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Malaria Prevention and Treatment in the Province of Toliara, Madagascar: A Socioeconomic and Cultural Perspective of Supermoustiquaire Use and Healing

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Malaria Prevention and Treatment in the province of Toliara, Madagascar:
A socioeconomic and cultural perspective of *supermoustiquaire* use and healing



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For Carolyn McNamara, because our discourse is so compelling.

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Introduction

Nao siloke ka haràre, Nao maràre ka ho mate.
“La fièvre conduit à la maladie et la maladie conduit à la mort”
-diction Masikoro

Statement of Intent

To preface my intentions, I never find myself viewing this place passively; I cannot help but be constantly attuned to the small struggles, conflicts, and successes that take place on a minute by minute basis as I roll through a village in a taxi-brousse or fly over the countryside in an airplane. I chose to study malaria in south-eastern Madagascar not only because it may have chosen me first, but because it is one of those continual struggles that is taking place between a plasmodium and red blood cells, families, communities, cultures, ethnicities, economic sectors, governmental agencies, and non-governmental organizations of the Malagasy. My intention for this independent study is to gain a new perspective on how the people most affected by malaria in Madagascar—the rural poor in the Toliara province—prevent, treat, and rationalize a malady that is intimately intertwined with their livelihoods.

Relevance

International Scale

An illness borne by a mosquito, malaria has a pronounced affect on at least forty percent of the world’s population annually; the morbidity rate is estimated to range between 350 and 500 million cases per year (World Health Organization, 2005). More relevant, eighty percent of these deaths occur in sub-Saharan Africa, predominantly in children under 5, with an African child dying of malaria statistically every 30 seconds (Roll Back Malaria, 2005). In these same countries, malaria is cited as a cause for 25-35% of outpatient visits to hospitals, 20-45% of hospital admissions, and 15-35% of hospital deaths (WHO, 2005)

Madagascar

As a sub-Saharan African country, Madagascar is directly affected by malaria, along with countless other diseases, many of which don't even have names. It might even be logical to associate Madagascar's tropical geographical location with a tropical disease like malaria. However, writes Paul Farmer, "not long ago, malaria was an important disease in areas far from the tropics- for example, the United States" (1996). In fact, in the 1920's, it is cited as the most important disease in US history (Farmer, 1996). We cannot simply link infectious diseases that tend to affect tropical regions to those regions for the sake of geography; there are more complex social reasons as to the high morbidity and mortality rates in regions such as Madagascar. Farmer writes that "many tropical diseases predominantly affect the poor who are bounded more by socioeconomic status than by latitude"(1996). Malaria declined in the US because of fast-paced agricultural development, improved housing, land drainage, mosquito repellents, nets, and electric fans, most of which are inaccessible to those most at risk for malaria today (Farmer, 1996). In the 1960s through 1980s, programs were constructed to eradicate malaria using DDT and other residual insecticides. These programs were typically successful in "developed" nations, although they were relatively unsuccessful in underdeveloped countries (Henrich, 1985).

Socioeconomics

For a country so rich in resources and culture, Madagascar is not rich in terms of GDP, which is 260 dollars per capita (WHO 2002). This translates into the fact that the 80% of the population living below the international poverty line cannot go to the local supermarket to buy a fan, mosquito repellent, or a bug net at the drop of a hat. Additionally, the ability to pay for services and curative measures from doctors or traditional healers is a luxury that not all rural Malagasy have. As a result of this disparity of wealth, some Malagasy may have better access than others to key tools that can better their health. The link between wealth and basic

physical health can be summarized by anthropologist Ringlehart when he explains that “emphasis on economic security and physical security tend to go together. Those who feel insecure about survival needs have a fundamentally outlook”(1997). One-half of Malagasy children under 5 are malnourished, with a child mortality rate of 135m and 117f per 1000 births per year. In a country of 17.5 million people where half of the population is under the age of 15, the healthy life expectancy is 47.3m and 49.9f, with an average of 13.1m/14.4f % of total life expectancies lost to poor health (WHO 2002).

Toliara

Of socioeconomic differences, Farmer writes “such inequalities have powerfully sculpted not only the distribution of infectious disease, but also the course of disease in those infected”(1996). Not only does there exist a disparity between countries, but also within regions of countries such as Madagascar. Farmer’s statement can be applied to this country in that malaria distribution varies from province to province; the poorest, Toliara, has some of the highest malaria morbidity rates in the country, with 9 zones considered at the epidemic level (Direction Regionale de Santé, 2005). In 2005, consultation rates with a medical officer or doctor for malaria were 11% higher in Toliara than the national average, and hospitalisation rates were about 4% higher (DRS 2005). Ahead of respiratory infections, sexually transmitted infections, diarrhoeal disease, rougeole, and others, suspected malaria cases accounted for 25% of hospital diagnoses. Between the years of 2001 and 2005, cases of malaria peaked in 2002 at 33,151, and have declined to 22,297 cases in 2005 (appendix 1). Malaria morbidity tends to be worse in the months of April, May, and June, but they remain relatively high (between 5 and 35%) throughout the year (appendix 2).

Malaria Background

Parasite

Malaria can be caused by 4 different species of protozoa: *Plasmodium malariae*, *Plasmodium vivax*, *Plasmodium falciparum*, and *Plasmodium ovale*. There are 5 other species that affect only monkeys and apes. The four species are distributed throughout the globe differently depending on geographic region. *P. Falciparum* is the strain of malaria found in Madagascar; this strain has shown resistance to chloroquine in the Toliara province (DRS, 2005). Malaria cases cause by *P. Falciparum* account for almost all mortality, and most morbidity.

Vector

The plasmodia are transferred from human to human by means of a female *Anopheles* mosquito vector (Kakkilaya, 2006). There are over 60 known species of *Anopheles* that transmit malaria (Kakkilaya, 2006). The mosquitoes typically breed in sunlit pools of water, such as irrigation ditches and in livestock footprints. They often seek shelter from the sun in human shelters and are lured to human beings by their odours. The reason for which a mosquito's presence isn't normally detected until after the bite is because the insect's saliva contains a "combination of anti-hemostatic & anti-inflammatory enzymes that disrupt host clotting and inhibit the pain reaction (Budiansky, 2002).

Pathology and Clinical signs

(All from Kakkilaya, 2006)

After reproducing in the gut of the mosquito, the parasite is injected into the bloodstream of the host and begins to infect red blood cells (RBCs). Hemoglobin (oxygen-carrying molecule, iron is the central atom of the complex) is destroyed within the rbc, and new proteins are added to the cell membrane of the rbc. These changes in the chemical

structures within the RBC lead to a shape change, which causes the cells to be knobby and clump together. These aggregates interfere with blood circulation and may result in high blood pressure. As the parasites reproduce and grow, haemolysis (breaking apart of the RBC) occurs, and causes the repeated, spiking fever that is a strong indicator of malaria. Hemolysis also causes anemia, especially in pregnant women and children due to decreased haemoglobin levels.

Malaria can be linked to respiratory illness due to the inflammation of the pulmonary blood vessels from hemolysis and the aggregates of red blood cells that form. In the gastrointestinal tract, presence of the parasite can cause nausea, vomiting, anorexia, abdominal distension, acute abdominal pain, and diahorrea. Effects on the central nervous system (CNS) can be particularly dangerous and include headaches, vomiting, delirium, anxiety, and restlessness. As the level of parasitized rbcs increases, malarial encephalitis (swelling of the brain), convulsions, and brain hemorrhages can occur.

Degrees of Malaria

There are two classes of malaria: simple malaria and complex malaria, which has more severe complications. Symptoms of both types include a spiking fever, headache, chills, sweating, and weakness. Indicators of complex malaria include convulsions, shock, and severe anemia, all of which can progress to coma and death in a short period of time, especially in small children and pregnant women (WHO 2001).

Diagnosis and Treatment

Malaria can be diagnosed either by examining blood under a microscope for parasites, or by using a rapid test. Currently, in Madagascar, basic health centers (CSB) do not have the means to perform either of these tests, so diagnosis of malaria is very much based on clinical symptoms. The standard protocol for treating simple malaria at the CSB is to use

chloroquine, with sulfadoxine-pyrimethamine as a second choice although with increasing numbers of resistant cases, the Minister of Health is changing the treatment to a combination therapy of artesunate and ammodioquine within the next year (DRS 2005), as this treatment has shown to be effective against chloroquine resistant strains (Oumar, 2005). For cases of complex malaria, quinine is given intravenously. For pregnant women with malaria, the same treatments hold, although the sulfadoxine pyrimethamine cannot be used during the first trimester of pregnancy (WHO, 2001). Children are treated with chloroquine in the form of palustop green for babies under 1 year, and palustop blue for children 1 – 5 year old. Both of these options are chloroquine in a smaller dose that is more easily administered to children (WHO 2001).

For pregnant women, chemoprophylaxis is offered and strongly recommended (Moreira, 2005). As part of the Intermittent Preventative Treatment (TPI), Chloroquine is given in the first trimester, and then sulfadoxine pyrimethamine is administered for the first time just after the first fetal movements are felt (usually in the 16th week). A second dose is given between one and two months after that, and the cycle continues throughout the 2nd and 3rd trimester at scheduled prenatal consultations (CPN) (Moreira, 2005). In addition to the prophylaxis, women are given folic acid supplements (FAF) and tetanus vaccines.

State and International Aid/Prior Studies

State Healthcare Structure and Goals

Malaria is “a significant threat to the health and well being of the Malagasy,” in the words of a USAID statement (USAID, 2006). Both governmental and non-governmental organizations (NGO) are well aware of the urgency of the situation in the Toliara province. The population of Madagascar living below the international poverty line (80%) relies considerably on the public, government funded sector of the country’s health care system. Total health expenditure by the government per capita in 2002 was 18 dollars, and the total

health expenditure as a percentage of GDP is 21% (WHO, 2002). External resources for health as a percentage of total expenditure on health is 32.2%. Any type of health insurance is rare; 88.8% of Malagasy pay for medical care out of pocket (WHO, 2002).

There are five different levels of health care facilities that exist within a health district (for example, Tuléar is a health district). At the most basic level is a *Centre de Santé de Base niveau I* (CSB I). These hospitals are found in the most rural of locations, and have paramedical staff, but no doctor. One level higher is the *Centre de Santé de Base niveau II* (CSB II). These health centers are also found in rural regions, but the difference is that they are staffed by a medical doctor. Both levels of CSB have the same essential drug stockage, some of which includes chloroquine and sulfadoxine for malaria treatment and prenatal chemoprophylaxis, paracetamol for fever, anti-diahhoreals, and antibiotics such as tetracycline and amoxicillin. These health centers also have childhood vaccination sequences and tetanus vaccines for pregnant women.

After the basic health centers are the *Centres hospital de District* (CHD level I and II). These hospitals are in more populated areas and are staffed by medical doctors. The CHD II has surgical facilities with specialists, whereas the CHD I serves as a referral hospital with no specialists or surgeons. Finally, there is the *Centre Hospitalier Reference Regional* (CHRR), with the most advanced medical capabilities, greatest number of specialists, and surgical facilities. Each CHRR has an ambulance. If a person in a rural area needs medical attention, they first visit the closest CSB. If they can be adequately treated, there is no need for them to visit a higher level hospital. However, if it is determined that person's illness and needs for treatment exceeds the capabilities to treat of the CSB, the person may be evacuated to a higher level facility. In the event that an ambulance is needed for the evacuation, communication occurs over radio. The cost for an ambulance is 11,000 ariary. Each district also has a pharmacy which supplies drugs to all health centers. Consultations at the hospital

are free, but it is necessary to pay for medicine or other supplemental treatments prescribed (All from Dr. Emma, Dr. Lala, and Dr. Jeri).

In the realm of malaria, the state has set forth five key goals for its fight against malaria (DRS, 2005):

By 2006:

1. At least 60% of those who suffer from fever/malaria will have access to the proper treatment within the first 24 hours after the first symptoms of malaria appear.
2. At least 60% of the at risk groups, notably pregnant women and children under 5 years of age, will sleep under mosquito nets treated with insecticide.
3. At least 60% of pregnant women will have access to preventative treatment.
4. At least 60% of malaria epidemics will be detected and controlled within the first two weeks that follow the beginning of an epidemic in at-risk zones.

By 2010:

5. Reduction by 50% of the morbidity and mortality as compared to 2000.

To accomplish this goal of 50% reduction, the state, along with NGOs such as MCDI, is promoting the use of treated mosquito nets for pregnant women and children under the age of 5, conducting epidemiological surveillance, and working to provide the most effective diagnostics and treatment for children under 5 years old.

Non-Governmental Organizations

In the Toliara province, the state collaborates primarily with eight NGOs: Santénet, Medical Care Development International (MCDI), UNICEF, ASOS, Red Cross, Care, SALFA, and the Global Fund (Dr. Emma). The NGO most pertinent to this research, MCDI,

takes a community based approach towards educating people in rural, high risk areas about family planning, sexually transmitted diseases with an emphasis on HIV/AIDS, pre-natal care, malaria prevention, pediatric disease prevention, and sanitation-to name a few. MCDI began as a non-profit organization in 1966 to improve health resources, health education, and the delivery of health care for people in the state of Maine. In 1976, the organization expanded its work to an international level. The mission of MCDI is to “develop and operate service and education programs and to conduct research and health policy analysis for the improvement of health and the delivery of health care worldwide.”

Currently, MCDI in Tuléar is working on the Toliara Province Child Survival Project (TPCSP), which aims to “reduce morbidity and mortality among children under 5 and to improve the health status of women of reproductive age” in two districts most in need of aid (MCDI 2002). Malaria is one of several focus categories for MCDI, along with respiratory disease management, control of diarrhoeal disease, breastfeeding, immunizations, child spacing, and reproductive health.

MCDI facilitates the availability of both preventative and curative measures for malaria. Population Services International (PSI) markets insecticide-treated mosquito bed nets and malaria treatment for children under the names of “supermoustiquaire” and “palustop.” MCDI designates members of communities as field vendors (AVBC) of these products, with the intent of providing relatively inexpensive access to all members of a community to simple products that could easily ameliorate the toll of malaria. Before these products became available, MCDI performed a “Knowledge, Practices and Coverage (KPC)” baseline study with assistance from the regional ministry of health (MOH) in December of 2002 as part of the TPCSP. The report found that 61% of children fewer than two years of age had had a fever in the 2 weeks prior to the survey. In terms of treatment, 33% of mothers

whose child suffered from malaria sought for treatment at the health center and only 13% of fevered children received a home treatment appropriate to malaria syndrome.

Concerning prevention, 13% of households owned a mosquito net (either insecticide treated or not), and 12.4% of children 0-23 months had slept under the net the night before the survey. Of this 12.4%, only 3% slept under an insecticide treated net. Additionally, only 30% of mothers took anti-malarial medicine (offered at basic health centers) during pregnancy

Goals based on the results of this survey for malaria prevention relevant to this study are to increase the percent of children 0-23 months who sleep under an insecticide treated net to 20%, and to increase the percentage of mothers who took anti-malarials during pregnancy to 80%.

Overall strategies for the project include promoting community based activities to promote good health behaviour, increasing the capacity of health officials and health workers to manage programs and deliver health services at primary level facilities, and promoting positive collaboration between different organizations working in the region of the TPCSP (MCDI 2002).

Traditional Medicine

Thus far, I have spoken of malaria as a disease in distinctly biomedical terms.— chemical drugs, doctors, and hospitals. Assuming that everyone would obviously want to treat malaria with chloroquine, for example, is dangerous, because it assumes that people believe that the sickness is caused by something that can be physically and chemically set back in good order. However, Lynn Payer writes that “while medicine benefits from a certain amount of scientific input, culture intervenes at every step of the way”(1996). There is a part of Malagasy culture in which some people do not believe that diseases are caused by foreign pathogens; moreover, sickness can be physical manifestations of social disorders such as

failures, family problems, imprisonment, alcoholism, divorce, or poor financial situation (Ramamonjisoa 1994). Sickness can be given from one person to another person not in the sense of a communicable pathogen, but in the sense of a communicable bad spirit. These sicknesses are not treated by doctors; rather, they are treated by traditional healers. While there are several different types of these healers, the *ombiasy* is the most commonly consulted in my intended region of study (Ramamonjisoa 1994). Can chloroquine get rid of an evil spirit? Can an object worn on a string be as affective at preventing malaria as a *supermoustiquaire*? One set of physical symptoms can mean so many things, and perhaps it is a person's set of beliefs and culture that determine how they conceptualize a disease and what it means to be ill.

Objectives

The objectives for this study are several-fold. The first is to examine how Malagasy living in rural areas of the Toliara province prevent and treat malaria. Since data was collected from villages in which MCDI has community animators (CVA) and AVBC established, I am interested to see if education and awareness provided by the NGO to the community has had an impact since the first baseline study was performed in 2002. Are people buying the *supermoustiquaire*? If so, children and pregnant women using them as recommended by the MCDI animateurs and CVA? I want to know why people are buying them, or why they don't. A second objective is linked to the first- to understand whether or not people have sufficient access to these preventative measures and treatments. It is one thing to know that a *supermoustiquaire* is available, but if barriers prevent someone from actually obtaining the net, I would like to know what they are. Does socioeconomic circumstance restrict people from paying for preventative and curative measures, or are there other cultural restrictions? Does a person who seeks aid from an ombiasy feel as though they cannot use medication from a hospital to treat *tazo* (fever)?

Methods

Study Area

(All ethnicity and economic information are results of this study)

The study areas Beleboka, Mitsinjo, Amboromanga, Andaboro, and Anakao villages were chosen because they were areas in which MCDI had established community awareness programs through visits by animateurs and designation of CVA and AVBC. These are communities in which *sensibilisation* has taken place and *supermoustiquaire/palustop* should be available through the vendors living within the village.

Beleboka and Mitsinjo, villages of *masikoro* ethnicity, were visited because of their close proximity to the city of Tuléar, and only one interview was conducted in each village for the purpose of preparation for future interviews. Preparation includes becoming acquainted with the interpreter/questioner dynamic, the order of questions, and a general sense of which questions might be beneficial to add to a general question guide after having discussions with some of the mothers. These two *quartiers* of Tuléar are not included in the quantitative analysis due to the small number of interviews and due to the fact that both households were chosen by the CVA because they had mosquito nets. The people of these two villages are cultivators and raise livestock, along with making local rum from sugarcane.

Amboromanga and Andaboro were chosen for logistical purpose; two MCDI *animateurs* were travelling to the region for a workshop to teach CVA about sexually transmitted infections (STI), Acquired Immuno-Deficiency Syndrome (AIDS), and Human Immunodeficiency Virus (HIV). I was able to accompany the *animateurs* and observe their work in the field, and they helped me conduct interviews. Amboromanga is an *Antandroy* village, and Andaboro is a *Masikoro* village. Both villages rely on cultivation and raising of livestock for their living.

Anakao was chosen because the occupation of its inhabitants contrasts with the cultivator/*élevage* life of the people who live in Amboromanga and Andaboro. Located on the coast just south of Tuléar, Anakao is a fishing village frequented by tourists. Anakao can be divided into two sections- Anakao Haut and Anakao Bas. Anakao Haut is located about one km inland, and its inhabitants are of the *Tanalana* ethnicity. Houses are built similarly to those of the *Tandroy* in Amboromanga, using dried mud and branches of small diameter for construction. The people of this village are primarily cultivators of corn, beans, manioc, potatoes, watermelon, other grains, and many raise zebu and other livestock. Anakao Bas is the sector of the village located directly on the coast. The ethnicity of its people is split between *vezo* and *sara*, and intermarriage occurs between the two groups.

Consent

After arriving in a village or new region, a day was spent for observation and familiarisation with the area and its people. The next day, we would begin by locating the community CVA to accompany us to all households. This association ensured us a certain level of acceptance by the villagers, as well as a wealth of local knowledge of the people and the area. We would then present ourselves to the leader of the village (*chef du village*) to explain or reason for being there and our mission in order to gain consent to carry out the interviews. It was explained to the *chef du village* that we were here on behalf of MCDI, and that I was an American student studying public health and *tazo*. We presented an official *ordre de mission*, which, upon acceptance, was stamped and signed as a sign of consent.

When approaching households, we again explained to whoever was present (usually the mother) who we were and what our mission was. Consent was verbally given as we were often invited to enter inside the house or to sit with the family outside for an interview.

Household Selection and Sampling Size

Households were, to the best of all ability, chosen at random to ensure sound quantitative data, despite the fact that the sampling size was small. I would arbitrarily point to the first house, and then we would generally move in one direction from house to consecutive house for the duration of the day. There was no pre-established number of houses to be surveyed; we worked to survey the highest number possible before the setting of the sun or other logistical time constraints each day.

Interview Procedure

Villages

Semi-structured interviews in Malagasy were conducted to gather relevant information. My interpreter, an *animateur* for MCDI, had a guide of core questions and topics to discuss (appendix 3) with the interviewee. The interviewee was either the mother or the father of the household. Occasionally, both husband and wife would answer questions together or take turns answering questions. It was not uncommon for children or other parents to be present, although they never responded to the questions or spoke with the interviewees during the interview. In order to maintain a sense of continuity throughout the interview, the interpreter would pose all questions in a conversational format and relay answers to me at the end of each segment of conversation. I would pose follow-up questions after interpretation in French, which would then be posed in Malagasy. No interviews were recorded to avoid the distraction and possible negative implications of having a recording device present.

After the completion of each interview, the *animateur* would often say a few words to the family to make them aware of how they could improve their health situation if certain indicators arose during the interview. For example, if an interviewee responded to a question saying that he/she did not know where to find a *supermoustiquaire*, the *animateur* would

explain how and where he or she could obtain one. If an interviewee explained that he/she did not understand why malaria is caused, the *animateur* would explain that it is transmitted through mosquito bites, thus the reason for which mosquito nets are used. Notes were taken throughout each interview, and details were added just after the end of each conversation.

Medical Professionals

Interviews with five different doctors were also performed in Ft. Dauphin, Soahazo, and Tuléar; the one in Ft. Dauphin took place before the beginning of the study period. These interviews took place in French without the use of an interpreter and were also semi-structured, with a general guide of questions (appendix 4).

Methods of Data Analysis

Quantitative Data

A simple analysis of quantitative data (consisting of number of people in each household, number of children under age 5, number of households using mosquito nets, duration of use, number of mothers and children under 5 who use the nets, literacy rates, number of families who use an ombiasy or doctor, childhood vaccination rates, and pre-natal care rates) was performed using Microsoft Excel.

Qualitative Data

Quantitative data will be analyzed in a cultural, social, and economic context. This data includes individual opinions towards doctors and ombiasy, perceptions of why diseases occur, utilisation of biomedicine and medicinal plants, thoughts on the prices of medication and *supermoustiquaire*, reasons for using or not using *supermoustiquaires*, and observations of the state of children's health throughout the years.

Obstacles and Strategies

One obstacle in this study (which could have also been a positive thing at some points) was that I am a *vazaha* (a foreigner, a outsider). My physical differences alone set me apart

from every family that I interviewed in a way that often made me receive more attention than a Malagasy student would receive doing the same study. In Ambovomanga and Andaboro, I was one of the first *vazaha* that many of the children had ever seen. People were often shocked by my presence and oftentimes stopped everything that they were doing to look at me. I am concerned that I may have received different answers to questions than if it were a Malagasy conducting the research. Many people assumed that I was completely different from themselves because I was an outsider, yet I tried to the best of my abilities to convey through emotion, hand movements, and limited Malagasy that we had more human qualities in common than they may have assumed. I tried to adopt as completely as possible to simple things like dress, food, and greeting customs. I was even told that I was a “good *vazaha*” because I ate corn.

The fact that I could not coherently communicate with the families except for using short Malagasy phrases was the biggest challenge that I faced. Although I was able to gain a great deal of quantitative data from the interviews, comprehending answers to more in-depth questions was more difficult because I was listening to an interpretation of the Malagasy responses. The Malagasy language sounds like a much more dynamic in intonation and inflection than the French language, so I felt as though at times, I was losing parts of responses because they were embellished with extra words and sounds that cannot be translated into French. A strategy that I used to regain some of this lost information was to pay close attention to the emotions displayed while responses were being given so that the French translations could have an appropriate context.

Biases

I come from a completely different cultural, socioeconomic, and educational background than any of those families whom I interviewed. Therefore, the context in which I analyze and reflect on the results of this research would be different than the context in which

the interviewees would view my results and discussion. I was raised in a society that, for the most part, values biomedicine with all of its doctors and pharmaceutical advances. However, I believe that most of the “modern” healthcare techniques for treatment could not exist if it wasn’t for “traditional medicine.” My personal traditional medicine involves seeing a doctor if I was ill. It would be un-traditional of me to visit an ombiasy. However, I hold the value of the two as even not because I feel that both approaches to medicine are equally effective or yield equal results, but because my educational background has told me that I should.

Research Findings

Demographics and Households Surveyed

A total of 51 households in three villages were surveyed (table 1). Anakao is divided into the *haut* (upper) and *bas* (lower) villages due to the difference in occupation of inhabitants and the two discrete locations of the houses.

Table 1

Village	Number of households surveyed	Average Family Size	Average number of children under the age of 5
Ambovomanga	9	6	2
Andaboro	13	8	2
Anakao Haut	14	5	1
Anakao Bas	15	6	1
average	13	6	2

Education

Parent Literacy

Literacy rates were determined in percentages for all villages except for Ambovomanga. The literacy question was added when it became apparent that literacy could coincide with supermoustiquaire (SM) use (Table 2).

Table 2

Village	Total mother literacy	Mother literacy with SM	Total Father Literacy	Father literacy with SM
Ambovomanga	n/a	n/a	n/a	n/a
Andaboro	30,8	42,8	30,8	42,8
Anakao Haut	71,4	66,6	42,9	33,3
Anakao Bas	46,7	42,9	60,0	57,1
average	49,8	50,8	44,6	44,4

Formal Education

School age children were present at most interviews and it became clear that not all school aged children went to school ever. Table 3 shows the percentage of children who attended school of the total population of children eligible to attend school based on age.

Table 3

Village	kids at school	kids at school with sm
Ambovomanga	n/a	n/a
Andaboro	69,2	85,7
Anakao Haut	50,0	100,0
Anakao Bas	80,0	85,7
average	66,4	90,5

One of the most common reasons for not attending school was the lack of money to buy school supplies. The thought is that it is not worth the time spent in class if the child does not have a notebook and writing utensil. In Mitsinjo, one mother explained that the only reason why her son is able to study past the secondary level is because the family is friends with the director who can certify diplomas, and he was able to obtain a certified copy without having to pay a bribe. When two boys around the age of fourteen of this same *quartier* were asked if they received any health education at school, the mother responded that they learn about AIDS, malaria, cleanliness, and prevention of dermatologic disease that results from uncleanliness. However, when the boys were asked what they had learned in school about health and what they thought the message was, they could not reply in any detail. They

understood that it was important to clean themselves, but had nothing to say about AIDS or *tazo*.

In Andaboro, one father explained that he did not personally feel the need for formal education because he could count his heard of zebu and he could count the number of years that his children had been alive—and that was enough. When asked if their children attended school, some parents simply answered yes or no, and some explained that their children attended private school. Both public and private educations were available in all areas surveyed, although private education is more expensive. When asked about the extra expense, families replied that they did not mind the cost because they believed that their children were getting a higher quality education.

Household presence of *tazo*

Due to the fact that there were no rapid tests available for the families with whom I spoke, the only way that the presence of malaria could be determined in a question was by asking if *tazo*, (fever) was a health concern in the household. All parents but two said that they or their children suffer from *tazo*. In Ambovomanga and Andaboro in particular, many people did not know why *tazo* occurred. One explanation was that it is from eating peanuts; another was that it is from oil in food and dirt. *Tazo* is a problem not only because it makes children very ill, but also because it interrupts the way in which people make a living. If a person cannot eat, drink, or is too weak to stand, they cannot be productive in the fields or on the sea. According to Helvin of Anakao Bas, fishermen with *tazo* have to stop fishing for a few days at a time while they are very sick. While they do not earn any money in this time, they have a savings to pay for things while they are sick.

Preventative measures against *tazo*

Mosquito Nets

The majority of the households surveyed had either an insecticide treated or untreated mosquito net (table 4). A higher percentage of Anakao households had mosquito nets; however, this may not be significantly higher because no statistical tests were performed. Households averaged having treated mosquito nets for more than half a year. In Ambovomanga, 2/3 households with a supermoustiquaire said that there had been no more *tazo* since they started using them, and that they were sleeping better because there were no mosquitoes or other larger bugs. One woman who used an untreated mosquito net said that he children still suffered from *tazo*. In Andaboro, 5/7 households with supermoustiquaires had no more cases of *tazo* after starting to use the nets. One household said there was still some incidence of *tazo* although it was decreased, and another said there was no change in the incidence of *tazo*. Mosquito nets were bought from either MCDI, SALFA, or at the marché (table 5).

Table 4

Village	% of houses w/nets	% houses w/SM	average # of months SM
Ambovomanga	66,6	33,3	8
Andaboro	69,2	53,8	9
Anakao Haut	84,6	69,2	6
Anakao Bas	93,3	93,3	7
average	78,4	62,4	8

Table 5

Village	%AVBC (MCDI)	%SALFA	%marché
Ambovomanga	40,0	0,0	60,0
Andaboro	55,6	22,2	22,2
Anakao Haut	66,7	33,3	0,0
Anakao Bas	66,7	26,7	6,7

Overall, just under 60% of the children under 5 in families surveyed had a *supermoustiquaire* in their house. Of these children, about ¾ slept under the net. Just over 60% of mothers surveyed had access to the *supermoustiquaire*, and over 90% slept under them (table 6).

Table 6

Village	% of children under 5 with access*	% of children with access who use the SM	% of mothers with access to SM	% of mothers with access who use the SM
Ambovomanga	31,3	40,0	33,3	100,0
Andaboro	50,0	80,0	53,8	85,7
Anakao Haut	52,6	90,0	69,2	100,0
Anakao Bas	100,0	94,1	93,3	85,7
average	58,5	76,0	62,4	92,9

* Access indicates that the child or mother has a *supermoustiquaire* in the house

There were four reasons cited for having a mosquito net, insecticide treated or untreated (table 7). All of the parents who cited decoration as their reason had un-treated nets.

Table 7

Village	only to mosquitos	to avoid mosquitoes and <i>tazo</i>	decoration	dont know
Ambovomanga	83,3	16,7	0,0	0,0
Andaboro	11,1	44,4	33,3	11,1
Anakao Haut	10,0	90,0	0,0	0,0
Anakao Bas	7,1	92,9	0,0	0,0

All but 2 households who did not have mosquito nets cited financial reasons as their reason. The other reason was that there was no need for nets, because there were no mosquitoes. Financial issues often consisted of not having the enough money at the right time. Many families explained that they would like to buy a *supermoustiquaire*, but when the AVBC receive their nets, they do not have the money on hand, and the nets are either pre-destined to specific people or they sell out before the right amount of money can be saved. Most who did have nets said that they did not have any problems affording them and that it

was worth the price. Mosquito nets did not pose any socio-cultural problems for the households; the demand is high but money and provisioning did not always coincide. .

Chemoprophylaxis in Pregnant Women

On average, 72.1% of all mothers surveyed said that they had used some form of chemoprophylaxis during their most recent pregnancy. The majority (82.8%) of these women also used supermoustiquaires (table 8).

Table 8

Village	% of Mothers who said they used chemoprophylaxis during their last pregnancy	% of these mothers who used <i>Supermoustiquaires</i>
Ambovomanga	n/a	n/a
Andaboro	69,2	100,0
Anakao Haut	60,0	55,6
Anakao Bas	93,3	92,9
average	72,1	82,8

Other Preventative Measures

In addition to or instead of using mosquito nets as a preventative measure against mosquitoes, there were several other methods. One was the placement of kinini leaves around a house or bed. A second was burning dried zebu feces and using the smoke and odors as a repellent. A third method was burning manioc root, which also released repelling odors. Lastly, mosquito coils were used.

Type of advice

For the families that were interviewed, medical advice came in three forms: the doctor at the hospital, an ombiasy, or a combination of the two (table 9).

Table 9

Village	Use the CSB			
	Only use the CSB when sick	for malaria, ombiasy for other things	Use the ombiasy for everything	Self treatment without CSB or ombiasy
Ambovomanga	66,7	22,2	0,0	11,1
Andaboro	61,5	23,1	15,4	0,0
Anakao Haut	50,0	50,0	0,0	0,0
Anakao Bas	100,0	0,0	0,0	0,0
Average of total pop	69.6	23.8	3.9	2.7

Doctor

Families who only saw only a doctor were a majority Christian, except in a few cases where the ombiasy was said to be to talk too much and be too expensive. The Christians explained that it was against the Ten Commandments to see an ombiasy, because that would entail worshipping a god other than their own God. Frequent responses included “ombiasy are liars.” The conflict was that the ombiasy say whatever they want and treat the ill with whatever they want randomly and without reason. They were described as being “profiteers” and not good healers. In one case, a man by the name of Mr. Bernard (age 84, the oldest of all interviewees) explained that there are two types of ombiasy: those who lie to profit and charge too much money, and those who do good work with traditional plants. In another case, Mme Jeanne from Mitsinjo described a situation where she had two very sick children and took them to see the ombiasy. She did everything that the ombiasy told her to do, but their condition worsened. By the time she could get the children to the CSB, it was too late and both died. Ever since, Mme Jeanne has only consulted a doctor when ill.

Ombiasy

For those who saw an ombiasy for things other than malaria, the reason given was that ombiasy don't know how to treat malaria. One such family explained their decision to see a doctor in the event of *tazo* described malaria as a natural disease, not a disease caused by other people. Ombiasy, they said, did not know how to treat those kinds of diseases. Although Rajabo and Voahirina from Anakaohaut treat malaria with medicine from the CSB, they consult ombiasy for other *mauvaise ésprits*, and have paid in zebu before.

Those who used the ombiasy for all sickness said that it was their tradition, and that the ombiasy can treat any maladie with any object depending on what the gods desired. One such tradition is to prevent *jabely an'ala* (malaria in a pregnant woman). She did not describe her treatment, but she paid 1700 ariary (just under a dollar) up front, and then 20 000 ariary when after giving birth without having *jabely an'ala* during her pregnancy. Another reason for which people consult an ombiasy for *tazo* is because they think a baby is sick with a bad spirit caused by another person (*tamporaza*). According to Mme Soanirina & Mr Alahamali, many people don't realize that their babies are sick because of malaria; they think that there is a bad spirit, so they take the child to the ombiasy, and many babies die as a result. To the contrary, Mme Floranti of Andaboro once paid 7 777 (almost 4 dollars) ariary for her infant to be cured, although now she uses *palustiop* from the AVBC.

One morning when I awoke in Andaboro, I was told of a tragedy that had occurred the previous evening. A pregnant woman had fallen gravely ill and her illness caused her to miscarry. As explained by the CVA, other families had urged her family to take her to the CSB, but her family did not because they believed in consulting the ombiasy for advice for sickness. The CVA did not know if they had, in fact taken her to an ombiasy, but the woman passed away during the night.

Treatment of *tazo*

Biomedical

All families who replied that there was *tazo* in their households said that they seek treatment in some form. Of 49 of these families, 18 (37%) used paracetamol or palustop sold at épicerie before going to the CSB. The other 31 families went directly to the CSB or ombiasy without pretreating. The most common reason for not self-treating was that there is no medical advice at the épicerie.

Ethnobotanical

Medicinal Plants were often used separately from or in addition to treatment received from doctors and ombiasy (table 10). The use of medicinal plants did not coincide with either the use of a doctor or an ombiasy.

Table 10

Plant Name	Part of Plant Used	Preparation	Use	Symptom
<i>keliantitsi</i>	leaf	hot infusion	drink	vomiting
<i>mandravaotsi</i>	leaf	hot infusion	drink	diahorrea
<i>taimboritsiloza</i>	leaf	grind, paste with water	spread on head and arms	palpitations
<i>nimo</i>	leaf	hot infusion	drink	
<i>gisenindamo</i>	seeds	hot infusion	drink	vomiting
<i>marogozy</i>	leaf	hot infusion	drink	fever
<i>trakorova</i>	leaf	hot infusion	drink	vomiting and fever
<i>voapiky</i>	leaf	hot infusion	drink	diahorrea, vomiting, fever
<i>vahapapy</i>	root	hot infusion	drink	vomiting and fever
<i>romba</i>	leaf	hot infusion, boil for vapor	inhale vapor under a cloth	headache
<i>ravin'adabo</i>	flower	warm infusion	drink	diahorrea and vomiting
<i>rekere</i>	leaf	hot infusion	drink	diahorrea
<i>volo-tsako</i>	silk and cob	hot infusion	drink	vomiting
		hot infusion, boil for vapor	inhale vapor under a cloth	
papaya	leaf			fever
<i>inganalika</i>	leaf	warm infusion	drink	fever
<i>bakakely</i>	leaf	warm infusion	drink	fever
<i>jamalan-jiriky</i>	leaf	hot infusion	drink	fever
<i>handy</i>	bark and stem	hot infusion	drink	fever and fatigue
		hot infusion, boil for vapor	inhale vapor under a cloth	
<i>hazo-mahasanà</i>	leaf			fever and fatigue

Financial concerns over treatment

On the subject of which type of medical advice a family seeks, Dr. Tiana explained that oftentimes, families wait too long to bring a sick person to come to the CSB for malaria. For many, she explained, the hospital is their last resort because they don't always come if they cannot pay. While consultations are free, it is necessary to pay for medication. A full treatment of chloroquine costs 300 ariary, and quinine costs 6 100 ariary for an adult. For children, a box of palustop costs 50 ariary. These sentiments are echoed in the voice of Safirini from Ambovomanga, who only goes to the hospital when she has the money. While some families sell personal items for money to pay for treatment, she uses traditional treatments for symptoms and forgoes chloroquine treatment. Resai, also of Ambovomanga, explains that families have to sell things when sick because they don't save money in their houses; they do other things with it because they are living in poverty. Most of the time, they have to wait a few days to sell something before they can actually take the sick to the hospital for treatment, and oftentimes it is too late. Alimartho, from Andaboro explains that she values life over cost. While she doesn't use a supermoustiquaire, she is willing to spend however much it costs to treat a sick person at the hospital because you have to be able to work to live, and you can't work if you have *tazo*.

Sensabilisation Observations

I was able to observe two types of *sensabilisation*. The first was a meeting of all the women in the village with their children. There were roughly 65 mothers, all sitting on the ground in a semi-circle while the CVA and an *animateur* led a group in a discussion about children's health (respiratory disease, malaria, stomach ache and vaccines). The exchange lasted for roughly 15 minutes, and consisted mostly of the CVA reading off of cards and that were in official Malagasy, and then re-explaining in the local dialect. The *animateur* energetically described all of the signs of the specific diseases, and explained that every child

must have a series of 5 vaccines. At the end, the mini-lecture, questions were answered, and the *animateur* went around the group and jokingly pointed at women asking if they had had their vaccines, or how many vaccines their children had. The messages for the malaria prevention part of the talk were to use a mosquito net, be treated with chemoprophylaxis when pregnant, and not to hesitate to seek help at the hospital for children when they have a fever.

The second sensibilisation was a two-day awareness workshop for CVA on the subject of HIV/AIDS at the CSB. The workshop consisted of some lectures, but also a great deal of discussion between the *animateur* and the 13 CVA from nearby villages. The first morning begins with a pre-test on STI, HIV, and AIDS, to assess the level of understanding of these topics before beginning the lectures. Over the course of the two days, the *animateur* began by teaching about STI in general, as well as symptoms, treatment, and getting tested. The class and discussion led up to AIDS and HIV during the end of the first day and the entire morning of the second. The CVA were shown statistics of recent jumps in the number of AIDS cases, and were informed of the seriousness of AIDS/HIV because it takes years for symptoms to manifest. Also presented to the CVA were the ABC's: Abstinence, Be faithful, use a Condom...with the emphasis on using a condom. At the end of the second day, a post test was given to mark progress (results were not available).

Analysis

Education

Overall, parent literacy rates were slightly lower than the 62% average literacy rate found in the 2002 KPC baseline survey, although with a much smaller sampling size (compared to over 300 for the KPC survey) and limited region of survey, this discrepancy may not be significant. This level of literacy is concerning in that it indicates that about half of parents would not be able to read medicine instructions, write down instructions from a

doctor, or read a health awareness poster. PSI marketing of palusop, for example, overcomes this problem by including instructions of administration both in text and in image form. Literacy rates for parents with SM in the household are not remarkably higher than the average literacy rate. While this result may seem insignificant, it could be a testament to the fact that literacy does not play a large role in whether or not someone decides to use a SM, and that people learn to use the SM through other methods of information sharing other than writing.

The fact that 90% of children who went to school surveyed had *supermoustiquaires* shows that households who value formal education (and thus keep their kids in school) may also tend to value informal education about health issues more because they bought the nets. While 66.4% of the children in families went to school, this does not necessarily mean that they go to school on a daily basis.

The existence of health education in schools is something that is ideally beneficial, but it is disappointing when students cannot recall simple messages about AIDS and malaria- both diseases that have the potential to cause significant impacts in the lives of the students. While it is always a logical recommendation to suggest “more education” in order to help make people aware of pressing health issues, the education is only effective if the message is understood beyond the classroom doors.

Malaria

Because CSBs do not have the capabilities of testing for malaria, the question of whether or not it actually exists is rather ambiguous. The problem in asking whether or not there was *tazo* in the household is that fever can be caused by numerous other maladies such as dysentery and cholera. The fact that all but two parents said that *tazo* was an issue in their household does not mean that all but two parents observe or suffer from malaria frequently in their houses. However, the very high incidence of *tazo* reported reinforces the gravity of the

previously discussed worldwide malaria situation; morbidity is high. In simple terms, when you are sick with malaria, you are not a productive worker if you are an adult, and this means that you suffer economically. If you are sick with malaria as a child, you are more likely to become anemic, which generally degrades your vitality and leaves you susceptible to other pathogens causing further illness and possibly devastating complications in the case of complex malaria.

Preventative

Mosquito Nets

The percentage of households using insecticide treated mosquito nets was much higher in this study than in the original baseline study, where only 3% slept under an insecticide treated net. Although that people this study was on a much smaller scale than the baseline study, this almost 60% difference in mosquito net usage is a strong indicator that MCDI efforts are productive and benefiting the rural communities. The introduction of such a simple, yet effective product into these communities have made it so that people can have a significant amount of control over disease, rather than disease being a nebulous affliction that dominates over humans. Once a members of a community begin to realize that they can decrease the incidence of *tazo*, a disease that was previously rendering them unproductive, weak, and unable to work, the knowledge and methods of controlling the disease will shared, thus helping even more people to improve the quality of life by improving the quality of their health.

The high percentages of children under 5 and mothers who have access to *supermoustiquaire* in their house and use them indicate that the message of who should use the nets is clear. However, oftentimes the recommended people end up sleeping under the nets by default since most houses only have one bed, in which the parents and young children sleep.

The most surprising results gained from this survey concerned why the population was using the nets in the first place. The Anakao villages seemed to understand that the nets not only prevent mosquitoes, but also malaria, but the connection was less direct in the villages of Ambovomanga and Andaboro. This lack of understanding could be due to the fact that the message of sensibilisation is not clear, or because the more immediate, noticeable results of no more bothersome mosquitoes seems more tangible and overshadows the more indirect effects of prevention of malaria. The fact that people would buy the nets merely for decoration or only to avoid mosquitoes indicates that the *supermoustiquaire* could be considered luxury items for some rather than a medical necessity. Buying nets to avoid only mosquitoes is an indicator that people were concerned with the quality of living, and were willing to spend a significant amount of money to improve that quality.

Lack of financial resources was a predictable barrier to accessibility of mosquito nets. The problem was not necessarily that the families never had enough money; it was that they only ever had small amounts of money with them or in their house, and it is spent before it is saved. I found that people tended to spend money on a need basis, and the concept of saving up for something does not really exist, except for in Anakao Bas. Some of the families who explained that they didn't have enough money for the nets also said that they would pay more than the price of a net at the hospital for treatment if needed. This again demonstrates a preference for curative medicine in part of the population. This preference may be due to the fact that the families are not aware of the potential benefits in that one *supermoustiquaire* could save several trips to the hospital for malaria treatment. When the *animateur* explained this to such families at the end of interviews, they usually laughed and realized that all along, they should have been using the net.

Chemoprophylaxis in Pregnant Women

The percentage of women who used chemoprophylaxis is about 40% higher than the percentage in the baseline survey. Once again, this change indicates that *sensabilisation* is having a positive impact on the population. Equally as important as the *sensabilisation* formations is the spread of news through word of mouth. If one woman realizes that the chemoprophylaxis is making a difference in minimizing the frequency of *tazo* and she shares her findings with her friends, she is spreading valuable information. 80% of the women who used chemoprophylaxis also used *supermoustiquaire*. This shows a type of mother who is concerned with using two separate means of preventative measures.

Type of advice

The use of doctors and ombiasy was not as clear-cut as I had expected. While I expected to find families who only consulted one or the other, I did not expect to find families who saw both but for different reasons. People who used the ombiasy for everything but malaria treatment demonstrate that they know and trust anti-malarial biomedicine at the hospital, most likely because they have seen it or experienced its benefits in the past. For such families, cultural beliefs towards using an ombiasy did not pose a problem in terms of an access barrier to treatment. The situation of the sick woman who miscarried and later died is, however, a circumstance of strong held cultural beliefs that were indeed a barrier to access of potentially life-saving medicine. One of the greatest causes for concern in treatment is the financial barrier that restricts access to medical care. While the majority of the population seeks medical care from either an ombiasy or a doctor, the delay involved in finding the money to pay for treatment means that the health of the individual suffers. Hospitals only accept currency, but ombiasy accept goods and animals as payment without having to sell anything. In this sense ombiasy may be more accessible to the poorer people because they don't have to go through the hassle of finding a buyer for an object.

Families interviewed used both medicinal plants as well as pharmaceutical drugs to treat malaria. While there is a large range of medicinal plants that are used in comparison to just a few choices of pharmaceuticals, the medicinal plants are used solely to treat symptoms and not to cure the disease. It is for this reason that the medicinal plants are often used alongside medicine such as chloroquine. There are no financial barriers that restrict the use of medicinal plants-only barriers based on season. The preparation of the plants is relatively simple, and several times it was demonstrated to me that the branch with leaves is placed into a pot of boiling or warm water and then the solution is drunk. While it may be more time consuming to prepare a plant remedy, there is no cost involved.

Conclusions

From this small scale study, I conclude that Malagasy in the *quartiers* of Belamboka, Mitsinja, and the villages of Ambovomanga, Andaboro, and Anakao are actively preventing and treating malaria, regardless of whether or not they know that malaria is transmitted through mosquitoes. They are able to prevent and treat this disease because of medical facilities made available to them at their regional basic health centers, as well as by using natural methods of treatments of symptoms and prevention of mosquitoes.

I find that while all of the villagers live within walking distance of CSB, some do not have good access due to financial barriers that make it impossible to pay for medicine when it is most needed. However, this situation could be ameliorated if families tried to keep a few hundred ariary saved for emergency purposes, as demonstrated by the residents of Anakao Bas. Cultural barriers also exist in the sense that those who seek the attention of an ombiasy exclusively deny themselves more affordable, effective treatments for malaria offered by the CSB. Ideally, the use of an ombiasy for some services and the doctor for others (especially for the treatment of malaria) would be the best solution- one that would reduce both

morbidity, and mortality, and one that would respect the place of an *ombiasy* within a cultural context. Further studies should include gaining an ombiasy's perspective of malaria treatment by doctors, and further investigating the role of traditional healing in the cultures of the villages in which MCDI works. It would also be interesting to better understand the economic situation of the villagers in terms of what they spend their money on, and why many cannot hold a savings for medicine. Additional work could investigate the possibility of integrating the production of the extremely effective *supermoustiquaires* into the economy of Madagascar. The price now at 3000 ariary still seems to be too high; it is more money than some of the poorest Malagasy ever have all at one time. How could mosquito nets be given for free? Is this feasible?

From this small scale study, I can conclude that the education in the communities by MCDI combined with the availability of *supermoustiquaires* is successful thus far. After observing the *animateurs* in the field, I realize that the reason why the *sensibilisation* is so successful is because they are so passionate, thorough, and direct with their audience in discussion. The *animateurs* with whom I travelled had an exceptional work ethic to the extent that they never hesitated to give a few minutes of advice to a family or a person after my interviews when they realized that they could clarify any health issues. The work in the villages that the *animateurs* do promotes an exchange from one Malagasy to another, using educational strategies that accommodate Malagasy cultural traditions of oral history and oral flow of information. For example, when a CVA educates five mothers about how they should go to the hospital for a pre-natal consultation, those 5 mothers are told to spread the word to another 5 mothers each. This organized "spreading of the word" creates a tradition of *sensibilisation* much like a tradition of a story being passed down through generations.

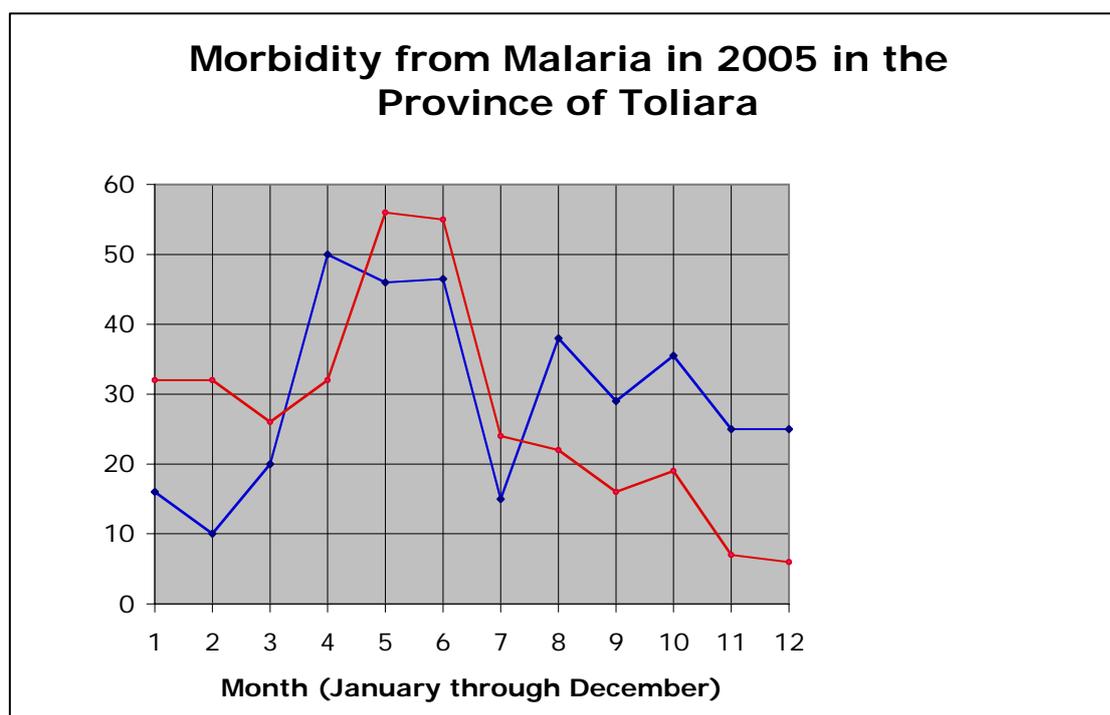
Recommendations for MCDI would be to make sure that the *animateurs* emphasize the origin of disease, especially diahorreal and malarial when they speak with communities.

This is due to the fact that many people did not know why they were using their mosquito nets or why their families were contracting malaria. If the emphasis is to be preventing illness before it begins, the mechanism for contracting a disease must be made clear. Additionally, to improve availability of *supermoustiquaire* and other PSI products from AVBCs who may have run out, *animateurs* could carry with them into the field a small supply to sell directly to villagers. Due to the apparent success thus far with the use of *supermoustiquaires*, I would also recommend that MCDI continue its course of *sensibilisation* action, making small adjustments on the way until a follow-up KPC survey can be done to see the results of their hard work on a larger scale.

Appendix 1: Cases of Malaria 2001 in Tuléar I district

Year	Number of cases of malaria
2001	23,551
2002	33,151
2003	31,759
2004	20,551
2005	22,297

Appendix 2: Malaria Morbidity, Toliara 2005



Appendix 3: Village Interview Guide

Question guide for village interviews

Note: this is the final version used in Anakao. Some questions were added throughout the course of the study, so there not necessarily a complete set of data for each question from all villages. Some of these questions only apply if a household did or did not have a mosquito net.

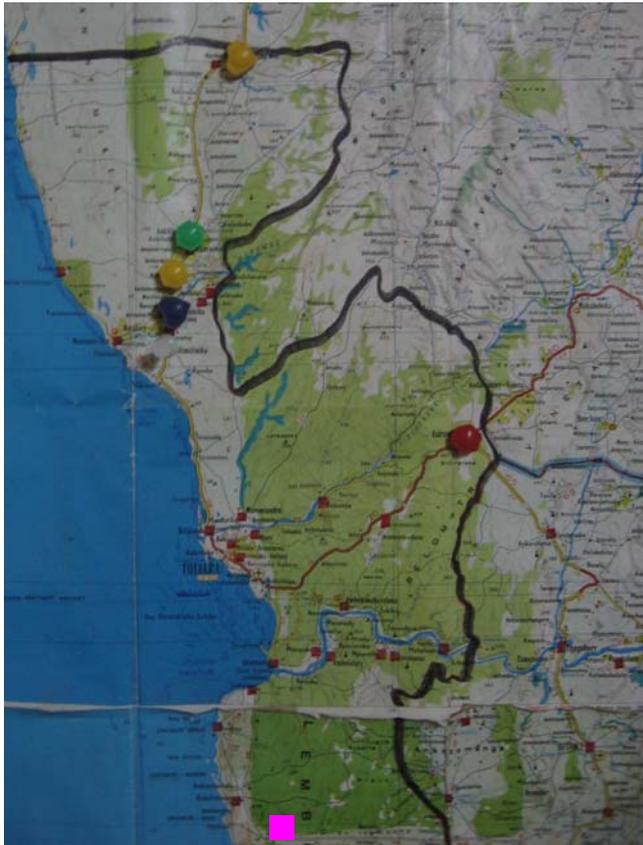
1. What is your name and your spouse's?
2. What is your occupation?
3. How many people are living in your house?
4. How many children under the age of 5 are living in your house?
5. Do people in your house suffer from fever or malaria in your house?
6. Do you know why people have fevers and malaria?
7. Do you have a mosquito net? If so, is it insecticide treated?
8. How many?
9. For how long have you had it?
10. Where did you buy it?
11. Who sleeps under it?
12. (If not everyone sleeps under a net) Why don't the others use a mosquito net?
13. Why or why don't you have a mosquito net?
14. Since you started using your mosquito net, have you noticed any changes in the incidence of *tazo* in your house?
15. What other preventative methods besides mosquito nets do you use to avoid mosquitos when someone in your house is sick and needs help, whose advice do you seek?
16. What religion are you? (religion was often closely related to source of medical treatment)
17. What other maladies are common in your house aside from *tazo*?
18. Do you know why these sicknesses exist?
19. What are your thoughts about doctors? About Ombiasy?
20. How do you feel about the price of medicine and mosquito nets? Can you afford it?
21. How do you pay for medicine and mosquito nets?
22. Do you have a savings in your house in case of a medical emergency?
23. Are you and your spouse literate?
24. Do your children go to school?
25. Have your children received their sequence of 5 childhood immunizations?
For the mothers,
26. Did you go to the hospital during your pregnancy for a pre-natal consultation?
27. Have you received a tetanus vaccine, folic acid treatment, and chemoprophylaxis for malaria?

Appendix 4

Question guide for doctors:

While interviewing the doctors, there were no specific questions, but topics of conversation included the general healthcare structure of Madagascar, malaria treatment specific to each CSB, the most common health problems in the region, prenatal consultations, questions of access, price of treatments, and childhood vaccinations.

Appendix 5: Area of study



The northernmost yellow dot indicates the region of Ambovomanga and Andaboro, and the southern magenta square indicates the location of Anakao. This image is a digital photograph taken of a map at the MCDI office.

List of interviews

Date	Interviewee	Location
14/03/05	Dr Lala	Ft. Dauphin
13/4/06	Clementine	Belemboka
13/4/06	Jeanne	Mitsinjo
18/4/06	Dr Tiana	Soahazo
19/4/06	Collette	Ambovomanga
19/4/06	Reteani & M Foste	Ambovomanga
19/4/06	Fideli	Ambovomanga
19/4/06	Soanirina & M Alahamedi	Ambovomanga
19/4/06	Tongamana	Ambovomanga
19/4/06	Resai	Ambovomanga
19/4/06	Redada	Ambovomanga
19/4/06	Florina	Ambovomanga
19/4/06	Safirini	Ambovomanga
20/4/06	Daufina	Andaboro
20/4/06	Mamy & Randria	Andaboro
20/4/06	Kakeli	Andaboro
20/4/06	Floranti	Andaboro
20/4/06	Doré & Naghareta	Andaboro
20/4/06	Flora	Andaboro
20/4/06	Claire	Andaboro
20/4/06	Rezery & M Tony	Andaboro
20/4/06	Revery & Remosa	Andaboro
20/4/06	Longosoa & Rasoa	Andaboro
20/4/06	Makariky	Andaboro
20/4/06	Alimartho	Andaboro
20/4/06	Mme Filisoahe & M Velitsiloho	Andaboro
26/4/06	Sakina & Dose	Anakao Haut
26/4/06	Bernard	Anakao Haut
26/4/06	Zite	Anakao Haut
26/4/06	Evelyne	Anakao Haut
26/4/06	Zara	Anakao Haut
26/4/06	Rajabo & Voahirina	Anakao Haut
26/4/06	Mahampino & Miza Justine	Anakao Haut
26/4/06	Venia & Ehama	Anakao Haut
26/4/06	Mamode & Zakia	Anakao Haut
26/4/06	Juliet & Justôme	Anakao Haut
26/4/06	Joseline & Frederi	Anakao Haut
26/4/06	Claudia & Ndrianarisoa	Anakao Haut
26/4/06	Florantine & Fitiv	Anakao Haut
27/4/06	Yvonne & Zak	Anakao Bas

27/4/06	Nirson & Anita	Anakao Bas
27/4/06	Lahiniriko & Bere	Anakao Bas
27/4/06	Katherine & Filomo	Anakao Bas
27/4/06	Mina & Pieraly Philenon	Anakao Bas
27/4/06	Tebalia & Lydie	Anakao Bas
27/4/06	Deline & Derik	Anakao Bas
27/4/06	Polome & Richard	Anakao Bas
27/4/06	Helvin & Algozive	Anakao Bas
27/4/06	Malala & Kelejean	Anakao Bas
27/4/06	Tita & Thièrie	Anakao Bas
27/4/06	Gaston & Landy	Anakao Bas
27/4/06	Gense & Noella	Anakao Bas
27/4/06	Perna	Anakao Bas
27/4/06	Balete & Pascal	Anakao Bas
4/3/06	Dr Oliva	Tuléar
4/3/06	Dr Emma	Tuléar
4/3/06	Dr Jeri	Tuléar

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Acronyms and terminology

NGO- Non-Governmental Organization
MCDI- Medical Care Development International
WHO- World Health Organization
USAID- United States Agency for International Development
UNICEF- United Nations International Children's Emergency Fund (currently United Nations Children's Fund)
ASOS-Action Santé Organisation Secours-Antenne Régionale
SALFA-Sampan'asa Loterana Momba Ny Fahasalamana (health department of the Malagasy Lutheran church)
PSI- Population Services International
DDT-Dichloro-Diphenyl-Trichloroethane
GDP- Gross Domestic Product
DRS- Direction Regionale de la Santé
RBC- Red Blood Cell
CNS- Central Nervous System
CSB- Centre de Santé de Base
MOH- Ministry of Health
TPI- Traitement Preventative Intermittent (Intermittent Preventative Treatment)
CPN- Consultation Pre-Natal (Pre Natal Consultation)
FAF- Folic Acid Fortification
CHD- Centre Hospitalier de District (District General Hospital)
CHRR- Centre Hospitalier Reference Regional (Regional Reference Hospital)
HIV- Human Immuno-deficiency Virus
AIDS- Acquired Immune Deficiency Syndrome
STI- Sexually Transmitted Infection
TPCSP- Toliara Province Child Support Project
KPC- Knowledge, Practices, and Coverage
AVBC- Agent de Vendre Base Communautaire
CVA- Communautaire Villageoise Animateur
SM- supermoustiquaire

Malagasy/French Terms

Ombiasy- Traditional healer
Tazo- fever
Masikoro- Ethnicity in Belembo, Mitsinjo, and Andaboro
Antandroy- Ethnicity in Ambovomanga
Vezo- Ethnicity in Anakao Bas
Sara- Ethnicity in Anakao Bas
Tanalana- Ethnicity in Anakao Haut
Vazaha- Foreigner, stranger
Ariary- Malagasy unit of currency (one US dollar is approximately 2000 ariary)
Jabely an'ala- Malaria in pregnant women
Tamporaza- malaria in infants and young children caused by bad spirits
Mauvaise esprits- bad/evil spirits
Sensabilisation- making aware
Quartier- neighborhood/district
Ordre de mission- official documents stating mission purpose

Chef du village- the leader of the village

Élevage- the raising of livestock

Animateur- field health worker who raises awareness about important issues within villages

Supermoustiquaire- PSI marketed insecticide treated bed-net

Palustop- PSI marketed chloroquine based malaria treatment for children