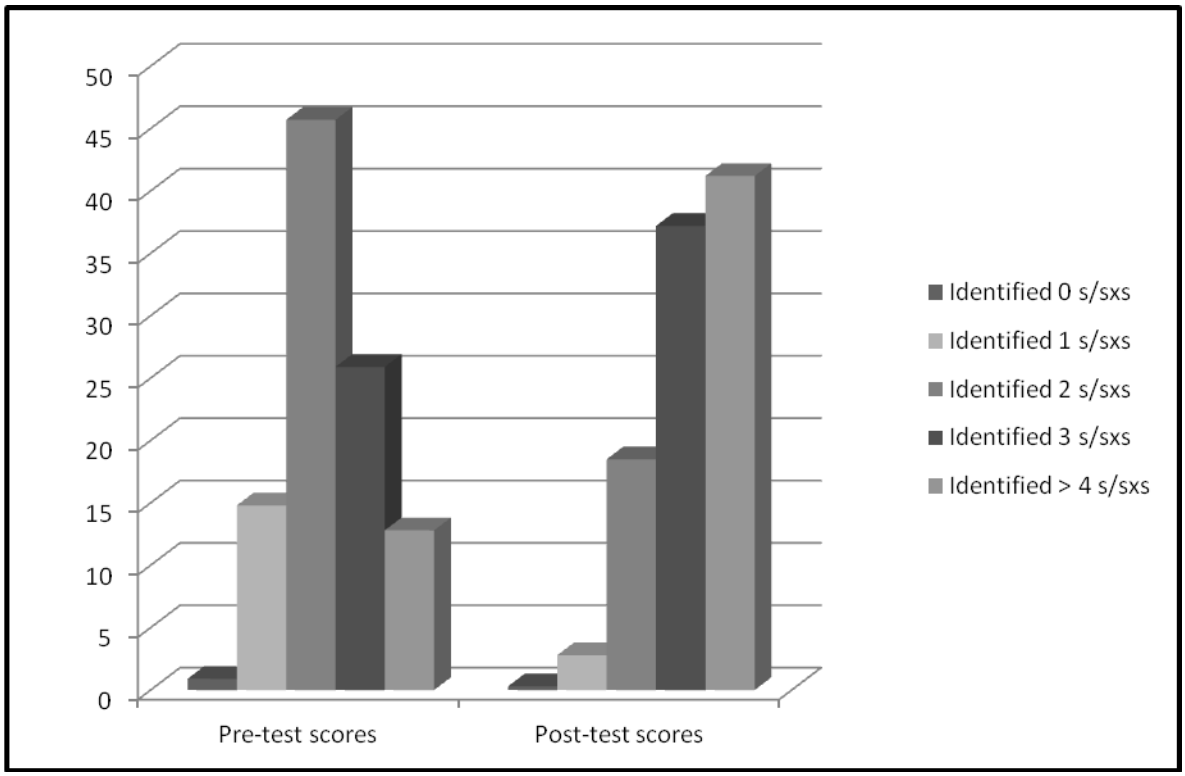

Figure 5. Bar chart of the pre-post-test percentage scores for signs and symptoms of malaria

One-way ANOVA to determine significant differences on signs and symptoms of malaria between the KAT pre-test and pos test scores was computed using IBM SPSS 19.0. The data is

displayed in Table 8. The calculations show a significant difference between the means, where $F(4, 347) = 506.207)$, $p < .05$. The F test showed a significantly reliable difference between the means of the groups for participants being able to identify and state more than two signs and symptoms of malaria following exposure to LPHEP (layperson health education program-about malaria). The investigator would accept the alternate hypothesis that "there are significant differences between pretest and posttest on KAT measures (signs and symptoms)pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region as a result of a community education program on malaria."

Table 8

One-way Analysis of Variance Results of Signs and Symptoms of Malaria

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	213.228	4	53.307	506.207	.000*
Within Groups	36.541	347	.105		
Total	249.770	351			

*$P < .05$

The KAT pre-/post test mean scores for remedies to treat malaria outbreak in households are displayed in Table 10. The results were ($M = 2.29$, $SD = .606$) and ($M = 2.66$, $SD = .606$) pre-/post-test, respectively.

Table 9

Descriptive Statistics of Pre-Post-Test Scores for the Remedies to Treat Malaria Outbreak in Households

Remedies to treat malaria outbreak in households	*N*	Mean	Standard Deviation
Pre-test	352	2.29	.606
Post-test	352	2.66	.606

Table 10 displays pre-post-test percentage scores for the remedies to treat malaria outbreak in households. Figure 6 shows graphical presentation on the pre-/post percentage scores reflected in Table 10.

Table 10

Pre-Post-Test Percentage Scores for the Remedies to Treat Malaria Outbreak in Households (N = 352)

Behavior	Pre-test scores	Post-test scores
Does nothing	1.4	1.7
Uses herbs	3.7	2.0
Over the counter medications	59.1	24.7
Goes to the hospital within 24 hours	35.8	71.6
Total	100	100

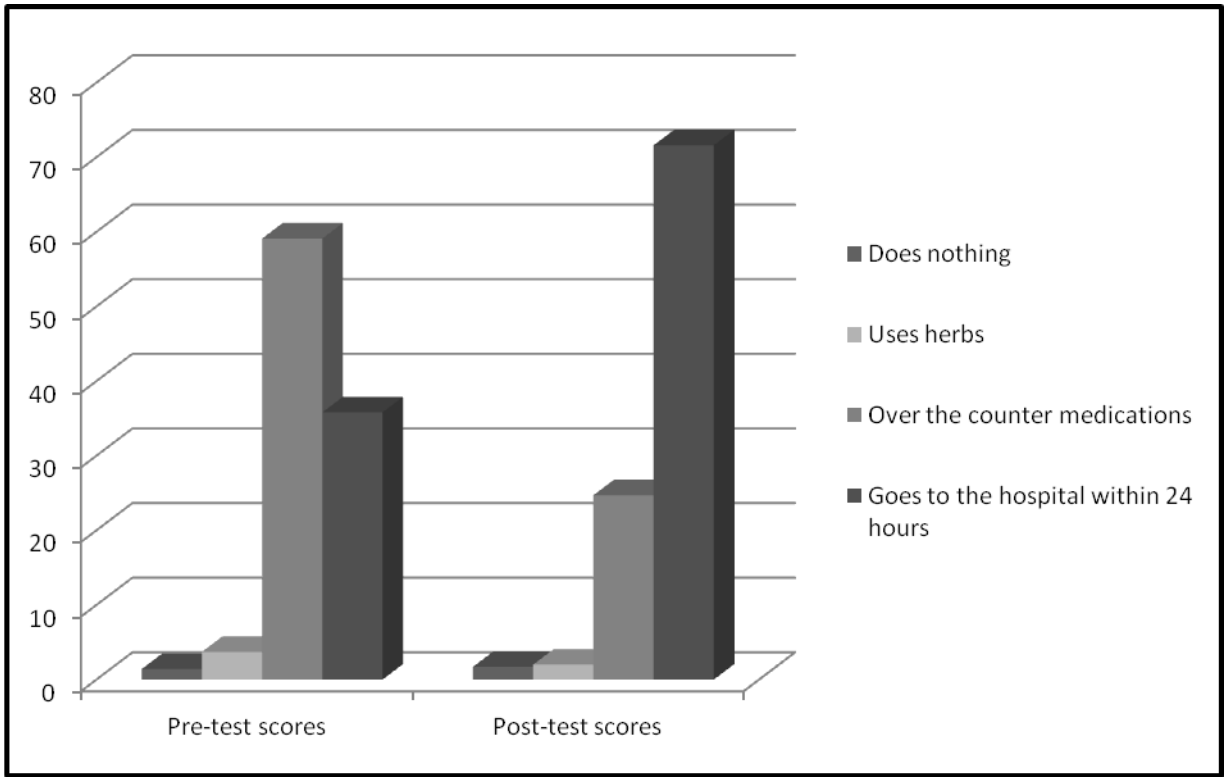

Figure 6. Bar chart of the pre-post-test percentage scores for the remedies to treat malaria outbreak in households

One-way ANOVA to determine significant differences on remedies to treat malaria outbreak in households between the KAT pre-test and pos test scores was computed using IBM SPSS 19.0. The data is displayed in Table 11. Computations in Table 11 show no significant difference between the means. The *F* values in Table 11 is $F(3, 348) = 2.351)$, $p = .072$). The *F* test showed a marginal significant difference between the means of the groups for participants being able to go to a clinic or hospital or bought over the counter malaria medication following exposure to LPHEP (layperson health education program-about malaria. The investigator would accept the alternative hypothesis that "there is a marginal significant difference between pre-test and posttest on KAT measures (on remedies to treat malaria outbreak in households) pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region as a result of a community education program on malaria. The investigator concludes that there appears to have been a slight improvement in the reported remedies to treat malaria after the intervention, although the results are not significant at $P < .05$.

Table 11

One-way Analysis of Variance Results of Remedies to Treat Malaria Outbreak in Households

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.558	3	.853	2.351	.072*
Within Groups	126.211	348	.363		
Total	128.770	351			

*$p < .05$

Research Question #2

Is there a relationship between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region?

Null Hypothesis #2

There is no significant ($P > .05$) difference between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region.

Alternative Hypothesis #2

There is a significant ($P < .05$) difference between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region.

Chi Square tests and Cramer's *V* were performed to determine if a relationship between education level on participants and malaria preventive measures were significantly different. The test results on education level and malaria preventive measures failed to indicate significant differences across variables: interior walls sprayed against mosquito, ownership of nets, factory treated nets, nets factory treated, and nets ever soaked (an alpha level of .05 was adopted for all statistical tests below).

Chi-square results on the relationship between education level and sprayed interior walls against mosquito showed X^2 (3, N = 352) = 6.14, p = .105, Cramer's V = .105, an indication that there is no significant relationship between these variables (see Table 12).

Table 12

Chi-square Data Analysis of Education Level and Interior Walls Sprayed Against Mosquito

		Education level				
		None	Primary	Secondary	College	Total
Sprayed interior walls against mosquito.	No	3	93	103	26	225
	Yes	6	44	56	21	127
Total		9	137	159	47	352

*X^2 (3, N = 352) = 6.14, p = .105, Cramer's V = .105

A chi-square result on education level and ownership of nets is reflected in Table 13. Chi-square results on sprayed interior walls against mosquito showed X^2 (3, N = 352) = .440, p = .932, Cramer's V = .932, an indication that there is no significant relationship between these variables.

Table 13

Chi-square Data Analysis of Education Level and Ownership of Nets

		Education level				
		None	Primary	Secondary	College	Total
Does your household own nets?	No	3	61	70	21	155
	Yes	6	76	89	26	197
Total		9	137	159	47	352

*X^2 (3, N = 352) = .440, p = .932, Cramer's V = .932

Chi-square results on education level and nets factory treated showed X^2 (3, N = 352) = 1.750, p = .626, Cramer's V = .626 (Table 14), an indication that there is no significant relationship between these variables.

Table 14

Chi-square Data Analysis of Education Level and Nets Factory Treated

		Education level				
		None	Primary	Secondary	College	Total
Nets factory	No	5	91	113	34	243
treated?	Yes	4	46	46	13	109
Total		9	137	159	47	352

*X^2 (3, N = 352) = 1.750, p = .626, Cramer's V = .626

Chi-square results on a relationship between education level and nets ever soaked showed X^2 (6, N = 352) = .7.990, p = .239, Cramer's V = .239 (see Table 15), an indication that there is no significant relationship between these variables.

Table 15

Chi-square Data Analysis of Education Level and Nets Ever Soaked

		Education level				
		None	Primary	Secondary	College	Total
Nets ever	Yes	1	27	26	6	60
soaked?	No	3	44	36	18	101
	Not sure	5	66	97	23	191
Total		9	137	159	47	352

*X^2 (6, N = 352) = .7.990, p = .239, Cramer's V = .239

Chi-square results on a relationship between education level and slept under net last night showed X^2 (3, N = 352) = 4.564, p = .207, Cramer's V = .207 (Table 16), an indication that there is no significant relationship between these variables.

Table 16

Chi-square Data Analysis of Education Level and Slept under Net Last Night

		Education level				
		None	Primary	Secondary	College	Total
Slept under net last night	No	3	90	103	33	229
	Yes	6	47	56	14	123
Total		9	137	159	47	352

*X^2 (3, N = 352) = 4.564, p = .207, Cramer's V = .207

Table 17 presents descriptive statistics for the mean scores related to signs and symptoms of malaria during the pre-testing and post testing phase on formal education levels. The means and standard deviations of participants with no formal education, primary school, secondary school, and some college education levels based on KAT pre-test scores were: M = 1.44, SD = 0.53; M = 1.48, SD = 0.502; M = 1.53, SD = 0.501; and M = 1.65, SD = 0.482, respectively. The second phase, KAT post testing means and standard deviations showed the following results: M = 1.78, SD = 0.441; M = 1.74, SD = 0.442; M = 1.78, SD = 0.42; and M = 1.85, SD = 0.36, respectively. The results in Table 17 show that, on a gross basis, all participants, regardless of education surveyed achieved better KAT mean scores during the second phase (post-testing).

Table 17

Descriptive Statistics of the Pre-Post-Test Mean Scores for Signs and Symptoms of Malaria Based on Education Level (n = 352)

	Pre- test scores		Post-test scores	
Education Level	Mean	Std deviation	Mean	Standard deviation
None	1.44	.527	1.78	.441
Primary	1.48	.502	1.74	.442
Secondary	1.53	.501	1.78	.419
College	1.65	.482	1.85	.363

The repeated-measures one-way ANOVA shows that there is no statistically significant difference between these changes based on education level, where F (3, 348) = 1.424, p = .235 (see Table 18). These results indicate that participants surveyed showed that there level of formal education had nothing to do with make significant changes to practice malaria preventive measures following the LPHEP program. Levels of formal education on participants and exposure to LPHEP did not yield significant results. Therefore, there were no statistically significant differences between education level and any of the remedies to treat malaria

Table 18

Analysis of Variance Results of Pre-Post-Test Mean Score for the Signs and Symptoms of Malaria versus Education Levels

Variable		Sum of Squares	df	Mean Squares	F	Sig.
Signs and symptoms (pre- /post test)	Between Groups	1.065	3	355	1.424	.235*
	Within Groups	86.705	348			
		87.770	351			

*$P < .05$

Summary and Forward

The purpose of chapter 4 presents the data and the results of the statistical analyses that were conducted. A total of 352 (97.8%) individuals responded to the questionnaires (MIS and KAT). Five (1.4%) participants who completed the surveys had to be excluded from the study because they did not meet all of the inclusion criteria, such as: had to be between the age of18 through 45 years old, men or women and able to make independent decisions to participated in the study, and parents with at least one child less than five years old. In addition, 3 (0.8%) surveys were excluded because they had extreme scores (outliers) and incomplete data. The

study sample comprised of more men (70.3%) than women (29.7%) participants. Most participants were classified as low socioeconomic status in a rural community, Gusii region, Kenya. The majority of participants (97%) spoke and wrote in English; the 3% who did not speak English were given the translated versions (MIS and KAT-Gusii Language). It took 2 months to collect data with the help of 10 research assistants who were trained and coached to administer the instruments and implemented the layperson health education program (LPHEP) on malaria prevention.

The calculations on KAT pre-test and post test scores show a significant difference between the means on signs and symptoms of malaria. The calculations in Table 8 show a significant difference between the means, where $F(4, 347) = 506.207$, $p = .000$, at an alpha level of .05.The *F* test showed a significantly reliable difference between the means of the groups for participants being able to identify and state more than two signs and symptoms of malaria following exposure to LPHEP (layperson health education program) about malaria. The investigator would accept the alternate hypothesis that "there is significant differences between pretest and posttest scores on KAT measures (signs and symptoms) pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region following a community education program on malaria." However, computations in Table 11 show no significant difference between the means for remedies to treat malaria, where $F(3, 348) = 2.351$, $p = .072$ (Table 11). The *F* test showed no significant difference between the means of the groups for participants being able to go to a clinic or hospital or bought over the counter malaria medication following exposure to LPHEP. The ANOVA result showed that there is no significant difference between the means of the participants following exposure to LPHEP based on remedies to treat malaria outbreaks in households. The findings in this specific

analysis will be discussed in chapter five. Chi square, Cramer's *V*, and ANOVA were performed to determine if relationship between education level on participants and malaria preventive measures; education level and signs and symptoms of malaria were significantly different. The test results on education level on malaria preventive measures and signs and symptoms of malaria failed to indicate significant differences across variables as indicated in Tables 12, 13, 14, 15, 16, 17, and 18.

Overall, the intervention (LPHEP) used in this study proved effective in changing the knowledge level in identifying more signs and symptoms of malaria. Descriptive statistics indicate that LPHEP had an impact in remedies used to manage malaria (such as going to the hospital within 24 hours following malaria infections or not buying over the counter medication which may not be effective in treating malaria) to treat malaria outbreak in households, although the results were not statistically significant. Possible interpretations of these findings are discussed in chapter 5. However, relationships between participant education level and malaria preventive measures did not show any difference; a phenomena which is addressed in chapter 5.

Chapter 5: Overview and Summary of Findings

Introduction and Chapter Organization

Chapter 5 describes an overview of why and how this study was conducted by reviewing the questions and hypotheses that were addressed in conjunction with the theoretical constructs used. A detailed interpretation of the findings is addressed as well. Additionally, the implication for social change, limitations of the study, delimitations of the study, recommendations for action and for further studies, and concluding remarks are succinctly presented.

Overview of Why and How the Study Was Conducted

A quantitative, community intervention with pre-post-test approach was used in this study to test the impact of a LPHEP on malaria control and prevention in Bondonya sub-location, Gusii-Kenya. In addition, this study assessed the relationship between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region.

This dissertation study posed the following questions and hypotheses:

First question, does a community education program on malaria have an impact on knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region? The *F* test in Table 8 showed a significantly reliable difference between the means of the groups for participants being able to identify and state more than two signs and symptoms of malaria following exposure to LPHEP. The investigator would accept the alternate hypothesis that "there is significant differences between pretest and posttest scores on KAT measures (signs and symptoms) pertaining to knowledge and associated behavioral

change in managing malaria cases among study participants in Gusii region following a community education program on malaria." Result showed that there is a significantly reliable difference between the means of the groups for participants being able to identify and state more than two signs and symptoms of malaria $F(4, 347) = 506.207)$, $p < .05$, at an alpha level of .05.

Research question 2 examined the relationship between socioeconomic variables in Gusii region. The Chi-square, Cramer's *V*, and ANOVA test results on education level and malaria preventive measures; education level and signs and symptoms of malaria failed to indicate significant differences at an alpha level of .05 across variables: - interior walls sprayed against mosquito, ownership of nets, factory treated nets, nets factory treated, and nets ever soaked, identifying signs and symptoms based on formal education level, among study participants in Gusii region. Therefore, null hypothesis was endorsed; that, "there is no significant ($P > .05$) difference between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region.

Background Summary

The overall goal for this dissertation addressed and provided a snap shot on the how and why malaria infections continues to be a major health problem in sub Saharan Africa with a particular site of reference, Gusii region Kenya. Literature after literature continued to show that millions of lives of young children below the age of 5years and expectant mothers are faced by very high morbidity and mortality rates associated with malaria infections in Africa (Amuyunzu-Nyamongo, 2010; Dinho, Van der Merwe, & Ehlers, 2009; Williams, Martina, Cumming, & Hall, 2009; Alonzo, 2006 & Tol, 2008; Nsimba & Kayombo, 2008; Bjorkman, 2005; Kelly-Hope

et al. 2008 & Muehlenbachs et al. 2008 Sirugo et al, 2008;). And yet malaria is a preventable disease (Williams et al. 2009).

My assumption was that the Gusii community is not exposed to health education programs which could sustain and empower participants to make informed decisions to manage and control malaria outbreaks in their villages. There is also a possibility of lack of health access and resources in the region to effectively manage malaria outbreaks. In order to systematically provide an evidence to substantiate my assumption, pilot testing was conducted to test the instruments (MIS and KAT) which were used to collect data on socioeconomic factors (sources of drinking water, kind of toilet facilities, participants owning electronics, type of fuel used for household needs, nature of floor materials used in participant residency, as well as transport means owned (car/truck, motorcycle/scooter, bicycle, or none). These variables stated did not yield results which could be used to divide participant as low, intermediate, or high socioeconomic class; the reason being that the sample selected entailed a small sample rural population with similar socioeconomic possessions; urban centers are over 50 miles away. The area has no manufacturing industries or well developed infrastructural facilities and consequently, no employment opportunities available near-by. The results showed that participants were rural and shared similar economic attributes which could not be compared in the present study. Similarly, knowledge-level/behavior changes outcome measures were based on KAT pre-/post scores (signs and symptoms of malaria - name at least two of them, levels of formal education in households – 4 levels: none, primary school, secondary school, and some college education, feels community clinics or hospitals are sufficient for region – 2 levels: yes or no, feels that health needs are provided and met by their community elders, chiefs, councilors, and district officers – 2 levels: yes or no). Two questions were asked primarily to measure

attitudes prevailing in the region as far as health access and support to control malaria is concerned. The last question in the KAT measurement tool assessed remedies used to treat malaria outbreaks in villages surveyed (6 levels: goes to hospital/community clinic for treatment within 24 hours, uses over-the-counter (OTC) medications from a shopping center, uses traditional herbs, consults a traditional healer, prays about it, does nothing).

Interpretation of Findings

This dissertation applied a quantitative, community intervention with pre-post-test research design. There were 360 participants that consented to the study and were interviewed using structured questionnaires. In the end, a total of 352 (97.8%) individuals responded to the questionnaires (MIS and KAT) in both pre-/post testing phases and met the criteria for analysis. Five (1.4%) participants who completed the surveys had to be excluded from the study because they did not meet all of the inclusion criteria, such as: had to be between the age of18 through 49 years old, men or women and able to make independent decisions to participated in the study, and parents with at least one child less than 5 years old. In addition, 3 (0.8%) surveys were excluded because they had extreme scores (outliers) and incomplete data. The study sample comprised of more men (70.3%) than women (29.7%) participants. Most participants were classified as low socioeconomic status in a rural community, Gusii region, Kenya. The majority of participants (97%) spoke and wrote in English; the 3% who did not speak English were given the translated versions (MIS and KAT-Gusii Language). Data entry and analysis was done using IBM SPSS Statistics 19; tabulations of important variables such as the place of residence, condition of bed nets, economic level (high socioeconomic status, average, and low socioeconomic status), and education level of participants were done.

The first phase of analysis involved testing the survey tools which were to be used in this dissertation for reliability and validity. Fifty participants from Gusii community were pilot tested to establish reliability and validity of the malaria indicator survey questionnaire (MIS) and knowledge assessment tool (KAT). The results indicated that the MIS and KAT were useful in this study. The two-tailed Pearson correlation was $r(50) = 0.99$, which indicates that the MIS and KAT scales have good reliability.

Table 2 shows descriptive statistics for 6 demographic variables in the MIS/KAT tool. There were 352 participants who participated in this research study. Descriptive results in Table 2 showed the following: the sample population had more men (70.3%) than women (29.7%) participants (1.4%), relationship to participant with spouses (8.1%), sons or daughters (12.5%), Son in-law and daughter in-law (23.1%), grand children (24.2%), parents (18.6%), parent in-law (5.8%), brother or sister (5.6%), other relatives (.3%), adopted/foster/step child (.6%). Those who lived in their residencies through most nights (62.2%) were more than those who did not stay in their villages at night, frequently (37.8%). Participants who were between the ages of 19-30 years old (44.7%) were more than those who were between 31-45 years old (41.1%); whereas participants between 46-49 years old were the least (14.2%). Participants' education levels were: none (2.6%), primary (38.9%), secondary (45.5%), and college (13.1%). These statistics are representative of the general population in the Gusii region (KNBS, 2010), except for a slightly higher proportion of males. Ojakaa et al. (2011) argued that community programs could be successful, like the LPHEP used in the Gusii community, if the program targets both men and women participants. Ojakaa and colleagues (2011) further argued that knowledge, behavior, and attitudes among study participants are vital factors to be considered when community programs are designed and implemented.

Malaria preventive measures as depicted in Table 4 indicated that most of the participants belong to a low socioeconomic status and consequently lacked the necessary tools to combat malaria. For example, there were 3.6% participants who indicated that they did not own bed nets. However, the good news was on the ownership of electronics (78.9%) as seen in Table 6, most of the indigenous population in Gusii region, own at least a cell phone, based on my overall observation; a tool which could be used to wage a massive campaign through telephonic comprehensive malaria education program on how to identify risk factors and prevent such deadly triggers for malaria infections and over time, ultimately control the high rates of morbidity and mortality in the region. Sixty three percent of participant showed lack of awareness about bed net brands and 43.6% participants could not be able to tell how long they had had the bed nets- which indicated lack of knowledge awareness/low level of knowledge about mosquito nets. The results also showed that about 41.1% participants were not sure whether they have ever had their houses sprayed by mosquito repellents. Above all, overwhelming 54.2 % participants were not aware how long ago bed nets were soaked-treated in mosquito repellents. A gain, this finding demonstrates a sign of low knowledge level among study participants in Gusii region. And according to past research knowledge-level versus literacy about malaria is significant, hence the need to educate individuals in community settings about the strategies to control and manage malaria (Hanafi-Bojd et al., 2011). Identification and elimination of knowledge gaps is critical in mitigating risk/gaps associated with cases of malaria infections (Alonso et al., 2011). However, based on a participatory model, it is important to engage communities by capacity building and training to empower individuals to become active participants in malaria control and prevention strategies (Attree et al., 2011).

In Table 5, five KAT categorical variables are displayed. Results showed that participants who scored less than 50% on the KAT tool about malaria signs and symptoms were 47.4%; and 52.6% of participants scored greater than 50% during the pre-test phase. During the post testing phase, the majority of participants (77%) could state more than two signs and symptoms of malaria; where only 23% were still having problems to adequately state and identify signs and symptoms of malaria. Other observations showed the following: There were no changes noted about health service accessibility in the community, participants maintained positions in both pre-/post testing phases, that there was not enough facilities (66.8%) in the area to accommodate their health needs; 33.2% responded the opposite way-that there was sufficient health access facilities in Gusii region. Similarly, there was an overwhelming indication (68.2%) among study participants that community leaders did not meet or provide health services to the local people; only 31.8% participants responded positively about their leaders' ability to provide and meet community health demands. In addition, the results showed that before the LPHEP about malaria was presented to the participants, 35.8% go to the clinic; 59.1% buys over the counter medication (which are not meant for malaria); 3.7% uses traditional herbs; and 1.4% do nothing when infected by malaria. However, during the post testing phase the results showed that participants responded better than previously: 71.6% stated they would go to the clinic within 24 hours, 24% stated they would still go and get medications over the counter, 2% would utilize traditional therapy, and 1.7% would not seek therapy.

Comparisons of signs and symptoms of malaria statistics for KAT pre-/post test scores in Table 6 indicated that there is difference between KAT pre-test and post test mean scores. The pre-test mean score is (M = 2.35, SD = .912); whereas the post test mean score is

($M = 3.16$, $SD = .844$). The results reflected that layperson health education program (LPHEP) on malaria had an impact in the way participants responded to the items in the knowledge assessment tool (KAT) in the post-testing phase.

One-way ANOVA to determine significant differences on signs and symptoms of malaria between the KAT pre-test and pos test scores was computed using IBM SPSS 19.0. The data is displayed in Table 9. The calculations show a significant difference between the means, where $F(4, 347) = 506.207$, $p < .05$ The F test showed a significantly reliable difference between the means of the groups for participants being able to identify and state more than two signs and symptoms of malaria following exposure to LPHEP. The investigator would accept the alternate hypothesis that "there are significant differences between pretest and posttest on KAT measures (signs and symptoms) pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region as a result of a community education program on malaria."

The present study replicated studies which have showed that knowledge about malaria as a disease process can be prevented in sub Saharan Africa (Dike et al., 2006). World Health Organization (WHO, 2010) reported that community-directed interventions (CDI) are more effective for priority health problems in Africa, such as malaria. Hence, the results in the present study indicate that a community education program on how to control and manage malaria has the potential of yielding positive results.

The rationale behind the assessment on hypothesis # 1 was to evaluate an impact which a malaria intervention program (LPHEP) implemented in the first phase in this project had on the participants on responding to the same items in KAT, during the second phase, pertaining to malaria outbreaks and the best ways to control and manage it.

One-way ANOVA to determine significant differences on remedies to treat malaria outbreak in households between the KAT pre-test and pos test scores was computed using IBM SPSS 19.0. The data is displayed in Table 11. Computations in Table 10 show no significant difference between the means, where F (3, 348) = 2.351, p = .072. The F test showed no significant difference between the means of the groups for participants being able to go to a clinic or hospital or bought over the counter malaria medication following exposure to LPHEP. The null hypothesis is endorsed, although the p-value could be considered marginally significant. Therefore, this finding could benefit from future research studies to confirm or dispute this result. Descriptive statistics on remedies to treat malaria in households showed a change in participants' responses. Increasing the sample to more than 352, changing the way the questions are asked, or coding responses differently as used in this study may show a significant difference between pre- /post test survey scores; the reason being, researchers are then able to collect accurate data and stratify groups during analysis. For example, using stratification there is the ability to dig deeper and capture more details pertaining to cases such as gender (men and women), age (older and younger), and economic status (low and high; or urban and rural) to perform a comparative study.

The investigator would accept the null hypothesis that "there is no significant differences between pretest and posttest on KAT measures (remedies to treat malaria outbreak in households) pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region following a community education program on malaria."

However, the alternative hypothesis was endorsed as far as scores on signs and symptoms of malaria are concerned; namely "there are significant differences between pretest and posttest

on KAT measures pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region following a community education program on malaria."

The results showed a snap shot on the impact of a 30 min presentation of malaria education and what it could produce. Webster et al. (2010) showed previously that a cross-sectional design is adaptable to natural experiments. Similarly, this investigation pointed out that changing human behavior in their natural habitat can be challenging. However, by utilizing a simple approach, like teaching the best ways to prevent malaria proved, on a gross basis, that it can work to empower Gusii community to respond appropriately during malaria outbreaks in villages. In addition, performing these kinds of studies at the grassroots level, and the data from routine surveys such as Health Surveys (like KAT), modified by the addition of one to two questions for each intervention could yield meaningful outcomes. Similar community approaches have the potential to enable wider application of rigorous evaluations and thereby improving utilization and delivery systems for malaria control and other public health interventions.

Research question # 2 examined whether there is a significance difference between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region.

Chi Square, Cramer's *V*, and ANOVA tests were performed to determine if relationship between education level on participants and malaria preventive measures; formal education level and knowledge on signs and symptoms of malaria following LPHEP intervention were significantly different. The test results on education level and malaria preventive measures; education level and knowledge on signs and symptoms of malaria following LPHEP exposure failed to indicate significant differences across variables as indicated in Tables 12, 13, 14, 15,16,

17, and 18. The analyses showed that there is no significant difference between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region. The data collected showed economic attributes which were similar (Table 3); such as not many participants own means of transportation (81.9%), most participants use firewood/straw 82.8% for fuel needs, and house floors are made up of earth and sand (88.6%). It was also found that participants (95.6%) use pit latrines with slap. Consequently, the sample could not be divided into low, intermediate, and high socioeconomic variables/status for comparison purposes. Future research may examine urban (Kisii Town) and rural population (Gusii region) for a possibility of tapping participant who could be of different classes; perhaps, then an analysis could be done to see whether there are significant relationships between socioeconomic status and malaria preventive measures.

Therefore, the null hypothesis in this study was accepted that "there is no significant difference between socioeconomic factors and knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region"

Theoretical Interpretation of the Results

Two theoretical constructs were utilized in this dissertation. First, participatory viewpoint as stipulated by Elden & Chisholm (1993) and second, SCT (Abraham, Clift, & Grabowski, year; Thilliez et al., 2010). Fals-Borda (1992) noted that participants would accept an intervention only and only if they see the benefit of it. However, for any benefit to be realized, individuals under any intervention program have to belief in the concept of SCT; that the environment, individuals, and behaviors have to be in a continuous and cyclical motion (Maibach & Parrot, 1995). As stated in chapter 1, a basic premise of SCT is that people learn not

only through their own experiences, but also by observing the actions of others, as depicted in a participatory theoretical construct (Minkel, 2010), and the results of those actions. Individuals have to be engaged (Attree et al., 2011) as well to comply (Dunn et al., 2011) in such programs to see positive outcomes, as was the case in this dissertation. Layperson research assistants were recruited from the community and were utilized to foster ownership in the program and to encourage participants that the project that was being conducted was part of them- because their own children were involved in the collection of data and implementation of the study. Additionally, participants could learn and retain malaria information better based on their levels of readiness (pre-contemplation, contemplation, preparation, action, and maintenance) to learn as depicted in the trans-theoretical model (Creswell, 2009). Such levels of readiness are embedded in the cognitive school of thought as postulated by Creswell (2009). The researcher in the present study incorporated the trans-theoretical model because participants who were surveyed and did not see the need to participate or even see the benefit of the project withdrew from the study before it was completed, particularly in the second phase. One study (Maibach &Parrott, 1995, p. 44) showed that for behavior change to occur, people must have knowledge both about their risk factors and the ways in which their risk factors can be reduced (alternative behaviors); without such knowledge people are unlikely to engage in the process that can ultimately lead to behavior change.

Community participatory education programs have been found to be effective as indicated in previous HIV/AIDS studies (Rhodes, Malow, & Jolly, 2010) as well as a similar study in Tanzania (Kinung'hi et al., 2010), Kinung'hi et al. (2010) utilized a community-based cross-sectional survey which involved 504 participants and found that 90.1% respondents knew that malaria was a major health issue in their area, 92.1% or respondents reported that they knew

that malaria is transmitted through mosquito bite, 86.7%, 60.8%, and 32.1% of the respondents knew and mentioned fever, vomiting, and loss of appetite as major symptoms of malaria, respectively. Fifty nine percent of the respondents reported that their participants owned at least one mosquito net. Of the 504 participants surveyed in the study (Kinung'hi et al., 2010), 87.2% of the respondents sought treatment from health care facilities, 8.5% obtained anti-malaria medications from the local shops, whereas 3.1% used local herbs. Findings through logistic analysis showed that household location and level of knowledge of cause of malaria were significant predictors of household being affected by malaria. These results are important to note when interpreting the findings from this study.

In this research an overview assessment was conducted using the MIS and KAT to identify risk factors/gaps which could create barriers in the control and prevention of malaria in Gusii region. Local leaders and research assistants were used to recruit and collect data, respectively. Involvement of local personnel in this research was in line with the concept of participatory theory; which is a process of collective decision making that combines elements from both direct and representatives in the field. Research articles reviewed in this dissertation would explain findings in this study that there is a trend in shifting facility based interventions to community settings to combat malaria (Gahutu et al., 2011; Hanafi-Bojd et al., 2011; Ngasala et al., 2011). World Health Organization (WHO) recommends such a shift (facility to community services) as well (Chanda et al., 2011). In the present research, results reflected that the LPHEP on malaria had an impact in the way participants responded on the items in the knowledge assessment tool (KAT) in the post-testing phase. Teaching participant on how to identify risk factors associated with malaria infections had a positive impact on participants as indicated in the

second responses to KAT items; participants were able to respond appropriately what they would do if they experienced future malaria outbreaks in their villages.

In this dissertation, the project focused on asking, for example, whether local people were adequately engaged in a 30 min intervention program; increasing their knowledge base and empowered participants to self-engage in health choice decision making; and leading them to make a lifestyle change as previous participatory studies indicated (Carr et al., 2008). The results showed that, on a gross basis, all participants surveyed achieved better KAT mean scores during the second phase (post-testing). The results could be interpreted that possibly participants may have gained some knowledge through a malaria education program (LPHEP) which was presented following the pre-testing phase. According to Wallerstein et al. (2010) participatory action involved the idea of bridging the gap between science and practice. And that society could be transformed to eliminate health inequities such as malaria in sub Saharan Africa, if education between scientists and the public took place in both directions. Participants in the present study were involved in giving their responses as far as malaria infections were concerned. Simply put, there was collective efficacy and behaviors related to community participation in an attempt to influence future policy change pertaining to malaria prevention and control in Gusii region. Over 90 % of participants in the sample selected in this dissertation were able to complete the study successfully. Research assistants and study participants exhibited community ownership, empowerment and hope at the grassroots level. Such social determinants created favorable conditions for health as put forward by Wallerstein et al. (2011), particularly in the way community participants involved in this present study showed an interest in wanting to become active agents of positive social change. Participants' responses in the present investigation identified knowledge gaps/risks and replicated similar studies (Alonzo et al., 2011) conducted in the

past. That knowledge alone is not adequate to mitigate risk factors associated with malaria. Malaria prevention strategies should entail a collective effort as in the participatory school of thought.

Previous participatory studies (Benach et al., 2010) have argued that combining mainstream scientific sources and important knowledge from relevant actors in society, as was done in this dissertation, provides the most comprehensive understanding of gaps/risks and allows scientists to identify and suggest solutions to issues such as malaria. Demographic indicators/attributes (formal education levels, residential characteristics, ownership of electronics, bed nets, and others) observed and analyzed in this study provided a snap shot that could warrant the need for integrated interventions at the community sphere of influence (individual level and environmental levels). Community participation fosters favorable health outcomes (Bryant et al. 2007).

The basic principles in SCT founded by Bandura (1986) defined human behavior as a triadic (environment, person and behavior), dynamic, and reciprocal interaction of personal factors, behavior, and the environment (Bandura, 1977a; 1986; 1989). The theory postulated that an individual's behavior is uniquely determined by each of these three factors. The results in the present study showed that an intervention (LPHEP) in the environment influenced participants (persons) the way they responded (behavior) to questions in KAT during the second phase. Repeated measures one-way analysis of variance (ANOVA) was used to test pre- and post-test. Chi-square, Cramer's *V*, and ANOVA tests were used to examine the relationship between MIS malaria preventive indicators and education level as well as knowledge level on signs and symptoms of malaria following LPHEP exposure. ANOVA results revealed that there were significant differences between pretest and posttest scores on KAT measures pertaining to knowledge

and associated behavioral change in managing malaria cases among study participants in Gusii region because of a community education program on malaria prevention that was presented during the study. Studies (Abraham, Clifft, & Grabowski, 1999; Thuilliez et al., 2010) in the past have argued that human behavior is explained in terms of a three-way, dynamic, reciprocal theory in which personal factors (ability to perform, social status), environmental influences (interventional programs), and behavior (actions) continually interact . A basic premise of SCT is that people learn not only through their own experiences, but also by observing the actions of others as would be depicted in a participatory theoretical construct (Minkel, 2010) and the results of those actions. Comparatively, Minkel (2010) would explain that the actions (difference in KAT pre- and post-test scores) in the present study demonstrated that participants responded differently to the same survey questions presented to them the second time because of the interactions in human, environment, and behavior. Exposure to new knowledge in the environment resulted in a change of participants' results in the KAT scale on signs and symptoms of malaria ($M^1 = 2.35$, $M^2 = 3.16$). In this study, actions of research assistants influenced actions of research participants. This finding is significant in demonstrating cognitive dispositions when persons are exposed to evidence-based research and particularly when they know that such knowledge could produce positive outcomes (Smith et al., 2009).

Smith et al. (2009) may have argued that the change in KAT scores observed in this study could have occurred because participants were empowered cognitively to select choices which made sense to address malaria infections in their households. In addition, King et al. (2010) would argue that health education activities such as the one which was presented in this dissertation (LPHEP) should be an integral part of a package to improve child survival in rural

areas and that men (70.3%) as well as women (29.7%), as demonstrated in this study, should be involved in education interventions.

In addition, Onwujekwe, Malik, El-Fatih, Mustafa, & Mnzava (2005) argued that little understanding of the relative importance of economic factors that contribute to people acquiring malaria may impact the way research participants would respond to malaria outbreaks. Onwujekwe, Malik, El-Fatih, Mustafa, & Mnzava (2005) and Dike, Onwujekwe, Ojukwu, Ikeme, Uzochukwu , & Shu (2006) found that predisposing characteristics of the household heads such as age, knowledge of malaria, education, and the size of the household, perhaps could have an impact on the incidence of malaria.

Social Change Implications and Recommendations for Action

The social change implications of this study include aiding stakeholders such as the indigenous people themselves, hospital institutions, local health clinics, and District hospitals, the Ministry of Health, non-governmental international agencies, and policy-makers in Kenya to quickly identify and mitigate gap/risk factors associated with higher rates of malaria infections. It was imperative to understand relationships between socioeconomic factors and participants' knowledge and associated behavioral change to control malaria cases in Gusii region, Kenya and that a community education program on malaria would have an impact in changing behaviors of participants on how to control malaria cases in Gusii region, Kenya. Previous studies (King et al. 2010) have suggested the importance of developing education programs such as the LPHEP which was utilized in this study as a means to empower the indigenous population in Gusii, Kenya to make wise decisions when faced with outbreaks of malaria infections in their villages.

The malaria endemic claims a lot of young children's lives under the age of 5 and expectant mothers (Smith, Dushoff, Snow, & Hay, 2005; CDC, 2010); and yet, malaria is a preventable and treatable disease (Williams et al. 2009). Such malaria related morbidity and mortality affects many innocent lives in rural Africa. Malaria is a major problem that deserves attention. The results of this study showed that the efficacy of community participatory and social cognitive approaches could be used by public health professionals to advocate change in malaria prevention and control measures. The results from this investigation showed a snap shot of an impact on "intermediate" effect; a result which could be utilized to reduce malaria transmission and lower incidence malaria cases in Gusii region Kenya, now and in the future.

It is important to note that demographic variables do matter when writing and implementing community education programs in rural Africa (Ericksen et al., 2010). Instead of getting caught up in the technicalities of a program structure, a 30-minute simple program such as the LPHEP on malaria could make a huge difference in the way indigenous populations would respond to malaria infections. The implications in this argument are that simple approaches to societal problems are cheaper, sustainable, and effective as demonstrated in this dissertation.

Recommendations for Future Research

The results of this dissertation have stimulated additional research questions for further studies. As this study showed that the layperson health program had an impact over a short period of time to elicit change in participants in Gusii region, the question still remains: would the same program have an impact the same way across gender lines? Similarly, what would be an ideal time, for content retention, to present health education teaching modules to research participants? There is also a major gap which was identified in this dissertation. There are a few

standardized tools to measure malaria infections in rural Africa like MIS (Malaria Indicator Survey Household Questionnaire by World Health Organization). More research tools/survey instruments need to be designed to make it easier for researchers to conduct malaria surveys in many parts of Africa and around the world. There is also a need to systematically review government and non-governmental malaria initiatives in rural Africa. The snap shot provided in this dissertation showed that the majority of the participants were not aware of the importance of malaria preventive strategies. For example, overwhelming 99.7 % participants in this dissertation were not aware how long ago bed nets were soaked-treated in mosquito repellents; a possible indication of a missed or lack of vital information to empower indigenous populations in rural Africa to make meaningful decisions in the fight against malaria.

Although significant differences between pretest and posttest scores on MIS and KAT measures pertaining to knowledge and associated behavioral change in managing malaria cases among study participants in Gusii region as a result of a community education program on malaria were identified, it is recommended that this study be repeated but with a research design and a large sample to incorporate a comparison group. The results from such future studies would serve to further validate or perhaps challenge malaria findings in this study particularly an economic component and participant demographics; additionally, a stronger evidence-base regarding malaria control and prevention in Africa would be generated. And the results would be of an immense utility, applicable to all persons in rural Africa and around the world.

The idea of assessing the true role of heads of household could be critical in future research. In the Gusii community, for example, men are considered the heads of households; a factor which needs to be examined closely. There are times when women are in-charge in the villages

because either their men are dead, gone to cities for jobs, or are not involved in the well-being of family members. Therefore, it is suggested in this dissertation for a thorough future investigation about the true definition of heads of households and the prevention of malaria. And finally, the gender factor may also need to be assessed in future research to evaluate the responses to clinical malaria cases between men and women in the rural areas as well as in urban centers.

Summary

This study sought out to identify risk factors/gaps existing in Gusiiland, Kenya. The goal in mind was to involve a community that has never participated in a study of this kind; unique and involving. Participants were given the chance to test their knowledge about malaria and then compare what they already knew and the evidence-based information as compiled by World Health Organization. Overall, participants learned that buying drugs over the counter to treat malaria without proper diagnosis was not effective in treating malaria. In addition, the idea of going to the hospital within 24 hours of malaria infection proved to be helpful and was embraced by the majority of participants. The community was introduced to a malaria dialogue and community resources. The study reinforced the concept of human behavior as a triadic (environment, person and behavior), dynamic, and reciprocal interaction of personal factors, behavior, and the environment (Bandura, 1977a; 1986; 1989). Management of malaria is a community issue; it is not an individual effort. And yes, malaria is preventable.

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Appendix A

Layperson Health Education Program (LPHEP)

Title of Activity: The Basics of Malaria Control and Prevention Module: A community education program

Total Number of Contact Hours: 30 minutes Session

Intended Level of Learner: Introductory and Basics

Objectives	Content (Topics)	Teaching/Learning Resources
Examine the different risk factors of malaria in Gusii region.	• mosquito bites • rainy season • stagnant water • lack of not taking malaria medication for preventing malaria infections • lack of information on malaria prevention • not using insecticide treated nets correctly • not using mosquito repellents	Written material Nets to demonstrate the correct ways to install them
Identify the warning signs and symptoms of malaria	• shaking chills • high fever, and sweating which are often associated with; o fatigue,	Written material

	○ headache, ○ dizziness, ○ nausea and vomiting, ○ abdominal cramps, ○ dry cough, ○ muscle or joint pain, and back ache	
List ways to control and prevent malaria infections	Prevention Research and treatment based on evidence Assistance and help for the indigenous population, Gusii Reporting malaria clinical cases	Written material

Information of this module is summarized from WHO 2010 fact sheet and WHO 2010 Malaria Prevention Guide

What is malaria?

Malaria is a life-threatening disease caused by parasites that are transmitted to people through the bites of infected mosquitoes. The good news is that malaria is preventable and curable. Malaria is caused by parasites. The parasites are spread to people through the bites of infected *Anopheles* mosquitoes, called "malaria vectors", which bite mainly between dusk and dawn. Malaria is an acute febrile illness. Symptoms appear seven days or more (usually 10–15

days) after the infective mosquito bite. The intensity of transmission depends on factors related to the parasite, the vector, the human host, and the environment.

Identify risk factors

- mosquito bites: such bites occur in the evening and night hours
- rainy season: there is an increase of mosquitoes during rain seasons and hence more frequent mosquito bites
- stagnant water: are bleeding sites for mosquitoes (broken pots, pot holes)
- lack of not taking malaria medication for preventing malaria infections: It is important to take medications to prevent malaria infections
- lack of information on malaria prevention as identified in the KAT tool
- not using insecticide treated nets correctly as observed in responses given by participants and in return demonstrations
- not using mosquito repellents: participants may not be aware of the repellents available in the region

What are the Signs and Symptoms of Malaria?

The first symptoms of malaria are:

- fever
- headache
- chills
- vomiting

Timing in the treatment of malaria is critical. If not treated within 24 hours of an infection, malaria can progress to severe illness often leading to death. Children in endemic areas with severe disease frequently develop one or more of the following problems, such as: severe anemia, breathing problems. In adults, multi-organ involvement is also frequent.

Who is at Risk, most?

- Young children under the age of five
- Pregnant or expectant mothers
- Individuals with HIV/AIDS
- Travelers

How can Malaria be Controlled and Prevented?

Early findings/identification and treatment of malaria reduces disease and prevents deaths. It also contributes to reducing malaria transmission. The best available treatment for malaria is artemisinin-based combination therapy (ACT) medication. WHO recommends that malaria be confirmed by parasite-based identification before giving treatment. Results of parasitological confirmation can be available in a few minutes.

According to World Health Organization recommendations, it has been shown that vector control is the primary public health intervention for reducing malaria transmission at the community level. It is an intervention that can reduce malaria transmission from very high levels to close to zero. In high transmission areas, it can reduce child mortality rates and the prevalence of severe anemia. For individuals personal protection against mosquito bites represents the first line of defense for malaria prevention.

Two forms of vector control are effective in a wide range of circumstances. These are:

- Insecticide-treated mosquito nets (ITNs): Long lasting insecticide impregnated nets (LLINs) are the preferred form of insecticide treated nets for public health distribution programs. WHO recommends universal vector control coverage, and in most places, the most cost effective way to achieve this is through provision of LLINs, so that everyone in high transmission areas sleeps under a LLIN every night;
- Indoor spraying with residual insecticides: Indoor residual spraying (IRS) with insecticides is the most powerful way to rapidly reduce malaria transmission. Its full potential is realized when at least 80% of houses in targeted areas are sprayed. Indoor spraying is effective for 3–6 months, depending on the insecticide used and the type of surface on which it is sprayed. DDT can be effective for 9–12 months in some cases. Longer-lasting forms of IRS insecticides are under development.

Medications can also be used to prevent malaria. For travelers, malaria can be prevented through chemoprophylaxis, which stops the progression of the blood stage of malaria infections, thereby preventing malaria disease.

Steps on how to hang nets correctly

- Hang the nets from the walls or roof to cover the bed or sleeping mat.
- Tuck the bottom of the net under the mattress or let it hang so that it touches the ground all around.

Appendix B

Malaria Indicator Survey

Household Questionnaire

Kenya
Bondonya sub-location, Kisii Region
2011

MALARIA INDICATOR SURVEY
MODEL HOUSEHOLD QUESTIONNAIRE

MALARIA INDICATOR SURVEY
MODEL HOUSEHOLD QUESTIONNAIRE

KENYA

INITIALS OF RESEARCHER__ __ __

IDENTIFICATION			
PLACE NAME:			
NAME OF HOUSEHOLD:			
CLUSTER NUMBER:			
HOUSEHOLD NUMBER:			
REGION:			
RURAL/URBAN (Rural =1, Urban = 2)			

	1	2	FINAL VISIT
DATE:			DAY ▒▒ MONTH ▒▒ YEAR ▒▒▒▒
INTERVIEWER'S NAME:			NAME ▒▒
RESULT*			RESULT ▒

NEXT VISIT: DATE: TIME:	_____ _____	_____ _____	TOTAL NO. OF VISITS [ ]

*RESULT CODES:

1 COMPLETED

2 NO HOUSEHOLD MEMBER AT HOME OR NO COMPETENT RESPONDENT AT

HOME AT TIME OF VISIT

3 ENTIRE HOUSEHOLD ABSENT FOR EXTENDED PERIOD OF TIME

4 POSTPONED

5 REFUSED

6 DWELLING VACANT OR ADDRESS NOT A DWELLING

7 DWELLING DESTROYED

8 DWELLING NOT FOUND

9 OTHER

(SPECIFY)_____

SUPERVISOR

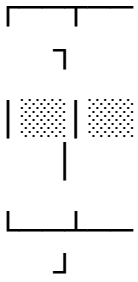
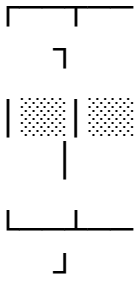
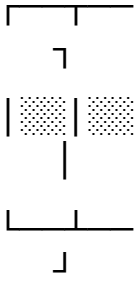
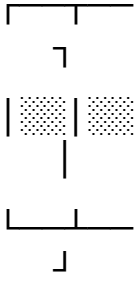
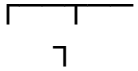
NAME:_____

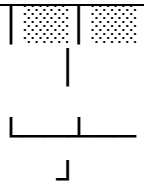
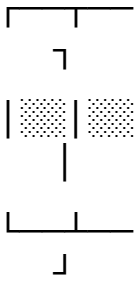
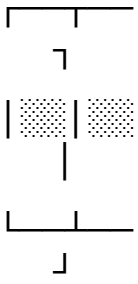
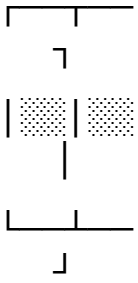
DATE:_____

HOUSEHOLD LISTING

Now we would like some information about the people who usually live in your household or who are staying with you now.

LINE NO.	USUAL RESIDENTS AND VISITORS	*RELATIONSHIP TO HEAD OF HOUSEHOLD	SEX	RESIDENCE		AGE	ELIGIBLE WOMEN	CURRENTLY PREGNANT?
	Please give me the names of the persons Who usually live in your household and guests of the household who stayed here last night, starting	What is the relationship of (NAME) to the head of the Household?*	Is (NAME) Men or Female?	Does (NAME) usually live here?	Did (NAME) stay here last night?	How old is (NAME)?	CIRCLE LINE NUMBER OF ALL WOMEN AGE 18-49	FOR ELIGIBLE WOMEN, ASK: Is (NAME) currently pregnant?

	with the head of the household.							
1	2	3	4	5	6	7	8	9
1			M F 1 2	YES NO 1 2	YES NO 1 2	IN YEARS	1	YES NO/DK 1 2
2			1 2	1 2	1 2		2	1 2
3			1 2	1 2	1 2		3	1 2
4			1 2	1 2	1 2		4	1 2
5			1 2	1 2	1 2		5	1 2

								
6			1 2	1 2	1 2		6	1 2
7			1 2	1 2	1 2		7	1 2
8			1 2	1 2	1 2		8	1 2

* CODES FOR Q.3
RELATIONSHIP TO
HEAD OF
HOUSEHOLD:
01 = HEAD
02 = WIFE/HUSBAND
03 = SON OR
DAUGHTER
04 = SON-IN-LAW OR
DAUGHTER-IN-LAW
05 = GRANDCHILD
06 = PARENT

07 = PARENT-IN-LAW
08 = BROTHER OR SISTER
09 = OTHER RELATIVE
10 = ADOPTED/FOSTER/
STEPCHILD
11 = NOT RELATED
98 = DON'T KNOW

TICK HERE IF CONTINUATION SHEET USED

☐

Just to make sure that I have a complete listing:
1) Are there any other persons such as small children or infants that we have not listed?
YES

☐ —>

ENTER EACH IN TABLE
NO

☐

2)
In addition, are there any other people who may not be members of your family, such as domestic servants, lodgers or friends who usually live here?
YES

☐ —>

ENTER EACH IN TABLE
NO

☐

3)
Are there any guests or temporary visitors staying here, or anyone else who stayed here last night, who have not been listed?
YES

☐ —>

ENTER EACH IN TABLE
NO

☐

NO	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
10	What is the main source of drinking water for members of your household?	PIPED WATER PIPED INTO DWELLING .....11 PIPED INTO YARD/PLOT.....12 PUBLIC TAP/STANDPIPE.....13 TUBE WELL OR BOREHOLE.....21 DUG WELL PROTECTED WELL .....31 UNPROTECTED WELL .....32 WATER FROM SPRING PROTECTED SPRING .....41 UNPROTECTED SPRING .....42 RAINWATER..... 51 TANKER TRUCK .....61 CART WITH SMALL TANK.....71 SURFACE WATER (RIVER/DAM/ LAKE/POND/STREAM/CANAL/ IRRIGATION CHANNEL .....81 BOTTLED WATER.....91	

		OTHER 96 (SPECIFY)	
*11	What kind of toilet facilities does your household use?	FLUSH OR POUR FLUSH TOILET FLUSH TO PIPED SEWER SYSTEM.....11 FLUSH TO SEPTIC TANK.....12 FLUSH TO PIT LATRINE.....13 FLUSH TO SOMEWHERE ELSE .....14 FLUSH, DON'T KNOW WHERE.....15 PIT LATRINE VENTILATED IMPROVED PIT LATRINE (VIP) .....21 PIT LATRINE WITH SLAB .....22 PIT LATRINE WITHOUT SLAB/ OPEN PIT.....23 COMPOSTING TOILET .....31 BUCKET TOILET .....41 HANGING TOILET/HANGING LATRINE .....51 NO FACILITY/BUSH/FIELD.....61 OTHER 99	

		(SPECIFY)……..	
*12	Does your household have: • Electricity? • A radio? • A television? • A telephone? • A refrigerator?	YES NO ELECTRICITY.....1 2 RADIO.....1 2 TELEVISION .....1 2 TELEPHONE.....1 2 REFRIGERATOR.....1 2	
13	What type of fuel does your household mainly use for cooking?	ELECTRICITY.....01 LPG/NATURAL GAS.....02 BIOGAS.....03 KEROSENE .....04 COAL/LIGNITE.....05 CHARCOAL .....06 FIREWOOD/STRAW.....07 DUNG.....08 OTHER 96 (SPECIFY)	

*Coding categories to be developed locally and revised based on the pretest; however, the broad categories must be maintained.

*Additional indicators of socioeconomic status should be added, especially to distinguish among lower socioeconomic classes.

#14	**MAIN MATERIAL OF THE FLOOR.1** **RECORD OBSERVATION.**	NATURAL FLOOR EARTH/SAND .....11 DUNG.....12 RUDIMENTARY FLOOR WOOD PLANKS.....21 PALM/BAMBOO.....22 FINISHED FLOOR PARQUET OR POLISHED WOOD.....31 VINYL OR ASPHALT STRIPS .....32 CERAMIC TILES.....33 CEMENT .....34 CARPET.....35 OTHER 96 (SPECIFY)	
15	Does any member of your household own: A bicycle? A motorcycle or motor scooter? A car or truck?	YES NO BICYCLE.....1 2 MOTORCYCLE/SCOOTER .....1 2 CAR/TRUCK 1 2	
*15A	At any time in the past 12 months, has anyone sprayed the interior walls of your dwelling against mosquitoes?	YES.....1 NO.....2 DON'T KNOW.....8	GO TO Q16 IF 2 0R 8
*15B	How many months ago was the	MONTHS AGO..... | | |	

	house sprayed? IF LESS THAN ONE MONTH, RECORD '00' MONTHS AGO.		
*15C	Who sprayed the house?	GOVERNMENT WORKER/PROGRAM... 1 PRIVATE COMPANY ..... 2 HOUSEHOLD MEMBER..... 3 OTHER _____ 6 (SPECIFY) DON'T KNOW..... 8	
16	Does your household have any mosquito nets that can be used while sleeping?	YES..... 1 NO ..... 2……go to…	27
17	How many mosquito nets does your household have? IF 7 OR MORE NETS, RECORD '7'.	NUMBER OF NETS..... | |	

#Categories to be developed locally and revised based on the pretest; however, the broad categories must be maintained. In some countries, it may be desirable to ask an additional question on the material of walls or ceilings. (In this research categories were maintained as listed)

*This question should be deleted in countries that do not have an indoor residual spraying program for mosquitoes (to be revised after the pre-test).

	ASK	NET #1	NET #2	NET #3

18	RESPONDENT TO SHOW YOU THE NET(S) IN THE HOUSEHOLD. IF MORE THAN THREE NETS, USE ADDITIONAL QUESTIONNAIRE(S)	OBSERVED.................1 NOT OBSERVED.................2	OBSERVED..............1 NOT OBSERVED..............2	OBSERVED..............1 NOT OBSERVED..............2
19	How long ago did your household obtain the mosquito net?	MOS AGO | | | MORE THAN 3 YEARS AGO...........................95	MOS AGO | | | MORE THAN 3 YEARS AGO...........................95	MOS AGO | | | MORE THAN 3 YEARS AGO...........................95
20	OBSERVE OR ASK THE BRAND OF MOSQUITO NET. IF BRAND IS UNKNOWN, AND YOU CANNOT OBSERVE THE NET, SHOW PICTURES OF TYPICAL NET TYPES/BRANDS TO RESPONDENT	'PERMANENT' NET1 BRAND A…………11┐ BRAND B…………12┤ (SKIP TO 24)=─┘ 'PRETREATED' NET2 BRAND C………...21┐ BRAND D………...22┤ (SKIP TO 22)=─┘ OTHER……………….31 DON'T KNOW BRAND……………….98	'PERMANENT' NET1 BRAND A…………11┐ BRAND B…………12┤ (SKIP TO 24)=─┘ 'PRETREATED' NET2 BRAND C………...21┐ BRAND D………...22┤ (SKIP TO 22)=─┘ OTHER……………….31 DON'T KNOW BRAND……………….98	'PERMANENT' NET1 BRAND A…………11┐ BRAND B…………12┤ (SKIP TO 24)=─┘ 'PRETREATED' NET2 BRAND C………...21┐ BRAND D………...22┤ (SKIP TO 22)=─┘ OTHER……………….31 DON'T KNOW BRAND……………….98
21	When you got the net, was it already factory-treated	YES.............................1 NO............................	YES.............................1 NO............................	YES.............................1 NO............................

	with an insecticide to kill or repel mosquitoes?	....2 NOT SURE.....8	....2 NOT SURE.....8	....2 NOT SURE.....8
22	Since you got the mosquito net, was it ever soaked or dipped in a liquid to repel mosquitoes or bugs?	YES..... ...1 NO..... ....2 (SKIP TO 24) =———┤ NOT SURE.....8	YES..... ...1 NO..... ....2 (SKIP TO 24) =———┤ NOT SURE.....8	YES..... ...1 NO..... ....2 (SKIP TO 24) =———┤ NOT SURE.....8
23	How long ago was the net last soaked or dipped? IF LESS THAN 1 MONTH AGO, RECORD >00' MONTHS. IF LESS THAN 2 YEARS AGO, RECORD MONTHS AGO. IF '12 MONTHS AGO' OR '1 YEAR AGO,' PROBE FOR EXACT NUMBER OF MONTHS	MOS │ │ │ AGO └———┴———┘ MORE THAN 2 YEARS AGO..... 95 NOT SURE 98	MOS │ │ │ AGO └———┴———┘ MORE THAN 2 YEARS AGO..... 95 NOT SURE 98	MOS │ │ │ AGO └———┴———┘ MORE THAN 2 YEARS AGO..... 95 NOT SURE 98
24	Did anyone sleep under this mosquito net last night?	YES..... ...1 NO..... ....2 (SKIP TO 26) =———┤ NOT	YES..... ...1 NO..... ....2 (SKIP TO 26) =———┤ NOT	YES..... ...1 NO..... ....2 (SKIP TO 26) =———┤ NOT

		SURE.....8	SURE.....8	SURE.....8

1 “Permanent” is a factory treated net that does not require any further treatment.
2 “Pretreated” is a net that has been pretreated, but requires further treatment after 6-12 months.

		NET #1	NET #2	NET #3
25	Who slept under this mosquito net last night? RECORD THE RESPECTIVE LINE NUMBER FROM THE HOUSEHOLD SCHEDULE.	NAME _____ LINE NO NAME _____ LINE NO NAME _____ LINE NO	NAME _____ LINE NO NAME _____ LINE NO NAME _____ LINE NO	NAME _____ LINE NO NAME _____ LINE NO NAME _____ LINE NO

		NAME _____ LINE NO NAME _____ LINE NO	NAME _____ LINE NO NAME _____ LINE NO	NAME _____ LINE NO NAME _____ LINE NO
26		GO BACK TO 18 FOR NEXT NET	GO BACK TO 18 FOR NEXT NET	GO BACK TO 18 FOR NEXT NET

Appendix C

Knowledge Assessment Tool (KAT)

1. What are the signs and symptoms of malaria? (Participantswill be required to name at least two).

(*Inaki okomanya ekero menria yakobwatire? Intebie ebimanyererio bibere gose goetania bibere)*

- _____
- _____
- _____
- _____

2. What are the levels of formal education in your household?

(*Intebie amasomo aino ase omochio oino*)

(None, primary school, secondary school, and some college school levels)

(Circle level of education stated)

3. Do you feel your community clinic or hospital is sufficient for your region? (Yes or no)

(*Mbwegenete buna ekenyoro kieino inkebwate ase mokogenda ekero menria ebuchete? ee gose yaya)*

4. Do you feel that you health needs are met with your community elders, chiefs, councilors, and district officers? (Yes or no) (*Oroche omokia nore aroro korwa ase abagambi na abarai ase ekenyoro ase okorwaria oborwaire bwa menria) (ee gose yaya)* - These two questions will attempt to measure attitudes prevailing in the region as far as health access and support to control malaria is concerned

5. What remedies do you use to treat malaria outbreak in your household? (*Inaki okorwaria menria ekero yachire omochi oo?)*

- Goes to hospital/community clinic for treatment within 24 hours
- Uses over-the-counter (OTC) medications from a shopping center
- Uses traditional herbs
- Consults a traditional healer, or
- Prays about it
- Nothing

Note: Italicized statements are malaria questions in KAT instrument translated to "Ekegusii" language.

Appendix D

Consent Form (Malaria study)

PROJECT INFORMATION AND INFORMED CONSENT

This project is about the relationship between participantstatus, knowledge level, and malaria control measures. The researcher is seeking your opinion and input about your individual beliefs on malaria and how it is managed in your community in general. The benefits of the study will be to understand how individual beliefs, participantstatus and knowledge levels influence the management of malaria in your area. Additionally, other benefits will be to increase knowledge about how to prevent malaria and coupon to buy insecticide treated bed net.

You should read and understand the following statement before you participate.

You are kindly asked to **voluntarily** participate in this study. You may choose not to answer any of the questions or stop at any time if you wish. You must be aged 18 years and over to participate. Your participation and responses in this exercise are completely **confidential**. You will not be identified in any presentations or publication of the results. If you choose to respond, all information you provide will be combined with the information from other respondents and reported as grouped data in this research. There are two questionnaire tools in this project, which **should take no more than 30 minutes of your time**. **There will also be a community education program to be presented to you for about 20 minutes of your time; on how to prevent malaria.** Upon completion of the first phase (pre-test) you will be presented with the same two questionnaires (post-test) the second time, on a separate date, after the community education program. There are minimal known risks such as disrupting your daily activities that will arise from your participation and no costs to you except for your time.

This research is an individual project undertaken for the fulfillment of a Ph.D. in Public Health. There is no involvement with your government or its institutions in this research. No one except the principal researcher and research assistants, will have access to the raw information on your questionnaires.

If you have any questions or concerns about participation, please contact the researchers: Christopher.arori@Waldenu.edu or at 001-919-607-3590. For additional information regarding human participation in research, please feel free to contact Walden University IRB office (Leilani Endicott) at 001-612-312-1210. Walden University's approval number for this study is **03-07-11-0121081** and it expires on **March 6, 2012.**

By participating in the survey, you are giving permission to the investigator to use your information for research purposes. Please keep this document for your records.

Participant signature _____ Date_____/2011

(Use code assigned as signature to protect your privacy)

Thank you.

Christopher Arori_____ Signature_____ Date: _____/2011

(Principal Researcher)

Appendix E

Version 2- Translated to Ekegusii

Ebimanyererio Biamaswari Amenria

Ase Emechi

Kenya
Bondonya (Ekenyoro), Ensemo ya' Gusii.
2011_

AMASWARI IGORO YAMENRIA
AMASWARI IGORO YA MENRIA

KENYA

ERIETA RIO OMOTUKI__ __ __

EBIMANYERERIO				
EKENYORO:				
OMONYENE OMOCHI:				
ENYOMBA:				
ENAMBA:				
EGESAKU:				
RISABU/ETAONI (RISABU =1, ETAONI = 2)				

	1	2	AMASWARI YO MOISO
	_____	____	RITUKO |▒▒|▒▒| |—|—| OMOTIENYI|▒▒|▒▒|

CHITARIKI: ERIETA RIOMOBORIWA AMASWARI: RICHIBU*			OMWAKA ERIETA RICHIBU
RITUKO RIOMOISO: CHITARIKI: CHINSA:			AMATUKO ARENGA YOGOTARERWA

*EBIMANYERERIO BIAMACHIBU:

1 BIONSI

2 ONDE TAIYO ORANYARE KOIRANERIA AMACHIBU

3 ABANYENE OMOCHI MBAIYO ASE EKERENGO EGETAMBE

4 AMASWARI ATENENIWE

5 IGANGETE

6 OMOCHI IGORE BOSA, BANTO IMBAMENYETI

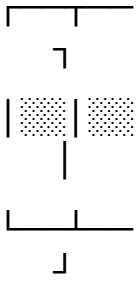
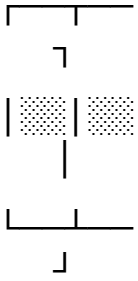
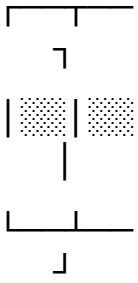
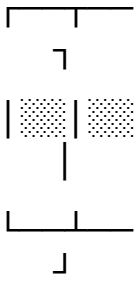
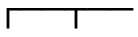
ARORO 7 OMOCHI TOIYO 8 OBOMENYI MBOIYO 9 NAYANDE (Buna arari aya)_____	

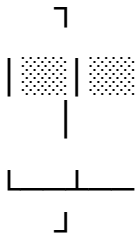
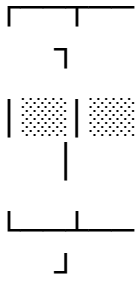
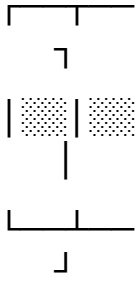
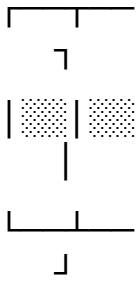
OMOTENENERI ERIETA:_____ CHITARIKI:_____

ENAMBA YOMOCHI

TOTEBIE BARIA MOMENYETE NABWO ASE ENKA YAO.

ENAMBA.	ABANYENE ENYOMBA NA ABAGENI	*OBOAMATE NA ABANYENE ENKA	OMOSACHA GOSE OMOKUNGU	OMOCHI		EMIAKA	NAISAINE ASE OBOTUKI WOMEN	OMOSUBATI NEBWATER-ANETI ?
	Koranche inga' amarieta yabanto bamenyete naye, abaraire	Mboiri ki more nabageniaraire aiga	Erieta omosacha gose omosubat	Nigo amen yet-e nainw	Nigo araire aiga botuk	Emiaka erenga are?	Chora esiro ase abasubati bare emiaka	Ase abasubati okoboria amaswari babori

	aiga botuko, bwechakere aye omonyene	botuko?*	i	e	o?		18 impaka 45	gose imorito bare
1	2	3	4	5	6	7	8	9
1			Omsacha (1) Omokungu (2) 1 2	Ee Yaya 1 2	Ee Yaya 1 2	Ase Emiaka	1	Ee Yaya 1 2
2			1 2	1 2	1 2		2	1 2
3			1 2	1 2	1 2		3	1 2
4			1 2	1 2	1 2		4	1 2
5								

			1 2	1 2	1 2		5	1 2
6			1 2	1 2	1 2		6	1 2
7			1 2	1 2	1 2		7	1 2
8			1 2	1 2	1 2		8	1 2

* Amachibu ase riswari riagatato (3) :
01 = Omoteneneri bwomochi
02 = Omorugi/Omosacha
03 = Omomura gose omoiseke
04 = Omoko
05 = Omochokoro
06 = Omoibori
07 = Tata moke
08 = Omomura gose Omoiseke ominto
09 = Omoiri onde

10 = Omwana omenyirie
11 = Bwamate imboiyo
98 = Timanyeti

Charokia igaiga onye amasakara ande atumegete

☐

Ase okoenekia inga abanto bonsi babarirwe:
1) Abana imbare oo gose ebingwerere batabariri ase omobaro kwangeire?
Ee

☐—>

Baichorie ase risakara
Yaya

☐

2)
Naboigo abanto bande imbare batigwa buna abayaya, abaremi, abarikwa ase omochi amarieta atarikwa?
Ee

☐—>

Baichorie nabarabwo
Yaya

☐

3)
Abageni mbare aroro bamenyete aiga gose baraire mwao botuko batarikwa?
Ee

☐—>

Baichorie ase risakara
Yaya

☐

ENAMBA	AMASWARI	EBIMANYRERIO BIA AMASWARI	TUMA

	AKOENEKIA		
10	Ingai mokorusia amache mokonywa gose mokoroseria chindagera?	Ememberesi .....11 Angusire gocha omochie.....12 Ememberesi Yeserekari.....13 Egesima.....21 Egesima kegiteire .....31 Roche .....32 Ensoko etarendiri .....41 Oroche…… .....42 Amache -yembura.....51 Eyeturera.....61 Mogongo-teni.....71 Amache atereime enyancha/ayagosiarerwa chindagera goe obonyansi …….....81 Amache yechuba.....91 (Ayande) 96 (teba)	
*11	Chichoo mogotumia inaki chirosirie?	Echiowaka amache.....11 Echiamache akogenda ase egechunchugo…….....12 Amache awakwa agenda ase engoro	

		eremire…….....13 Amache agosiarerwa agenda ase atamanyire …….....14 Titomanyeti …….....15 Engor o entambe eremire.....21 Echoo eremire ekomwa igoro no omochanga …….....22 Engoro etabekirie omochanga igoro…….....23 Echoo etigire yagunda yoka .....31 Ogutumia omokebe ….....41 Eyesungire. .....51 Okogenda orosana…….....61 Terikire 99 (Inaki ekorokwa)……	
*12	Enyomba yeino nebwate: • Omorero? • Eredio? • Eterebisoni? • Esimi? • Erifirichiireta?	EE YAYA Omorero.....1 2 Eredio.....1 2 Eterebisoni ..... 1 2 Esimi…….....1 2 Erifirichireta.....,1 2	

13	Imorero ki mogutumia ase okorosia endagera?	Esitima…….....01 Omorero bweegasi.....02 Omorero bwesike.....03 Amabuta yetaya .....04 Amakara yookoiywa.....05 Amakara ye'emete .....06 Chingo…….....07 Esike yechiombe..... .....08 Terikire…… 96 (Inaki ekorokwa)	

Ebimanyererio bikorokia obotenengu gose obotaka.

#14	**Obwagachi bwe-enyomba inaki bokororekana.**	Eremire inse ekeraniwa .....11 Esike yechiombe.....12 Emete yarire inse.....21 Emote ya Mombasa.....22 Estimate……..…….....31 Enyomba yamagene…….. .....32 Cheater cheekier Igor.....33 Estimate etumegete enyomba yonsi…….....34 Omogeke obikire inse.....35 Amagacho ande…….96 (Inaki akorokwa)	

15	Ase enyomba yaino onde nare oo obwate: Enyange? Erori enke? Egari enke gose enene?	EE YAYA Enyange.....1 2 Erori enke…….. .....1 2 Egari enke gose enene.....1 2	
*15A	Ase emetienyi ikomi nebere yaerire eriogo riogoita chiumbwa rianya gosiareru nyomba?	EE.....1 YAYA.....2 TIMANYETI.....8	Genda Riswari 16 Onye kogochora 2 gose 8
*15B	Indirari eriogo riasiareretwe nyomba? Onye omotienyi oyomo toraera chora "esiro esiro".	Emetienyi yaerire…..... | | |	
*15C	Ningo osiarerete enyomba eriogo erio?	Eserekari…….. 1 Ebiasara biomonyene ..... 2 Intwe abanyene…….....3 Tarikiri_._____6 (Inaki akorokwa) Timanyeti…….....8	
16	Imobwate chineti mogutumia botuko gotanga chiumbwa?	EE..... 1 YAYA ..... 2……genda riswari ria……..>	27

17	Chineti irenga mobwate? Onye chietanetie 7 rika '7'.	Enamba yechineti…..... | |	

#Amaswari nabo akoboriwa koren'gana ne emeroberio yogosiara amariogo agoita chiumbwa. Naboigo nagokora obotuki igoro yechineti chigotumeka.

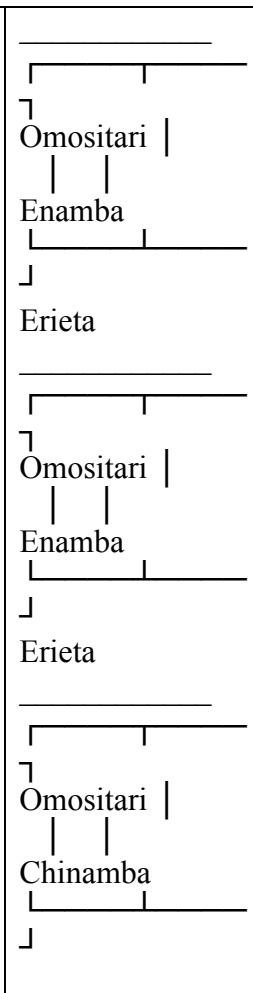
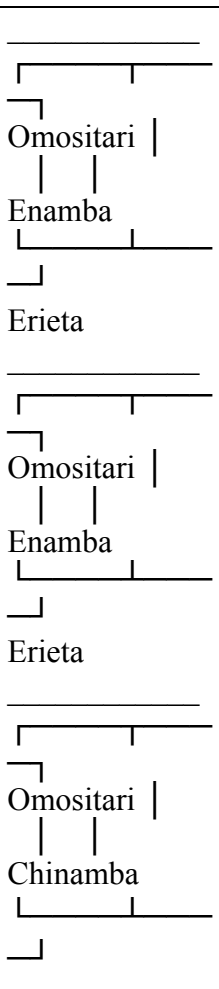
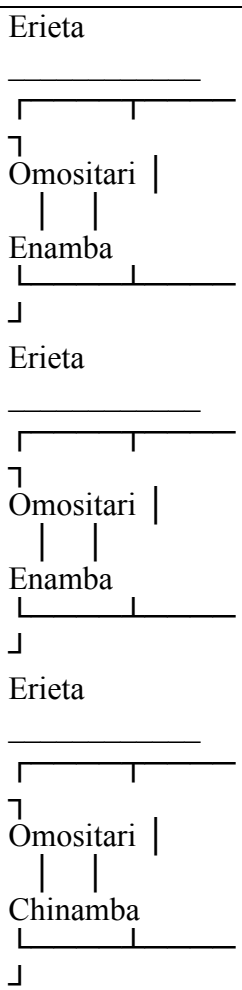
18	Chineti irenga chigotumeka. Onye chire goetania isato, tumia amasakara ande.	Eneti #1 Nachirigerereti.....1 Tinchirochi….....2	Eneti #2 Nachigirereti.....1 Tinchirochi….....2	Eneti #3 OBSERVED.....1 NOT OBSERVED.....2
19	Engaki en'gana inaki mwatwarire chineti?	Emetienyi | | | En'gana Emiaka goetania etato.....95	Emetienyi | | | En'gana Emiaka goetania etato.....95	Emetienyi | | | En'gana Emiaka goetania etato.....95
20	Rora gose ineti ki omochi obwate. Onye tokorora chineti, borokie chibicha chiechineti ao ao	'Eyamatuko amange"1 Ekorokwa A……11┐ Ekorokwa E……12┤ (Tuma genda 24)=┘ 'Nebekire eriogo tayare"2 Ekorokwa I……...21┐ Ekorokwa	Eyamatuko amange"1 Ekorokwa A……11┐ Ekorokwa E……12┤ (Tuma genda 24)=┘ 'Nebekire eriogo tayare"2 Ekorokwa I……...21┐ Ekorokwa	'Eyamatuko amange"1 Ekorokwa A……11┐ Ekorokwa E……12┤ (Tuma genda 24)=┘ 'Nebekire eriogo tayare"2 Ekorokwa I……...21┐ Ekorokwa

	korora gose imbanyare gochora.	O……...22-┤ (tuma genda 22)=┘ Eyende..……. 31 Timanyeti inaki ekorokwa…….. 98	O……...22-┤ (tuma genda 22)=┘ Eyende..……. 31 Timanyeti inaki ekorokwa…….. 98	O……...22-┤ (tuma genda 22)=┘ Eyende..……. 31 Timanyeti inaki ekorokwa…….. 98
21	Eneti kwagorete nere neriogo riogoseria gose goita chiumbwa?	EE.....1 YAYA.....2 TIMANYETI…….....8	EE.....1 YAYA.....2 TIMANYETI…….....8	EE.....1 YAYA.....2 TIMANYETI…….....8
22	Ekero kwagorete eneti imbanyebegete ime yeriogo riogoseria goe rigoita chiumbwa?	EE.....1 YAYA.....2 (Genda) 24) =——┤ Timanyeti 8	EE.....1 YAYA.....2 (Genda) 24) =——┤ Timanyeti 8	EE.....1 YAYA.....2 (Genda) 24) =——┤ Timanyeti 8
23	Engaki en'gana inaki yaerire korwa eneti ebekwa eriogo? Onye nomotienyi inse oyomo rika > 00 . Onye nemetienyi an'ge ebere, rika enamba eyio. Onye	Emetienyi ┃ ┃ ┃ Yaerire ┗━━━┻━━━┛ Emiaka goetania ebere yaerire……..... 95 Timanyeti.. 98	Emetienyi ┃ ┃ ┃ Yaerire ┗━━━┻━━━┛ Emiaka goetania ebere yaerire……..... 95 Timanyeti.. 98	Emetienyi ┃ ┃ ┃ Yaerire ┗━━━┻━━━┛ Emiaka goetania ebere yaerire……..... 95 Timanyeti.. 98

	ngoetania omwaka oyomo, rika emetienyi eyio.			
24	Onde oino nararete ime yeneti?	EE.....1 YAYA..... 2 (genda 26) =——┤ Timanyeti.....8	EE.....1 YAYA..... 2 (genda 26) =——┤ Timanyeti.....8	EE.....1 YAYA..... 2 (genda 26) =——┤ Timanyeti.....8

1 “Eyamatuko amange” ebekire eriogo otari konya koirora komenta
2 “Ebekire eriogo” eneti ekobekwa eriogo kera emetienyi sita

		Eneti #1	Eneti #2	Eneti #3
25	Imbarabi baraire inse yechineti botuko? Rika korwa chinamba buna chirure.	Erieta _____ Omositari Enamba Erieta _____ Omositari Enamba Erieta	Erieta _____ Omositari Enamba Erieta _____ Omositari Enamba Erieta	Erieta _____ Omositari Enamba Erieta _____ Omositari Enamba

				
		Irana riswari ria 18 ase eneti ekobwatia.	Irana riswari ria 18 ase eneti ekobwatia	Irena riswari ria 18 ase eneti ekobwatia

Appendix F

(Version 2- Translated version)

Korigereria ekerengo giesemi (Knowledge Assessment Test- KAT)

1. Inaki *okomanya ekero menria yakobwatire?Intebie ebimanyererio bibere gose goetania bibere)*

- _____
- _____
- _____
- _____

2. *Intebie amasomo aino ase omochio oino?*

(tinsometi, eburemari, esekondari, ekolechi gose ekosi)

(rika omositari ase erieta erimo igoro ase oigete ase esemi)

3. *Mbwegenete buna ekenyoro kieino inkebwate ase mokogenda ekero menria ebuchete? (ee gose yaya)*

- ee
- yaya

4. Oroche *omokia nore araro korwa ase abagambi na abarai ase ekenyoro ase okorwaria oborwaire bwa menria) (ee gose yaya)* - Amaswari aya abere nigo agotema korigereria gose chinyagitari inchire araro ase ekenyoro korwaria abanto ekero amarwaire achiere.

5. *Inaki okorwaria menria ekero yachire omochi oo?*

- Nigo inkogenda nyagitaria chinsa emerongo ebere nainye chitaraera
- Amariogo korwa echiro atarikiri nomonyagitaria
- Ingotumia amariogo yemete
- Okorogigia omonto bwemete, gose
- Amasabo oka
- Tindi gokora kende

Appendix G

(Version 2- Translated to Ekegusii Language)

***"Title of Activity**: The Basics of Malaria Control and Prevention Module: A community education program*

***Total Number of Contact Hours**: 30 minutes Session*

***Intended Level of Learner**: Introductory and Basics"*

Ekegusii Version

Ekerasi: Ogotanga menria: Ekerasi giekenyoro igoro ya menria

Chinsa gekoira: Chitageka emerongo etato (30 min)

Ningo okoira ekerasi eke: Okomanya buna menria egotangwa

Aman'gana Amanene	**Igere Igoro Ya**	**Inaki Egosomiwa**
Okorigereria ayakorenta menria	• okoromwa ne chiumbwa • Embura enyinge • amache atereime • ogotanywa amariogo agotanga menria • ogotamanya igoro yobotangi menria • ogotumia bobe chineti chiogotanga chiumbwa botuko • otari gotumia eriogo riowesiareria; rigotanga chiumbwa	Chipaketi chiogosomwa Okworokia buna chineti chibwenerete gosungwa buya

Ninki gekworokia/imbimanyererio ki bire ekero menria yabwatire omonto	• okoigusiwa • riberera, na okogiramora iyio ebwatekaine na; o omoroso, o ogwatiwa omotwe, o ensiororia, o okoroka, o okoromwa enda, o ogokorora kore okwomo, o okoromwa omogongo na amaru, amareko,	Chipaketi chiogosomwa
Inaki menria egotangu	ogwekon'gera obotuki bworokirie amariogo agokora buya gokonyana twensi buna Abagusii okogenda nyagitari gopimwa ekero oyomo oino arwarire	Chipaketi chiogosomwa

Aman'gana aya igoro yamenria igarikire ase obwen'ge korwa "Ekeombe Giense Engima" (WHO 2010 fact sheet and WHO 2010 Menria Prevention Guide)

Ninki Menria?

Menria igo ekoretwa ne chiumbwa chire nesumu embe. Ekero chiakoromire nigo okonyora menria embe mono onye tokonyora amariogo yokonywa bwango. Obuya noboria in'ga menria nabo ikonyara gotongwa namariogo are aroro ase chinyagitari . Menria igokoretwa negento gekorokwa eparasaiti (*parasite*) ase egesongo. Eparasaiti eyio nigo egosoa omobere ekero chiumbwa chikoroma omonto chinsa ciamogoroba. Menria igo ekereta riberera na okogiramora ekero chiumbwa chiaromire omonto. Ebimanyererio buna menria yasoire omobere nabo ekoira ange amatuko atanebere gose nonye chiwiki ibere buna obotuki bokworokia. Oborwaire bwamenria igo bokobwatekena eparasaiti (parasite), eumbwa, ase aetanaine omochi, na omonto eumbwa ekoroma.

Ninki gekogera menria ere enyinge

- ekorokwa nechiumbwa: chiumbwa nigh chikoroma abanto chinsa chiamagoroba gose botuko
- ekero kiembura enyinge: ekero embura ebuchete, chiumbwa chinyinge echichire ase okoroma abanto abange.
- amache atereime: chinyongo, chibakuri, ebikombe biategete na bitugutire isiko ebikogera chiumbwa chianyora ase chikoroseria amagena abo. Omoiso oye, chituragia omobaro omonge bwechiumbwa naboigo okoromwa kwabo kwamentekana.
- ogotanywa amariogo agotanga menria: Imbuya konywa amariogo agotanga menria
- ogotamanya: buya buna menria egotangwa buna obotuki obo boraorokie (KAT)

- ogotamanya buya buna chineti chigotumeka: goika chineti chisungu buya ase ogotanga oborwaire bwe chiumbwa.
- ekero eriogo riogosiarerwa ritatumegeti ase ogotanga okoromwa nechiumbwa: emechie nabo erabe temanyeti buna amariogo nare aroro yogwesiarera gotonga okoroma wechiumbwa

Inaki omonto akomanya buna menria yamobwatire?

Ebimanyererio ebitan'gani nabio ebi:

- riberera na okogiramora
- ogwatiwa omotwe
- obokendu
- okoroka

Chinsa nechiengecho ase okorwaria menria. Onye menria tekorwariwa bwango chinsa emerongo ene nainye etaraera, nabo oborwaire obwo boramente mono ase nonya nogoita. Aseigo nere nen'gecho enene ase korora omonyagitari bwango(chinsa emerongo ebere nainye chitaraera) ekero chiumbwa chiakoromire nande onye koiwete omobere bobe. Mono abana abake ase menria eichire nigo bakobwatwa na amarwaire akorentwa namenria buna: amanyinga akea, na okoeyana. Na ase abanto abanene, ebimo ebinge ase omobere nabo bigosareka..

Ningo mono okobwatwa noborwaire bwamenria?

- Abana abake inse yemiaka etano
- Abasubati abare morito
- Abarwarete no oborwaire bwa- "AIDS/HIV"
- Abageni korwa chinse chiaisiko

Inaki oborwaire bwamenria bogotangwa?

Okoba omwango ase okorora ase omochio oo ninki abanto bao bakonya korwara ngokonya ere mono ase ogochaka korwa amariogo bwango ake. Okomanya inaki menria ekororekana nabo okonyora kwagorire amariogo yekeene. Na ekeombe giense engina nigo egotebekana inga amariogo amaya bono nayakorokwa ACT. Na imbuya kogenda nyagitaaria ase okoenekia buna imareria ere ase omobere oo go ase omochi oo. Goetera ne ekeombe giense enigma (WHO), nigo ekororekana buna ekero chiumbwa chiatangirwe na amariogo agochita, abanto bange imbari korwara. Abanyagitari baise kobwatia chingecho echio, ebinyoro nabo birakonywe mono. Ase menria eichire nabo chinhea echio chiakwanirwe igoro chiragere abana abange imbagokwa. Nonya oborwaire bwamanyinga nabo bogotangwa. Aseigo ne engecho enene gotumia chineti as ogotanga oborwaire bwa menria.

Chinchera Ibere Chiogotanga Menria

- Chineti chibekire amariogo agoita chiumbwa: Chineti chibekire amariogo agoita chiumbwa inchitakeire mono na abarwaria ase okobang emeroberio yogotanga menria. Ekeombe

giense engima (WHO) inkebwate emeroberio emiya yogotanga amarwaire buna menria buna okorwa chineti gochia chiserekari ao ao

- Ogosiara amariogo amenria nyomba: Ogosiara amariogo amenria nyomba nare nechinguru chiogotanga oborwaire bwe chiumbwa. Chinyomba emerongo etano-etato igoro yemia eke-ro chiasiaireru na amariogo amenria nabo ogokea kwamarwaire gokororekana as emetienyi etato; emenge emetienyi etano noyomo. Ayio igakororekana goetera ase eriogo ritumegete. Eriogo rikorokwa nigo ribwate chinguru chire igoro ake ; nabo rigokora egasi goetania emetienyi kianda nonya nikomi. Namariogo ange buna ayio nagendererete korosigwa. Amariogo igagotumeka ase ogotonga menria. Ase abageni menria nabo eranyarekane go-tongwa ase okonywa amariogo amenria ekero ogotora chinse chia Abirika.

Inaki eneti yogotanga menria igosibwa nyomba

- Siba eneti korwa enyesi gose gati ase okorara; orore in'ga egetanda gionsi inkebisiri

Appendix H

Authorization to utilize MIS (questionnaire)

From: "Carr, Richard Michael" <carrr@who.int>
Date: 06/10/2010 03:33 AM
To: "Ndiaye, Adja Aminata C.M." <ndiayec@who.int>, Christopher Arori <christopher.arori@waldenu.edu>
Subject: RE: A request for a Roll Back Document to utilize for research

Hi,

Feel free to use this - all of our documents are freely available for use by anyone.

Thank you.

Best,

Richard Carr | Technical Officer | RBM Secretariat hosted by WHO | 20 Avenue Appia, CH-1211, Geneva 27, Switzerland |Tel: +41 22 791 3518 | E-mail: carrr@who.int | Web: http://www.rollbackmalaria.org

---

From: Ndiaye, Adja Aminata C.M.
Sent: 10 June 2010 10:30
To: Christopher Arori
Cc: Carr, Richard Michael
Subject: RE: A request for a Roll Back Document to utilize for research

Hello,

I guess it is fine. I am copying a colleague for confirmation.

Regards,

RBM Secretariat

From: Christopher Arori [mailto:christopher.arori@waldenu.edu]
Sent: 12 April 2010 09:48
To: verhoosel@un.org
Cc: Ndiaye, Adja Aminata C.M.; nbabazip@ug.afro.who.int
Subject: A request for a Roll Back Document to utilize for research

WHO Office and Concerned Parties,

This communication is meant to request permission to utilize one of your instruments (ROLL BACK MALARIA- MIS (Malaria Indicator Survey questionnaires) for a dissertation research to be conducted in Kenya Africa. Your assistance in this matter will be highly appreciated. Thank you.

Sincerely,

Chris Arori, Public Health PhD Student.

*NB: Your permission in e-mail form will serve the purpose. Also, if you have any new survey instruments pertaining to malaria research-sub Saharan Africa, please e-mail them to me.

Appendix I

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Christopher Arori** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 07/28/2009

Certification Number: 261353

Appendix J

IRB APPROVAL

Dear Mr. Arori,

This email is to notify you that the Institutional Review Board (IRB) has approved your application for the study entitled, "Assessing the Influence of Socioeconomic Factors, Knowledge Level, Attitudes, and Practices on Malaria Prevention among the Gusii People of Kenya."

Your approval # is 03-07-11-0121081. You will need to reference this number in your dissertation and in any future funding or publication submissions. Also attached to this e-mail is the IRB approved consent form. Please also ensure that the Ekegusii version contains the IRB approval number and expiration date included within this letter as well (the English version has already been updated).

Your IRB approval expires on March 6, 2012. One month before this expiration date, you will be sent a Continuing Review Form, which must be submitted if you wish to collect data beyond the approval expiration date.

Your IRB approval is contingent upon your adherence to the exact procedures described in the final version of the IRB application document that has been submitted as of this date. If you need to make any changes to your research staff or procedures, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive an IRB approval status update within 1 week of submitting the change request form and are not permitted to implement changes prior to receiving approval. Please note that Walden University does not accept responsibility or liability for research activities conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with the policies and procedures related to ethical standards in research.

When you submitted your IRB application, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to the researcher.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained at the IRB section of the Walden web site or by emailing irb@waldenu.edu: http://inside.waldenu.edu/c/Student_Faculty/StudentFaculty_4274.htm

Researchers are expected to keep detailed records of their research activities (i.e., participant log sheets, completed consent forms, etc.) for the same period of time they retain the original data. If, in the future, you require copies of the originally submitted IRB materials, you may request them from Institutional Review Board.

Please note that this letter indicates that the IRB has approved your research. You may not begin the research phase of your dissertation, however, until you have received the Notification of Approval to Conduct Research (which indicates that your committee and Program Chair have also approved your research proposal). Once you have received this notification by email, you may begin your data collection.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKlmdiQ_3d_3d

Sincerely,

Jenny Sherer, M.Ed., CIP

Operations Manager

Office of Research Integrity and Compliance

Email: irb@waldenu.edu

Fax: 626-605-0472

Tollfree : 800-925-3368 ext. 1341

Office address for Walden University:

155 5th Avenue South, Suite 100

Minneapolis, MN 55401

Appendix K

Notification of Approval to Conduct Research-Christopher Arori

Dear Mr. Arori,

This email is to serve as your notification that Walden University has approved BOTH your dissertation proposal and your application to the Institutional Review Board. As such, you are approved by Walden University to conduct research.

Please contact the Office of Student Research Support at research@waldenu.edu if you have any questions.

Congratulations!

Jenny Sherer
Operations Manager, Office of Research Integrity and Compliance

Leilani Endicott
IRB Chair, Walden University

Curriculum Vitae

CHRISTOPHER ARORI, DIP., BA, BS, MA,

HIGHLIGHTS OF QUALIFICATIONS

1. Exceptional collaborator, able to bridge students and peer interests
2. Highly organized and accurate, strong analytic and presentation abilities
3. Impressive reputation for motivating, building cohesion among disparate groups and individuals
4. Confident and poised in interactions with students and individuals at all levels

EXPERIENCE HIGHLIGHTS

Administration, Management, and Supervision

1. President/Director- Atlantic Coast Healthcare Institute, Raleigh-North Carolina: 2007- 2008.
2. Director of Clinical Services, Select Specialty Hospitals, 2005-2007
3. Performed administrative and managerial support functions
4. Wrote company manuals and policies to comply with state and federal guidelines
5. Maintained accurate, detailed, up-to-date confidential employee and client files
6. Resolved problems among employees, mediates staff disputes and handles patient complaints

EMPLOYMENT HISTORY

1. Nov., 2010 – Present, University of North Carolina Hospitals, Patient Focus Care

Staff – Medicine Unit.

2. July, 2008-2010, Department of Veteran Affairs, Denver Colorado: Patient Focus Care Staff, Surgical Unit (Adult)
3. 2007 – 2008, Atlantic Coast Healthcare Institute: President/Director
4. Jan. 2008- July, 2008: Oaks of Carolina, Health Staff, Geriatric Care Personnel
5. Feb. 2005-2007, Select Specialty Hospital, Durham, North Carolina: Director for Clinical Services, Patient Care Services,
6. Aug. 2003-Nov. 2005, UNC Hospitals, Chapel Hill, North Carolina
7. 1997-2002, Shaw University, Raleigh, North Carolina: Lecturer and student mentor.
8. 1998-2001, Wake Medical Center, Raleigh, North Carolina: Allied Health Staff, Acute Neuro care Unit
9. 1995-1998, Lapcorp of America, Research Triangle Park, North Carolina: Team Leader, Forensic Laboratory
10. 1990-1995, Voca Corporation, Raleigh, North Carolina: Habilitation Technician

EDUCATION AND TRAINING

1. Walden University: Public Health PhD Student 2007-Present.
2. 2006: Select Medical Corporation, Durham North Carolina: 6 online wound modules
3. 1999-2003: Barton College, Wilson North Carolina: BSc.
4. 2003: The University of NY, New York: Diploma, Health Care
5. 1990-May, 1995: North Carolina Central University, Durham North Carolina: BA, MA
6. 1989-1990: Wake Technical Community College, Raleigh North Carolina: Course Work, Computer Operations