LOCAL KNOWLEDGE, BELIEFS, AND TREATMENT-SEEKING BEHAVIORS FOR MALARIA AMONG THE MATSES OF THE PERUVIAN AMAZON

By

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A THESIS PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS

UNIVERSITY OF FLORIDA

2013

To Daniel and Mercid Jiménez

ACKNOWLEDGMENTS

I first thank Daniel and Mercid Jiménez, who took me in as a daughter during my first week in Estiron and always made me feel like a part of their family. I also thank the Jiménez children who so graciously took the time to teach me so much about the Matses way of life. I especially thank Dr. David Fleck for his time and insights about health and illness in Matses communities. I also thank my informants in Estiron who gave of their time and knowledge and shared their personal stories with me. The strength and resilience of the Matses people continues to impress and inspire me.

I offer my deepest thanks to my committee chair, Carmen Diana Deere, whose support and dedication to this project encouraged me throughout my research. I am also thankful for the many insights of my committee members, Lance Gravlee and Alba Amaya-Burns. I am grateful for the opportunity to pursue this research through funding from the Tinker Foundation field research grant through the Center for Latin American Studies.

Finally, I thank my family who supported me even when my research carried me to the remote Amazon Rainforest. I am especially thankful to my parents, who have always supported and encouraged my adventurous spirit, and to my uncle, Lee, for first inspiring my love for Latin America.

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LIST OF ABBREVIATIONS

ACT	Artesunate-plus-mefloquine Combination Therapy/ Artemisinin-based Combination Therapy
EM	Explanatory Model of Illness
FES	Focused Ethnographic Study
ITN	Insecticide-treated Bed Net
LLN	Long-lasting Insecticide-treated Bed Net
MINSA	Ministerio de Salud (Peru)
PAHO	Pan American Health Organization
SNEM	Servicio Nacional de Erradicación de la Malaria
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Abstract of Thesis Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Master of Arts

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May 2013

Chair: Carmen Diana Deere
Major: Latin American Studies

Biomedical clinicians and local people often attempt to treat the same sickness episodes with very different healthcare models. Ethnographic studies of local perceptions of illness and treatment-seeking behaviors can help to negotiate differences in these health models. This study explores perceptions and knowledge of malaria among an indigenous population in the Peruvian Amazon, and examines causation theories and sociocultural factors that influence treatment preferences. Primary research was carried out using a focused ethnographic study in a Matses community in northeastern Peru. Semi-structured interviews with 30 individuals reveal that most informants believe that mosquito bites cause malaria. However, many additional causation theories are also popular, diverging from the clinical model of malaria transmission.

In using explanatory models of illness for malaria to investigate treatment preferences, the results suggest that beliefs about malaria causation are correlated to treatment-seeking behaviors. Individuals that identify mosquito bite as a potential cause of malaria are more likely to seek antimalarial medication as their first treatment

preference. Although most people eventually resort to antimalarial drugs to treat the disease, nearly half of the informants prefer to use medicinal plants first. Only when medicinal plants fail to eliminate malaria symptoms or the disease becomes more severe do people choose antimalarial drugs as a secondary treatment. Additional factors are relevant when individuals choose which primary treatment to pursue, including the side effects of antimalarial medicine, beliefs in efficacy of medicinal plants, and a desire to continue with traditional practices of using medicinal plants to treat illness.

CHAPTER 1
INTRODUCTION

Malaria is one of the leading preventable causes of death in the world today. With an estimated 200 million clinical episodes and 655,000 deaths in 2010, malaria remains an enduring health threat for three billion people in more than 100 countries. Although several countries implemented successful control efforts for malaria in the past, malaria is now considered a reemerging disease in many parts of the world. In much of the developing world, initial treatment for malaria is sought outside of the national healthcare system. The World Health Organization and Roll Back Malaria campaign have recognized the importance of early recognition of symptoms and treatment at home or at community health posts as a critical component of malaria control. When local or community programs are unsuccessful, however, it is often because the health program or health workers fail to take into account the local perceptions of disease and treatment preferences of the target population (McCombie 1996; Lipowsky et al. 1992; Nyamongo 1998; Tanner and Vlassoff 1998).

As one of the most ethnically diverse countries in the world and with the largest population of indigenous peoples in South America, Peru faces these challenges in designing malaria control strategies. The coordinator of the Technical Unit for Indigenous Peoples of the Amazon of the Ministry of Health acknowledged that many indigenous communities in the Peruvian Amazon have been “practically invisible” in national and regional data on health and disease, and that culturally and socially-defined notions of illness greatly influence how Amazonian peoples perceive and treat illness (Fraser 2006). Furthermore, official healthcare practices do not take into account

the worldview of indigenous people and often dismiss the traditional medical practices of the local populations.

Research Objectives and Design

This study has two primary objectives. The first objective is to describe explanatory models of illness for malaria through an investigation of the knowledge and beliefs of an indigenous population in Peru, the Matses, concerning the causes and symptoms of malaria. These explanatory models are used to consider treatment-seeking behaviors, including types of treatment, and treatment preference and sequence. The second objective is to examine access and availability to healthcare in Matses communities, specifically for malaria treatment.

Primary research was conducted in the Matses village of Estiron over the course of six weeks in June and July, 2012. Estiron is located in the department of Loreto in northeastern Peru in the lowland Amazon Rainforest. A focused ethnographic study (FES) provided the basis for the research methodology and primary data collection. Data was collected using structured and semi-structured interview techniques, focusing on interviews with key informants, freelisting to elicit information on common illnesses and malaria causes and symptoms, and collecting malaria narratives. I conducted 30 semi-structured interviews in the community, interviewing an equal number of men and women over the age of 20, with additional informal interviews conducted throughout the research period. An inventory of antimalarial medications was also collected, along with written and visual materials regarding health that were available to community members.

The Matses

The Matses, also referred to as the Mayoruna, are an Amerindian group living on both sides of the Peru-Brazil border. The Matses belong to the larger Panoan language family, which includes numerous indigenous populations still in existence in the Amazon basin. According to the 2007 census, 10 ethnic groups and 39,000 people belong to the Panoan language family. The median age for individuals is 16.3 years, with more than 50% of the population below 17 years of age (INEI 2011: 140). The Matses are the fourth largest ethnic group within the Panoan family, according to this data.

The Matses first established peaceful contact with outsiders in 1969 when they accepted two missionaries from the Summer Institute of Linguistics into their communities. Prior to this date, the Matses were engaged in a period of hostility and warfare with outsiders as rubber tappers and other mestizos encroached upon traditional Matses territories. Much of the population was decimated during this time due to conflict as well as new epidemics. In the last four decades, however, the Matses have more than doubled their population, with an annual population growth rate of 4%. In 2004, the total Matses population was estimated at approximately 2,000-2,200 individuals (Romanoff et al. 2004: 135). The Peruvian National Institute of Statistics and Informatics (INEI) reported 1,724 Matses living in Peru in 2007 (INEI 2010: 137). Most Matses villages are located along the Javari and Galvez rivers and Choba Creek, sixteen of which are located in Peru in the province of Loreto[1] (Romanoff et al. 2004). Matses territory is legally recognized in Peru. Currently, the Matses have an extensive territory (approximately 452,735 hectares) recognized by the government. In addition,

[1] The Matses people, the Peruvian government and other outsiders enumerate Matses villages differently, with fourteen to sixteen villages generally recognized as independent communities or annexes.

the Matses National Reserve was established in 2009 by Supreme Decree of the Ministry of Environment, which added 420,635 hectares to Matses land (Requena 2007; MINAM 2009).

The primary language of the people is also called Matses, although some individuals also speak Spanish with varying degrees of proficiency. Communities continue to rely on traditional subsistence activities such as hunting, fishing, and small-scale agriculture to meet their needs and have limited participation in market activities, although this is rapidly changing (Fleck 2003; Kovasna 2009). They have increasing contact with non-Matses, and migration of the younger Matses to mestizo communities in urban settings is becoming increasingly common, especially among young men (Kovasna 2009).[2]

Thesis Overview

This study explores the knowledge, beliefs, and treatment-seeking behaviors for malaria among the Matses, using explanatory models of illness as a framework. Chapter 2 focuses on explanatory models of illness for malaria through a review of the scholarly literature. It highlights theories of disease causation, with specific attention given to indigenous theories of contagious disease. The review also analyzes previous ethnographies, KAP survey studies, and additional sources that consider explanatory models of malaria. Chapter 3 details the malaria situation in Peru. First, the chapter traces the history of the disease and control strategies employed in the twentieth century. The current status of malaria within the country, including incidence rates, vectors, and species of malaria parasites, is also discussed. The second part of the

[2] For more information on Matses history, traditional life, language and cultural practices, see Romanoff (1984), Matlock (2002), Fleck (2003), Romanoff et al. (2004) and Kovasna (2009).

chapter describes Peruvian government policies concerning malaria diagnosis and treatment.

Chapter 4 presents the primary research findings of the study. In the first part of the chapter, I introduce the study site, Estiron, and describe the Matses' illness paradigm. The current role of traditional medicine men, indigenous health promoters, and the community health post are central themes, particularly as they relate to treatment options for illnesses in Estiron. The data collection process and methodology are also described in detail. The second portion of the chapter examines knowledge and beliefs about malaria, highlighting informants' responses about malaria causation, transmission, and symptoms. The chapter emphasizes treatment-seeking behaviors, revealing that biomedicine or a sequence of medicinal plants and biomedicine are the preferred treatments for malaria. Some factors that affect treatment choice are also discussed, including availability of biomedicine in the community, cost of medication, side effects of biomedicine, and beliefs in the efficacy of natural medicines. Finally, the chapter examines malaria prevention strategies employed by community members, such as the use of bed nets and preventative medicine for malaria. Chapter 5 concludes the thesis with a brief summary of research findings and the significance of the research. I also provide suggestions for future research on health and illness among the Matses.

CHAPTER 2
THEORIES OF DISEASE CAUSATION AND TREATMENT-SEEKING BEHAVIORS FOR MALARIA

Malaria remains a serious health issue in many areas of the world, including South America. In addition to climatic factors which contribute to the persistence of malaria, limited knowledge regarding the causes and treatment options for the disease further exacerbates malaria prevalence in rural areas and among indigenous populations. In order to reduce malaria cases, malaria issues must be assessed at the local level, concentrating on factors that influence treatment-seeking behaviors and access to resources for malaria prevention.

In this chapter, I discuss models of disease causation and their influence on treatment-seeking behaviors. I also examine the concept of explanatory models of illness for understanding sickness episodes, and I review the current literature on perceptions of malaria and treatment preferences in different sociocultural contexts. Finally, I consider how these causation theories and other determinants affect treatment-seeking behaviors for malaria. The wide range of disease causation beliefs and treatment practices for the disease highlights the need for further study in areas with high malaria morbidity and mortality rates, focusing on local beliefs, knowledge and preferences for treatment.

Malaria: A Reemerging Disease

Malaria has existed in humans for at least 4,000 years, and is one of the oldest known infectious diseases in the human population (CDC 2012; Cormier 2011). Despite successful eradication campaigns in some countries and overall reductions in mortality rates since the 1950s, malaria is now considered a reemerging disease in much of the

developing world. Malaria is often referred to as a “tropical disease,” as it is endemic in warm, humid climates throughout the world. The suggestion that malaria is an inevitable and permanent feature of tropical areas, however, implies that physical geography and climate are the primary culprits for malaria’s thriving presence in the world. Diverging from popular rhetoric concerning malaria, Farmer (2001: 41) writes: “In fact, many ‘tropical’ diseases predominately afflict the poor; the groups at risk for these diseases are often bounded more by socioeconomic status than by latitude. […] This aspect of disease emergence is thus obscured by an uncritical use of the term ‘tropical medicine,’ which implies a geographic rather than a social topography.” Malaria remains an endemic disease not only in many tropical areas of the world, but moreover, in many of the world’s poorest and most neglected populations.

Kleinman (1978) states that healthcare systems must be treated as local systems and cannot represent an entire society. While national and international malaria eradication campaigns are critical, understanding local perceptions of disease is essential for effectively controlling malaria. Ethnographic studies must move beyond simple statistics and traditional knowledge, attitudes and practice surveys in order to understand beliefs and their influence on treatment-seeking behaviors. According to Inhorn and Brown (1990: 104), “ethnomedical studies of lay recognition, etiology, and treatment of infectious diseases are even rarer than behavioral studies, in part because of the entrenched belief in the biomedical community that indigenous beliefs and practices are irrelevant to the problem at hand.” While the need for such research was recognized more than two decades ago, Cormier (2011) notes the lack of ethnographic investigation in indigenous communities in South America. She describes how

communities that are the “least Westernized” are likely to be overlooked or neglected in surveys. These same communities are also the most likely to lack access to medical treatment facilities and malaria education campaigns, reducing their options for effective malaria control strategies.

Explanatory Models of Illness

Healthcare systems differ greatly both within and across cultures. Medical systems and beliefs about health and illness cannot be separated from an individual’s sociocultural context, creating difficulties when medical clinicians and local residents attempt to treat the same sickness episodes with very different healthcare models (Kleinman 1978). When individuals with different models of healthcare interact, tensions can arise when the actors involved have divergent ideas on the underlying causes of the sickness episode, the best line of treatment, and even what constitutes “illness” and “disease.”[1] This is particularly true when clinicians and local residents have different perceptions about sickness, and are unaware of the beliefs that the other party holds about his or her healthcare model and subsequent treatment practices.

Explanatory models of illness are used to understand the sociocultural aspects of a medical system, and can assist in making cross-cultural comparisons as well as comparisons within systems. First introduced by Arthur Kleinman, explanatory models (EMs) can help to identify differences in the way individuals and clinicians view illness,

[1] The different uses of the terms “disease” and “illness” are explicit in this study, following distinctions used by medical anthropologists within academic literature. Disease is used to describe a biological or physical malfunctioning of the body, generally used when speaking of issues related to biomedicine. Illness represents the experience of a sickness episode, including social and cultural understandings of sickness and culture-bound syndromes. These terms retain similar meanings throughout the thesis, particularly when discussing informants’ perception of sickness. See Kleinman (1978) and Erickson (2008) for further reference regarding these distinctions. When referencing other literature, I have applied the term used by the author(s). In addition, the term “infection” is used occasionally, describing the presence of malarial parasites in the body, regardless of visible symptoms.

and the actions and treatment necessary for curing the illness. EMs can explain why patients are seemingly noncompliant with some biomedical treatments, which is a source of conflict between patients and clinicians. Explanatory models allow a researcher to gain an emic understanding of illness from the point of view of different actors involved in a sickness episode. An emic account explains an illness from the perspective of the studied culture or community, in contrast with the etic model which is imposed from outside, and is sometimes considered “culturally neutral.” EMs can be used for patients, doctors, family members, etc., concerning any (or all) of the following issues: cause of disease; onset of symptoms; pathophysiology; severity and type of sick role; and treatment practices and preferences.

The differences in explanatory models, particularly between clinicians and patients, often lead to substandard clinical care and poor health outcomes (Kleinman 1978). While clinicians generally adhere to explanatory models grounded in biomedicine with diseases having biological origins and treated using modern medical technologies, patients and their families may see the illness as having underlying sociocultural origins. The patient’s divergent views of causation may ultimately determine the course of treatment for the illness—which may differ from the doctor’s biomedical suggestion for treatment. The importance placed on disease etiology is stressed in explanatory models, as patients’ views concerning what caused their illness will influence treatment preferences.

Theories of Contagious Disease in Ethnomedicine

Theories of disease causation and treatments for disease are diverse, varying not only by geographic region, but also along social and cultural lines. Western medical practice generally uses biomedicine as a model to explain causes of disease and how

diseases progress, citing physical, biological origins of disease which influence modes of treatment. Populations in both the Western and non-Western world, however, also rely on social and cultural explanations for illness origins.

Although numerous factors influence treatment-seeking behavior including socioeconomic status, access to health clinics, social networks, and additional underlying determinants, many scholars have argued that one of the most important factors in understanding and predicting treatment choices are beliefs concerning disease causation (Foster 1976; Lieban 1977; McCombie 1996; Green 1999; Muela et al. 2002; Erickson 2008). Disease etiology, or causation, is relevant in all ethnomedical systems. Ethnomedicine is the study of medical systems within a cultural group, and it encompasses the social, political, cultural, and economic domains of a population, as well as the ecology of health and illness (Erickson 2008). Breaking from long-standing traditions that separated biomedicine from other medical systems, biomedicine is now considered an ethnomedical system, and is the dominant medical model in Western societies (Hahn and Kleinman 1983; Erickson 2008). In contrast with most traditional and alternative medical systems, however, biomedicine does not place the same importance on the social and cultural underpinnings of disease causation.[2] Biomedicine focuses on the biological, physical causes of disease, while traditional and alternative medicines also consider sociocultural factors that influence beliefs about disease causation and treatment-seeking preferences.

[2] Traditional and alternative medical systems include a wide array of medical practices outside of biomedicine, including indigenous traditional medicine, homeopathy, naturopathy, osteopathy, chiropractic, and Ayurvedic practices, among many others.

Foster (1976) refers to disease etiology as the “primary independent variable” in predicting diagnosis and treatment-seeking behaviors for a sickness episode, stating that beliefs about disease causation are foundational for comparing medical systems in different sociocultural contexts. Lieban (1977: 23) also states that “in most indigenous medical systems the primary consideration in the diagnosis of the disease is its cause.” Green (1999) reaffirms these claims in more recent literature. The cause of illness, he asserts, is the most important factor in understanding beliefs about illness in indigenous populations, especially for treatment behaviors and prevention strategies. This section explores different theories of disease causation, highlighting indigenous concepts of contagious disease.

Naturalistic and Personalistic Models of Disease

Most illnesses and diseases fall within one of two broad models of disease causation. The naturalistic system is explained in systemic terms and is said to be caused by an impersonal agent (parasites, bacteria, virus, etc.) or an imbalance in the equilibrium of the body. Biomedicine is considered a naturalistic model of medicine, along with homeopathy, chiropractic, Chinese traditional medicine, and other alternative medical therapies. In contrast, a personalistic view of disease causation believes in a supernatural cause, usually due to aggression or retaliation. Foster (1976) notes three agents that are responsible for this malevolent interference: witches, sorcerers or other humans involved in magic; non-human spirits such as ancestors or ghosts; and supernatural deities. Most cultures use both models of disease causation, although biomedicine is extremely naturalistic and certain indigenous medical beliefs have very personalistic qualities. This dichotomy is one of the core differences in medical models. Nearly all medical belief systems, with the

exception of biomedicine, are concerned with the interdependence of the mind and body to the extent that social, political, cultural, spiritual, supernatural and environmental elements are considered within one system (Erickson 2008). These differences in causation theories influence the understanding of how an illness functions and progresses, and subsequently have a profound impact on treatment-seeking behaviors.

Indigenous Contagion Theory

In his book *Indigenous Theories of Contagious Disease* (1999), Edward Green introduces a model of disease causation which he titles “indigenous contagion theory.” Although countless studies have explored concepts related to indigenous medical beliefs, Green defines a distinct theory that moves beyond folk models of indigenous healthcare. In the context of indigenous contagion theory (ICT), Green finds that most diseases are impersonal and naturalistic in many rural and indigenous communities where he has conducted his research. Using data from several countries, the author explains that although there are illnesses that continue to have personalistic origins, diseases such as malaria, tuberculosis and cholera are more likely to have explanatory models that borrow concepts from modern germ theory, but use local terminology. This shift away from folk medical models provides a more contemporary understanding of indigenous belief systems, and further allows for syncretic or pluralistic explanations for disease causation and treatment preferences.

Green’s book classifies indigenous explanatory models of disease into three etiological categories: naturalistic infection, mystical contagion, and environmental hazards. Naturalistic infection is similar to germ theory, but describes a disease as caused by “worms or tiny insects” rather than viruses, bacteria or parasites. These

beliefs, however, are often quite similar to Western notions of disease (Green 1999). Mystical contagion, also called pollution, is described as the belief that an individual will become ill if he or she comes into contact with an unclean person or substance (such as a person who has been ill and has not yet been cleansed, or menstrual blood). Finally, environmental hazards include illnesses caused by the surrounding environment, such as the wind carrying illnesses through the air. The etiologies identified by Green further divide the naturalistic/personalistic beliefs, with naturalistic infection, environmental hazards and (at times) mystical contagion falling into the naturalistic model, while mystical contagion may also be considered a personalistic belief. These concepts serve as a framework for understanding perceptions of illness and disease in indigenous populations.

Malaria Causation Theories

The literature indicates that beliefs about malaria causation are quite heterogeneous, ranging from biomedical concepts to supernatural origins of disease. The results from previous studies show that, although numerous factors influence treatment choices, perceived cause of the disease is one of the most significant indicators for treatment-seeking behavior. Several studies also reveal that there is limited knowledge on effective treatments and prevention strategies for malaria, creating difficulties for many communities to effectively combat the disease.

Scholarly literature on the social and cultural factors that influence malaria is inadequate when compared to the abundance of biomedical and quantitative studies on malaria throughout the world; yet, several studies on cultural perceptions of malaria have emerged from research conducted in developing countries. With the importance of social and cultural variables in traditional medical systems, explanatory models of

illness are a valuable tool that can be used to understand these diverse systems within specific settings. Although set in different sociocultural contexts, previous investigations provide examples of the various models of disease causation and their influence on treatment preferences.

Naturalistic Theories of Malaria

Perceptions of malaria causation often differ from the biomedical understanding of the disease. In various studies conducted in Colombia, Tanzania and Kenya, respectively, informants were often unaware of the link between mosquitos and malaria transmission (Lipowsky et al. 1992; Muela et al. 2002; Nyamongo 1998). In a study on community perceptions of malaria in southern Ghana, Agyepong (1992) explores the causes, symptoms, treatments and prevention of malaria in a rural farming town. She found that nearly all of her respondents agreed that excessive exposure to heat or the sun caused malaria. When limiting the results to young women in the community, only 2% of respondents cited mosquitos as the cause or mode of transmission for malaria (p. 134). One community member described how heat affects the blood, commenting that "when you work in the sun your body absorbs the heat from the sun then it melts your blood" (Agyepong 1992: 134). A community spiritual healer further described the effects of heat, saying that the "blood spoils" and becomes black, which leads to malaria.

In contrast to Agyepong's study, Muela et al. (2002) found that most informants in their study in Tanzania cited mosquitos as the primary cause for malaria. Other causes that were mentioned included exposure to the hot sun outdoors and drinking or bathing in dirty water. Explanations for malaria causation that include the sun or dirty water fall into Green's environmental component of indigenous contagion theory. While neither mode of transmission corresponds to the biomedical model, these naturalistic

beliefs reflect interesting correlations. People who work outside may be exposed to mosquitos more often than others. Likewise, as *Anopheles* mosquitos breed in stagnant water, the relationship between dirty or stagnant water and malaria causation is a logical correlation. The perception of malaria causation from dirty water is also indicative of the people's knowledge of other parasitic transmission through contaminated water, even though malaria is not transmitted in this manner.

In addition to understanding the link between mosquitos and malaria, many informants in the study also recognized that a parasite (*Plasmodium*) caused the disease and could name the type of mosquito vector (*Anopheles*). Informants' descriptions of malaria symptoms corresponded with a clinical understanding of malaria, with fever, vomiting and convulsions as the most commonly mentioned symptoms (Muela et al. 2002). The authors attribute the population's extensive knowledge of malaria to health messages and school programs that have helped to create greater awareness and prevention of the disease.

Other studies detail beliefs about malaria in several countries in Africa. Most people believed that malaria was transmitted through the air, relating to historical beliefs of "mal'aira," or bad air. Additional modes of transmission included sleeping in the same bed as sick person or sharing their utensils, ingesting dirt, drinking dirty water, and eating certain foods such as small mangoes, green corn, or sugary foods (Green 1999; Nyamongo 1998). Some studies also note, however, that in communities with health programs related to malaria some individuals mentioned "tiny insects," germs, or even parasites as the cause for malaria.

Many of the studies on malaria causation beliefs reported that people did not think that there could be disease without symptoms (Green 1999; Lipowsky et al. 1992; Muela et al. 2002). This is particularly concerning as malaria can exist in the body for months or years without appearing, but with detrimental effects. Testing and treatment of asymptomatic malaria cases are two of the most critical—and most difficult—strategies for decreasing malaria prevalence in endemic areas.

Witchcraft and Supernatural Causes

Although malaria causation beliefs attributed to witchcraft have decreased over time due to health education programs and the use of pharmaceutical drugs to treat the disease, the relation between malaria and witchcraft is still apparent. In studies in Tanzania, the majority of respondents believed that, although malaria had a naturalistic cause, witches could cause an illness that had the same symptoms as the disease, but was considered “fake” malaria (Muela, Ribera and Tanner 1997; Muela et al. 2002). Informant interviews revealed that “the illness ‘looks like’ malaria, but in fact, has nothing to do with malaria; malaria and witchcraft are, so to speak, two possible, but exclusive explanations for the same appearance of illness” (Muela et al. 2002: 409). In this instance, explanatory models provided a valuable tool for understanding “fake” malaria, the origins of the illness, and beliefs related to treatment. The authors found that, because of the trust in Western medicine to correctly diagnose and cure malaria, people believe that an alternate cause must be to blame if biomedicine fails to cure the disease. Therefore, witchcraft is often cited as a cause for an illness when Western medicine fails.

Many people, however, do not openly blame witchcraft for malaria or other diseases. Among the Abagusii of southwestern Kenya, social stigmas exist for

individuals that believe in witchcraft (Nyamongo 1998). Furthermore, the person blamed for being involved in the supernatural is at risk of social exclusion or physical harm. Only when biomedicine fails to cure the disease, or a malaria episode results in the death of an individual, do people explicitly attribute the disease to witchcraft.

A reoccurring theme in rural and indigenous studies of malaria is the correlation between convulsions and supernatural forces. Despite visible manifestation of other malaria symptoms, most individuals blame spirits or witchcraft for convulsions, which are a common symptom of cerebral malaria. Nuwaha (2002) reports that most informants in his study in Uganda believe febrile convulsions were caused by vengeful ancestral spirits that could best be treated by traditional medicine. The reliance on traditional medicine to treat severe forms of malaria usually results in dire consequences. The resulting injury or death, however, only reinforces beliefs that convulsions are caused by supernatural forces that have no biomedical cure.

Treatment-seeking Behaviors for Malaria

Medical systems usually have three areas in which sickness episodes and treatment-seeking behaviors play out: the popular sector, the professional sector, and the folk sector (Kleinman 1978; Erickson 2008). The popular sector is made up of friends and family members, extended social networks, and community participants and events. Most sickness episodes are treated within the popular sector. The professional sector includes doctors, health clinic workers, and other professionals trained in alternative medicine. The folk sector consists of non-professional traditional healers, shamans, bone-setters, etc. Treatment may be sought from each of these three sectors at different times depending on disease severity and worsening conditions, and individuals may seek treatment from all three sectors simultaneously. Even within highly

personalistic medical systems, biomedicine is still used in conjunction with other treatments. Medicine is sought to treat the proximate cause or symptoms, even if a supernatural agent is believed to be the ultimate or underlying cause of the disease.

Limited knowledge regarding the causes and treatment options for malaria further exacerbates malaria prevalence and mortality rates. In a review of the literature concerning perceptions of and treatments for malaria, McCombie (1996) writes:

> There has been increasing recognition of the need to understand treatment seeking behaviors that are relevant for malaria. General research in the area of treatment seeking has documented that it is related to cultural beliefs about the cause and cure of illness. The choice of treatment has been shown to be affected by a number of factors, including access, cost, attitudes towards providers, and beliefs about disease. (p. 933)

Most of the studies found that people in rural and indigenous communities preferred to treat malaria at home before seeking professional medical care. Treatment-seeking behavior varied substantially, however, when considering the different reasons attributed to malaria causation.

A study by Lipowsky et al. (1992) in Buenaventura, Colombia shows that individuals sought very different treatment plans contingent on the symptoms in the malaria episode and geographic location. In the urban population sample, most people sought their first line of treatment at specialized malaria posts, relying on physicians and home treatments as their second and third choices, respectively. In rural areas with less biomedical influence, the community members pursued alternative treatments. A number of herbal remedies and medicinal plants were recognized by rural community members. Informants classified these remedies into hot and cold categories, with “hot” remedies used to reduce inflammation of the liver or spleen, and “cold” medical plants used to reduce fever. When the only symptom or most visible

symptom was an enlarged spleen, most community members relied on certain privileged community members known as “spleen prayers” who were responsible for conducting ceremonial rituals and preparing herbal remedies for the sick.

In a more recent study in Colombia, Nieto, Mendez and Carrasquilla (2004) contend that the knowledge, beliefs and practices of a community must be taken into account for effective malaria control strategies. The results of the investigation showed that 75% of their informants went to malaria eradication services (health posts dedicated specifically to malaria control) as the first line of treatment (p. 605). However, in treating malaria, 71% of the population reported that they took lower doses of medication than is recommended for effective elimination of the disease. Improper use of anti-malarial drugs can result in repeat episodes as the malaria parasites continue to thrive in the body. Another concerning indicator in the Colombian study is that only a quarter of the population identified bed nets as an effective prevention measure against malaria. Many informants complained that “they are ‘too warm’; ‘they deteriorate easily and must be repaired or replaced, making them costly’ … ‘the can cause suffocation or catch fire’ and ‘mosquitos can pass through the net’” (Nieto, Mendez and Carrasquilla 2004: 607).

While treatment differed in other studies, Muela et al. (2002) describe how informants preferred professional treatment to traditional alternatives throughout the treatment-seeking process. Individuals said that they would first try home treatments with biomedicine, which is obtainable without a prescription and is widely used without professional oversight. Informants explained that they would only consult a traditional healer if, after numerous visits to the hospital or clinic, the malaria condition had not

improved. In these instances, the episodes originally identified as malaria are recast as a supernatural maladies, or “fake” malaria.

Similarly, Nyamongo (1998) and Kamat (2009) found that people preferred to pursue treatments at home using biomedicine as the first treatment choice. The authors also observed that, although most people could identify several malarial drugs, they did not fully understand how to manage malaria and were therefore limited in their self-treatment options. Informants said that a lack of improvement or worsening of the condition eventually prompted treatment at a professional facility. Similar to other studies, Nyamongo’s informants reported that they use different strategies for “enlarged spleen,” which is a biomedical symptom of malaria. Boiled or crushed herbs were the first line of treatment, which were also used if traditional treatment for malaria was sought.

Finally, Agyepong’s study (1992) in Ghana revealed that most people with uncomplicated malaria were treated at home with biomedicine, herbal treatments, or a combination of the two. Also, since many community members believed it to be caused by the sun, few believed that anything could be done to prevent malaria. One informant stated that “ ‘unless you can provide us with other jobs so we do not work too hard in the sun. There is nothing we can do because as for fever it is a disease that attacks everybody whether you like it or not.’ ” Others said that malaria is “an unavoidable fact of life” (Agyepong 1992: 135). The author contends that, since most treatments were at the household or community level which limits contact between healthcare professionals and community members, misinformed beliefs about malaria and the proper treatment are unlikely to change.

Sociocultural Determinants of Treatment-seeking Behavior

Tanner and Vlassoff state that "perceptions of illness, knowledge and understanding of illness are socially and culturally constructed, as are actions taken with regard to treatment" (1998: 525). In addition to disease causation models, additional social and cultural factors influence treatment behavior. Agyepong (1992) observed that nearly all the respondents who mentioned mosquitos as a possible cause for malaria in her study had some type of formal education, indicating that socioeconomic factors play an important role in malaria knowledge and may affect subsequent treatment choices. Another study notes the critical role that tradition plays in treatment-seeking behavior. If the social norm for a community is to visit a traditional healer before resorting to modern medical care and an individual chooses a different treatment plan, they may face temporary social exclusion (Jones and Williams 2004).

Discrimination

Medical professionals and government programs can exacerbate problems concerning the misconceptions about malaria in the local community. Health officials are often unaware of the residents' beliefs and behaviors regarding malaria, and they do not know the methods that residents use to treat the disease (Lipowsky et al. 1992). Although structural impediments obstruct healthcare access in many regions of the world, some rural and indigenous populations are understudied, rather than underserved by health programs or health facilities. These populations may officially have equal access to healthcare, but the clinic or hospital may not meet the needs of the local people or fail to account for sociocultural differences in health beliefs and practices, deterring the use of facilities. Studies on explanatory models of illness can help to identify these

misconceptions and differences between medical models. Unfortunately, such in-depth, ethnographic studies are rare in areas where they could be of most value (Inhorn and Brown 1990; McCombie 1996; Cormier 2011). Therefore, miscommunication and distrust between communities and health workers persists, with neither side understanding the healthcare beliefs of the other party.

Individuals often choose to seek local or traditional treatment over treatment at a health clinic due to misunderstandings. They may feel that clinicians do not respect individuals of lower socioeconomic status or indigenous background. Health professionals can also discriminate against people who have ideas that differ from Western medicine and therefore seem uneducated or noncompliant when they delay biomedical treatment (Fraser 2006). The negative experiences of rural and indigenous people in the modern healthcare system can create a damaging reputation for hospitals and clinics, prompting community members to seek care outside of modern medical facilities.

Gender

In most regions of the world, gender plays a strong but often invisible role in treatment-seeking behavior for illness. Gender roles are socially constructed, and there are expectations for each gender concerning illness behavior and the caretaker role in every society. In many societies, medical knowledge is also gendered, as men and women are privy to different information or varying degrees of knowledge about health and illness. Rathgeber and Vlassoff (1993) place the study of tropical disease and gender in the context of women’s economic, social, cultural, and private roles, which greatly affects knowledge and subsequent treatment of disease.

Tanner and Vlassoff (1998) write that women generally have less access to information about health, and that women are also less likely than their male counterparts to seek biomedical treatment quickly when they become ill. In low and middle income countries, there are often more male health providers than female health providers, and women may be hesitant to discuss personal matters of illness with men. Social taboos and restrictions can also influence a woman's access to treatment when only a male health provider is available, or may influence her to seek help from female family members or female traditional healers rather than treatment at a biomedical facility. These obstacles can limit exposure to biomedical knowledge that is gained through contact with health providers.

Rodriguez et al. (2003) state that women in their study in southern Mexico had a lower social standing than men, and that a higher percentage of women were illiterate as compared to men which can affect knowledge about malaria. While women may know more about health and illness in areas where specific interventions or programs have targeted women in the past, factors such as social hierarchies, deferral of treatment-seeking, and a lack of access to health information often contributes to disparities between men and women concerning health knowledge.

Women are usually the primary caretakers of family members when they fall ill, and they have a notable influence on decisions concerning when to seek treatment, and what type of treatment is most appropriate. Despite women's responsibility for caring for their sick family members and seeking medical treatment, the head of the household—usually a man in two-adult households—has the final decision regarding treatment-seeking outside of the home. This may be particularly evident in societies

where the area outside the home is seen as the man's domain, or when monetary transactions for healthcare services or store-bought medicines are involved (Tanner and Vlassoff 1998).

In a review concerning the social costs of malaria, Jones and Williams (2004) assert that gender roles are apparent not only in financial decisions regarding treatment, but in the expected social behaviors for men and women when they are ill. In their research, the authors found that these culturally-bound "sick roles" play a large role in treatment-seeking behaviors for men and women. For example, a man may seek treatment immediately so he can continue working and supporting the family (seen as his primary responsibility), while a woman who is sick is expected to stay home and continue her duties without treatment. If a woman seeks professional treatment before the illness becomes severe or before she has explored other home remedies, she might be criticized for using family resources to spend money on unnecessary treatment, and she may be seen as weak or incapable of dealing with the illness on her own (Jones and Williams 2004). In addition, there is evidence that male children tend to be given better treatment when they are ill than their female counterparts, in regards to both home treatments as well as access to outside health clinics (Rathgeber and Vlassoff 1993).

Although women are the primary caretakers of sick family members, strategies that target women alone are sometimes ineffective because of the power distribution in the home. For example, women may learn about the use of bed nets for malaria prevention, but they do not have the financial power to purchase the nets if they are not the head of the household (Jones and Williams 2004). Therefore, programs must

create integrative strategies that incorporate both men and women as decision makers in treating ill family members.

Conclusion

In this chapter, I described how explanatory models of illness can be used to understand similarities and differences in medical models within and across cultures. I examined beliefs about the underlying cause of malaria as a critical variable in understanding and predicting treatment-seeking behaviors. Additional social and cultural determinants, such as discrimination experienced at medical clinics or expected behaviors in gender roles can also have an effect on treatment for malaria.

As a reemerging disease, malaria is again gaining the attention of anthropologists and public health officials. Despite renewed interest in the disease, few studies examine the relationship between underlying beliefs and their influence on treatment-seeking behaviors in geographically remote or indigenous communities. Research has shown that community knowledge and beliefs of malaria depend on several sociocultural factors, and that medical systems must be studied at a local level. Through a greater understanding of malaria perceptions and treatment preferences, appropriate malaria control strategies can be implemented and aid in the reduction of the burden of disease.

CHAPTER 3
MALARIA IN PERU: RECOGNITION, RESPONSE AND REEMERGENCE

Since malaria's emergence as a national epidemic in Peru, the country has worked to control the spread and incidence of the disease, with mixed results. Although infection rates have been drastically reduced since the malaria epidemic in 1997-1998, more than 29,000 cases were still reported in 2010. Approximately 75% of the national territory is considered to be at risk for malaria, with one-third of the population living in malarious areas (MINSA 2009).

This chapter traces the rise of malaria in Peru during the mid-twentieth century to the current state of malaria, describing initial government control efforts and malaria reemergence in the 1990s. I focus specifically on incidence rates, vectors, and environmental factors for malaria in the department of Loreto. This chapter also explains the contemporary policies for malaria treatment and prevention, including the first-line medications for malaria, as recommended by Peru's Ministry of Health.

Malaria Background: Parasite Species, Vectors and Clinical Symptoms

Malaria is caused by the *Plasmodium* parasite, of which there are five confirmed species that infect humans: *Plasmodium vivax, Plasmodium falciparum, Plasmodium malariae, Plasmodium ovale, and Plasmodium knowlesi* (CDC 2012). *P. falciparum* and *P. vivax* are the two most common parasites in human malaria infections, with *P. falciparum* presenting the most severe symptoms and contributing to most malaria deaths around the world. The parasites are transmitted by the female *Anopheles* mosquito, with more than 30 species that serve as malaria vectors. *Anopheles* mosquitos feed between dusk and dawn, and their preferred feeding habitat (indoor v. outdoor) varies between species. Although malaria is primarily transmitted through the

bite of *Anopheles* mosquitos, the disease can also be spread through blood transfusions as well as from mother to child during pregnancy or delivery, known as congenital or vertical transmission.

The lifecycle of the malaria parasite occurs in five to six main stages, four of which are important for an understanding of the malaria parasite in humans.[1] First, malaria parasites are transmitted from the female *Anopheles* mosquito through the salivary glands of the mosquito to its human host during feeding. The parasites, in the form of sporozoites, are injected into the bloodstream. The sporozoites then travel to the liver, where they grow, divide, and multiply, producing thousands of daughter cells, or merozoites. Upon entering the liver, however, the parasite may remain dormant for weeks or even months, causing relapses in the human host at a much later time. The merozoites exit the liver and are circulated through the bloodstream and infect red blood cells, where they replicate and release tens of thousands of merozoites into the bloodstream. During this stage symptoms begin to occur in the human host. Finally, some merozoites develop into gametocytes. In the gametocyte stage, the cells are viable when ingested by a mosquito vector, continuing the lifecycle and replication of the malaria parasite in the new vector (CDC 2012; Cormier 2011).

Malaria symptoms begin to appear ten days to one month after initial infection, although some parasite species may not cause visible symptoms for up to a year in human hosts. The disease is generally classified as either uncomplicated or severe. Clinical symptoms of uncomplicated malaria include: fever, headache, nausea,

[1] This explanation is intended to inform the audience of the lifecycle of the *Plasmodium* parasite as it relates to human infection, and is not an exhaustive description of the full parasite lifecycle. See Cormier (2011) and CDC (2012) for further reference.

vomiting, sweats, chills, trembling or shivering, body aches, enlarged spleen and general weakness. In addition to these symptoms, severe malaria may also cause seizures, convulsions, anemia, respiratory distress and low blood pressure. Without treatment, malaria symptoms may disappear and subsequently reappear months or years later. Untreated cases of severe malaria, however, often result in death.

Historical Malaria Situation in Peru

In Peru, historical accounts dating to the colonial period refer to the existence of malaria, acknowledging the presence of malaria in the country for at least 350 years (MINSA n.d.). Malaria first became a recognized epidemic in the 1940s, and by 1944, reported malaria cases had reached over 95,000 (Guarda, Asayag and Witzig 1999). In 1955, malaria was the leading cause of death in Peru (Escobedo 2010). In an effort to combat the disease, UNICEF and the Pan American Health Organization (PAHO) worked extensively with the Peruvian government to lead an eradication campaign. In 1957, the Peruvian state formed the National Service for Malaria Eradication (SNEM) to reduce malaria rates throughout the country. The success of the campaign was enormous—malaria rates were reduced by more than 95% from annual rates in the 1940s, with only 1,500 confirmed cases in 1965 (Guarda, Asayag and Witzig 1999; MINSA n.d.).

In 1979, the World Health Organization (WHO) announced that initial efforts to achieve malaria eradication were not feasible in Peru and other malaria-endemic countries (Vargas 2003). Malaria rates had dropped to an average of 30,000 cases per year in the 1980s, and the Peruvian government considered malaria campaigns to be successful and in a “control phase” for the disease (MINSA 2001). As Peru maintained low levels of reported malaria cases throughout the decade, the control efforts of SNEM

were decentralized and the organization eventually dissolved (Escobedo 2010). The Malaria Control Program briefly assumed some of the responsibilities of SNEM, with various responsibilities also given to regional governments and independent professional organizations. This program, however, was also decentralized in the early 1990s, and malaria control efforts were expected to be carried out by regional and local health systems with minimal supervision from the national government (Escobedo 2010).

The ramifications of these actions proved disastrous. In 1997-1998, a massive malaria epidemic hit the country. More than 247,000 cases were reported in 1998, an eight-fold increase from average malaria rates in the 1980s (PAHO n.d.; MINSA 2001). High annual temperatures and climatic fluctuations due to the El Niño phenomenon are often blamed for the unusually high number of malaria cases during the mid-1990s (Vargas 2003). It must also be considered, however, that the dissolution of SNEM and passive control efforts for malaria, inadequate diagnostics, lack of preventative measures, and increasing resistance to anti-malarial drugs contributed to the rapid rise in malaria cases (Escobedo 2010).

Malaria in Loreto, Peru

The increase in malaria cases in the late 1990s was particularly evident in the department of Loreto in northeastern Peru. While malaria cases had been reduced throughout the country in previous decades, the SNEM campaign proved less successful in the rain forest (MINSA 2001). Of the more than 180,000 cases of malaria reported in Peru in 1997, 121,268 cases (67%) occurred in Loreto (Vargas 2003; Guarda, Asayag and Witzig 1999). This reflects a substantial rise in both *P. falciparum* as well as *P. vivax* cases. In 1988, Loreto had no reported cases of *P. falciparum*

infections. In 1997, less than a decade later, 54,290 cases of *P. falciparum* were reported, along with 85 deaths due to this malaria strain (Guarda, Asayag and Witzig 1999). In 1999, Loreto had 54% of all *P. vivax* infections and 79% of all *P. falciparum* infections in the country (Vargas 2003).

Current Malaria Situation

After more than a decade of aggressively combating the disease again, Peru has decreased malaria rates to levels comparable to the 1980s. In 2010, only 29,413 cases were officially reported (MINSA 2012). Figure 3-1 illustrates the progress made against malaria since the height of the malaria epidemic in 1997-1998. Although Peru is now considered to be in the control phase regarding the spread and incidence of malaria, Loreto, the department in which the Matses communities are located, continues to have high rates of malaria. Loreto is considered a high risk area for malaria, with 10-49 cases per 1000 inhabitants reported annually, and the eastern border with Brazil is a “very high risk” zone with more than 50 cases for every 1000 individuals (Vargas 2003; MINSA 2012). PAHO (2010) reported that in 2008, Peru had a total of 42,214 cases of malaria, 55% of which were in the department of Loreto. The region also reported 99% of all *P. falciparum* cases in 2008, enduring the burden of this severe form of malaria (PAHO 2010).

Malaria Vectors and Parasite Species in Loreto

Approximately ten species of the *Anopheles* mosquito carry and transmit malaria in Loreto, and the primary malaria vectors in western Loreto are *An. darlingi* and *An. benarrochi*. *An. darlingi* are most numerous from March to June, with peak feeding hours from 22:00 to 1:00 hours, and at dawn. *An. benarrochi* are must abundant from November to April, with peak feeding hours from 18:00 to 22:00 hours, and also at dawn

(Guarda, Asayag and Witzig 1999; Vargas 2003). Both species are most prevalent and active during the rainy season, and prefer to breed in swamps, small lakes, cleared land (particularly common in areas of severe deforestation), fish hatcheries, and other areas with stagnant water sources.

The two main types of malaria parasites in Loreto are *Plasmodium vivax* and *Plasmodium falciparum*. Some cases of *P. malariae* have also been reported, although they account for less than 0.1% of malaria infections in Loreto.

Environmental and Climatic Factors for Malaria

The warm climate, heavy rains and natural environment of Loreto make the region an ideal setting for malaria vectors and malaria parasites. Average temperatures range from 68° F to 95° F, and humidity often exceeds 80%. The rainy season lasts from November to May, with annual precipitation rates averaging 98-100 inches. Flooding of Amazon tributaries creates standing flood plains that serve as ideal breeding sites for *Anopheles* mosquitos.

In addition to flood plains, lakes, and other natural breeding sites for mosquitos, agriculture and land use practices also create breeding grounds. Rice fields, water reservoirs for agriculture crops, and logging and deforestation serve as habitats for mosquito eggs and larvae. Although there have been some efforts to reduce mosquito breeding sites, control efforts are limited and cycles of rainfall and flooding create natural impediments for successful control.

Infectious Disease and Mortality among the Matses

Since initial contact with outsiders, the Matses have suffered from new diseases and epidemics, and a lack of access to safe drinking water (Romanoff et al. 2004). The Matses have one of the highest mortality rates of all Amazonian tribes in Peru, and they

have the highest mortality rate among the Panoan language group (INEI 2011). The 2007 census data reveals that the Matses reported 36.5 mortalities per 1,000 individuals—a mortality rate that is more than double the next highest mortality rate among other Panoan ethnic groups (INEI 2011). Another indicator of the short life expectancy among the Matses is the low median age of the population. In 1993, the Matses had the lowest median age of all Panoan populations at 11.98 years of age. There were 143 dependents for every 100 working individuals in the population, and the literature indicates that this is due to both a short life expectancy as well as high fertility rates among the Matses rather than a large elderly population (INEI 2011; INEI 2010). In 2007, the median age of the population had increased to 13.2 years, and dependents had been reduced to 120 dependents for every 100 individuals of working age (INEI 2010).

According to the 2007 census data, the leading causes of death among the Matses in the previous 12 months were infectious diseases or complications from infectious disease. The three leading causes of death were: parasites (N=20), vomiting and/or diarrhea (N=15), and malaria (N=9) (INEI 2011).

Malaria

The first malaria epidemic among the Matses occurred in 1993, and malaria continues to be one of the leading causes of morbidity and mortality in Matses communities. As previously noted, census data from 2007 listed malaria as the third leading cause of death for Matses. Malaria was also reported to be the second leading cause of morbidity among the Matses (INEI 2011). Kovasna (2009) reported that, in the seven weeks she lived in a Matses community, approximately one-fourth of the population became ill with malaria. Today, Estiron and several other Matses

communities are considered to be at “very high risk” for malaria, as shown in Figure 3-2 (MINSA 2012). Despite the prevalence and severity of malaria among the Matses, no further studies have been conducted to explore Matses’ knowledge of the disease, availability of antimalarial drugs, or treatment practices.[2]

Government Policies for Malaria Treatment and Control

In Peru, government resolutions guarantee the provision of malaria diagnosis and treatment free of charge throughout the country.[3] As part of previous eradication and control campaigns, malaria medications remain without charge in order to prevent outbreaks experienced in previous decades (MINSA 2007).

Malaria Diagnostic Testing

Clinical testing for malaria uses thick smear microscopy to determine the presence of malaria parasites (MINSA 2007). A blood sample is collected from the individual, mixed with a stain, and viewed under a microscope. A thin smear sample may also be examined to determine the type of malaria parasite present in the blood. At the community level, rapid diagnostic testing (RDT) is often used when there is no microscope available or the community lacks a trained microscopist.

Active and passive case detection methods are employed in endemic areas of Peru. Active case detection is an aggressive malaria diagnostic procedure when occasional testing of a population is conducted, regardless of confirmed malaria cases

[2] Anna Kovasna’s study *Building Bodies, Balancing Powers- of Insides, Outsides, and Changing Notions of Male and Female Personhood among the Matsés of the Western Amazon* (2009), is the only available academic study that includes some research on Matses’ health and illness in Peru. The scope of the study is limited, however, as much of the information on Matses’ health is related to the author’s central theme of the notion of personhood among the Matses, and how illness and medicine are related to this concept. Specific beliefs about malaria and treatment behaviors are not included in Kovasna’s study.

[3] The Peruvian government is the principal financier of the current malaria control program in the country. Peru does not currently receive funding for malaria control campaigns through international donors, such as the Global Fund or the Roll Back Malaria campaign.

in the community or visible malaria symptoms. Active malaria testing is more prominent in areas with limited healthcare access and in cases where people remain malaria carriers for extended periods of time. Passive case detection is a regular procedure in most areas of Peru, and occurs when an individual seeks treatment on his or her own, usually due to the display of symptoms associated with the disease.

Malaria Treatment and Drug Resistance

Recently, drug-resistant strains of malaria prompted the Peruvian government to change first-line treatment policies. *P. falciparum* has become resistant to a number of drugs throughout the country, and treatment varies according to geographic region. Guarda, Asayag and Witzig (1999) report that three different strains of *P. falciparum* are present in Loreto, with varying degrees of resistance to antimalarial drugs. The study also notes that the area with the "highest percentage of strains resistant to multiple drugs" is the Javari River and the city of Colonia Angamos. Half of the Matses villages are located on the Javari or a tributary of the river, and Colonia Angamos, as the closest city for most Matses communities, serves as their primary point of trade and travel. The possibility of drug-resistant strains in addition to high transmission rates further complicates the malaria situation for the Amazonian indigenous people.

Current Biomedical Treatment for Malaria

In 2001, the government changed its recommended treatment guidelines for the Amazon, with artesunate-plus-mefloquine combination therapy (ACT) as the first-line drug for *P. falciparum* (Bacon et al. 2009; MINSA 2007). Currently, the government recommends ACT for three days to treat *P. falciparum*. In some areas of the Amazon, ACT-resistant strains have originated and require more complicated, prolonged

treatment to fully eliminate malaria in the body. [4] The current treatment for *P. vivax* is a chloroquine and primaquine combination for seven days.

Malaria Prevention Strategies

The WHO (2011) reports that Peru adopted a policy recommendation to distribute insecticide-treated bed nets (ITNs) and long-lasting insecticide-treated bed nets (LLNs) free of charge beginning in 2006, although the actual distribution of free bed nets is limited. Bed nets cost $10 to $20 USD when they are unavailable through free distribution campaigns. ITNs are one of the most crucial prevention strategies, and are particularly important in areas of the Amazon where typical houses have open, uncovered windows and exposed spaces in the housing structure.

In addition to bed nets, Peru engages in other preventative measures for malaria. Indoor residual spraying is provided for homes and buildings in some parts of the country, especially during periods of high malaria rates. Larviciding is also practiced in some endemic areas, with pesticides sprayed or placed at mosquito breeding sites. The government has also encouraged better management of drainage systems to prevent standing water. Despite these efforts, malaria prevention campaigns are often confined to urban areas, resulting in limited coverage for prevention and control measures. In addition, Cormier (2011: 144) notes that the current recommendations for malaria vector control measures "are likely inadequate and inappropriate for tropical forest dwelling people… [and] can offer little protection for peoples who spend significant amounts of time in the forest." Although control efforts such as larviciding, indoor residual spraying

[4] See MINSA (2007) for further details on treatment policies for malaria in Peru.

and ITNs are necessary, the unique situation of many indigenous populations may necessitate distinctive control and treatment strategies in the Peruvian Amazon.

Conclusion

This chapter provided background information on malaria control strategies and treatment policies in Peru, as well as the current situation of mortality and morbidity among the Matses. It described how successful malaria control efforts in the 1980s were replaced with more passive, decentralized control strategies which led to a resurgence of malaria in the 1990s. Today, Peru has approximately 30,000 malaria cases annually, with most cases occurring in Loreto. Although environmental and climatic factors contribute to the prevalence of malaria in Loreto, drug-resistance strains of malaria, inefficient control strategies, and a lack of information on local peoples' knowledge and beliefs about malaria exacerbate the epidemic in the region. Amazonian indigenous peoples such as the Matses continue to have exceptionally high malaria rates, and malaria is one of the leading causes of mortality in Matses communities. In the following chapter, I will explore Matses beliefs about malaria and how this influences treatment-seeking behaviors and prevention strategies.

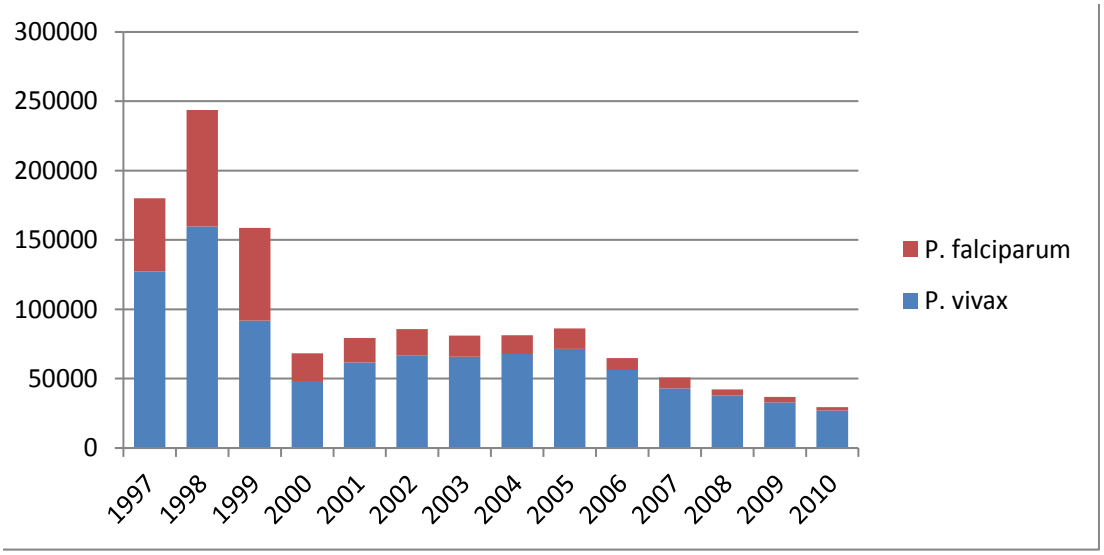

Figure 3-1. Malaria rates in Peru, 1997- 2010.
Source: Author's elaboration; Vargas 2003; PAHO n.d.; PAHO 2010; MINSA 2009; MINSA 2012.

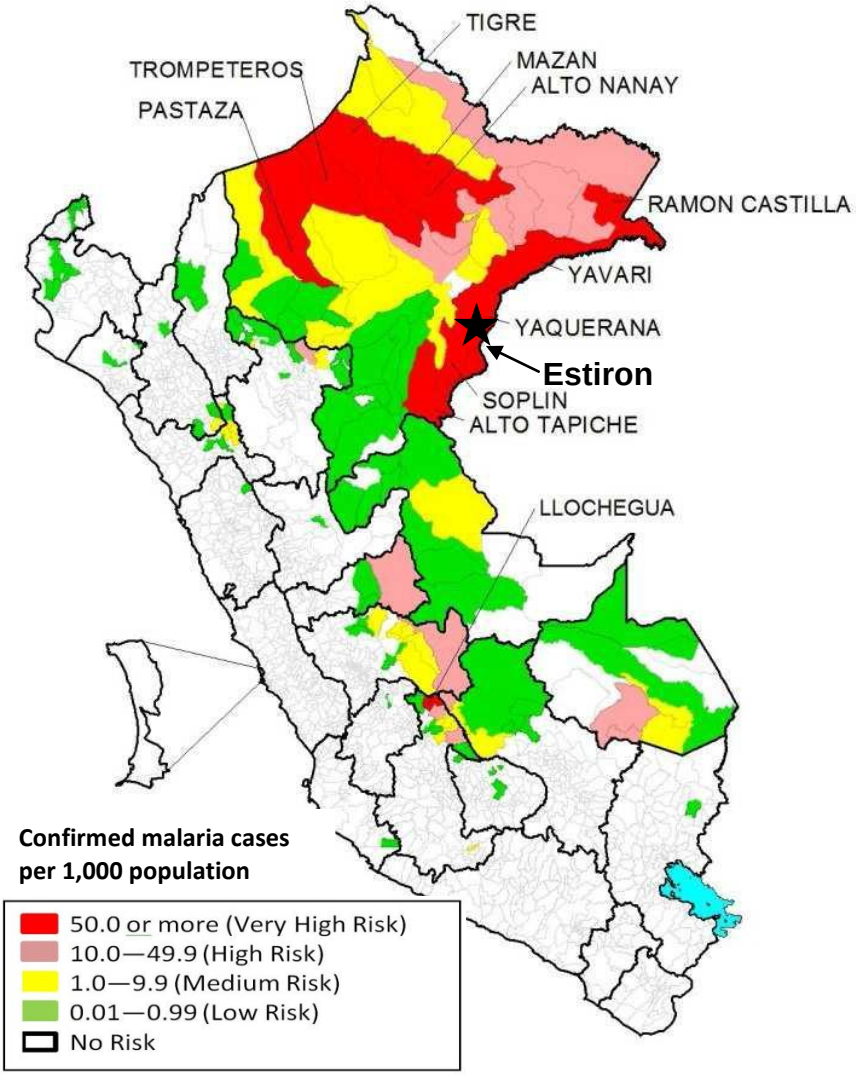

Figure 3-2. Malaria risk for P. vivax in Peru, 2012.
Source: Author's adaptation, MINSA 2012.

CHAPTER 4
RESEARCH FINDINGS: DISEASE RECOGNITION AND TREATMENT-SEEKING BEHAVIORS

This chapter aims to provide an understanding of health, disease, and concepts of illness among the Matses, especially as they relate to malaria. First, I describe the study site, Estiron, Peru, the role of medical practitioners in the community, and knowledge and beliefs surrounding illness in the community. I also explain the data collection methods employed during the research. I then present the primary research findings of the study, such as symptoms associated with malaria, and theories of malaria causation among the Matses. I also discuss treatment-seeking behaviors, including natural remedies and antimalarial pharmaceuticals, and the factors that affect treatment preferences. Finally, I discuss malaria prevention strategies in Estiron and how beliefs about the cause of malaria influence prevention methods.

Study Site: Estiron

Estiron is located on Choba Creek in northeastern Peru in the district of Yaquerana, near the border with Brazil. The nearest city is Colonia Angamos, located six to seven hours from Estiron by the small, motor-powered canoes used by the Matses. Estiron has approximately 140 inhabitants, with an additional 60 individuals living in the neighboring community of San Roque. [1] Together, these communities make up the Estiron annex. Primary research was conducted exclusively in the

[1] Population estimates for the Estiron annex vary, from 165 individuals (CEDIA 2007), to 200 (Kovasna 2009). Migration and frequent travel for work, hunting, fishing, and other activities make accurate estimates difficult. The population figures used in this paper were drawn from the author's estimates during fieldwork, and estimates given by several key informants.

community of Estiron.[2] The village is made up of approximately 35 houses, a church, a medical post, two school buildings, and a community gathering building. One resident family also has a trade store located in their home, which sells basic clothing and shoes, toiletries, batteries, flashlights, and an assortment of other small goods.

The community has a primary school, which most young children attend during the day. A secondary school is located in San Roque, and is within walking distance from Estiron for students that want to continue their education. Although education is becoming increasingly important in Matses communities, completion of both primary and secondary school is not common.

Most individuals engage in subsistence activities on a daily basis, providing food for their families through small-scale agriculture, hunting, and fishing. In addition to these activities, some individuals serve as pastors, school teachers, health promoters, or engage in temporary work in other towns. Regular, salaried income is uncommon in Estiron. Some small business enterprises by community members in Estiron have generated nominal financial income for residents, although they do not supply steady cash flow or enough financial resources to generate a cash economy within the community.

Due to the prolonged missionary presence in Matses territory, most people in Estiron are Christians, although the religious belief system is highly syncretic and incorporates animist beliefs from Matses culture prior to contact. Polygamy is still accepted and practiced among the Matses, although the practice is decreasing. Familial

[2] All statements regarding Estiron refer to the single village of Estiron rather than the Estiron annex unless noted otherwise.

pressure for more material goods places economic constraints on the primary provider, and men usually cannot support more than one woman and their children.

Traditionally, the Matses lived together in a large longhouse. Today, only nuclear families share a home, although additional rooms are sometimes added as the family grows. Houses are made of palm bark with palm thatch roofs, and are raised 2-6 feet off the ground. Windows are not covered by screens, glass, or other protective materials. There is no running water or electricity in the village, with the exception of one home that uses solar panels to provide electricity for brief periods during the day. All water (including drinking water) is retrieved directly from Choba Creek, or from a groundwater tap accessible by PVC pipe extending from the creek bank. The community has simple pit latrines, with some located uphill of the river water source. An open wood fire and grill are used for cooking, with no chimney or other improved cooking source available. Common diets consist of wild game (venison, monkey, tapir, peccary, paca, etc.), fish, manioc, plantains, and various fruits. Additional foods that must be purchased or transported from Angamos include rice and noodles, as well as salt and cooking oil. Other outside goods such as clothes, medicine, flashlights and batteries, knives and cookware, soaps, radios, boat motors, shotguns and cartridges are purchased from vendors in Angamos or Iquitos. In general, the community has a very subsistence-based economy, although monetary exchanges are becoming more frequent.

Estiron is one of the only Matses communities that has allowed regular visits and contact by researchers. In general, tourists do not travel to Matses communities. Estiron, however, has developed relationships with a limited number of researchers from around the world that are interested in the culture of the Matses. The community

has benefitted from these collaborations, as foreign researchers and visitors have brought added financial and material resources into Estiron in compensation for research and participation in community life. These relationships have often continued after the research period, with friends of the community donating medical supplies, school supplies, and other necessary goods for the benefit of the village. In addition to short-term researchers, a linguist from the United States, Dr. David Fleck, has resided in Estiron for several years and is considered a member of the community. The relatively remote location of the community and its history of collaboration with foreign researchers make Estiron a unique village among Matses communities, where local traditions have merged with outside practices, contributing to perceptions of health, disease, and treatment-seeking behaviors.

The Matses Illness Paradigm

In Matses society, three distinct categories of contagion beliefs exist: spirit illness, shamanic illness, and naturalistic illness.[3] Spirit illness, though less common today than in previous decades, is still a widely accepted contagion theory. Animals, plants, and other natural elements have spirits that can cause illness. Revenge or retaliation is the most commonly cited motive for avenging animal spirits and subsequent illness, especially after a person has antagonized, killed, or eaten an animal. The Matses term used to describe this type of attack, “cuid,” translates as “to make sick by an animal spirit,” or “to avenge oneself,” implying that animal spirits seek revenge for such actions. Children are most susceptible to spirit illness caused by animals. They may fall ill with fever, chills, screaming episodes, and behaviors

[3] Information concerning the Matses illness paradigm was obtained in interviews during the author’s primary research in June-July, 2012, unless otherwise noted.

representing specific animals. For example, a child may display symptoms such as cold feet or cold lower limbs associated with some river-dwelling animals, screaming like a spider monkey, or a hand clasped in the form of a boa's head. While young children are less likely to hunt animals, especially larger or more dangerous animals with powerful spirits, the actions of parents affect their children. A spirit may retaliate after a child's parent(s) have hunted or consumed the animal. Therefore, parents may refrain from eating certain animals until children are old enough to withstand the attack in adolescence, as observed by Kovasna (2009).

Shamanic illness is nearly obsolete in Matses communities today, but it remains an important part of Matses understanding of illness. This form of contagion includes any illness caused by the work of a shaman. Historically, afflictions are cast through "curses" and are usually accompanied by a physical act, such as blowing tobacco or smoke near the intended recipient of the curse. The Matses tradition of shamanism slowly disappeared throughout the twentieth century, and no shamans practiced openly in the Matses population by the time of contact in 1969.[4] Although no practicing shamans exist within the Matses population, the existence of shamans in other indigenous populations is acknowledged, and the potential (though unlikely) threat of shamanic illness is still present today.

Germ theory and environmental contagion are usually classified as one category in Matses culture, and include diseases spread by eating with a person that is ill, drinking dirty water, through the air, etc. In a 2009 study, Kovasna reported that Matses

[4] While there is no record of shamanic practices after the arrival of Western missionaries in 1969, some Matses recount stories of shamans practicing in secrecy through the 1970s. See Fleck (2003) for further reference.

attribute most contemporary illnesses to naturalistic contagion, reaffirming previous assertions that indigenous contagion theories are similar to Western contagion beliefs. However, specific biomedical knowledge concerning disease transmission and progression of infectious disease is limited. Kovasna's study also noted the distinctive characteristics of spirit illness and disease caused by germs or environmental factors: spirit illnesses have always existed in the natural world of the Matses, while other diseases are new and come from the outside Western world. The origin and retaliatory motivation behind spirit illness are generally understood, yet new "mestizo" diseases sometimes have unknown origins, and as Kovasna (2009: 96) writes, "almost no one knows enough to even guess where they come from, apart from the outside, or why a person falls ill with them."

Finally, it is important to note Matses' beliefs concerning disease symptoms. Kovasna writes that, although many Matses recognized outside diseases and the need for Western medicine to treat these diseases, individuals did not believe that illness could exist without visible symptoms. Ideas about "hidden infections, recurring illness or incubation time does not exist among the Matses. […] It also makes them prone to quit biomedical treatment as soon as the symptoms start to go away, whereby they soon come back" (2009: 77). This belief may have severe consequences for Matses that become sick with diseases such as malaria, tuberculosis, HIV, and other infections that may have latent symptoms or reoccurring episodes.

Health Practitioners in Estiron

Several types of health practitioners have a presence in the community, creating a distinct, pluralistic healthcare system. Different health practitioners are sought for specific types of illness or disease, and each genre of healthcare has authority over the

treatment and healing of certain sickness episodes. The health practitioners in the community include biomedical or Western medical practitioners, traditional medicine men, and indigenous health promoters.

Role of Outside Health Workers and Clinicians

During my research period, no doctors, dentists or nurses were actively working in Estiron, and only one external health official visited the community to deliver medicine. No professional clinicians reside in Estiron. While many informants reported that mestizo health workers visit infrequently to administer vaccinations, regular access to a doctor is not typical in the community.

Several of the individuals I interviewed mentioned that doctors came one to two times a year, although they only did dental checks and extracted teeth. One informant explained that, rather than medical doctors, they were part of a dental team that was responsible for indigenous communities in the area. Although they give health advice for issues of general wellbeing, hygiene and health, their actions are limited to dental care.

Community members access medical treatment in Angamos when necessary. In cases of severe illness and when a family can afford the expense, an individual may travel to Iquitos to seek advanced medical attention. Most informants did not speak extensively about outside health practitioners as they had little presence in Estiron. Individuals that had experience with medical facilities outside of Estiron were generally ambivalent in their assessment of clinicians and biomedical treatment, believing that advanced biomedicine was useful for certain diseases, while traditional medicine was preferred for other sickness episodes.

Role of Traditional Medicine Men

While shamanism is no longer practiced in Matses communities, individuals with extensive knowledge of healing and natural remedies remain important actors in the community health system. Many older men in Estiron were recognized for their exceptional knowledge and skill in using curative plants.[5] Two men in particular were referred to as “medicine men” in Estiron. Matses from smaller communities came to seek advice and treatment from the medicine men when illnesses were chronic or became severe, and biomedical treatment was deemed ineffective.

The most important role that contemporary medicine men play is finding cures for spirit illness. Although the men are able to cure many forms of spirit illness, medicine men, unlike shamans, do not interact directly with the spirit world. Shamans were required to adhere to a strict diet, engage in special activities and rites of passage, and were involved with the spirit world directly through various modes of communication. In contrast, medicine men learned their skills from older male relatives over time and are not required to engage in particular practices to maintain their status. The men continue to seek out new remedies through their personal practice of medicine. Medicine men are responsible for finding the proper plant remedy for spirit illness, although parents or close relatives usually administer the medicine. Children are bathed with the plant medicine, and plants for spirit illness are generally not ingested. These plants may also serve as a protective measure against certain illnesses, and infants and young children

[5] Although women may have some knowledge about plant remedies, informants only mentioned older men when discussing individuals that could cure with plants. All informants knew some medicinal plants, with men knowing comparatively more medicinal plants than women. Only two men, however, were specifically sought to treat illnesses with plant remedies by other community members.

are often bathed in plants for future protection against spirit attacks during childhood.[6] Medicine men serve an invaluable role in Estiron, but even these men support the use of biomedicine for many diseases which they see “outside” or “mestizo” diseases that are best treated with the corresponding mestizo medicines.

Role of Health Promoters

Health promoters (*promotores de salud*) are trained health workers that work predominantly in remote areas where clinical care, hospitals and doctors are not widely available. In Estiron, indigenous health promoters run the local health post and distribute pharmaceutical medicines when necessary. Only one Matses man in Estiron has officially received training by health professionals and is a registered health promoter, and another young Matses man has received sufficient instruction to assist in many responsibilities at the health post. Indigenous health promoters receive occasional training in the military outpost city of Colonia Angamos, the nearest Peruvian city with a medical facility and available clinicians.

The health promoter in Estiron has received training in order to detect malaria parasites (*P. vivax* and *P. falciparum*) by microscope and administer the proper dosage of medicine. He is responsible for dispensing all medicines for common diseases and health problems, but does not perform exams or other clinical work.

Community Health Post

The community health post (*botiquín*) is a small, one room building that serves as a medicine dispensary and houses the limited medical equipment for the village (Figure 4-1 and Figure 4-2). The health post does not have a doctor or nurse present, and the

[6] See Kovasna (2009) for a more detailed description of these practices.

Matses health promoter is responsible for the health post. The post in Estiron is usually open five to seven days a week for an hour in the afternoon, although the health promoter is available to open the health post for special purposes.

In 2008, a microscope was donated to Estiron by a researcher associated with a university in the United States, which has allowed the health promoter to detect malaria cases in the community. Prior to the use of the microscope, blood samples had to be collected and sent to Colonia Angamos, or individuals had to travel the seven hours to the city to seek treatment for malaria. Results from blood samples were returned after 48 to 72 hours, delaying treatment for people with active malaria cases. Since 2008, however, Estiron has had regular access to malaria detection and diagnostics in the community health post. The village is only one of two Matses communities that currently have access to a microscope and malaria diagnostics on site, reducing the financial resources and time cost for travel to receive malaria diagnoses.

Data Collection and Methodology

Primary data were collected over a six week period through a focused ethnographic study, using semi-structured interviews, freelisting, participant observation, and an inventory of medicines at the local health post. Thirty formal semi-structured interviews were conducted, with men and women equally represented in the sample. The ages of interviewees ranged from 20 years old to at least 50 years old.[7] Included in the thirty interviews were interviews with two traditional medicine men in the community, and one indigenous health promoter in Estiron. Interviews were conducted in Matses, the local language of the community, and Spanish. Twenty-eight of the interviews were conducted

[7] Several informants did not know their age, as birthdays and ages only became regularly recorded after contact with missionaries in 1969.

in Matses with the aid of two assistants that served as translators for informants that did not speak sufficient Spanish or preferred to speak Matses during the interview. The translators, which included the current chief of the community, Daniel, and his son, Aleandro, translated interviews from Matses to Spanish *in situ*, and all interviews were later transcribed in Spanish.

Focused Ethnographic Study

A focused ethnographic study (FES) is a data collection strategy that can be used to elicit information on the knowledge, beliefs and treatment-seeking behaviors of a community in regards to a particular illness (Pelto & Pelto 1997). FES arose as a solution to the time intensive methods of traditional ethnography and the lack of cultural understanding in structured knowledge, attitudes and practice (KAP) questionnaires. FES allows the researcher to work inductively, gaining an emic understanding of disease or illness that can be used to construct an explanatory model of illness. An emic account explains an illness from the perspective of the studied culture or community, in contrast with the etic model which is imposed from outside, and is in this case, the biomedical understanding of malaria. In the case of this malaria-focused ethnographic study, malaria narratives were recorded, and additional data collection techniques were used to identify patterns of cultural knowledge.

In an initial exploratory phase, general information on key terms and concepts associated with malaria was collected in the community through informal interviews. Subsequently, thirty formal, semi-structured interviews allowed me to obtain malaria illness narratives, which included topics concerning malaria symptoms and severity, treatment preferences and factors that influence treatment-seeking behaviors, and experience with natural and/or Western medical treatments and health providers.

Freelists

A common method employed in focused ethnographic studies is freelisting. Freelists are often used to study a cultural domain (Bernard 1994). During interviews, informants were asked to list all the items they knew in a certain category to collect data for freelists. For example, “List all the causes of malaria that you know.” In obtaining freelists, I was able to identify the frequency and salience of items in three categories: common illnesses in Estiron, malaria symptoms, and causes of malaria. Data for freelists were analyzed using Visual Anthropac Version 1.0, by Analytic Technologies.

In addition to freelists, quantifiable responses from malaria narratives were analyzed using a simple frequency analysis.

Common Illnesses in Estiron

Data on illnesses were collected to find if malaria was a widely recognized disease among individuals, and to understand the importance of malaria among the many illnesses in Estiron. Informants were asked to list all the illnesses they knew that affected people in the community. Illnesses mentioned by informants included items that are generally considered symptoms of other diseases (vomiting, diarrhea, etc.), clinical disease states and viruses (malaria, HIV), and general health concerns unrelated to infectious or chronic disease. The information was compiled and analyzed using the Visual Anthropac software. When two or more illness terms were used to describe the same or similar illnesses, these terms were combined in the list. For example, “skin boil” and “skin abscess” were combined in the freelist, although both responses are listed under the illness name. A freelist of the illnesses given by informants generated a total of 64 unique illnesses. The frequency, response number of informants, and salience of the illnesses are listed in Table 4-1.

Malaria was the most common item mentioned by informants, cited by 27 of the 30 informants (90%) and with a salience of 0.834. Other important illnesses in the community include diarrhea, mentioned by 73.3% of informants (salience= 0.497), urinary tract infection or urinary tract pain (70%; salience= 0.361), and cough (53.3%; salience= 0.367). The freelist reveals the importance of malaria among all diseases in the community, and highlights the popular recognition of the disease among community members.

Symptoms of Malaria

In order to seek treatment for malaria, symptoms of malaria must be associated with the disease, and must be familiar to the general population. Information was gathered on symptoms of malaria in order to gain an understanding of how malaria is first recognized and the symptoms that prompt individuals to seek treatment. The information also allowed for a comparison of the symptoms listed by informants to malaria symptomology in biomedicine.

Informants were asked to list all the symptoms of malaria they knew, generating data that was compiled into a freelist (Table 4-2). The most common symptoms mentioned were headache (90%), fever (70%), trembling/shivering (43%), and vomiting (37%). Several of the symptoms listed for malaria were also listed as distinct illnesses in the previous freelist, including headache, fever and vomiting. Informants listed between two and six symptoms, citing the most common symptoms of malaria recognized in the clinical model of malaria. Lucho, a 49-year-old medicine man in the community, gave the following description of malaria: “Your head starts to hurt… You feel really hot, and

you don't get better. You have a fever, and begin to shiver. The next day it is the same, every day with fever."[8]

Half of the informants (N=15) believed that a person could have malaria without manifesting outward, physical symptoms, while 12 informants thought that an individual had to display visible symptoms or pains in order to have malaria (missing=3). There were no apparent differences in responses for men and women. Although reported by a minority of informants, the belief that a person must display symptoms in order to have malaria can have dire consequences. Because malaria can remain dormant for weeks or months, individuals may remain active carriers of malaria for extended periods of time. In addition, many people using natural medicines that relieve symptoms of malaria may believe that they have treated and eliminated the malaria parasite because symptoms disappear, while remaining active carriers of the disease.

Some individuals recognized that there were different strains of malaria, with 47% of informants stating that there were different types of malaria. Over one-third of informants (37%) could also name the two types of malaria that are known in the community, *P. falciparum* and *P. vivax*. Although both men and women reported that different strains of malaria existed, men were much more likely to name the two malaria types present in the community. Only three women identified *P. falciparum* and *P. vivax*, while eight men named the two types and could often differentiate the symptoms and severity of the strains. Most of the individuals that could identify the different strains of malaria had recently contracted malaria, had a child with a recent infection, or reported that they had been infected with both strains of malaria in the past.

[8] All quotes are author's translation from Spanish, unless otherwise noted.

The majority of informants did not recognize a difference in symptoms for the two types of malaria, and believed that that only the health promoters could see the difference when they looked at the blood smear with the microscope. Some people reported, however, that there can be different symptoms for each strain of malaria. The current chief of Estiron, Daniel, explained the difference in the two types of malaria:

> First, when you get sick with malaria, you have a slight fever and aching bones. You also have a headache. And then a little time passes, and again you have a fever. This is vivax, when you have fever one day but not the next day. Then you feel worse the following day. You aren't hungry, sometimes you vomit, and your whole body aches. But falciparum, it gives you a fever every day, and it doesn't pass. They give you a pill, like Paracetamol or Tylenol, and it goes away for a while and then starts again. It continues like that with fever, body aches, headache, and pains that don't stop.

The recognition of malaria symptoms is one of the most significant factors for individuals to seek treatment for malaria, even if the parasite species is unknown. Most informants could name at least two symptoms of malaria, which often prompted them to seek official diagnosis at the local health post. The health promoter is then able to diagnose the presence and strain of malaria through microscopy, and prescribe a prompt, accurate treatment plan if necessary.

Fever and Illness

In malaria studies, the symptom or term for "fever" is sometimes used as a proxy for malaria in endemic regions, using a symptoms-based approach for malaria recognition and diagnosis (see Polanco 2003). In Estiron, however, a number of other illnesses were mentioned that caused fever and symptoms similar to malaria. Many of these were spirit illnesses, but also included diseases such as hepatitis, dengue, and intestinal parasites. When informants were asked how they knew they had malaria

rather than another disease that caused fever, many reported that “you began to shiver and tremble”—a symptom recognized as unique and characteristic of malaria. Others said that when they had a few symptoms of malaria or their symptoms did not go away with Paracetamol (acetaminophen, or “Tylenol”), they went to the health post to have their blood smear viewed by the health promoter. The majority of informants, however, said that when specific symptoms appear, they know it is a certain animal spirit that is causing the illness. Therefore, the individuals choose to use medicinal plants first, rather than trying biomedicine or having a blood smear test at the health post. For example, Douglas, a 41-year-old pastor, shared the following when asked which animals cause fever:

Douglas [18]: There are fish that cause illness with fever and excessive heat, but your feet are really cold. Also the deer—with fever, headache, and you become really hot. But when you have this animal illness, you drink a lot of water.

Jessie: How do you know that it is an animal spirit illness and it is not malaria, when there is only this fever or a headache?

D [18]: When the animal spirit is making you sick, you have fever and get hot, but with malaria it’s easy to see because you begin to shiver a lot.

When adults become sick with a fever and malaria symptoms, they may be more likely to dismiss the possibility of animal spirit illness, as children are the primary target for spirit illness and adults rarely become ill through spirit revenge. Another man explained that there are a multitude of animals that cause fever, but each animal has specific symptoms associated with spirit illness. This allows the parents or medicine men to diagnose which animal is causing the illness and prescribe the proper plant remedy. A conversation with a middle-aged man in the community further explained the how various illnesses are determined:

> [My son] got sick when he was 12 years old. I didn't know what illness it was, because he had a very high fever, and then it passed. And then again he had a fever, and vomiting, and then nothing. He began to scream with this terrible headache. I was very worried. Finally, I gave him this medicine for vomiting, because this injection is very strong. And then a little time passed and again he was sick—it didn't calm his illness. Then when he was worse, my brother went to look for the plants that night and he knew that my son was sick with vomiting that passed and came again. He [my brother] knew that it was the tree worm that was making him sick. So he brought the plants for this, and we prepared it and made a bath with it. And in that moment, my son was better, with these plants. As each animal has a spirit, so too is there a plant remedy for each spirit illness.

In this case, the illness highly resembled the symptoms of malaria (*P. vivax*), as previously described by residents. The boy had an initial fever that passed, but continued to recur regularly. He also had a headache and vomiting, two additional symptoms of malaria. As there was no microscope available in the community at this time (approximately six years prior to the interview), an official malaria diagnosis was unavailable, and the family would have to pay to travel to Angamos for testing. Although the plant remedy appeared to be successful and eliminated visible symptoms, the delay in illness diagnosis for a possible malaria infection is problematic. Untreated malaria can lead to serious complications for the ailing individual, and presents an opportunity for malaria transmission to other community members.

Many illnesses cause fever in Estiron. Some of these sickness episodes have established biological origins, while others have their origin in spirit illnesses recognized by the Matses. The many illnesses associated with fever demonstrate that the symptom cannot be limited to malaria cases alone, or even infectious diseases.

Causes of Malaria

Most informants believed that malaria was caused by the bite of a mosquito. Nineteen informants (63%) reported that a mosquito bite could cause malaria. Many

also reported other naturalistic causes of infection, including eating or drinking after someone with malaria (20%), drinking water that had not been boiled (6.7%), or not cleaning the house frequently (6.7%). Other causes cited included eating food with too much fat or grease (6.7%), eating food with fly eggs (3.3%), and drinking water from the river after using a poisonous root (*barbasco*) to fish (3.3%). Table 4-3 provides a complete list of the malaria causation theories cited by informants. A prominent gender difference was found regarding reported causes of malaria, illustrated in Table 4-4. While most men (N=12) mentioned that mosquitos transmitted malaria, only seven women stated mosquitos as a cause. Women were more likely to report “don’t know” (N=6), or refer to causes associated with cleanliness of the home or hygienic practices such as not cleaning or sweeping the house, or drinking unboiled water.

Notably, all the causes listed by informants were naturalistic causes, and are related to naturalistic infection or environmental hazards. Even though many causes listed did not transmit malaria, they are modes of transmission for other diseases. Several of the causal factors were related to health messages taught by health promoters, the dental team, and clinicians in Angamos. Informants said that they have been taught that washing one’s hands, boiling water before consumption, and keeping a clean home are vital for staying healthy and free of disease.

There was no recognition of a certain species or type of mosquito that transmits malaria. Although many informants believed that mosquitos carried the disease, none of the interviewees mentioned parasites, germs, or a blood infection when probed for the specific transmission route of malaria or how it worked to make the body sick. This may

indicate limited knowledge of how the diseases functions internally, or how the disease progresses.

All informants agreed that malaria was not caused by a spirit or shamanic illness, as the disease was “too new” among the Matses. One informant explained that, if malaria were a shamanic or spirit illness, they would have encountered it in the past. Several informants said they did not know how malaria came to the Matses or where it originated. Others believed, however, that malaria had “come from the mestizos,” while some informants related stories of how other indigenous populations had originally brought malaria to the Matses population. Three people (10%) blamed mestizos for the malaria epidemic, reaffirming previous research that some Matses believe that new illnesses come from the outside world of the mestizos (see Kovasna 2009). Others said that malaria had come when Matses visited other indigenous groups, and had brought the disease with them when they returned. Although almost all of the informants cited a proximal cause for malaria, the ultimate cause and origination of disease was blamed on outsiders. In many interviews, certain diseases were attributed to the outside world that is increasingly criticized for bringing undesirable effects to Matses communities.

Treatment-seeking Behaviors for Malaria

A treatment regimen of medicinal plants and biomedicine was often cited as the preferred treatment for malaria, although some informants reported using solely natural treatments, while others relied on biomedicine. Several factors influence treatment-seeking behavior in Estiron, including recognition of symptoms and availability of diagnostic procedures, availability of antimalarial drugs in the community, the cost of medication, side effects of biomedicine, and attitudes towards natural medicines.

Sequence of Treatment Preferences

Informants reported that when individuals first begin to display symptoms associated with malaria, they seek a number of treatment options. If fever is the only apparent symptom, the first treatment choice is often acetaminophen (Tylenol or Paracetamol). This temporarily reduces fever, but the fever appears again, usually within 24 hours. Prolonged fever often prompts people to seek a blood smear for malaria testing, either to begin treatment or rule out malaria as the source of the symptoms. In addition, if the individual develops other symptoms during this time, especially when a fever is accompanied by shivering or trembling, they usually visit the community health post for a blood smear to confirm the malaria diagnosis. Most people delay malaria diagnosis no longer than 24 to 48 hours, and certain symptoms initiate quicker treatment-seeking behaviors (i.e.—shivering). In Estiron, individuals have the option to receive the full malaria prescription after diagnosis and continue treatment at home, or they may return to the health post every day to receive the daily dose of medication directly from the health promoter. The second option is more common, but may lead to incomplete treatment. It is the responsibility of the individual to return to the health post for treatment, rather than the obligation of the health promoter to seek out individuals that fail to return for the full treatment regimen for malaria.

Biomedicine was reported as the first line of treatment by most informants (N=15), although many informants also reported using medicinal plants first (N=13), or a combination of biomedicine and plants (N=2).[9] Men and women were equally likely to

[9] In this study, treatment-seeking behaviors have been divided into “biomedicine” and “medicinal plants,” rather than using classifications such as “home treatment,” “health post,” or “traditional healer.” Although medicinal plants may be considered a home treatment, the plants are often sought by family members,

report using each approach as their first treatment practice. Although most people reported using both biomedicine and medicinal plants at some point during their treatment regimen for malaria, some informants emphasized that both forms of treatment cannot be used simultaneously. Antimalarial drugs and natural remedies for malaria are believed to be very strong, and pursuing these treatments concurrently makes an individual very weak and potentially very ill.

Table 4-5 provides a cross-tabulation between whether mosquitos were reported as a potential cause of malaria transmission and the type of treatment sought. Individuals that reported “mosquito bite” as a cause of malaria were more likely to use biomedicine or a combination of biomedicine and plants rather than rely on plant remedies alone. In contrast, informants that reported “don’t know” or cited causes other than mosquito were more likely to use plant remedies.

Most individuals in the study reported using medicinal plants for malaria treatment in the past, although the availability of antimalarial drugs has replaced the necessity of natural remedies for malaria. Nine of the twelve informants that reported using medicinal plants as their first treatment preference eventually resorted to malaria pills when natural remedies failed to fully cure them of the disease in a previous malaria episode. If the symptoms of the disease continued after two to four days of treatment with natural remedies or worsened during medicinal plant treatment, individuals were more likely to seek biomedical treatment.

Only two people relied exclusively on medicinal plants to treat malaria, and one additional informant reported that she had discontinued her antimalarial medication and

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sometimes with the help of a medicine man. In addition, most treatments for malaria are sought in Estiron at the local health post, and require no travel costs or expense for antimalarial drugs.

resorted to natural medicines after the malaria pills had made her very dizzy and disoriented in her most recent malaria episode. The sequence of treatment preferences suggests that, although many individuals would prefer to use medicinal plants, the efficiency of clinical medicines has encouraged community members to rely on pharmaceutical drugs to treat malaria.

Cost and Availability of Antimalarial Drugs

Antimalarial drugs are provided free of charge throughout Peru, including Matses communities. However, one informant reported that “the government pays, but the pills don’t arrive here so easily. Because in Angamos they control them a lot, so when we ask for the pills, they don’t want to give them to us. So sometimes we have to beg for them, but even then it is still very little. They always treat us like this.” He recounted that the community of Estiron is able to purchase pills at times when the government health officials refuse to provide antimalarial medication, even though the sale of these drugs to indigenous communities is prohibited. The man said that, although Estiron had the resources to purchase pharmaceutical drugs when necessary, “other [Matses] communities suffer” because they do not have the same financial resources donated by friends or researchers. Despite the policies of the national malaria program in Peru, distribution of antimalarial medicines is not always equitable at regional and local levels.

An inventory of medications available at the health post was conducted during the research period, with detailed information collected for antimalarial drugs. Although the health post was stocked with a large quantity of primaquine and limited quantities of chloroquine and mefloquine, ACT (artesunate-plus-mefloquine combination therapy), the first line treatment recommendation for *P. falciparum*, was not available. During the research period, the health post had also recently used the last of the staining drops

necessary for viewing malaria blood smears. The health promoter said that blood samples would have to be sent to Angamos for testing until a new bottle of the expensive stain (US $45) could be purchased.

Side Effects from Antimalarial Medication

Several informants said that the antimalarial drugs were very strong and cause adverse side effects, including weakness, nausea and headache. For three informants, the negative side effects caused them to avoid or discontinue use of antimalarial drugs and instead rely on natural remedies. A 39-year-old women with seven children stated that “I used the malaria pills before, but now I don’t take them because I’m afraid. They caused me to itch too much, so now I take natural medicines […] But my children take the pills, because they aren’t scared.” Another informant said that she felt very dizzy and sick after taking antimalarial medication, and later chose natural medicines instead of continuing biomedicine. The woman used prepared papaya leaf to treat malaria. In these cases, individuals sought alternative treatments that were reported to be effective for their particular circumstances.

Beliefs in Efficacy of Natural Medicines

A number of natural medicines were believed to treat malaria. Table 4-6 provides a list of common and scientific names of medicinal plants used to treat malaria in the community. Natural remedies for malaria are new to the Matses and continue to be explored and assessed, but every informant knew at least one natural medicine for malaria. On average, men knew more medicinal plants than women. Men named an average of 2.9 plants, while women recalled an average of 1.8 plants to treat malaria. In the past, natural medicines were the first treatment of choice for malaria, primarily because antimalarial drugs were not typically available in the community, and malaria

could not be accurately diagnosed until the arrival of the microscope in 2008. Until this time, natural medicines were the first line of treatment and were prepared and administered by family members or medicine men. When several of these remedies failed to cure malaria, diagnosis and treatment was sought in Angamos.

Today, biomedicine as well as natural medicine are believed to be effective remedies for malaria by most people, and they are both actively used in malaria treatment in Estiron. Although most individuals choose to use biomedicine over natural medicines for malaria, all informants in this study believed that medicinal plants can also provide effective treatments for malaria. While other factors described in this chapter contribute to treatment choice among individuals, the use of natural medicines by some people was attributed to the idea that they simply "worked better" for certain individuals over others. Several informants described their experiences with natural remedies for malaria, with mixed results. For some people, these remedies eliminated all physical symptoms of malaria within a few days. In contrast, several interviewees described their attempts to cure malaria with multiple medicinal plants, but biomedical treatment was eventually sought to fully cure the disease.

One of the community medicine men, Lucho, only used natural remedies for his own malaria treatment, although he believed that biomedical drugs were also effective. After relating that he had contracted malaria five times, he described his beliefs about natural and biomedical malaria treatments:

Lucho [4]: When I was like this [with malaria], I drank the plant remedies. Because I am afraid of the pills, I have to fix my plant remedies. I don't take the pills—I only give them to my children with malaria. Every three months I became like this, and I had to drink the plants remedies.

Jessie: Do you give other people these remedies? Do they come to you to get plant remedies for malaria?

L [4]: Sometimes, until they get better.

J: Do you think that the pills work better for malaria, or that natural medicines are better for this?

L [4]: I think that the plants or trees are better than the pills—for me.

J: And for other people…?

L [4]: I don't really know, because for other people the pills work well, too.

The assertion of the medicine man that he became sick with malaria "every three months" most likely indicates repeat episodes of a single malaria infection. His decision to rely exclusively on medicinal plants may have treated malaria symptoms, without fully treating the internal parasitic infection. In this case, he remained an active carrier of the malaria parasite during this time, in which mosquitos could have easily transmitted the disease to others.

Natural remedies for malaria do not lack support in Estiron, and community members believe in the efficacy of these treatments. The relatively new appearance of antimalarial drugs and diagnostic procedures in the village, however, make people more prone to use biomedicine first, rather than rely on natural remedies that do not always treat the disease.

Malaria Prevention and Control Strategies in Estiron

Although control strategies implemented by the government are minimal in remote geographic areas such as in Matses communities, community members in Estiron practice some preventions strategies. The use of bed nets is highly encouraged by health workers and the health promoter, and occasional active case detection occurs. Other local strategies are popular, including the use of medicinal plants as a preventative method for malaria. Beliefs about malaria causation also had a strong

influence on prevention, with various suggestions for other strategies related to causation theories.

Bed Nets

In the study sample, 93% of informants said that they use a bed net every night to protect against mosquitos and other insects. The remaining two informants reported that they use a bed nets most nights, but sometimes choose to sleep outside the bed net when it is extremely hot. Individuals obtained bed nets from a number of sources, including personal purchase, distribution by health workers, or as a gift from friends or family. When purchased, bed nets cost approximately 30 to 40 soles (US $12 to $16).[10] One informant mentioned how he thought it was important to treat bed nets with insecticide to better control malaria in the community, however, information was not collected on use or frequency of insecticide treatment for bed nets. Several people mentioned that placing clothes or blankets on the inside edges of bed nets could help to reduce mosquito bites. Most people use bed nets at night, but mosquitos can penetrate the bed net if skin is placed directly against the netting. Although more information concerning insecticide-treated bed nets is needed, the promotion and use of bed nets in Estiron contributes to malaria control in the community.

Even when using bed nets properly, mosquitos have ample opportunity to bite individuals when people are not protected under the netting. One informant condescendingly stated that the doctors tell community members that they should be under their bed nets from six o'clock in the evening until after dawn to prevent malaria.

[10] This is equivalent to 1.5 to 2 days of minimum wage labor in Peru (MTPE 2012). However, temporary wage laborers are often paid less than the official minimum wage, or are compensated by productivity rather than receiving a daily or monthly wage.

Suggestions such as this make individuals more likely to dismiss clinical recommendations as irrational and unfeasible. Bed nets must remain just one of many prevention strategies employed in Estiron.

Medicinal Plants

In addition to treating malaria, medicinal plants were also used as a preventative measure against malaria. The same medicinal plants used to treat malaria are also used to prevent the disease, although some plants were deemed more effective for prevention. The most common plants used for malaria prevention are itininga, papaya leaf, and huacapú. Preparation for each plant varies, although they are usually boiled and made into a drink which is consumed one to three times a day. For prevention, informants stated that a person can drink the plant brew anytime, although one should drink it more frequently when many people start to become sick with malaria. Although the biological implications of the protective plant remedies for malaria are unknown, many people reported less frequent malaria episodes when consistently consuming preventive natural plants.

Active Case Detection

Active case detection for malaria was conducted by mestizo health workers approximately once a year. A round of active case detection had occurred approximately four months prior to the research period, although informants provided little information on the procedures and frequency of active case detection in Estiron. The local health promoter said that mestizo health workers collected blood samples and tested them on site, diagnosing malaria cases and prescribing medication during their brief stay in the community. Unfortunately, due to the mobility of the Matses to hunt, fish, or work on their agricultural fields on a daily basis, active detection can miss a

significant portion of the population. Nevertheless, active case detection is an important strategy that can reduce the number of active malaria carriers in the community, which can lead to a reduction in transmission rates.

Availability of Public Health Information

The majority of public health information is disseminated through unofficial channels, primarily by person-to-person oral communication. Most information on malaria causes and symptoms is “common knowledge” and is gained from family members or other community members. Health workers that administer vaccines and the dental brigade also contribute health messages, advising individuals to boil water before drinking, or sleep under mosquito nets. The local health promoter reported that he also encouraged these practices, and he relates health information to the community at community meetings upon returning from training courses.

No written information is available in the Matses language at the health post in Estiron, and there are limited visual aids on malaria parasites, vaccination schedules for children, and recommendations for child health. The charts and health propaganda are in Spanish, with the exception of one poster in English. Although a few households own radios, there were no reports of health information broadcast over available radio stations. The lack of health information in Matses or visual aids is a considerable detriment to disseminating health messages in Estiron.

Additional Control Strategies

As several malaria causation theories were mentioned by informants in addition to mosquito bites, other prevention methods were suggested. Prevention methods were closely related to causation beliefs, especially when a feasible control strategy was available. The most common suggestions to reduce malaria included boiling water

before consumption, washing hands, keeping a clean house and clean plates, and avoiding foods with too much fat. One woman that believed that malaria could be caused by drinking dirty water stated that malaria could be reduced “by boiling water, and if the people did this, there would be no more malaria.” Despite these recommendations, most people did not engage in these practices regularly. Even informants that recognized these prevention strategies reported that they did not practice these tactics with regularity. Although these may not prevent malaria, they are health messages that people have retained, and if implemented properly in the future, can bring added health benefits to the community.

Discussion: Explanatory Models of Malaria among the Matses

In Estiron, individuals’ explanatory models of illness for malaria draw on a pluralistic healthcare model, integrating traditional beliefs and practices with clinical medicine. Perceptions and knowledge about malaria closely reflect concepts and beliefs of indigenous contagion theory (ICT) expounded by Green (1999). All of the causation theories reported in interviews were naturalistic, and there was no mention of personalistic causes of malaria, such as witchcraft or retaliating spirits. In contrast with Kovasna’s (2009) assertion that the people of Estiron did not know where “outside” diseases such as malaria came from, the correlation between mosquito bite and malaria was apparent in the data from my research. The results show that 63% of informants believed a mosquito could transmit malaria. Many other theories were also popular, such as sharing food or a plate with an individual that has malaria or not keeping one’s house clean. Individuals’ explanatory models of malaria revealed that people who believed that mosquito bites were a cause of malaria were more likely to use pharmaceutical medicines to treat malaria, while those who did not cite mosquitos

preferred to use medicinal plants as their first treatment. These results are important, as more knowledge about malaria may lead to better treatment practices. However, the ethnographic data was unable to elucidate the reasons behind the correlation.

Although malaria causation theories and treatment-seeking behaviors are related, other factors appear to be more influential in predicting treatment preferences, such as beliefs about natural remedies for malaria, side effects of biomedicine, and the recent availability of antimalarial medication in the community. Antimalarial pharmaceutical drugs were reported to be the first line of treatment by most informants, but a large proportion of individuals (43%) reported that they preferred to use medicinal plants for malaria. As various individuals recounted, the Matses have always used medicinal plants to cure their diseases, and these plants do not have the same side effects as “mestizo” pharmaceutical drugs that are relatively new to the community, such as antimalarials. As one community leader stated, “the Matses keep trying new plants to cure diseases, even new diseases. One day, we hope to only use plants, like in the past. Then we wouldn’t have to buy the pills, we wouldn’t have to worry. One day.” As several people believed that the mestizos were to blame for introducing malaria to the Matses and for other negative health outcomes in their communities, some people are reluctant to depend on Western medicine to treat disease. Despite the desire by some community members to rely exclusively on natural treatments for disease, another informant noted the severity of *P. falciparum*, stating that “if there wasn’t this pill, we wouldn’t get better.” For many people in Estiron, the use of biomedicine is a matter of efficacy in treating malaria, rather than preference.

Overall, informants had a relatively high level of knowledge about malaria as compared to many similar studies discussed in Chapter 2. In addition to recognizing the relationship between mosquitos and malaria, many informants (37%) could name the two types of malaria present in the community, and all informants knew at least two symptoms of malaria. Knowledge about malaria in Estiron may be heightened because of the prior visits of researchers to the community, as well as the long-term residence of linguist Dr. David Fleck. The explanatory models of illness for malaria may differ from EMs in other Matses communities, and knowledge of malaria in Estiron may reflect a higher level of knowledge about health and disease due to greater exposure to outside visitors.

Some impediments to accessing antimalarial medication were noted, but only two informants (the current chief and the health promoter) mentioned problems in drug availability. Most likely, the health promoter and chief are the individuals responsible for obtaining antimalarials for the community in Colonia Angamos. Therefore, they are the only people highly aware of the difficulties in procuring medication. This shows that some structural impediments exist regarding access of medication.[11] For the ordinary citizen, however, access and availability to malaria treatment is not an issue. Decisions are based more upon personal choice rather than availability of treatments. The health post is located in the community and requires no travel time or expense. In addition, as malaria medication is provided free of charge at the community level, the cost of medicine is not an obstacle for malaria treatment.

[11] Although explanatory models of illness and structural impediments are often used as two separate frameworks to study healthcare, Kleinman (1978: 88) notes how differences in EMs and the conflicts they create often "reveal the underlying discrepancies in status and power between the key participants in health care relationships." While EMs can reveal these disparities on a local scale, additional data is needed to discover the factors that contribute to these obstacles.

There were some gender differences in the responses, reflecting gender roles. For example, regarding the cause of malaria, women were more likely than men to mention causes related to the cleanliness of the home and preparation of food and water. These causation theories reflect the role of women in the household, as they are more likely to be responsible for keeping the house clean, and preparing food and beverages in the home. Women were also much more likely than men to say they didn't know they cause of malaria. This may be due to a bias in the responses, as both translators were men. Women may be less direct in their responses when discussing matters of health with men, or when they are unsure of the answer desired by the translator and researcher. Regarding natural remedies for malaria, men were more likely to know more medicinal plants than women. The gender difference may be related to the role of traditional medicine in Estiron, which is a responsibility normally assumed by men. In general, knowledge of diseases such as malaria may be gendered, as men are the traditional medical practitioners and indigenous health promoters, and usually have more social interaction with non-Matses who might share new health knowledge.

Conclusion

This chapter examined the symptoms, causes and treatment preferences for malaria among the Matses in Estiron, Peru. I hypothesized that the Matses' perceived causes of malaria would influence treatment-seeking behaviors and prevention strategies, and that these would differ from the biomedical model. The explanatory models of malaria in Estiron contrasted in many ways from the clinical model of malaria, particularly in the many causation theories and treatments. Most people recognized that mosquitos transmit malaria, but eleven additional malaria causation theories were also identified. Individuals that believed that the bite of a mosquito could cause malaria were

more likely to use antimalarial drugs as their first treatment, while those who did not mention a mosquito bite as a potential cause usually chose to begin treatment with medicinal plants. Causation theories were also important in predicting prevention strategies. Causes related to having a dirty house, unwashed plates or drinking dirty water prompted informants to suggest prevention methods that would alleviate these conditions, like keeping a tidy home and kitchen. In Estiron, biomedicine and medicinal plants are used by individuals as effective methods to treat malaria. The pluralistic healthcare system in Estiron allows individuals to pursue different treatment regimens for malaria, depending on personal preference.

Figure 4-1. Photo of community health post in Estiron.
Photo courtesy of Jessica Franey.

Figure 4-2. Photo of community medicine stock in Estiron.
Photo courtesy of Jessica Franey.

Table 4-1. Freelist of illnesses in Estiron

	Item	Frequency (%)	Informants (N=30)	Salience
1	Malaria	90.0	27	0.834
2	Diarrhea	73.3	22	0.497
3	Urinary tract infection/ pain	70.0	21	0.361
4	Cough	53.3	16	0.367
5	Headache	46.7	14	0.279
6	Liver pain	43.3	13	0.178
7	Flu/ cold	40.0	12	0.256
8	Vomiting	40.0	12	0.284
9	Conjunctivitis	36.7	11	0.219
10	Stomach ache	33.3	10	0.219
11	Fever	33.3	10	0.184
12	Hepatitis	23.3	7	0.087
13	Intestinal parasites	23.3	7	0.098
14	Pain in knees	23.3	7	0.092
15	Toothache	20.0	6	0.102
16	Earache	20.0	6	0.105
17	Black urine	20.0	6	0.089
18	Heart pain/ heart problems	16.7	5	0.055
19	Back pain	16.7	5	0.080
20	Kidney pain	16.7	5	0.083
21	Ulcer	16.7	5	0.068
22	Aching muscles	16.7	5	0.064
23	Bronchitis	13.3	4	0.089
24	Animal spirit illness	13.3	4	0.052
25	Swollen foot	13.3	4	0.083
26	Aching joints	13.3	4	0.038
27	Yellow urine	13.3	4	0.054
28	Skin boils/furuncles/skin abscess	13.3	4	0.050
29	Aching bones	13.3	4	0.045
30	Mouth ulcers	10.0	3	0.035
31	Vaginal bleeding (non-menstrual)	10.0	3	0.030
32	Itching	10.0	3	0.043
33	Pneumonia	10.0	3	0.070
34	Swelling of body	10.0	3	0.057
35	Excessive bleeding (from injury)	10.0	3	0.030
36	Scabies	6.7	2	0.015
37	HIV	6.7	2	0.009
38	Constipation	6.7	2	0.030
39	Colic	6.7	2	0.051
40	Anxiety, with throbbing stomach	6.7	2	0.036

Table 4-1. Continued

	Item	Frequency (%)	Informants (N=30)	Salience
41	Chest pain	6.7	2	0.041
42	Sore throat	6.7	2	0.047
43	Pain of vagina	6.7	2	0.016
44	Swollen neck/neck stiffness	6.7	2	0.031
45	Cancer	6.7	2	0.030
46	Groin pain	6.7	2	0.025
47	Breast pain	3.3	1	0.007
48	Swollen eye/eyelids	3.3	1	0.006
49	Anal prolapse	3.3	1	0.007
50	Dengue	3.3	1	0.005
51	Puss from penis	3.3	1	0.009
52	Puss from ear	3.3	1	0.011
53	Pain of gallbladder	3.3	1	0.004
54	Chicken pox	3.3	1	0.013
55	Tumor	3.3	1	0.004
56	Leishmaniasis	3.3	1	0.010
57	Cholera	3.3	1	0.010
58	Swollen lips	3.3	1	0.005
59	Weak body	3.3	1	0.013
60	Dizziness	3.3	1	0.025
61	Fungus	3.3	1	0.011
62	Gonorrhea	3.3	1	0.015
63	Hot skin/ hot body	3.3	1	0.010
64	Lock jaw	3.3	1	0.009

Source: Author's field work, June-July, 2012.

Table 4-2. Freelist of malaria symptoms

	Item	Frequency (%)	Informants (N=30)	Salience
1	Headache	90.0	27	0.686
2	Fever	70.0	21	0.518
3	Shaking/shivering	43.3	13	0.315
4	Vomiting	36.7	11	0.236
5	Body weakness	30.0	9	0.132
6	Aching bones	20.0	6	0.097
7	Liver pain	16.7	5	0.100
8	Sweats/hot skin	16.7	5	0.085
9	Body aches	16.7	5	0.097
10	Pale face	10.0	3	0.044
11	Dizziness	10.0	3	0.047
12	Chills	6.7	2	0.026
13	Stomach ache	6.7	2	0.033
14	Yellow urine	3.3	1	0.013
15	No appetite	3.3	1	0.017
16	Cough	3.3	1	0.022
17	Diarrhea	3.3	1	0.011
18	Weight loss	3.3	1	0.017
19	Sleeping a lot	3.3	1	0.007
20	Do not want to eat meat	3.3	1	0.011
21	Colic	3.3	1	0.006
22	Cannot sleep	3.3	1	0.007

Source: Author's field work, June-July, 2012.

Table 4-3. Freelist of malaria causes

	Item	Frequency (%)	Informants (N=30)	Salience
1	Mosquito bite	63.3	19	0.564
2	Don't know	26.7	8	0.267
3	Sharing food/plates with someone with malaria	20.0	6	0.128
4	Not sweeping the house	6.7	2	0.050
5	Drinking unboiled water	6.7	2	0.050
6	Eating food with too much fat/grease	6.7	2	0.050
7	Conversing with someone with malaria (air)	6.7	2	0.019
8	Drinking water contaminated with *barbasco*	3.3	1	0.022
9	Virus	3.3	1	0.033
10	Flies/ fly eggs in food	3.3	1	0.017
11	Not washing dishes	3.3	1	0.033
12	Sleeping beside someone with malaria	3.3	1	0.017
13	Not washing hands	3.3	1	0.033

Source: Author's field work, June-July, 2012.

Table 4-4. Freelist of malaria causes by gender

Item	Men (N=15)		Women (N=15)	
	Frequency (%)	Salience	Frequency (%)	Salience
Mosquito bite	80.0	0.711	46.7	0.417
Don't know	13.3	0.133	40.0	0.4
Sharing food/plates with someone with malaria	13.3	0.089	26.7	0.167
Eating food with too much fat/grease	13.3	0.1	-	-
Not sweeping the house	-	-	13.3	0.1
Drinking unboiled water	-	-	13.3	0.1
Not washing dishes	-	-	6.7	0.067
Virus	6.7	0.067	-	-
Not washing hands	6.7	0.067	-	-
Drinking water contaminated with fishing poison	6.7	0.044	-	-
Flies/ fly eggs in food	-	-	6.7	0.033
Sleeping beside someone with malaria	-	-	6.7	0.033
Through the air- conversing with someone with malaria	6.7	0.022	6.7	0.017

Source: Author's field work, June-July 2012.

Table 4-5. First treatment preference by mosquito as cause

Treatment	Reported mosquito bite as malaria cause	
	Yes	*No*
Biomedicine	11	4
Medicinal Plant	6	7
Combination	2	-
Total	19	11

Source: Author's field work, June-July, 2012.

Table 4-6. Common and scientific names of medicinal plants used for malaria

Common Name		Scientific Name
English/Spanish[1]	Matses	
-------/ Huacapú	Tedia	*Minquartia guianensis* (Fam. Olacaceae)
-------/ Soga	Nënë pada	*Strychnos* sp. (Fam. Loganiaceae)
-------/ Itininga	Isipachi	*Philodendron* spp. (Fam. Araceae)
-------/ Remo caspi	Cuëte chuda	*Aspidosperma* spp. (Fam. Apocynaceae)
Papaya/ Papaya	Dectad	*Carica papaya* (Fam. Caricaceae)
Guava/ Guayaba	Oyaba	*Psidium guajava* (Fam. Myrtaceae)
-------/ Huasai	Cobisan	*Euterpe precatoria* (Fam. Palmae)

Source: Author's field work, June-July, 2012; Fleck, Uaquí & Jiménez (2010).

[1]Common names are given in both English and Spanish, as many plants do not have common English terms.

CHAPTER 5
CONCLUSION

Incidence rates for malaria have been declining in Latin America in the last decade. Yet, many rural and indigenous populations continue to report large numbers of malaria cases annually in some countries. In Peru, the Matses suffer one of the highest indigenous mortality rates, with malaria reported as a leading cause of death. The purpose of this study was to examine the beliefs, knowledge, and treatment-seeking behaviors for malaria among the Matses in Estiron, Peru, using explanatory models of illness as a framework. The study also considered access and availability of pharmaceutical medicine and diagnostics for malaria in the community.

In Peru, malaria has been in existence for hundreds of years. Aggressive control strategies after 1957 greatly reduced malaria incidence rates until the end of the century. A reduction in malaria control and prevention at the national level led to an epidemic in the late 1990s, when more than 150,000 cases were reported annually. Since this time, malaria control has been stronger and remains under careful vigilance, with malaria diagnostics and medication provided free of charge. However, certain geographic areas and ethnic groups continue to have high malaria rates, including the Matses. Statistics from INEI indicate that the Matses have the highest mortality rate among all the ethnic groups in the Panoan language family, and malaria is the third leading cause of death in Matses communities. Despite these shocking statistics, there have been no academic studies on health and illness among the Matses, and the government census data only reports simple statistics on incidence rates for disease and mortality.

Explanatory models of illness can act as a tool in understanding health beliefs and practices, especially in sociocultural contexts that use pluralistic healthcare systems, and in areas where clinicians and community members have very different health practices. Explanatory models can point out differences in health beliefs and practices, allowing researchers or clinicians to mitigate conflicts that arise from these differences. They can also reveal the reasons that people choose certain treatments, when alternative and more effective treatments are available.

As the perceived cause of a disease is one of the best indicators for which treatment practice an individual follows, I discussed different theories of disease causation for malaria. Several studies conducted in other parts of the world point out differences in local healthcare beliefs and the biomedical model of malaria, and how ideas about the cause of malaria influence treatment-seeking behaviors or prevention strategies. When witchcraft or supernatural causes are the presumed origin of the illness, studies show that people choose traditional healing methods rather than clinical care. When naturalistic causes are cited, individuals begin malaria treatments at home or seek care in a clinical setting, depending on the severity of the disease. Other sociocultural determinants influence treatment-seeking, including discrimination and judgment of local health practices, as well as gender roles.

In this study, I found that beliefs about malaria causation are correlated to decisions about treatment practices. Individuals that knew the clinically recognized cause of malaria, the bite of a malaria-infected mosquito, were more likely to seek antimalarial medication as their first treatment preference. Although most people eventually resorted to biomedicine to treat malaria, nearly half of the informants

preferred to use medicinal plants first. Only when the plants failed to eliminate malaria symptoms or the disease became more severe did people choose to take antimalarial drugs as a secondary treatment. When deciding the first treatment to pursue, other factors that were relevant include the side effects of biomedicine, beliefs in the efficacy of natural medicine, and a desire to continue with traditional practices of using medicinal plants to treat illness.

In using explanatory models to explore knowledge and beliefs about malaria, I discovered that causation beliefs also play an important role in prevention strategies. Some prevention strategies, such as using bed nets or consuming preventive medicinal plant remedies, were prevalent regardless of the perceived cause of malaria. Yet, when informants reported other naturalistic events such as drinking dirty water or not sweeping the house, they recommended prevention methods directly related to these causation beliefs.

The study shows that there may be some structural impediments to access to malaria treatment, but it is not a major influence on decisions for malaria treatment in Estiron. This may be different, however, in other Matses communities where on-site malaria diagnosis is not feasible due to a lack of diagnostic equipment, and the financial resources are not available to purchase additional medicines when necessary. The results from this study in Estiron should be regarded as a best-case scenario for malaria diagnosis and treatment among Matses communities in Peru.

Significance of the Research

As the first study explicitly investigating health beliefs and practices of the Peruvian Matses, the research provides an understanding of Matses' perceptions of health and illness, as well as insights into their healthcare system. It enhances the very

limited academic literature on the Matses, and adds to the ethnographic literature of malaria among indigenous peoples of South America. As Cormier (2011) notes, there is still a severe lack of research available on malaria in indigenous populations of South America. This study explains the tripartite illness paradigm of the Matses and describes the different roles of health practitioners in the pluralistic healthcare model. The results show that “new” diseases such as malaria have some similarities with the biomedical model of disease and naturalistic theories of disease causation. Other illnesses such as animal spirit illness, however, are still related to personalistic causation beliefs, and are generally illnesses that the Matses have experienced for generations.

The study also contributes to the literature concerning local perceptions of disease causation and treatment preferences for malaria in indigenous communities, and how they compare and contrast with the clinical model of the disease. The explanatory models of malaria in Estiron revealed some similarities with the biomedical model regarding beliefs about malaria causes and symptoms. However, treatment preferences and prevention methods reflected greater divergence from the biomedical model. Treatment and prevention practices were influenced by many factors, including causation theories. The results are critical for understanding contemporary health beliefs in indigenous communities.

The structural barriers to malaria diagnosis and treatment illustrate a need for greater advocacy for Matses healthcare at the regional level. Although Estiron has access to additional resources, most Matses communities continue to have high rates of malaria mortality and morbidity. Financial investments in malaria diagnostic equipment

and training of health promoters is needed in order to reduce the burden of malaria among the Matses.

Finally, I hope that these results can contribute to future malaria control programs in Matses communities. Through a better understanding of beliefs about malaria and the factors that contribute to treatment choices and access, community leaders and outside health workers will be more adept in creating successful malaria education and control programs in the future.

Suggestions for Further Research

In order to advance research on this subject, future investigations need to incorporate additional Matses communities. As previously noted, Estiron provides a best-case situation for malaria diagnosis and treatment among Matses villages as the community health post has access to a microscope on-site, making it one of only two Matses communities that have access to this resource. Estiron also has access to financial resources that other communities do not, due to collaboration with foreign researchers. Other Matses communities are more isolated and have fewer resources. General health data on the Matses also needs to be collected, which may include further ethnographic studies, anthropometric measures, and other measures of physical and mental health.

The scope of the research on health in Matses communities could also be broadened by investigating structural factors that affect healthcare access and availability. Studying the role of the Centro de Salud (Health Center) and clinicians in Colonia Angamos as well as mestizo health promoters that work in Matses communities could reveal additional factors that influence treatment-seeking behaviors for health issues.

Ultimately, this study hopes to contribute to research that can lead to better health outcomes in Matses communities, and stimulate further research on malaria and infectious disease among indigenous peoples of the Amazon.

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BIOGRAPHICAL SKETCH

Jessie Franey graduated from Owensboro Catholic High School in 2006. She attended Samford University, where she studied abroad through the Samford in Spain program and International Study Abroad's multi-country program in Mexico, Peru, and Argentina. In 2010, she graduated *summa cum laude* from Samford University, receiving a Bachelor of Arts in International Relations and Spanish. Jessie began her graduate studies at the University of Florida in 2011 in the Latin American Studies program, specializing in development. She received her Master of Arts in Latin American Studies in 2013.