Economics, Epidemics & Eradication:

A Case Study of Malaria in Madagascar

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To Barack Obama, for giving a new generation of voters a reason to be hopeful about the future:
May our commitment to righting the wrong in the world be so resolute as to inspire future generations as much as your dedication has inspired ours.

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There's so many different worlds
So many different suns
And we have just one world
But we live in different ones

- Mark Knopfler, "Brothers in Arms"

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GLOSSARY OF TERMS

Anopheles – the species of mosquito that acts as a vector for the malaria parasite

Ariary – Madagascar's official currency

Centre de Santé de Base – Basic health centers funded by the government

Endemic – when a disease exists permanently in a given region

Epiceries – small roadside shops that sell a range of goods, including a variety of foods, drinks, and medicines

Epidemic – a sudden outbreak of a disease that causes simultaneous mass infection

Epidemiology – the study of the origins, distribution, and management of disease

Morbidity – the rate of infection

PaluStop – a CQ-based malaria treatment distributed at a subsidized costs throughout Madagascar

Pathology – the scientific study of disease, including its origins, growth, and effects on human populations

Prophylaxis – preventative treatment for a disease

Vector – the animal species that carries and transmits an infectious disease; for malaria, the Anopheles mosquito is the vector species

ACRONYMS

ACT – Artemisinin-based combination therapy

AR – *Ariary*

CHW – Community Health Worker

CSB – *Centre de Santé de Base*

CQ – Chloroquine

DDT – Dichlorodiphenyl trichloroethylene

DRS – The *Direction Régionale de la Santé du Planning Familiale et de la Protection Sociale*

GNP – Gross National Product

HIV/AIDS – Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome

IMR – Infant Mortality Rate

ITN – Insecticide-Treated Net

LLIN – Long-lasting insecticidal mosquito net

MAP – The Madagascar Action Plan

MRDT – Malaria Rapid Diagnostic Test

NGO – Nongovernmental Organization

P. – *Plasmodium*

PEC – *Prise en Charge*

SP – Sulfadoxine-pyrimethamine

USD – United States Dollars

PSI – Population Services International

WHO – World Health Organization

INTRODUCTION

INTRODUCTION & RELEVANCE

Despite effective techniques for preventing and treating malaria, the malaria burden in Madagascar remains quite high, particularly in rural areas where poor villagers are more isolated from health services, and less likely to be able to afford prevention methods or treatment. In response to this challenge, Madagascar's government has made malaria eradication a high priority, stating that it hopes to reduce the incidence of malaria from its current level of 1,234,520 to 320,000 by 2012, and to eliminate the disease entirely by 2018.[i] Ultimately, though, it remains to be seen if their efforts will be sufficient to meet these ambitious goals.

STATEMENT OF INTENT

For this paper, I attempted to gain an understanding of what resources are available for preventing and treating malaria in rural villages in Madagascar. While some of my objectives changed slightly over the course of the project, I was able, I believe, to answer the following questions that gave direction to my planning and research:

- What is malaria? How is malaria transmitted?
- How can malaria be prevented? How can malaria be treated?
- What is the malaria burden in Madagascar?
- What do people living in rural Madagascar know about malaria prevention and treatment?
- What resources are available in rural Madagascar to help prevent and treat malaria?

- What is Madagascar's government doing to help reduce the incidence of malaria?
- What are nongovernmental organizations (NGOs) and doctors doing to help reduce the incidence of malaria?
- Will Madagascar be able to eradicate malaria in the future?

With these questions guiding my research, I attempted to gain insight into the village-level perception of malaria. As one Tanzanian agricultural worker explains, "So-called leaders do entirely too much talking to the peasants. No one ever wants to listen to them."[ii] With this idea in mind, I tried to see what insights talking to rural Madagascar's poor population—those who are most at risk for contracting and dying from the disease—could lend to the malaria crisis in Madagascar, and the efforts being made to address it. After analyzing the information I gathered through conducting interviews with villagers, doctors, various NGOs, and government health officials, I was able to draw my own conclusions about problems currently hindering Madagascar's efforts to control the disease, as well as what needs to be done if the country is going to overcome these problems and accomplish its goal of eradicating malaria by 2018.

THESIS

While the Malagasy government has a solid plan to eradicate malaria, current efforts receive insufficient attention and financial resources. If the subsequent discrepancies between the reality at the village level and the government's strategy are not addressed, malaria will continue to plague the country for many years to come.

DISCUSSION OF METHODOLOGY

Due to time constraints, it would have been impossible for me to conduct my study in more than one region, or even in multiple villages. Instead, I focused on one region, and one village in particular, and did a sort of case study that I believe is more or less representative of the malaria situation in general in Madagascar. I chose to conduct my case study in southeast Madagascar in the Atsimo Atsinanana region where there are particularly high rates of malaria rates due to the wet climate.

National & Regional Level:

I started my research in Antananarivo, the capital of Madagascar located in the Central Highlands, where I interviewed doctors and read through books they recommended in order to familiarize myself with basic background information about malaria. Having this information proved very helpful for the next stage of my research, when I traveled to Farafangana—the capital of the Atsimo Atsinanana region—where I met with local health officials and doctors in an effort to gain an understanding of the efforts being made at the regional level to combat malaria.

In Farafangana, I also worked closely with two NGOs: a local chapter of Welthungerhilfe, a German organization dedicated to alleviating rural poverty, and a local chapter of Inter Aide, a French organization that focuses on reducing the infant mortality rate in Farafangana and the surrounding districts. Over the course of many interviews with various employees of these two NGOs, as well as through observing the operations of these organizations, I was able to learn a great deal about the health issues in the region, particularly those relating to malaria.

Village Level:

In the village of Anosikely, with the help of a translator, I conducted a general survey in which I asked questions about malaria, particularly about what resources are available to them for preventing and treating the disease. By establishing close relationships with some of the villagers, I was able to get more personal information about malaria-related issues. My research in the village was both quantitative and qualitative—I tried to gather not only facts and figures pertinent to my study, but also anecdotal information that could help to improve my overall understanding of malaria in Madagascar.

BIASES & OBSTACLES

For this paper, I used both primary and secondary sources to obtain the information I needed. While ideally I would have preferred to use only primary sources, due to time constraints—I had only four weeks to collect data and write the paper—it became not only more practical and efficient, but also more reliable to gather certain types of data through secondary sources. I did, however, always make sure to use only those secondary sources that provided data consistent with what I found through primary sources.

Obstacles arose when using primary sources as well. Throughout the course of researching and writing this paper, I did my best to prevent my own opinions from becoming apparent during interviews. Despite my best efforts, though, it is probable that information I gathered was tainted in minor ways due to my own biases. Furthermore, because I am a foreigner, villagers and health officials alike often assumed that I was an aid worker researching malaria with the intention of

helping in some way. While I was always sure to identify myself as an undergraduate student and to explain the purpose of my research from the outset, I have no doubt that in some instances, interviewees tried to give me answers they thought I wanted to hear, or that they thought would benefit themselves in some way.

In addition, interviews with primary sources proved to be somewhat difficult due to a language barrier. For the most part, I also had no choice but to conduct interviews in French, or in Malagasy with the help of a translator who could relay the information back to me in French. While my French is strong enough to be able to speak about malaria-related issues, it is not sophisticated enough to distinguish the nuances of the language, which ultimately might have contributed to tainted questions or misinterpreted responses. When working with the translator, even though I explained to him the importance of asking questions in such a way so as not to encourage any particular answer, because I cannot speak Malagasy, it is impossible for me to verify that he was in fact translating the questions in the same manner as I was explaining them to him.

Finally, in order not to get skewed results about resources available in rural villages, I intentionally did not contact or seek out any NGOs working on malaria-related projects in Farafangana or Anosikely before my arrival. However, for logistical reasons, I was in touch with Welthungerhilfe before I went to Farafangana. Even though they do not do any work specifically relating to malaria, they do have projects in Anosikely, which was what allowed them to help me coordinate my stay there. While their assistance was crucial for my being able to live in the village and

conduct research there, their already established presence in Anosikely might have affected the results of my inquiries in subtle, unforeseeable ways.

BACKGROUND INFORMATION: STUDY AREA

MADAGASCAR—A BRIEF HISTORY

The history of Madagascar, the world's fourth-largest island located around 250 miles off the coast of East Africa, is as complex and unique as its distinctive flora and fauna, most of which is found no where else in the world. Despite the island's proximity to the east coast of Africa, home to some of the earliest human settlements, human history in Madagascar is limited to relatively recent times. Different theories about the origins and arrival times of the first residents exist, though it is generally accepted that the island's contemporary inhabitants are descended from migrants who made their way to Madagascar from East Africa, Arabia, and South-East Asia, starting around 2000 years ago. While relations between these different migrant groups have historically been marked by some tension, in general, many aspects of these various ethnic groups have successfully combined to create a unique Malagasy culture that blends African, Asian, and Arabic elements.

Europeans did not arrive in Madagascar until the sixteenth century, after an astray Portuguese merchant ship stumbled across the island. For the next several hundred years, Madagascar continued to be a place of interest for European merchants, slave traders, missionaries, and ultimately imperialists. While there was much to attract the Europeans, such as a somewhat hospitable political regime and

valuable natural resources, there was also much to discourage them. For example, Madagascar's climate was, and remains today, one in which tropical diseases flourish: many settlers died of malaria and other tropical illnesses. However, the disease burden was not enough to dispel European interest, particularly from Great Britain and France.

Eventually this European interest evolved into European colonization. In 1896, after years of political contention and military clashes with Madagascar's government, France officially claimed Madagascar as a colony. Incidentally, around this same time, it was a French military physician, Charles Louis Alphonse Laveran, who originally identified the malaria parasite in the blood of soldiers while serving in Algeria. By 1884, Laveran had suggested that mosquitoes were the vector for malaria. Eventually, Laveran went on to receive a Nobel Prize for his contributions to the understanding of malaria and other tropical diseases. Despite these advancements, though, it was malaria and other tropical diseases, not Malagasy soldiers, that proved to be the biggest killer of the French invaders.[iii]

CONTEMPORARY MADAGASCAR

While there were arguably some positive aspects of French colonial rule, the overall effect was undoubtedly negative. Among other human rights outrages, French leaders often used forced labor, essentially enslaving Malagasy men in an effort to maximize the profits associated with the island's natural resources. It was not until after World War II when Madagascar, like many other colonized African countries, started to experience serious political unrest and agitation against French

rule. After years of battling for independence, which resulted in the deaths of over 89,000 Malagasy,[iv] Madagascar became officially independent from France in 1960.

Although not marked by the same sort of violent conflict that has plagued many decolonized African nations, the years since Madagascar's independence have not seen significant economic growth or development. Indeed, with 85 percent of the population living on less than $2 United States Dollars (USD) a day, and a per capita Gross National Product (GNP) of $250 USD, Madagascar is now the fourth poorest country in the world.[v] This level of severe poverty, which is particularly pronounced in rural areas, renders Madagascar vulnerable to large-scale public health problems. In coping with malaria, Madagascar's poor are particularly at risk. As the World Health Organization (WHO) explains, "Malaria traps families and communities in a downward spiral of poverty, disproportionately affecting marginalized populations and poor people who cannot afford treatment or who have limited access to health care."[vi]

ANOSIKELY—RELEVANT DEMOGRAPHIC INFORMATION

Anosikely, with a population of about 1886 people, is a small fishing village in the rural commune of Anosy Tsararafa, the District of Farafangana, Region of Atsimo Atsinanana, in southeast Madagascar.[vii] The region and district's capital, Farafangana, is located about 25 kilometers south of Anosikely. As the largest town in the area, Farafangana offers the nearest hospitals, post offices, banks, and secondary schools.

The population of Anosikely is marked by the same sort of poverty that plagues many other rural communities in Madagascar. Most of the village's

population relies on fishing as both the primary source of food and income, though some families also grow rice or raise zebu. As a result of this subsistence lifestyle, 90 percent of the population lives on less than two dollars a day; 30 percent lives in extreme poverty, meaning that they live on less than one dollar a day. About 90 percent of the population is illiterate, and an alarming 26 percent of the population is chronically malnourished.[viii] Furthermore, resources in the town are limited: there are two churches, one protestant and one catholic, three *épiceries*, and one elementary school that is too small to hold all the students.

Regardless of these distressing statistics, there are many positive things to be said about Anosikely. The people are warm and welcoming, and despite their limited means, they are incredibly generous: if a family does not have enough to eat, neighbors will often give away some of their food, even if they do not have enough for themselves. Furthermore, while most of the villagers have very limited formal education, they still have a good understanding of contemporary political issues, at least at the village level. For instance, most villagers appreciate the importance of using mosquito nets, and they realize they should have free access to them. However, they also understand how "the system" works—they know that despite what the government says, it will be a long time before distribution efforts reach their tiny village. Overall, while the village does face real problems associated with its poverty, there is hope for the future, and a general atmosphere not marked by despair or anger, but by contentment and camaraderie.

BACKGROUND INFORMATION: MALARIA

HISTORY & IMPACT

Throughout human history, malaria has played an important role in shaping civilization. It has controlled where people live, forcing them into higher altitudes where the disease does not survive; it has obliterated various armies invading sub-Saharan Africa, whose adolescent and middle-aged soldiers had never before been exposed to the disease; and it helped Europeans conquer the Americas, as they brought the new disease with them from the Old World. Indeed, some scientists estimate that no other single disease has done more to push humans forward in evolution due to the high levels of mortality associated with the disease.

Unfortunately, despite effective treatments and reliable prevention methods, malaria's impact on the human population is not limited to the past: today, over 45 percent of the world is at risk for contracting malaria,[ix] resulting in a higher incidence of the disease than any other infectious disease across the globe.[x] The WHO estimates that more than 500 million people are infected every year, of which approximately one million die.[xi] 90 percent of those mortalities are in sub-Saharan Africa, where malaria remains the number one cause of infant mortality. Indeed, in Africa, one child under five dies from malaria every 30 seconds.[xii] In addition to children, pregnant women are another demographic group for whom malaria poses serious dangers. Pregnant women who become infected with malaria are at risk for severe iron deficiencies and impaired fetal growth. As a result of malarial infection, approximately 10,000 pregnant women and 200,000 of their infants die every year.[xiii]

As mentioned earlier, deaths rates associated with malaria are disproportionately high among poor populations, as families cannot access appropriate treatment or health care. However, not only are the poor more likely to die from malaria, but the disease also has a substantial negative economic impact on entire regions where it is endemic. In Africa, for instance, high infant mortality rates, which can be attributed in large part to the malaria burden, reduce the rate of growth by an estimated 1.3 percent.[xiv] In total, the financial repercussions of malaria cost African countries an approximate $12 billion USD every year.[xv]

Furthermore, studies indicate that in the future, malaria may start to play an even larger role, and affect places and people that have never before been exposed to the disease. Some scientists estimate that "as our globe warms a degree or two, the percentage of humans exposed to malarial parasites will rise from 45 to 60 percent."[xvi] Indeed, if the malaria burden continues to increase at its current pace, the number of deaths caused by malaria could double over the next 20 years.[xvii]

Despite these grim statistics, however, there is hope for the future. For malaria to continue to thrive in any given area, it requires a dense human population, a large mosquito population, as well as significant rates of transmission of the malarial parasite from both the mosquitoes to humans, and from humans to mosquitoes. Malaria has been successfully eradicated from North America, Europe, and many places in the Middle East by interrupting these conditions. Only time will tell, though, if humans will be able to overcome and potentially even eradicate forever the disease that has been hindering growth and development for the past 50,000 years.[xviii]

THE DISEASE—PATHOLOGY

Malaria is a potentially lethal disease caused by parasitic protozoa called *Plasmodium* (*P.*). There are four different kinds of malaria parasites, *P. falciparum*, *P. vivax*, *P. ovale*, and *P. malariae*, each of which causes a different kind of malaria. *P. falciparum*, the most common strain of malaria, causes approximately 80 percent of all malaria cases, and also is the cause for around 90 percent of all malaria-related deaths.[xix] The disease is found mostly in tropical and subtropical regions where its vector, the female Anopheles mosquito, thrives. An Anopheles mosquito first acquires the parasitic protozoa by biting a human who is already infected. After the mosquito has fully digested the parasite, a process that takes approximately 30 minutes, the mosquito will start to pass on the parasite to the humans it bites.

PREVENTION

Currently, there is no vaccine available to protect against malaria. While prophylactic medicines do exist, they are not effective for long-term prevention. However, prophylactic medicines are still a valuable option for people for whom short-term prevention is sufficient, such as for pregnant women, or for tourists traveling to an endemic region. There are several drugs available for prophylactic use, most of which can be used to treat malaria as well. For visitors to an endemic region, popular medicines include Malaron, Cotrifazid, Lariam, and Plaquenil. For pregnant women, the prophylaxis most commonly used is Sulfadoxine-pyrimethamine (SP), which requires only two doses taken at the start of the fourth and fifth months of the pregnancy. These prophylactic medicines work essentially the same way malaria treatment does, by cutting off the lifecycle of the *Plasmodium*

parasite before it can develop fully in the bloodstream.

For people who live in malaria endemic regions the only effective prevention method available is long-lasting insecticidal mosquito nets (LLINs), which, when used correctly, can help reduce the transmission of the parasite by up to 70 percent.[xx] Because Anopheles mosquitoes tend to feed at night, using these LLINs to cover a bed is an effective way of preventing bites. In the past, insecticide-treated nets (ITNs), which are nearly two times as effective as their untreated counterparts,[xxi] needed to be re-treated every six months. Recent advancements, though, have allowed for the production of these LLINs that continue to work for up to five years.

Malaria prevention efforts also include limiting the growth of the Anopheles mosquito population, which can be accomplished by spraying insecticides, or by eliminating the breeding grounds for the mosquito by covering, poisoning or draining standing water. In the past, such methods have helped to control or even eradicate malaria in regions where it was once endemic. However, in recent years, some mosquitoes have developed a resistance to Dichlorodiphenyl trichloroethylene (DDT) and other pesticides, making this a less effective method by which to control the growth of the mosquito population.

SYMPTOMS

Malaria can have a wide range of symptoms, including fever, chills, nausea, iron deficiencies, and joint pain. The most common sign of malaria is recurring onset of chills, followed by rigor and fever. Children who are suffering from malaria often start to show signs of irregular posture, which can be indicative of serious,

long-term brain damage. However, symptoms of malaria vary from case to case, and also vary depending on the strain of the disease.

The most dangerous and lethal kind of malaria is caused by the *P. falciparum* parasite. With this type of infection, symptoms often do not start to show up until a week or two after first contracting the parasite. Symptoms tend to be more severe, and if left untreated, can lead to coma and death. This kind of malaria can develop very quickly, leading to death within days or even hours. Chronic malaria, caused by both *P. vivax* and *P. ovale*, can cause symptoms to recur months or years after the first exposure, as the parasite remains in the liver even after treatment.

DIAGNOSIS

Essentially, malaria is diagnosed by identifying *Plasmodium* in a patient's blood. However, in regions where laboratory equipment is impractical or simply too expensive, doctors often rely on symptomatic indicators to diagnose the disease. While in the past this sort of symptomatic diagnosis was the only way to diagnose malaria, new technologies are now available that yield much more accurate results.

In areas that have access to more sophisticated technology, the most reliable way to diagnosis malaria is through microscopic examination of blood films. Because each different kind of the *Plasmodium* parasite has its own unique characteristics, using this sort of test, doctors can not only accurately diagnose malaria, but can also more effectively treat the illness by identifying the specific strain the patient has contracted. However, in many areas, access to this sort of technology, or to someone who is trained in how to use it, is simply not a possibility. In these areas, rather than simply rely on less accurate symptomatic indicators, it is

now possible to use antigen detection tests, which require only a drop of blood on a sort of testing strip to identify the presence of the *Plasmodium* parasite, similar to the way a diabetic tests blood sugar levels.

These sorts of Malaria Rapid Diagnostic Tests (MRDTs), are often more practical in rural areas because, as Dr. Liery Ranaivo explains, there is no need for a laboratory, or for a specially trained physician.[xxii] These tests require only one drop of blood drawn from a finger prick, and after approximately fifteen minutes, the "dipstick" indicates whether the patient indeed has malaria. Because the test takes so little time, patients can wait around for the results and receive the appropriate treatment. However, these tests are not as accurate as the tests conducted under microscopes, and they cannot distinguish between the different types of *Plasmodium*.

TREATMENT

The different strains of malaria each require different sorts of treatments. For instance, when infected with *P. falciparum*, patients must be hospitalized immediately, whereas cases of *P. vivax*, *P. ovale*, or *P. malariae* can usually be treated on an outpatient basis. In general, though, treatment consists of antimalarial drugs, as well as supportive measures, including drugs to repress fevers, in order to help alleviate some of the more uncomfortable or even life-threatening symptoms. With the appropriate treatment, nearly all malaria patients can make full recoveries.

There are several different drugs that are available to treat malaria. Until recently, Chloroquine (CQ) was an effective and relatively cheap way to treat malaria. Over the past several decades, however, *P. falciparum* has developed a

resistance to the drug. This resistance, which has spread from Asia to Africa, means that this cheap drug is no longer a viable option in most parts of the world. Apart from CQ, there are several other drugs that still effectively treat malaria, including artemether-lumefantrine (known commercially as Coartem and Riamet), artesunate-amodiaquine, artesunate-mefloquine, artesunate-sulfadoxine/pyrimethamine, atovaquone-proguanil (known as Malarone), Quinine, cotrifazid, doxycycline, mefloquine (known as Lariam), sulfadoxine-pyrimethamine, and hydroxychloroquine (known as Plaquenil).

In 2001, the World Health Organization officially started to recommend using artemisinin-based combination therapy (ACT) as the first option when treating simple cases of malaria, especially in regions where CQ resistance is common. These treatments blend several antimalarial drugs, including one derivative of artemisinin—drugs derived from the plant *Artemisia annua*. Currently, artesunate and artemether are two of the most widely used artemisinin derivatives found in ACTs. These drugs are then used in conjunction with "partner drugs," such as mefloquine, lumefantrine, or amodiaquine. When used properly, ACTs are effective over 90 percent of the time.[xxiii] Unfortunately, costs still remain a major obstacle to their being used in many developing nations. Thus, even though many countries, including Madagascar, have changed their official malaria treatment policies in order to conform with WHO recommendations, because these new medications are as much as 20 times more expensive than older drugs, ACTs are still out of reach for many countries in which malaria is endemic.[xxiv]

MALARIA IN MADAGASCAR

Malaria is a major public health problem in Madagascar—in 2005 there were 1,234,520 presumed cases of the disease.[xxv] As in most African countries, it is the single biggest killer of children under five years old.[xxvi] Indeed, it is responsible for more consultations at *Centre de Santé de Base* (CSB)—the basic health clinics funded by the government—throughout the country than any other infectious disease.[xxvii] Despite government efforts, as well as the efforts of various NGOs, malaria continues to cause thousands of deaths every year in Madagascar.[xxviii] Madagascar's malaria mortality also remains quite high—approximately 17.5 percent.[xxix] Furthermore, Madagascar always stands the risk of experiencing a malaria epidemic, such as the one that took place from 1986 to 1988 during which approximately 40,000 people living in Madagascar's Central Highlands were killed—a staggering one percent of the region's population.[xxx]

Recently, Chloroquine resistance has finally started to appear in Madagascar. The Malagasy government officially announced this resistance in October 2008, though significant levels of resistance—in approximately 15 percent of cases—started occurring as early as 2005.[xxxi] This new development in Madagascar's malaria situation is not surprising—CQ resistance started occurring in Asia a few decades ago, and has been widespread throughout the rest of Africa for many years. Nevertheless, this relatively new CQ resistance in Madagascar is unfortunate. Now Madagascar must rely on other more expensive drugs in order to treat malaria effectively.

THE SOLUTION

FEASIBILITY

Madagascar currently finds itself at the start of an intensive 10-year plan to eradicate malaria from the island, a feat the government believes achievable due to unprecedented levels of political engagement, as well as access to new technologies to prevent and treat the disease. It is possible to eradicate malaria, as mentioned earlier, by removing the conditions necessary for the parasite to continue to survive: dense human population, a large mosquito population, and significant rates of transmission of the malarial parasite both from humans to mosquitoes, and from mosquitoes to humans. Because of its relative geographic insularity, Madagascar has a unique opportunity to control these factors and eliminate the disease.

From 2002 to 2006, Madagascar implemented a trial malaria-eradication program on the small island of Ile Sainte Marie, located 40 kilometers off the east coast of Madagascar. By supplying appropriate diagnostic tools, prevention methods, and treatment options, and by ensuring coverage for more than 90 percent of the population, the government was able to reduce significantly the incidence of malaria.[xxxii] Now as these same techniques are being applied across the island, the government hopes it will enjoy the same level of success as it did on Ile Sainte Marie.

NATIONAL LEVEL—THE M.A.P

In 2007 the Ravalomanana administration released its "Madagascar Action Plan," more commonly referred to as the MAP. The 113-page booklet is full of facts and figures about current problems in Madagascar, listed alongside milestones the government plans to achieve by 2012. An entire section of the MAP is set aside for defining goals pertaining to health, and within that section, a considerable portion is

dedicated to listing goals pertaining to malaria. The first health challenge laid out by the MAP is to "provide quality health services to all." This means ensuring that "adequate and quality health services will be increased to ensure easy access, affordability and reliability," that "[Madagascar] will have an educated population which understands and uses quality health services and treatment options," and "there will be a partnership with Community Agents and the private sector at local levels."[xxxiii]

After these more general health-related goals, the MAP focuses on more specific goals, including those related to malaria. It states that the government hopes to reduce the number of presumed cases of malaria from 1,234,520 to 320,000 by 2012. Furthermore, while in 2005, the mortality rate of malaria was nearly 18 percent, by 2012, they hope to reduce the mortality rate to nine percent. To accomplish this goal of "effectively controlling malaria," the government—specifically the Minister of Health—plans to "implement all available services for effective control of malaria including indoor and outdoor spraying, distribution of bed nets and adequate treatment," as well as "link and coordinate national campaigns in order to maximize coverage and effectiveness."[xxxiv]

Because the MAP's goals do not extend past 2012, no further details about plans to eradicate malaria by 2018 are presented. Overall, the MAP is fairly vague, does not give specific information about what the government actually plans to do to accomplish its goals. For more specific details, it is necessary to examine the eradication plan at the regional level. Much emphasis has been placed on the importance of decentralizing the efforts to eradicate malaria, so as to give

community doctors and health officials the leeway they need to apply effectively their understanding of unique local conditions.

REGIONAL LEVEL—THE PLAN

The *Direction Régionale de la Santé du Planning Familiale et de la Protection Sociale* (DRS) in Atsimo Atsinanana, a region where malaria is considered endemic, has adopted a three-tiered approach to eradicating malaria. While similar to the approaches in other regions throughout the country, this approach is tailored slightly to meet the specific needs of this region. Firstly, they are trying to manage the dispersal of malaria in what they call the *Prise en Charge* (*PEC*), or "taking charge" of the disease. This entails getting biological confirmation of all suspected cases of malaria either through microscopic tests or MRDTs. It is important that everyone who contracts a fever gets tested for malaria and given appropriate treatment within the first 24 hours of symptoms. This will help to reduce rates of transmission from humans to mosquitoes, interrupting one of the essential conditions necessary for the continued existence of malaria in any given region. *PEC* efforts also include the monitoring of success rates of various medicines to ensure that resistance is not developing. If a drug has a 15 percent rate of resistance, the state no long recommends using it, and no longer subsidizes the cost of that particular drug.

The second part of the approach is focused on preventing new cases of malaria. Prevention efforts are mostly directed at pregnant women and children under the age of five—the two groups most vulnerable to malaria. Pregnant women and children under five are all qualified to receive free, LLINs from their local

hospitals or CSB. Recently, the state has also started subsidizing the costs of Sulfadoxine-pyramethamine, a prophylactic medicine for pregnant women given away for free at the CSB or hospitals when they come in for their pre-natal visits.

Thirdly, the regional office is working to increase general awareness about malaria through social mobilization campaigns, particularly geared towards rural populations. As Dr. Razafimaharo explains, in order for the other two aspects of their approach to work, it is crucial that everyone in the region has at least a basic understanding of malaria: how it is transmitted, how to prevent it, how to recognize its symptoms, where to get treatment, *etc*. The regional office tries to disseminate this kind of information in several different ways, so as to access various sectors of society. In more recent years, the radio has also become a particularly effective way of transmitting these messages to a mass audience, as more and more people now own radios, even in rural villages.[xxxv]

THE TIMETABLE

In order to gauge its progress, the Malagasy government has developed a timetable that lays out the four different stages towards the eradication of malaria. The first stage, the Preparatory Phase takes place from 2007 until 2008. This phase consists of examining the distribution of the disease and evaluating the administrative capacity and operations of the eradication programs. This Preparatory Phase also allows time for the public and private sectors to be reoriented and reorganized in such a way so as to work together more efficiently to accomplish their common goal of eradicating malaria. Following this first step comes the Attack Phase, which lasts from 2008 until 2012. During this stage, efforts

are focused on the interruption of the transmission of malaria by putting into place effective interventions with 100 percent coverage. Essentially, this is the stage during which the DRS' three-tiered approach is applied.

Once evaluation shows that malaria transmission has been interrupted, the Consolidation Phase begins. During this phase, which lasts from 2012-2017, the government focuses on reinforcing surveillance to detect and eliminate all cases of malaria and prevent the reintroduction of sources of infection. Finally, in 2018 once elimination has been fully achieved, the Maintenance Phase begins. During this stage, efforts are focused exclusively on malaria surveillance to ensure that the disease is not introduced to the country.[xxxvi]

THE RESOURCES

Long-Lasting Insecticidal Nets:

Madagascar's government and other various NGOs have worked to supply CSB's all across the country with the new technologies now available to prevent and treat malaria more effectively. As of 2006, in cooperation with various international NGOs, the government of Madagascar pledged to provide free LLINs to pregnant women and children under the age of five. Pregnant women can obtain these nets during their pre-natal exams at any CSB or hospital.

As mentioned earlier, these nets can be extremely effective at preventing malaria transmission. Furthermore, recent studies also indicate that it is best to give these LLINs away for free. In the past, many believed that recipients of free nets would not appreciate their purpose. In 2007, however, in response to excellent results in a trial–program conducted in several sub-Saharan African countries, the

WHO officially renounced this "responsible ownership" theory and started to encourage nets to be given away for free. In Kenya, when nets were given away for free, the WHO noticed a 44 percent decrease in infant mortality in families who had received the free LLINs. In Zanzibar, malaria-related deaths decreased by an astonishing 95 percent after nets were given away for free.[xxxvii] Indeed, distributing free LLINs has proven to be both an incredibly effective and cost-efficient way to reduce the incidence of malaria.

Malaria Rapid Diagnostic Test:

Malaria Rapid Diagnostic Tests allow rural communities to have access to reliable malaria diagnosis. Now, Madagascar's government has worked to ensure that these MRDT are available in all CSB and hospitals throughout the country. This is an important step towards getting control over the disease. As Dr. Liery explains, for every approximately ten people she tests for malaria, perhaps only one or two actually test positive. In the past, those other eight people would probably have also been treated for malaria. This kind of unnecessary treatment not only means that the real source of the fever is being ignored, but also that by unnecessarily exposing patients to new medications, their potential future malarial infections are more likely to develop resistance to these new drugs.[xxxviii]

Artemisinin-based Combination Therapy:

In response to the WHO's recommendation to use artemisinin-based combination therapy when treating all simple cases of malaria, as well as in response to the growing problems associated with CQ resistance in Madagascar, the government now provides all hospitals and CSB with ACTs to be distributed for free

whenever a patient tests positive for malaria. ACTs are easy to administer: the treatment for children consists of one dose a day for three days. This easy-to-follow treatment plan favors better adherence by patients, which in the long run can lead to reduced rates of resistance. Studies also show that "ACTs produce the fastest clinical recovery because the artemisinin derivatives kill parasites more rapidly than any other antimalarial known."[xxxix] Furthermore, by essentially treating patients with several different drugs at the same time, the risk of artificially selecting for mutants in the parasite population is significantly reduced, meaning it is a lot less likely that resistance will develop.

INTER AIDE

In addition to the role of the government in working to eradicate malaria, NGOs also play a large role. In Farafangana, Inter Aide, a French organization, is the only NGO that focuses on malaria.

Description of Organization:

Inter Aide has been working in southeast Madagascar for the past 12 years, when they started a program in Manakara to help ensure all of its residents had access to clean drinking water. Around eight years ago, in response to alarmingly high infant mortality rates—around 200/1000 in the region,[xl] as opposed to around 5/1000 in most European countries[xli]—Inter Aide developed a program that tried to address two of the main causes of infant mortality in the region: malaria and diarrhea. Essentially, in the Manakara region, Inter Aide uses a sort of Community Health Worker approach to teach villagers how to avoid and how to deal with these

two preventable and treatable illnesses that are responsible for the unnecessary deaths of so many children.

Then in May 2007, Inter Aide conducted its own health survey in the 20 rural communes surrounding Farafanana. They learned that in this area, the infant mortality rate is 182/1000,[xlii] almost two times the national average of 94/1000.[xliii] In response to this, Inter Aide quickly began the process of replicating the health program that had worked so successfully in the Manakara district in Farafangana.

Their Techniques:

Inter Aide uses a sort of three-pronged approach to addressing these two health issues. Firstly, they train and pay the aforementioned CHWs who each go live in different villages for six months at a time. When the CHWs first arrive in their villages, they present themselves to local traditional and administrative authorities, distribute the results of their earlier surveys to all the villagers, and explain to everyone the methods and objectives of the program. After building this relationship, the CHWs run a series of six workshops directed primarily towards mothers. Four of these workshops address diarrhea related issues, and two are centered around malaria prevention and treatment. Because most of the villagers they work with are illiterate, the CHWs use illustration booklets and games in order to disseminate the information.

Secondly, from these groups of mothers who attend the workshops, some of the more engaged women are chosen to receive additional training from the CHWs. For malaria, they learn how to recognize the symptoms, and for basic cases, they are given medications to treat the children. Finally, Inter Aide also helps to combat

malaria by subsidizing part of the cost of LLINs, reducing the cost to 2,000AR for pregnant mothers and children. Not only is the price subsidized, but also the mosquito nets can be ordered in the village and delivered by the CHWs. By personally delivering the nets, Inter Aide effectively eliminates one of the main obstacles for villagers in getting the nets.[xliv]

While the program in the Farafangana district has not been around long enough to know whether it has been successful, in the villages surrounding Manakara, where Inter Aide has been using the same approach for almost eight years, this approach already has some well-established results. For instance, over 30,000 LLINs have been distributed in 150 villages, and in villages where Inter Aide had placed CHWs, the infant mortality rate dropped to 66/1000 compared to a rate of 137/1000 in villages where Inter Aide had not staged an intervention.[xlv]

THE "REALITY"—VILLAGE FINDINGS

Despite the positive indicators for malaria eradication, the national- and regional-level plans, and the history of success of Inter Aide, in Anosikely, the malaria situation is far from being under control. There exist large gaps between the eradication plans proposed by the government, and the reality at the village level.

VILLAGE FINDINGS

In Anosikely, approximately 33 percent of households reported having at least one member who had malaria in the past year. Infant morality rates in the village are alarmingly high: in the past year, nearly 27 percent of households lost at

least one child under the age of five. Furthermore, nearly 26 percent of households lost at least one child under the age of one in the past year. The most significant cause of this high infant mortality rate is malaria. An approximate 69 percent of households reported that their children sleep under mosquito nets, while an estimated 31 percent do not, rendering them vulnerable to the transmission of the disease. Furthermore, approximately 31 percent of pregnant women did not use mosquito nets during their pregnancy, or receive prophylactic medicine.[xlvi]

Self-medicating is a reality in the village of Anosikely, as only 35 percent of households buy their medicines at the CSB II in Tsararafa, whereas 41 percent choose to buy their medicines at *épiceries*, and 17 percent from traditional healers. As for where the villagers choose to get treatment, only 58 percent of households get treatment for serious illnesses at the CSB. An alarming 28 percent still prefer to get treated by traditional healers. The self-medication phenomenon associated with limited use of the CSB in Tsararafa by the population of Anosikely is consistent with the percentage of households in which children did not receive the appropriate treatment for malaria—an alarming 61 percent. This practice will only increase the rates of infant mortality caused by malaria if it is continued at its current rate. [xlvii]

Despite these statistics, villagers seem to have a good understanding of malaria, how it is transmitted, how to prevent it, and the most effective way to treat it. Therefore, there must be other factors influencing their decisions not to get treatment, medicines, or mosquito nets. Many villagers attributed these decisions simply to the inaccessibility of resources. Indeed, it is usually impossible to buy mosquito nets or treatment in the three *épiceries* located in the village. Instead,

villagers have no choice but to travel to the nearest CSB in order to receive any sort of reliable health treatment.

CENTRE DE SANTÉ DE BASE

The closest CSB to Anosikely is in Tsararafa, around nine kilometers away. As most villagers do not own bikes, let alone any sort of motor transportation, this means that a trip to the doctor is a daylong affair, requiring them to make the nearly three-hour walk both to and from the CSB. As many villagers reported, this is particularly difficult for the people who most need to get to the CSB—for pregnant women who wish to receive their free mosquito nets or their free prophylaxis, or for sick children who need to get tested for malaria at the CSB in order to qualify to receive the free medicine. Unfortunately, this sort of inaccessibility of reliable healthcare in Anosikely is common in Madagascar: an estimated 65 percent of the population lives more than five kilometers from any CSB.[xlviii]

Furthermore, as many villagers reported, getting to the CSB did not ensure that they would be treated: there are usually long lines to see the one doctor who works there, and she often leaves to spend long-weekends in Farafangana. In response to these sorts of issues, the government has tried to initiate a Community Health Worker program, so as to have a kind of hospital representative in each of the villages who can distribute mosquito nets, diagnose and treat simple cases of malaria, and refer people to the CSB who need to get more advanced treatment. However, the CHW in Anosikely did not have any sort of formal training, or access to mosquito nets or medicine. His role, as he defined it, is to encourage people to go to the CSB whenever they need to buy mosquito nets or medicine, or need any other

sort of medical care.[xlix] Thus, there are obvious discrepancies even between the plan at the CSB in Tsararafa, and the reality in the village.

Sadly, inaccessibility of proper medicines in the village was not the only problem: one source privy to the inner workings of the health care system explained that since the government made the decision no longer to use CQ when treating malaria cases, but instead to treat solely with ACT, they have not been effective at distributing the new medications. Instead, stocks of CQ sit unused on shelves in CSB while doctors wait for the new medications to arrive. Often when sick children come in, rather than at least trying to treat with the old medications, doctors turn families away, letting children go untreated even when a medication is available that still works in 85 percent of cases.[l]

CORRUPTION

At the CSB in Tsararafa, there did seem to be an adequate stock of the new ACT medicines that the government recommends using to treat simple cases of malaria. However, every villager interviewed throughout the course of this project insisted that they were charged money for treatment at the CSB. Depending on the severity of the fever, they were charged more money, ranging from $2000AR to $12,000AR. While the doctor at the CSB maintained that the medicines were given away for free—indeed, they are supposed to be free—the consistency with which villagers reported their having to pay a fee indicates that corruption is in fact a problem at the CSB.

Other evidence also leads to this same conclusion. For instance, when asked why so many people choose to buy less effective medicine in the *épiceries*, rather

than receive free, effective medication from the CSB, a phenomenon the doctor herself reported, she struggled to find an answer. It would be uneconomical for villagers—90 percent of whom live on less than two dollars a day—to buy medicine if instead they could get medicine for free. This is particularly true in Anosikely, since for the people who live there, getting any medicine at all—whether the effective medicine from the CSB or the less effective medicine from *épiceries*—means traveling nine kilometers to Tsararafa. Thus, such high rates of self-medication, as mentioned before a total 58 percent, indicate that villagers are charged fees for medications that are supposed to be free.

While no exact numbers exist, anecdotal evidence suggests that this sort of corruption is alarmingly common, and is widely accepted simply as a part of the health care system. Indeed, many villagers seemed to know that the medications they paid for were supposed to be free, yet were not surprised when they charged a fee. Although it is easy to fault individual doctors for this seemingly selfish behavior, the enormity of the problem indicates that something more profound than human greed is to blame. Many doctors are overworked, and too much pressure is put on them to ensure the health and wellbeing of quite a large group of people. Indeed, the one doctor who works at the CSB in Tsararafa is essentially responsible for all of the district's 19, 817 residents.[li]

PALUSTOP

As a result of these marked up prices, many poor families have no choice but to buy *PaluStop* in the *épiceries*, a CQ-based medicine distributed at a subsidized cost by Population Services International (PSI), an American NGO. However,

because resistance has developed to CQ, this treatment is no longer effective approximately 20 percent of the time. This resistance has developed in large part due to misuse of the medicines: often, people will take the medicine until they feel better, and then save the rest for the next time they contract a fever. Not only does this misuse help to build up a resistance, but it also makes patients more likely to develop serious, sometimes lethal cases of malaria. Furthermore, once patients have self-treated, if they go into the CSB to get tested for malaria, the tests will come back negative. While it is hard to fault people for trying to treat themselves, particularly since for many it is the only affordable treatment option, in the long run, this sort of behavior might be worse for their health.

MOSQUITO NETS

Even though mosquito nets are supposed to be free in this region for pregnant women and children under five, all of the CSB and hospitals, even those in Farafangana, no longer have any in stock. Instead, people must purchase their own LLINs, which can cost from $2000AR to $3500AR, a price that is reduced due to subsidies provided by various NGOs. While this fee—approximately $1.75 USD—may seem nominal by Western standards, to many villagers in Anosikely this cost puts mosquito nets out of reach.

Even if the CSB in Tsararafa had mosquito nets in stock, though, it would still be very difficult for many women to get them. In order to receive the LLINs, pregnant women would have to travel the nine kilometers to Tsararafa for a pre-natal exam, a long enough trip for a completely healthy woman, let alone for a woman four months pregnant. Indeed, approximately 30 percent of pregnant

women in Anosikely do not visit the CSB for their pre-natal care, but instead choose to be treated by the traditional midwives available in the village.[lii] So ultimately, while most women in the village understand the importance of using a mosquito net during their pregnancy, many still find themselves unable to get them.

ANALYSIS & CONCLUSION

SUGGESTIONS

In order for Madagascar to accomplish its goal of eradicating malaria by 2018, in addition to addressing more complex infrastructural and developmental issues, there are several specific actions the government should take. First, if any of their other efforts are going to succeed, they must address the issue of doctors taking bribes for medications that are supposed to be free. It is also probable that once mosquito nets are again distributed for free at the CSB, the same sort of problems will arise. Money invested in subsidizing the costs of those medicines and mosquito nets is essentially being wasted, since the poor—the people whom those subsidies are meant to help—are often still forced to pay.

Corruption is a problem so engrained into parts of Malagasy society that many have come to accept it as a part of daily life. While this makes it more difficult to overcome, in the short-run simply by improving the living conditions of doctors who are assigned to rural areas, and by ensuring that they receive adequate compensation for their work, Madagascar could at least ensure that doctors are not taking bribes just to meet their basic needs. In addition, systems need to be put in place to monitor doctors in rural areas. It was not difficult to find out that the

doctor at the CSB in Tsararafa was corrupt, yet no one was doing anything about it. Local officials responsible for the CSB are thus either unaware of the problem, or choose simply to overlook it. At times, the health care system in Madagascar seems so disorganized that it is also certainly possible that there is no one who is directly responsible for monitoring this CSB, or who realizes that he is supposed to be monitoring it. Either way, the health care system needs to be restructured so that such problems do not go unnoticed, and cannot just be ignored. This doctor should have to answer to someone, and it should be someone who recognizes her "fee" for what it is: stealing from the poor.

Secondly, if Madagascar hopes to eliminate malaria by 2018, the government needs to make good on its promise to distribute free mosquito nets for pregnant women and children under five. Giving these nets away for free would significantly improve Madagascar's efforts to eradicate malaria. However, simply giving away the LLINs at hospitals and CSB is not adequate. Community Health Worker programs need to be promoted throughout the country, and regulated at least at a regional if not national level, so as to ensure that all CHWs receive adequate training and compensation. CHWs should be informed about malaria prevention techniques, and should also know how to diagnose and treat simple cases of the disease. Then, by giving these CHWs access to LLINs, MRDT, and ACT kits, the CHWs can effectively narrow the large gap that currently exists between health resources and isolated rural villages. While there are certain hazards associated with this sort of program, such as resources being distributed unfairly or inappropriately, in the past, properly implemented CHW programs have proven to be a remarkably efficient way of giving

rural communities access to basic health care. Indeed, the success of organizations like Inter Aide is a strong indicator that CHW programs can go a long way towards improving rural health.

Ultimately, though, if malaria is ever to be eradicated from Madagascar, more money needs to be invested in both prevention and treatment efforts. Indeed, many of the aforementioned suggestions are already in place in theory, but have fallen apart due to inadequate funding. While technically only Madagascar's government can be blamed for lack of sufficient funding, morally, the entire international community is at fault. Malaria does not get the attention at the international level it deserves, in large part due to the fact that it has been eradicated in nearly all developed countries, including in Western Europe and the United States. If more people in developed nations were aware of how devastating the disease is, and how easy it is to prevent and treat, malaria efforts would get the financial support it needs.

CONCLUSION

For the people of Anosikely, such theoretical discussions about the possibility of eradicating malaria are irrelevant. What matters to them is that their wives, mothers, children and babies are dying, and they feel there is nothing they can do about it. Their options are, in fact, fairly limited: many simply cannot afford the mosquito nets they know might help to prevent the disease, or the treatment they know might save their lives.

Unfortunately, there is no quick fix to the malaria crisis facing Madagascar today. However, there are solutions that, carried out over the long-term, could lead

to eradicating malaria from the island. Scientific advancements just over the past few decades have made it possible to control the disease, both through simple and effective prevention and treatment techniques. If the Malagasy government and the rest of the international community take appropriate action, malaria could be eradicated from Madagascar by 2018. We have the tools and resources we need to address this devastating problem; time will tell if we will use them well enough to help the villagers of Anosikely and others like them throughout Madagascar.

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