

**The whole world will be able to see us:  
Cultural factors affecting insecticide-treated bed net use  
for malaria control in the Peruvian Amazon**

by  
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## **Abstract**

According to the most recent WHO estimates, 107 countries worldwide are endemic for malaria, putting about 3.2 billion of the world's population at risk. Malaria causes or contributes to between 1.5 and 3 million deaths and up to 500 million acute clinical cases each year. Because of their demonstrated effectiveness at reducing malaria-related morbidity and mortality, insecticide-impregnated bed nets (IBNs) are distributed and promoted by malaria control programs throughout the world.

This dissertation draws upon qualitative evidence to document how social, cultural, and economic factors affect malaria exposure and bed net use in rural mestizo villages around the city of Iquitos in the Peruvian Amazon. The introduction presents an overview of malaria epidemiology worldwide, in the Americas, and in the Peruvian Amazon. It describes the theoretical framework of the research, the study sites, and the data collection methods employed.

Paper #1 describes the use of nighttime household observations to determine the type and extent of bed net use and document evening and nighttime social, cultural, and economic activities that might increase exposure. Data confirm that untreated net use is nearly universal in the study area, but IBN use less common. Entering and leaving nets frequently throughout the night is likely to reduce their protective effect. Findings also point to early evening television viewing, religious services, and vending as potentially risky activities.

Paper #2 draws upon in-depth ethnographic interviews to determine the barriers to uptake of the most common type of IBN and then explore the characteristics of a more

culturally appropriate net. Users identify warmth, privacy, protection against small biting insects, and esthetic appeal as important net characteristics.

Paper #3 describes a series of household trials carried out over six months to test home-based insecticide impregnation of nets and cultural acceptability of a pre-treated nylon netting fabric designed to address preferences identified by net users in paper #2. Based on the findings, I recommend promotion of both home-based treatment of existing (mostly cotton) nets and distribution of a more densely woven nylon IBN that better fulfills non health-related functions of nets sought by net users.

**Advisor:** Peter J. Winch

**Readers:** Janice Bowie  
William Brieger  
Clive Shiff

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## Glossary of acronyms

|        |                                                                                                                       |
|--------|-----------------------------------------------------------------------------------------------------------------------|
| AIDS   | Acquired immune deficiency syndrome                                                                                   |
| An.    | Abbreviation for Anopheles                                                                                            |
| BCC    | Behavior change communication (see also IEC)                                                                          |
| CHR    | Committee on Human Research, the ethics review committee of the Johns Hopkins Bloomberg School of Public Health       |
| CHW    | Community health worker                                                                                               |
| CI     | Confidence interval                                                                                                   |
| CQ     | Cloroquine                                                                                                            |
| DDT    | Dichlorodiphenyl-trichloroethane                                                                                      |
| DISA   | Regional Directorate of Health (from the Spanish: <b>D</b> irección de <b>S</b> alud)                                 |
| EC     | European Commission                                                                                                   |
| ELISA  | Enzyme-linked immunosorbent assay                                                                                     |
| GDP    | Gross domestic product                                                                                                |
| GFATM  | Global Fund to Fight AIDS, Tuberculosis and Malaria                                                                   |
| HBM    | Health Belief Model                                                                                                   |
| HIV    | Human immunodeficiency virus                                                                                          |
| IBN    | Insecticide-impregnated bed net                                                                                       |
| IEC    | Information, education and communication (this term has now largely been replaced by behavior change campaign or BCC) |
| IRS    | Indoor residual spraying                                                                                              |
| JHSPH  | Johns Hopkins Bloomberg School of Public Health                                                                       |
| KAP    | Knowledge, Attitudes and Practices                                                                                    |
| MOH    | Ministry of Health                                                                                                    |
| NGO    | Non-governmental organization                                                                                         |
| OR     | Odds ratio                                                                                                            |
| PCR    | Polymerase chain reaction                                                                                             |
| PRISMA | A Peruvian non-governmental organization ( <i>Proyectos de Informática, Salud, Medicina y Agricultura</i> )           |
| RBM    | Roll Back Malaria                                                                                                     |
| RTF    | Rich text file                                                                                                        |
| SD     | Standard deviation                                                                                                    |
| SNL    | Saving Newborn Lives, an initiative of Save the Children                                                              |
| SP     | Sulfadoxine-pyrimethamine                                                                                             |

|       |                                                    |
|-------|----------------------------------------------------|
| TB    | Tuberculosis                                       |
| TIPs  | Trials of improved practices                       |
| TPB   | Theory of Planned Behavior                         |
| TRA   | Theory of Reasoned Action                          |
| USAID | United States Agency for International Development |
| WHO   | World Health Organization                          |

# Introduction

## ***Malaria worldwide***

According to the most recent WHO estimates, 107 countries worldwide are endemic for malaria, putting about 3.2 billion of the world's population at risk.<sup>1</sup> Malaria causes or contributes to between 1.5 and 3 million deaths and up to 500 million acute clinical cases each year.<sup>2</sup> Sub-Saharan Africa suffers about 60% of the world's malaria morbidity and 80% or more of its malaria mortality.<sup>1</sup> Children under five are the most affected group in this region, where malaria is thought to be the direct cause of nearly 20% of childhood deaths, though as a co-morbidity it is probably a contributing factor in many more. In addition to children under five, high-risk groups include pregnant women, refugees, migrant workers, and non-immune travelers. In areas of high HIV/AIDS prevalence, malaria co-infection can lead to increased viral load, increased parasite density, and other complications.<sup>3</sup> Most human malaria infections are caused by *Plasmodium falciparum* or *P. vivax* with *P. malariae* and *P. ovale* playing a lesser role. *P. falciparum*, the predominant strain in sub-Saharan Africa, accounts for most malaria-related disability and death.

Young children face the greatest risk of death from malaria in sub-Saharan Africa because much of the region is characterized by stable transmission, a situation in which disease prevalence remains relatively high at all times, despite possible seasonal variation.<sup>4</sup> With constant exposure to infection, most of the population develops some level of immunity by about age five. As a result, the rate of clinical malaria in older children and adults remains relatively low despite ongoing parasitaemia. Prior to age five, children have not yet developed sufficient immunity to withstand constant infection

and re-infection. In other areas of the world, prevalence may vary greatly by season, due to environmental conditions, or for other reasons. In these conditions of *unstable* transmission, the population receives insufficient exposure to confer even partial immunity; people of all ages remain at risk of clinical malaria.

In addition to its direct health effects, malaria causes significant economic dislocation worldwide. At the household level, families face expenses for treatment as well as forgone income when adults are too ill to work or must take time away from income-producing activities to care for sick children. Studies from Sri Lanka and several African countries have variously estimated the combined direct and indirect costs of malaria as equal to between 2% and 6% of annual household income.<sup>5-13</sup> However, these costs fall disproportionately on the poor, who, though they spend less per malaria episode than wealthier households, sacrifice a greater share of earnings.<sup>5</sup> One study from Malawi estimated the overall cost of malaria to households as equivalent to 7.2% of annual income, but costs for the poorest households surpassed 30%.<sup>13</sup> Beyond the economic effect on individual households, economist Jeffrey Sachs and others have argued that—even after controlling for factors such as geography, infrastructure, colonial history, and type of government—malaria-endemic countries have one-fifth the annual GDP and a 1.3% lower growth rate than non-endemic countries.<sup>14, 15</sup> Sachs and colleagues point to substantial malaria-related loss of human capital stemming from factors such as low birth weight, missed school days, and the cognitive sequelae of cerebral malaria. This loss, they argue, has a long term negative impact on economic development and population health. Peter Brown and Randall Packard among others find Sachs' argument unconvincing.<sup>16, 17</sup> Indeed, many of the variables included in Sachs' model are



imprecisely defined and based on questionable assumptions.\* But whatever malaria's economic effect at the macro level, its impact on households is significant.

Based on the promising results of DDT spraying in the United States, Southeastern Europe, and a handful of other countries in the early 1950s, members of the international health community began to promote the idea of a global campaign against malaria. In 1955, the World Health Assembly approved the principle of eliminating malaria worldwide. This led to formation of the global malaria eradication campaign, launched by the World Health Organization (WHO) in 1957.<sup>4</sup> The campaign was initially successful but ran into difficulties because of increasing vector resistance to DDT as well as administrative, logistical, and political problems. Amid much discouragement, WHO abandoned the goal of global malaria eradication in 1969 and did not announce a new global control strategy until 1992.<sup>18</sup> Global malaria control, rather than eradication, became the goal for the Roll Back Malaria (RBM) initiative, founded in 1998. RBM's stated objective is to 'halve the burden of malaria by 2010,' an objective it hopes to achieve through more effective control, rather than eradication.<sup>19</sup> WHO defines a malaria control program as:

...an organized effort to institute, carry out, and evaluate such antimalarial measures as are appropriate for achieving the greatest possible improvement of the health situation of a population living in given epidemiological and socioeconomic conditions and subjected to the burden of this disease or exposed to the risk of it.<sup>20</sup>

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\* As Randall Packard has noted (unpublished lecture notes, 2005), Sachs' model is based upon a regression analysis comparing 150 countries. As a result, Sachs has had to standardize measures that may vary considerably from country to country. For instance, Gallup and Sachs (2001) control for the effect of government on GDP with a dichotomous variable indicating whether the country is socialist. Since the model does not distinguish between different types of socialism, it assumes that socialist rule affects such diverse countries as China, Cuba, East Germany, Tanzania, and the Soviet Union in the same manner. For a more detailed critique of this "malaria blocks development" thesis (though written prior to publication of Sachs' work on the subject), see Brown (1997) and Packard and Brown (1997).

Organized as a partnership of 90-some private, public, bilateral, and multilateral organizations, RBM has been praised for rallying flagging donor support, bringing malaria control back to the forefront of the international health agenda, and renewing the energies of an international health community dispirited by the collapse of malaria eradication. Unfortunately, RBM has also been criticized from early on as incapable of translating its political capital into concrete action.<sup>21</sup> Critics characterize the partnership as disorganized and dysfunctional and note that the global burden of malaria—especially in Africa—has actually increased since RBM’s founding.<sup>22-24</sup>

Malaria control programs employ a variety of strategies to kill adult mosquitoes, including prevention of human-vector contact, elimination of breeding sites, application of larvicide, and indoor residual spraying (IRS). They use opportune case detection and treatment to reduce parasite load in the human host and thus limit further opportunities for reproduction when the parasite is picked up by another mosquito.<sup>4</sup> Which combination of strategies makes most sense in a given situation depends upon environmental conditions such as temperature and rainfall, vector feeding and resting behavior, and human behavior and preferences. Within the malaria control armamentarium, several trials have now demonstrated the effectiveness of properly used insecticide-impregnated bed nets (IBNs) at reducing under-five mortality as well as morbidity in pregnant woman, particularly in sub-Saharan Africa.<sup>25</sup> Promoting IBNs has become part of most malaria control programs worldwide, and IBN use has become widespread in many malaria-endemic countries. Still, barriers to wider adoption include lack of a tradition of net use, cost of the nets themselves and of re-treatment, failure to understand the relationship between mosquito bites and malaria transmission, and

cultural needs and preferences related to type of netting material and size, shape, and color of the net.<sup>26</sup> It is difficult to determine the relative importance of cultural and consumer needs and preferences compared to costs as a barrier, but programs that take needs and preferences into consideration have a better chance of success than those which offer a one-size-fits-all approach.

### ***Malaria in the Americas***

The global eradication campaign nearly eliminated malaria in the Americas during the 1970s and early 80s, though some low-level transmission continued, especially in Colombia and Brazil. From these foci, the disease spread gradually outward so that by 1994 WHO was reporting that 231 million people in 21 countries or about 30% of the hemisphere's population "lived in areas with ecological risk for malaria transmission."<sup>27</sup>

Unlike in Africa, only about 18% of malaria cases in the Americas are due to *P. falciparum*, the rest attributable mainly to *P. vivax* with a handful of cases caused by *P. malariae*.

According to the most recent WHO estimates, the Americas account for only 3% of the global burden of clinical malaria cases, about 1% of the falciparum cases, and less than 1% of the deaths.<sup>28</sup> Understandably, this makes malaria in the Americas a low priority for

international initiatives such as Roll Back Malaria and the Global Fund to Fight AIDS, Tuberculosis, and Malaria (GFATM). Still, malaria remains an important public health priority for countries along the Amazon Basin, in Central America, and on the island of Hispaniola, where it causes considerable morbidity and contributes to impoverishment.

Further, drug efficacy studies show that in South America up to 80% of *P. falciparum* cases are now resistant to chloroquine and around 20% are resistant to sulfadoxine-pyrimethamine, with resistance to primaquine, mefloquine, and quinine growing.

There has been much debate about the efficacy and effectiveness of IBNs for malaria control in Latin America, though one recently published study from the Colombian Amazon reports a significant risk reduction for IBN users (adjusted odds ratio for mild malaria 0.44, 95% CI 0.20–0.98).<sup>29-31</sup> Moreover, despite equivocal evidence about the biting habits of the principal malaria vector in the Peruvian Amazon, recent entomological studies also suggest that IBNs should protect users for a significant part of the peak biting period.<sup>32-34</sup> In addition, three independent studies have found that use of non-impregnated nets is nearly universal in this region.<sup>35-37</sup> Still, there is concern that irregular or incorrect use limits net effectiveness, and we have little data on the cultural acceptability of IBNs compared to untreated nets. Such data are needed if IBNs are to be promoted in a manner consistent with the needs of area residents: evaluation of the Peruvian Ministry of Health (MOH) bed net distribution program provides evidence that many recipients of MOH-distributed nets opted not to use them, preferring their own untreated nets instead.<sup>35</sup> Even if using IBNs is culturally acceptable and effective against the local malaria vector, other social and economic activities might increase exposure to infective bites at times when people are not inside their nets. Documenting such activities would be the first step towards developing effective malaria prevention measures for times when bed nets cannot offer protection.

My dissertation involves use of qualitative evidence to document how social, cultural, and economic factors affect malaria exposure and bed net use in rural villages around the city of Iquitos, Peru. I collected and supervised collection of these data from February 2000 to December 2002. Co-investigators included Lic. Enf. Clara Bustamante Pezo of the Peruvian Ministry of Health in the Department of Loreto, Peru (MOH), Elli Leontsini of the Johns Hopkins Bloomberg School of Public Health (JHSPH), Lic. Enf. Luz Marina Olórtogui

Pezantes (MOH), Maribel Paredes Olórtegui (JHSPH), and Dr. César Ramal Asayag (MOH).

I also draw upon a set of qualitative data which I helped to collect in the same area from January 1999 to December 2000 for a project titled “Insecticide Impregnated Bed Nets for Malaria Control in the Iquitos Region of the Peruvian Amazon: formative research for an efficacy trial.” Peter Winch (JHSPH) served as principal investigator in both studies.

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### ***Ethical review***

This project was approved by the Johns Hopkins Bloomberg School of Public Health Committee on Human Research (CHR#: H.22.00.09.06.A), the Ethics Committee of the *Asociación Benéfica PRISMA* (CE211.00), and the MOH. The earlier project (“Insecticide Impregnated Bed Nets for Malaria Control in the Iquitos Region of the Peruvian Amazon: formative research for an efficacy trial.”) also received ethics review and approval from the JHSPH Committee on Human Research (CHR H.22.98.12.12.E), the PRISMA Ethics Committee (no number), and the MOH.

## **Goals and Objectives**

Reviewers of bed net research in the Americas note that an understanding of social, cultural, and economic factors related to malaria exposure are a critical prerequisite for testing the effectiveness of IBNs.<sup>29</sup> Nevertheless, there is little published research on how such factors impact either malaria epidemiology or the effectiveness of different malaria prevention interventions in the Western hemisphere. The overall goal of this study was to use qualitative methods to help fill gaps in knowledge about Mestizo communities in the Peruvian Amazon. Specific research questions and intervention objectives are described below. In addition to the research questions, many of the data collection activities carried out in conjunction with this project were focused on programmatic needs in the project area. Since these capacity-building objectives parallel many of the research questions, I describe them below as well.

### ***Research questions***

The data and findings discussed in this dissertation stem from two primary research questions:

1. To what extent are insecticide-impregnated bed nets socially and culturally acceptable to the population of the study communities? What factors influence the social and cultural acceptability of IBNs? What design characteristics would maximize this acceptability?
2. How might social, cultural, and economic activities affect exposure to malaria in the study communities? Are IBNs likely to be effective at preventing malaria given the interaction between human and vector behavior?

Interviews and observations carried out to address these two questions led to many additional questions. As described in the literature, this is typical of the iterative process that drives qualitative research.<sup>38-42</sup> These additional questions and the data I collected to address them do not form part of the dissertation itself. Nevertheless, I list them here because they were part of the same research project and I have reported on them elsewhere.<sup>35, 43</sup>

3. How does the population of the study communities understand the etiology of malaria? What does the population see as being its range of options for preventing, diagnosing, and treating malaria? How does local knowledge of malaria etiology influence decisions about:
  - a. Which prevention measures to adopt in different situations?
  - b. What type of treatment to seek in different situations?
4. What does the study population see as its range of available options for preventing mosquito bites? What is the perceived efficacy of these different options in different situations and at different times? How do different dimensions of perceived efficacy (effectiveness, cost, ease of use) affect decisions about what prevention measures to use and when to use them?
5. To what extent do study area residents recognize the re-emergence of malaria and the development of antimalarial resistance in the region over the past decade? To the extent that people *do* recognize re-emergence and resistance, how do they explain these phenomena? To what, if anything, do they attribute the epidemiological changes identified by the biomedical and public health communities? How might local knowledge related to re-emergence and resistance affect:

- a. Acceptability of new lines of malaria treatment introduced by the biomedical health sector?
- b. Use of alternative therapies including herbal or supernatural treatments?

### ***Capacity building and intervention development objectives***

The five capacity building objectives described below were developed jointly with the MOH, *Proyecto Vigía*, and the National Malaria Control Program.

1. Assist health personnel from the MOH in developing more appropriate and effective malaria prevention and treatment interventions and behavior change communication (BCC) campaigns by incorporating information on the social, cultural, and economic context of the study population.
2. Use the findings from research question 1 and previous formative research to develop Trials of improved practices (“TIPs”) for malaria prevention that:
  - a. Test the feasibility of treating of bed nets at home;
  - b. Develop acceptable methods for storing and washing bed nets so as to maximize the effective life of the insecticide;
  - c. Determine if a multifilament polyester net with different fabric characteristics can overcome the problems reported with WHO standard 156-mesh nets;
  - d. Recommend an improved strategy for employing IBNs as part of an integrated malaria prevention program.
3. Use findings from data collection related to local understandings of etiology, re-emergence and resistance, and drug use to develop recommendations for the MOH



- about how to increase adherence to prescribed malaria treatment and decrease the potential for abandonment of treatment.
4. Provide training for MOH program managers in the use of qualitative research techniques for program development and evaluation.
  5. Understand media use patterns among the target population to recommend and select appropriate media channels for BCC campaigns.

## **Background**

### ***Malaria in Peru***

#### **Epidemiological context**

While malaria was never completely eliminated in Peru, transmission remained very low throughout the 1980s, with only 32,000 cases reported nationwide in 1988.<sup>27</sup> The disease re-emerged as an important public health problem in the early 1990s and by 1994 the country reported 122,039 cases distributed between the northern coastal region and the Amazon basin.<sup>44</sup> In 1997, Loreto, the largest department in the Peruvian Amazon, experienced an epidemic outbreak with 122,244 cases. From 1998 to 2001 the number of cases in Loreto declined steadily but began to climb again in 2002.<sup>\* 45, 46</sup>

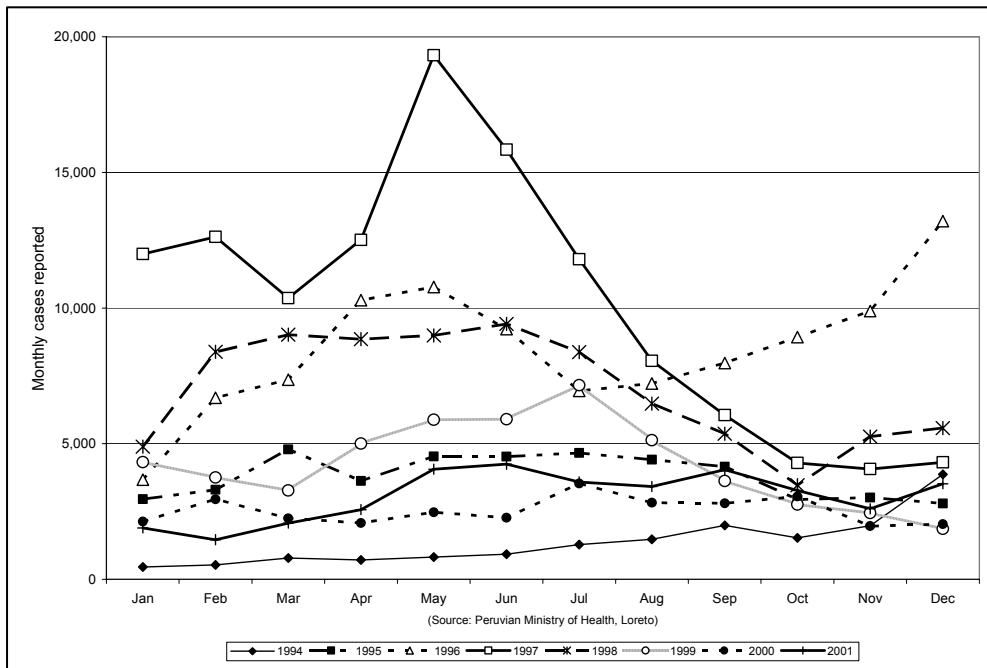
Malaria in Loreto can be currently characterized as hypoendemic. It follows an unstable transmission pattern, though a recent cross-sectional study in the project area found PCR-positive rates as high as 14.2% for *P. vivax*.<sup>47</sup> This same study reported that about 1/3 of PCR-positive cases were asymptomatic, a somewhat surprising finding given

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\* These numbers are based on my own review of Loreto MOH Malaria Control Program surveillance records. They are consistent with published reports from other sources (Celis 2003).

that unstable transmission is thought to provide insufficient exposure to develop partial immunity. Incidence varies greatly across the year with a large peak often occurring sometime between May and July and another smaller peak sometime between early November and late January. However, as shown in Figure 1, it is difficult to define a consistent seasonal pattern: in some recent years there have been no peaks; in others they have occurred outside the normal range.

**Figure 1: Seasonal change in malaria transmission, Loreto, Peru 1994-2001**  
(Combined vivax and falciparum malaria)



As early as 1996, there was evidence of *P. falciparum* resistance to both chloroquine (CQ) and sulfadoxine-pyrimethamine (SP) in the province of Maynas.<sup>48</sup> More recently, there has been evidence of *P. vivax* resistance to CQ as well.<sup>49</sup> As a result, the Ministry of Health was using quinine and clindamycin or quinine and tetracycline as first-line drugs for treating *P. falciparum* during 2000–2001. In November 2001, the MOH switched to a regimen of mefloquine and artesunate, reserving quinine, clindamycin, and tetracycline for

treatment failures.<sup>50</sup> At present, a combination of CQ and primaquine remains the first-line treatment for *P. vivax*.\*

## **Malaria control activities**

During the 1997 epidemic, the MOH responded initially with a massive effort at opportune case detection and treatment. In 1998, with the outbreak more under control, the MOH broadened its focus to incorporate health education and vector control campaigns. These efforts have included indoor residual spraying, application of larvicide in ponds and bodies of standing water, and distribution of IBNs in high-incidence communities. Between 1999–2000, the MOH distributed 82,000 bed nets treated with deltamethrin (25 mg/m<sup>2</sup>). The nets conformed to WHO-recommended specifications: 156-mesh, 100-denier white multifilament polyester. With support from the European Commission (EC), the MOH also developed and carried out a health communication campaign directed at schoolteachers in the provinces of Loreto, Requena, and Alto Amazonas.

By 2001, the MOH had stopped distribution of IBNs and was doing very limited IRS. Subsequent to the EC health communication campaign, health personnel and health facilities have continued interpersonal counseling on malaria prevention and treatment, but have carried out no additional BCC campaigns. Current malaria control efforts consist primarily of opportune case detection and treatment.

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\* Malaria diagnosis in Peru is parasite-based and relies principally on slide-microscopy though some remote areas have begun to implement diagnosis with rapid diagnostic tests. According to national guidelines, there is no presumptive treatment. However, since the health system may take as long as a week to report slide microscopy results, volunteer community health workers are allowed to begin treatment for *P. vivax* while awaiting definitive diagnosis. Officially, antimalarials are available only through the health system and are forbidden to be sold on the private market. In reality, CQ, PQ, SP, quinine, clindamycin and tetracycline are widely available in pharmacies and small shops as well as from itinerant vendors. At the time of this study, mefloquine and artesunate did not appear to be available on the private market and were not readily accessible to volunteer CHWs. MOH facilities distributed these drugs to patients only after a confirmed diagnosis of *P. falciparum*.

## **Economic burden**

A 1998 study commissioned by USAID and the MOH estimated the total economic burden of malaria in Peru at nearly \$40 million per year. This estimate included direct costs to the Ministry, to other health providers, and to families, as well as lost tourism revenues.<sup>51</sup> Absent a specific context, this \$40 million figure seems rather abstract. But at a household level, these costs amount to about \$85 per malarial episode, including treatment, transportation, and time lost at work due to illness and disability.\* Gross national income per capita in Peru was \$2,150 in 2003.<sup>52</sup> Subsistence farming households in the Amazon region would earn considerably less, so \$85 per malarial episode is a substantial amount. These household costs account for about \$26.7 of the \$40 million. The Ministry spent about \$9.3 million, other institutions about \$1.2 million, and the study estimates lost tourism revenues at around \$680,000.

## **Entomological context: behavior of the principal vector**

To evaluate the potential usefulness of IBNs and the risk of different daily activities, it is important to know something of *Anopheles darlingi*, the principal malaria vector in the project area. *An. darlingi* was thought to have been eliminated from South America in the late 1960s, but began to reappear in both Brazil and Peru in the early 1990s.<sup>53,54</sup> Recent studies have found *An. darlingi* to be ubiquitous throughout the Department of Loreto.<sup>55</sup> Flores et al. (2004) performed enzyme-linked immunosorbent assay (ELISA) tests on 82,000 anophelines captured in the Departments of Loreto and Ucayali, Peru. Of the 13 different species tested, only *An. darlingi* and *An. benarrochi* were found to be positive

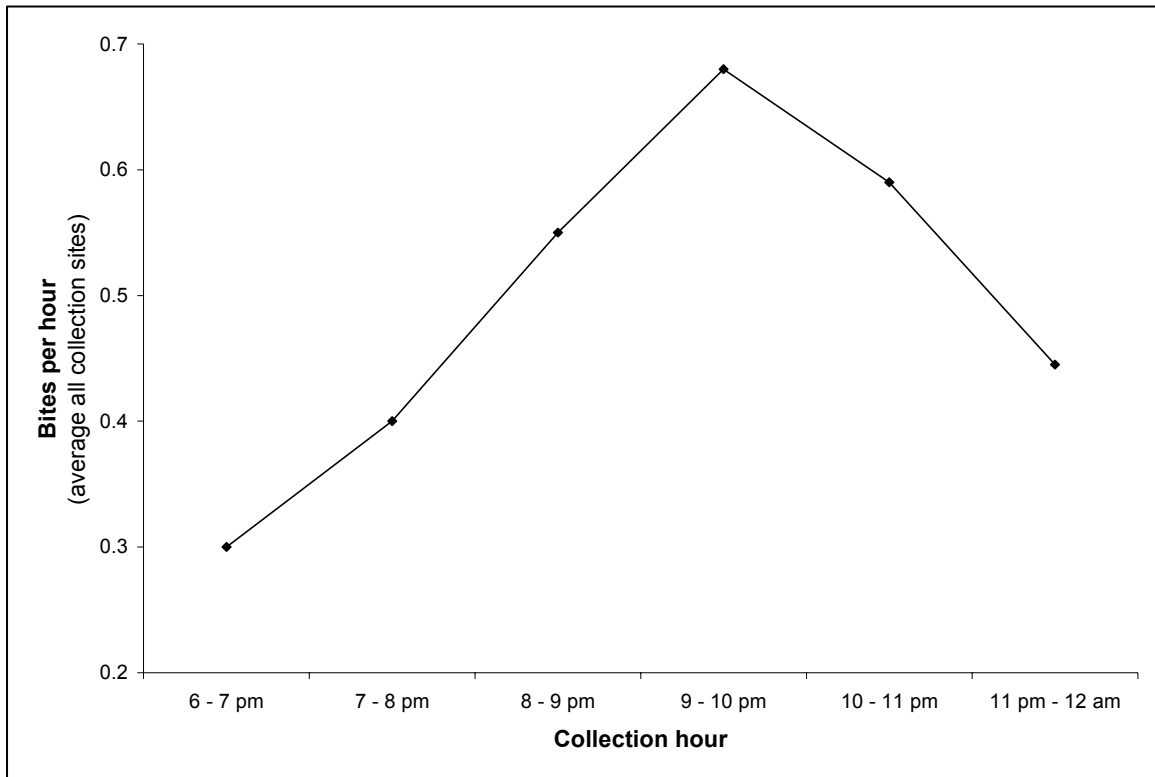
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\* The same study calculated the annual expenditure on prevention at less than \$50 per household nationwide and only around \$13 per household in Loreto, the Department discussed in this paper.

for *Plasmodium* circumsporozoite proteins. Infection rates among *An. darlingi* (0.98%) were considerably higher than those among *An. benarrochi* (0.14%)<sup>56</sup> Interestingly, though between 2/3 to 3/4 of reported malaria cases in Loreto are *P. vivax*, infection rates in *An. darlingi* were higher for *P. falciparum*.<sup>56</sup>

To better characterize *An. darlingi* feeding behavior, Vittor carried out human landing collections of adult mosquitoes from December 1998–June 1999 and again from September 2000–August 2001.<sup>34</sup> During the first period, Vittor’s team collected mosquitoes from eight sites between km 7 and 48 of the Iquitos-Nauta highway and from 20 sites along the Nanay and Pintuyacu Rivers. Collections took place from 18:00–06:00 with each site being sampled once per month over the six-month period. During the second period, collections took place at 56 sites between km 7 and 72.5 of the Iquitos-Nauta highway. Collection sites during this period were representative of the different ecological zones found in both inhabited and uninhabited areas of the jungle. The 56 sites included 16 villages. Collections took place from 18:00–24:00 each night. Since the collection sites included some of the project villages as well as others with similar characteristics, the information should be quite relevant to risk of exposure in the project area. As shown in Figure 2, Vittor found that peak biting time for *An. darlingi* in the project area occurs between 21:00–22:00. She also found that the density of *An. darlingi* was much higher in settled areas than in primary- and secondary-growth forest. Unfortunately, Vittor’s collections occurred in a year with an unusually low density of *An. darlingi*. It is not clear why so few *An. darlingi* were present in 2000–2001 as compared to earlier years. It is also not clear what effect, if any, this unusually low density might have had on feeding behavior.

**Figure 2: Hourly biting behavior of *An. darlingi* in the project area**  
(Vittor, 2003)



Vittor's findings are similar to some studies and different from others. Two studies from the Brazilian Amazon in the late 1980s and 1990s observed a bi-modal pattern in *An. darlingi* feeding, with one peak around dusk (about 18:00) and another around sunrise.<sup>32, 33</sup> However, the principal investigator from the first study also recorded a single biting peak around midnight in some areas.<sup>32</sup> Both studies report a mix of indoor (endophagic) and outdoor (exophagic) feeding. Collections in Suriname in the 1980s showed a single biting peak around 23:00.<sup>57</sup> More recent collections carried out in central Belize during 1993–1994 from 18:30–20:00 p.m. found that *An. darlingi* tended toward endophagic behavior at a ratio of 1:0.6. *An. albimanus*, the species competing with *An. darlingi* as a malaria vector in the region, tended to be more exophagic (ratio 1:0.21).<sup>58</sup> In Costa Marques,

Brazil, Klein and Lima found a bi-modal crepuscular biting pattern with peak hours varying according to changes in sunset and sunrise throughout the year. Some biting activity continued throughout the night. The population was most abundant “during late wet season and early dry season when Costa Marques was flooded on 3 sides by water.” However, seasonal abundance varies in other areas and may be influenced by other climatic factors.<sup>59</sup> In another paper, Klein, Lima, and Tang note that *An. darlingi* exhibited the strongest anthropophilic and endophagic tendencies of all anophelines captured in the area. However, they still characterize *An. darlingi* as a about equally endo- and exophagic.<sup>60</sup> Rosa-Freitas, et al., found three distinct biting patterns in three different regions of Brazil:

The Costa Marques population displayed a bi-modal cycle with a major peak at sunset and a minor one at sunrise. Dourado had a trimodal cycle, with the main peaks at both morning and evening twilight periods and a minor peak at 2300 h. Juturnaiba showed no crepuscular peaks but there was a slight increase in activity at 2000 and 0100 h.<sup>61</sup>

The authors describe *An. darlingi* as exophilic in Dourado and imply, but never state directly, that it is more endophilic elsewhere. A study on *Anopheles darlingi* behavior was conducted in the area of Padre Cocha—about a half hour downriver by boat from the city of Iquitos—from April to August 2000. Collections were conducted using human volunteers, and 98.3% of anophelines captured were *An. darlingi*. This study showed a biting peak beginning before sunset and continuing until 21:00 with a smaller peak of activity at midnight. *An. darlingi* was observed to feed both indoors and outdoors and was entirely anthropophilic.\* Some have suggested that the different feeding behaviors observed in different locations and at different times are evidence that *An. darlingi* may be a species complex rather than a single species. Others argue that both genetic and morphological evidence is more consistent with a single species.<sup>62</sup> Whatever the differences in behavior, there does seem to be consensus on

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\* Dr. Carmen Flores, personal communication.

several points: (1) *An. darlingi* exhibits stronger anthropophilic tendencies than other anophelines in its habitat; (2) while its biting peaks may (but do not always) occur at dusk or dawn, some biting activity takes place throughout the night; and (3) though some feeding and resting may take place outdoors, it always exhibits significant endophagic and endophilic behavior. All three points suggest that IBNs should offer an important degree of protection from infective bites, even if they do not offer complete protection.

## **Methods**

### ***Theoretical orientation of the research***

#### **Psycho-social behavior change theories**

In early 2000 when I proposed an ethnographic study on malaria prevention to the Peruvian Ministry of Health and *Proyecto Vigía*, their first question was, “why go to all that trouble and expense, why not just do a KAP (Knowledge, Attitudes, and Practices) survey?” Of course, one answer to this question was that the Ministry had already done KAP surveys in rural villages around Iquitos. These surveys demonstrated that most respondents “knew” that malaria was transmitted by mosquitoes and also “knew” that IBNs could help protect them against mosquito bites. As described earlier, the Ministry had already distributed over 40,000 IBNs the previous year and was set to distribute another 40,000 or so during calendar year 2000. But malaria control program officials had heard anecdotally that many net recipients weren’t using their IBNs and weren’t taking other Ministry-recommended protective measures such as bathing before dusk or going to bed before peak biting hours. How could this be?

Part of the answer is best illustrated by an incident that occurred on a field visit in late 1999 or early 2000. Elli Leontsini and I were walking one morning through the



village of Villa Buendía (a pseudonym), shortly after reviewing this KAP survey “knowledge” data. Leontsini expressed skepticism about the extent to which village residents accepted the idea that malaria is transmitted only by mosquitoes. We stopped by the house of a 60-some year old woman whom I’ll call Doña Rosa, and Leontsini asked her, “Señora, where does malaria come from?”

“It comes from mosquitoes, doctora” came the answer.

“Ah,” Leontsini continued, “how did you learn that it comes from mosquitoes?”

“The people from the Ministry tell us that,” Doña Rosa replied.

“Yes, that is what they say,” Leontsini responded, “but what do *you* think?”

“Well, they’re the doctors, they should know...”

“Sure, they’re the doctors, they should know, but really, what do *you* think?”

“If you want to know the truth,” Doña Rosa said, “*I* think malaria is a punishment from God (*un castigo de Dios*) that comes when we don’t act the way we should.”

Doña Rosa told us that she slept inside a net even though she didn’t believe mosquitoes cause malaria because her house had no walls and it gave her some feeling of security at night. She showed us a non-impregnated rectangular net hanging over her platform bed; the net was made of *tocuyo*, a coarsely finished opaque muslin. She had received a nylon IBN from the Ministry, but said she had stopped using it because it was too transparent and she didn’t like the idea of people being able to look at her while she slept. Also, sleeping inside the nylon net scared her grandchildren because they could see outside and would start to imagine what might be coming after them from the jungle. Finally, she said, the nylon net let in too much air and made her cold at night; in contrast, the *tocuyo* net kept her warm.

Had Doña Rosa responded to a KAP survey, she would have been counted as a person with “correct” knowledge about malaria whose attitudes and practices, for some reason, hadn’t changed. For many health systems, the typical response to such a situation is to carry out more “health education”: send doctors or nurses out to villages (or bring volunteer community health workers in) to provide more training; perhaps give a more detailed explanation of the parasite life-cycle and the role of the mosquito in sustaining that cycle. The “more education” prescription is typical because the premise of KAP surveys is that a change in knowledge will produce a change in attitude which, in turn, will produce a change in behavior. If the behavior hasn’t changed, it must be because of insufficient knowledge.

The KAP behavior change model, if one can call it that, is extremely simple.\* At its most basic, it assumes that knowledge is the sole determinant of attitude and attitude the sole determinant of practices (behavior). Some health research demonstrates that behavior change may not happen in quite such a linear fashion: for instance a change in behavior might lead to a change in attitude or a change in attitude might lead to a desire to seek more knowledge. But even in this slightly more sophisticated form, the KAP model assumes that behavior is the result of individual choice; it lacks a construct to account for social or peer influence. Further, in the realm of disease prevention, it cannot explain behavior that might be motivated by factors unrelated to the disease, such as bed net use for privacy, security or warmth. Finally, it fails to consider other barriers, from conflicting explanations of etiology to economic limitations to issues of physical access.

What, then, about more elaborate psychosocial models of behavior change? The Health Belief Model (HBM) is probably the psychosocial model most widely used to

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\* Schematics of the different behavior change models discussed here appear in Appendix B.

explain health behaviors. The HBM was developed by the U.S. Public Health Service in the 1950s to help researchers understand why more people were not participating in free tuberculosis screening (chest x-rays).<sup>63</sup> The model posits that individuals make decisions about preventive measures for their health influenced by a variety of background factors (education, age, sex, race, ethnicity) and two sets of complementary perceptions: the degree to which they feel threatened (perceived susceptibility to + perceived severity of the illness in question), and their expectations about the protective behavior (perceived benefits minus perceived barriers to adopting the behavior and perceived self-efficacy to carry out the behavior). HBM was well-suited to analyzing participation in TB screening because deciding to participate was an action most individuals could presumably take on their own. Participation was free and involved minor inconvenience or opportunity cost.

In recent times, HBM has been used to analyze traveler adherence to malaria prophylaxis regimens, to explain why some travelers continue taking their antimalarials for the prescribed time after returning from an endemic area and why others do not.<sup>64, 65</sup> HBM probably makes sense in this context as well. Because most travelers from non-endemic countries (e.g., Europe, North America) have limited experience with malaria, it is probably safe to assume that they see the disease as a threat and accept the biomedical explanation of its etiology. Antimalarials are readily available, and most international travelers (at least most adult international travelers) have the individual agency to decide whether to take them. There is little need for group reinforcement and little concern about possible normative consequences.

HBM is much less adequate for explaining prevention or treatment seeking decisions among residents of malaria endemic regions. First, HBM has limited ability to

deal with pluralistic models of health and competing etiologies. For instance, studies in Kenya and Tanzania show that many caregivers in high-transmission areas see uncomplicated malaria as a benign illness transmitted by mosquitoes and cerebral malaria as a serious illness caused by spirits.<sup>66, 67</sup> If, as has been recorded in Peru, one believes that malaria is a *castigo de Dios*, or caused by eating “hot” foods such as pork or mango, drinking contaminated water, ingesting mosquito larvae, or spending too long in the sun on an especially hot day, HBM provides no help predicting bed net use or propensity to take a blood test for diagnosis.<sup>43, 68, 69</sup> In these cases, it makes no sense to talk about perceived susceptibility or perceived benefits of adopting a behavior since the population in question does not accept the premise upon which these categories are based.

Second, HBM has nothing to say about situations in which the principal motivation for adopting a behavior may be unrelated to health, such as sleeping under a bed net for reasons of privacy or because it’s warmer or to prevent “nuisance” insect bites. Similarly, it has nothing to say about access: I may be predisposed to treat my net, but what if, as is the case in Loreto, the appropriate insecticide is not available? I may be anxious to get diagnosed, but what if there is no microscopist or no microscope? HBM also lacks a construct for dealing with social norms, for instance frequent washing of ITNs because, by prevailing standards of hygiene, my neighbor will consider me filthy (*cochino*) if my net is dusty or stained. Finally, HBM offers no construct for understanding the role of superstructural factors, the political and economic decisions taken by governments or disease control programs that influence individual malaria exposure and limit individual options for protection and treatment.

After the Health Belief Model, the Theory of Reasoned Action/Theory of Planned Behavior (TRA/TPB) is probably the second-most common behavior change framework in public health. Developed in 1967 by Ajzen and Fishbein, TRA/TPB focuses on behavioral intention as the most important determinant of whether an individual decides to perform a certain behavior. In TRA, behavioral intention is influenced by the actor's attitude toward the behavior in question and his or her 'subjective norm.' Attitude is composed of the actor's beliefs about both the behavior and the likely results of performing it. 'Subjective norm' refers to the actor's appraisal of the extent to which the target behavior is normative in his or her social setting and his or her motivation to comply with (or reject) a social norm. To these components, TPB adds perceived behavioral control, meant to account for situations in which the actor faces external barriers to performing the behavior. Perceived behavioral control consists of a balance between control beliefs and perceived power. Montaña and Kasprzyk explain these concepts as follows:<sup>70</sup>

...perceived control is determined by *control beliefs* concerning the presence or absence of facilitators and barriers to behavioral performance, weighted by the *perceived power* or impact of each factor to facilitate or inhibit the behavior. Thus a person who holds strong control beliefs about the existence of factors that facilitate the behavior will have high perceived control over the behavior. Conversely, a person who holds strong control beliefs about the existence of factors that impede the behavior will have low perceived control over the behavior. (italics original)

TRA/TBP is not necessarily health- or disease-dependent: in theory, it could be applied to explain decisions about any behavior. As a result, it may be better equipped than HBM to deal with pluralistic health systems, competing etiologies, and 'disease prevention' decisions taken for reasons unrelated to health (such as sleeping under a bed net for privacy). Further, TRA/TPB claims to be exhaustive in terms of the determinants of human behavior: "Both theories assume that all other factors including demographics

and environment operate through the model and do not independently contribute to explaining the likelihood of performing a behavior.”<sup>70</sup> Seemingly, then, TRA/TPB should be much more suited than HBM to analyzing people’s decisions about using IBNs. In fact, the first of the previously cited studies on adherence to malaria prophylaxis among travelers drew more from TRA/TPB than from HBM.<sup>64</sup>

But TRA/TPB, too, is lacking for at least two reasons. First, there is limited experience using TRA/TPB in international health settings. A Medline search using “Theory of Reasoned Action” or “Theory of Planned Behavior” combined with “malaria” turned up only the two aforementioned articles. The same two search terms used in all possible combinations with “international health,” “HIV/AIDS,” “AIDS,” and “Tuberculosis” turns up about 25 articles, most related to HIV prevention in Africa with a few on other themes ranging from contraceptive use to sugar consumption.<sup>71-75</sup> The closest fit to malaria in Latin America was a series of three articles related to Mexican migrant farm worker participation in TB screening programs in the U.S.<sup>76-78</sup> But application of TRA/TPB depends on scale construction and validation which has not taken place either for malaria or for Latin America. Second, while TRA/TPB claims to include all external influences on individual behavior within the “perceived behavioral control” construct, it is difficult to see how one could usefully analyze factors related to superstructure, ecology, economy, infrastructure, and so on all lumped together into a single group. Without ability to disaggregate such factors in a meaningful way, the construct might better be named “all other unexplained variance.” To put it another way, claiming that all non-specified factors “operate through the model and do not independently contribute to explaining the likelihood of performing a behavior” is

tantamount to declaring by fiat that any phenomenon *not* specified in the model cannot, by definition, be a determinant of behavior.

To their credit, proponents of TRA/TPB insist that the constructs which determine behavioral intention in any particular situation are not fixed features, but must be established in advance through careful formative research. As Montaño and Kasprzyk explain:<sup>70</sup>

We cannot stress enough the importance of conducting in-depth, open-ended elicitation interviews to identify the behavioral, normative, and control beliefs that are relevant to the particular behavior and population under investigation... This process allows one to ground the measures empirically as well as identify information that can later be used in the process of designing specific intervention messages.

The two authors go on to say that focusing on a few factors in each construct may not produce accurate results if the selected factors “are a small proportion of the total set of beliefs affecting intentions.”

In Montaño and Kasprzyk’s terms, the research I describe here begins at the elicitation stage. My objective in carrying it out was neither to create a behavior change nor to measure the factors contributing to such a change, but rather to understand *existing* behavior and the different factors that contribute to it as a step towards building a framework for successful behavior change efforts in the future. To put it another way, my task was not so much to *test* a hypothesis as to gather sufficient information to *generate* a hypothesis. In light of this objective, an ethnographic approach was more appropriate than a psychosocial behavioral model. In Malinowski’s words, the goal of ethnography is “to grasp the native’s point of view, his relation to life, to realize *his* vision of *his* world.”<sup>79</sup> Applying an ethnographic approach obligates the researcher to begin fieldwork without preconceived notions about the determinants of a local behavior or the meaning of that behavior to the people who practice it. What leads people in a malaria-endemic region to reject IBNs and continue their non-impregnated *tocuyo* nets?

One possible explanation is “insufficient knowledge” of the malaria transmission cycle (or a stubborn lack of willingness to abandon “incorrect beliefs”). But there are many other possible explanations. Perhaps *tocuyo* nets serve functions other than malaria prevention for which IBNs are inadequate or inappropriate. Perhaps IBNs have some characteristic that makes caring for them more difficult or bothersome than caring for a *tocuyo* net. Perhaps potential users of Ministry-distributed IBNs have concerns about the potential health effects of the insecticide. If some combination of these and other factors help explain people’s net-related behavior, it might be possible to determine whether some existing behavior change framework fits or can be adapted to the particular circumstances. But before establishing if and how people use nets and what potential net users can tell us about the meaning of this use or lack of use to them, applying a pre-packaged model would be overly limiting and overly reductive.

### **Approaches from medical anthropology**

To develop a complete picture of malaria prevention and care-seeking practices in the Peruvian Amazon, we would need to draw on at least three approaches from medical anthropology: ethnomedical, ecological, and critical. The ethnomedical approach is particularly useful in coming to understand how local explanations of disease etiology affect prevention and care-seeking decisions. These local explanations may derive from constructs such as the humoral or animist understandings of illness at work in the Peruvian Amazon. Robert Hahn’s Anthropology in Public Health provides numerous examples of this type of analysis, from Winch’s taxonomy of febrile illness in Tanzania to McCombie’s work on the different meanings of the word “flu” in the United States.<sup>80,81</sup> Local explanations may also derive from individual explanatory models of illness that draw upon



larger cultural constructs but are adapted to the particular circumstances of the sick individual and change over time as that person's situation and understanding of it change.<sup>82</sup> In the context of this dissertation, an ethnomedical approach is helpful in evaluating the extent to which bed net use is driven by local knowledge about malaria transmission. Ethnomedical analysis also informed my work on local techniques for preventing mosquito bites and local understandings about malaria's re-emergence and the development of drug resistance in the region. Though they are not the focus of my three papers, these topics were part of my dissertation field work; they are listed in the table of research activities below and described briefly in Appendix A.

The ecological approach is useful for understanding how the relationships between humans and environment in the affected region impact malaria transmission. As McElroy and Townsend explain in the latest edition of Medical Anthropology in Ecological Perspective, the core construct underlying this approach is adaptation: the process by which human biology, culture, and individual behavior adjust to fit a particular environment.<sup>83</sup> Over long periods of time, adaptation happens at the genetic level through mutations in gene alleles that provide a protective advantage against a particular pathogen, for instance the sickle cell trait that provides partial protection against malaria. But McElroy and Townsend point out that adaptation can also happen at the cultural, physiological, and even psychological levels in such a way that human relationships to a particular environment change within the lifespan of a single individual. Anthropologists have applied ecological analysis to such diverse problems as discovering the cause of kuru in New Guinea, analyzing the chewing of coca leaves in the Andes, and explaining malnutrition worldwide.

A critical approach would help sort out the macro-level political and economic factors influencing the re-emergence and spread of malaria in the Peruvian Amazon. Such an approach might begin with a study of how the rubber boom in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries led to development of a large city in formerly uninhabited jungle; how the subsequent bust with the rubber industry's move to Southeast Asia led to massive unemployment, turned Iquitos into a near-ghost town, and led former rubber workers to create small settlements based upon subsistence agriculture in the surrounding forest. A critical approach would go on to describe how the cycle repeated itself with the petroleum boom and bust in the 1980s and 1990s, how high levels of unemployment in both Iquitos and the Peruvian Sierra continue to drive in-migration, and how construction of the Iquitos-Nauta highway is making rural settlement easier, thus propelling deforestation which leads in turn to decreased biodiversity and greater human-vector contact.<sup>84</sup>

Critical medical anthropologists have criticized practitioners of both ethnomedical and ecological approaches as focusing too much on individual- or local-level determinants of health and ignoring the larger economic and political forces that put people's health at risk.<sup>85</sup> But the demarcations between one approach and another are less clear than they first appear. Paul Farmer's work on AIDS in Haiti is largely critical in orientation, but Farmer incorporates ethnomedical analysis into his research.<sup>86, 87</sup> Peter Brown's research on malaria in Sardinia combines ecological and critical elements. Brown discusses the "microparasitism" of *Plasmodium* and contrasts it with the "macroparasitism" of absentee landlords exploiting peasant sharecroppers:<sup>17</sup>

Although macroparasitism drains much more energy from the producer than microparasitism, it makes sense that the landlord class views the parasitic disease as an enemy. Improving the health and productivity of the peasant producer through malaria control has tangible economic benefits to the macro-parasites. The "real" enemy, of both the rich and poor, is identified as the microparasitic disease. The

conquest of malaria would not require any reconfiguration of patterns of macroparasitism.

In other words, by framing malaria as a problem of exposure to *Plasmodium*, wealthy landowners divert attention away from their own role in creating economic conditions that force people into sustained contact with a biological entity that is only the *proximate* determinant of disease. Introducing the new version of their text, McElroy and Townsend note that they continue to see an ecological framework as useful, but that their work has incorporated an increasingly critical perspective in recent years. The authors add that medical anthropology “with its emphasis on viewing humans as both biological and cultural creatures” offers a unique vantage point from which its practitioners can bridge and reintegrate the four sub-disciplines of the larger field.

If we define our task as figuring out whether IBNs are culturally acceptable and—assuming that they are—figuring out how to convince people to use them, a minimal amount of ethnomedical analysis within a mostly ethnographic approach may suffice. This analysis draws upon ethnomedicine because some study of non-biomedical health systems and some reference to local etiological understandings may be useful to promote IBN use. But the data needed to promote IBNs and understand why they are—or are not—culturally acceptable depend less on medical pluralism than on an understanding of the meanings and functions of bed nets in the local context. This latter task requires application of ethnographic *methods*, but not necessarily within the theoretical framework of ethnomedicine *per se*.

A successful IBN program, perhaps together with some other malaria prevention activities, may reduce harm by decreasing malaria transmission and morbidity. This harm reduction will make the intervention area safer and more comfortable, thus creating

an environment conducive to the cycle of increased settlement, deforestation, and human-vector contact described earlier. To explore the economic and social forces that drive this increased settlement (including public health interventions that make the area more attractive to the dispossessed) without attending to the ecological consequences or vice-versa, would be to leave half the story untold. A critical and ecological analysis that failed to address local symbology, meaning, and function might make for a lyrical academic analysis, but would not provide the basis for any short- or medium-term action. The issues are inextricably intertwined, and the mutual influences between and among them are too complex to explain in terms of a single approach. In my experience, this is true of most human behavior.

**Figure 3: A framework for malaria prevention & careseeking**

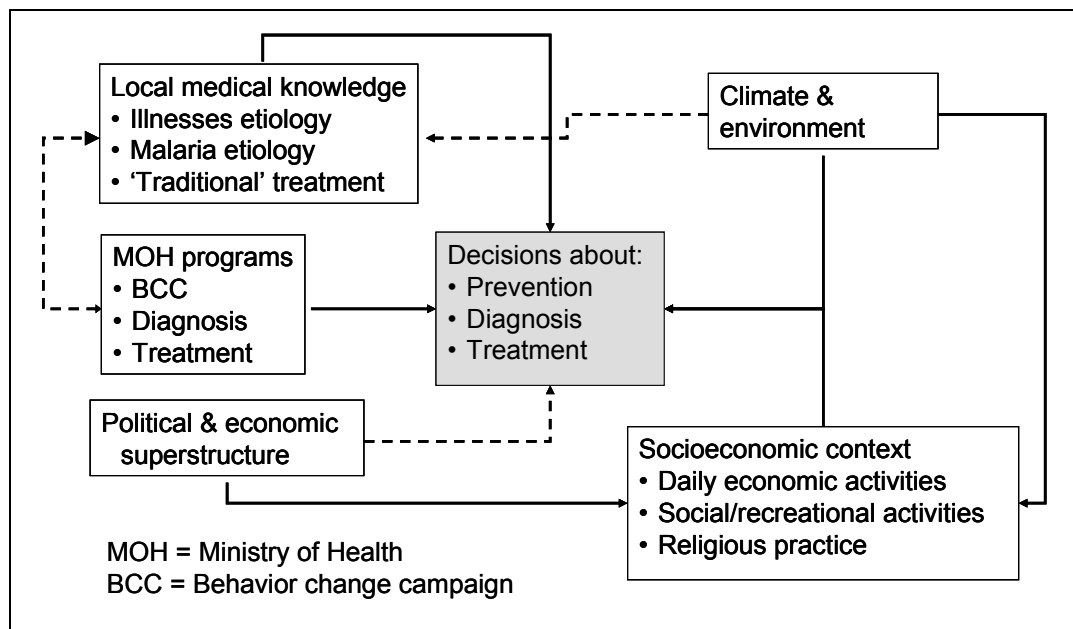


Figure 3 illustrates how these forces interact to influence malaria prevention and care-seeking behavior in the Peruvian Amazon. A diagram outlining how different theoretical perspectives apply to this situation appears in Appendix B. In practical terms, because of their relatively narrow focus, the three papers included in this dissertation

draw mostly on ethnographic analysis. This is complemented by limited forays into ethnomedicine, inasmuch as local conceptions of etiology influence bed net use.

### ***Study site characteristics***

The city of Iquitos is located at 3.75° S, 73.2° W in northeastern Peru at the confluence of the Amazon, Nanay, and Itaya Rivers. Most study activities took place in five small villages (*caseríos*) outside the city, three located along the Iquitos-Nauta Highway, two on the Nanay River. Selection of villages was made purposively with input from the MOH. Selection criteria included that each village have experienced a high incidence of malaria over the two years prior to the study, that each be located within two hours' travel time from the city of Iquitos, that each be reasonably typical of the semi-rural and rural mestizo communities around Iquitos, and that village authorities and residents agree to participate. After coordinating with village officials, we held community meetings in each village to present the project to residents, answer questions, and request community consent.

To protect the confidentiality of study participants, village names used throughout this paper are pseudonyms unless otherwise noted. Two villages, Villa Buendía and San Anselmo, participated in virtually all project activities. The other three, El Manantial, Santa Catalina, and San Pedro, were involved in some stages of the research, but not others. In addition to the five key villages, we carried out some activities in three additional communities located between kilometer 9 and kilometer 35 of the Iquitos-Nauta highway. All had characteristics similar to Villa Buendía. Table 1 in the section on detailed data collection methods below, lists the activities carried out in each village.

Villa Buendía, San Anselmo, and San Pedro share similar socio-economic characteristics including a mestizo population and an economy based on subsistence and small market

swidden agriculture, fishing, hunting, charcoal, and firewood production. A few families in Villa Buendía also distill a local liquor (*aguardiente de caña*). Though similar in character, El Manantial is located closer to the city and is more urbanized than the other villages. In addition to the activities mentioned above, El Manantial is the site of a brick factory.

At the time of the study, Villa Buendía was accessible by car during most of the year except when heavy rains washed out the 4 km unpaved road from the highway. San Anselmo was accessible on foot, about five km from the last point where a motorized vehicle could enter. Located along the banks of the Itaya River, San Anselmo is also accessible by boat from the port of Iquitos, a journey of about three hours. A small cargo boat passes twice daily: in late morning traveling up-river from the city and in mid-afternoon on its return. San Pedro is accessible via a combination of truck from Iquitos to the village of Santa Catalina and motorized canoe from the port of Santa Catalina. Both the cars running between Iquitos and Villa Buendía and the trucks and boats running between Iquitos and San Pedro are a form of privately owned and operated public transportation. The trucks from Iquitos to Santa Catalina run every half hour from dawn until dusk; the cars and canoes make several trips back and forth throughout the day but do not run on a regular schedule. El Manantial can be reached via an unpaved road off the Iquitos-Nauta highway. This road is usually better maintained than the road leading to Villa Buendía and San Anselmo, so it is accessible by car or truck during all but the rainiest parts of the year.

Villa Buendía and San Anselmo each have a volunteer health promoter, a village resident selected by the doctor in charge of the nearest health center in consultation with the community. When residents of these two villages have a health problem that cannot be treated by the health promoter or by an indigenous practitioner such as a *curandero* or

*vegetalista*, they go to the Varillal Health Center which serves many communities along the first 25 km of the highway and supervises several smaller health posts. Some residents of San Anselmo also use the health post in San Juan de Porres, another small village located on the banks of the Itaya River. San Pedro has its own health post, usually staffed by a nurse and an auxiliary nurse. The health post in San Pedro also serves four surrounding villages, located between a 15-minute and two-hour walk away. At the time of this study, San Pedro did not have a volunteer health promoter. El Manantial has a health post supervised by the Varillal Health Center. At the time of the study it was staffed sporadically by an auxiliary nurse. Santa Catalina has a full-sized health center staffed by a doctor and several nurses. A microscopist is usually on duty to read thick smears brought in from the surrounding area to diagnose malaria.

All villages have primary schools, constructed and staffed by the municipal government of Iquitos. Houses in Villa Buendía, San Anselmo, and San Pedro are of similar design: thatched roofs of braided palm leaves (*crisnejas*) and walls made of a slender, bamboo-like palm known as *pona*. El Manantial also has a few buildings constructed of cinderblock with corrugated metal roofs. Some houses are built directly on the ground and generally have dirt floors; others are built on a *pona* platform one to three meters off the ground. Open eaves leave a gap of about 750 cm between the walls and roof to provide ventilation. The edges of the *pona* slats used for walls and floor are butted up against one another, but not sealed. Windows, on houses that have them, are open and lack screens and panes. At the time of the study, Villa Buendía, San Anselmo, El Manantial, and San Pedro all lacked plumbing, potable water, and electricity. Nevertheless, a few households had television sets operated by car battery and many owned battery-operated radios or stereos.

Santa Catalina, the closest village of all to the city, is considerably more urbanized than the others. Almost all houses have electricity. A potable water system was installed in mid-2001. A large percentage of houses are made of cinderblock with corrugated metal roofs.

Based on a census taken in each village between 1999–2000 and updated in 2002, Villa Buendía had a population of 311, San Anselmo a population of 154, San Pedro a population of 255, El Manantial a population of 780 and Santa Catalina a population of 2,569. Santa Catalina residents have the most contact with the city due to both physical proximity and regular transportation. More distant, but still near the highway with its relatively cheap and rapid transportation, villagers from both Villa Buendía and El Manantial visit the city somewhat less often, perhaps 2–3 times per week. For residents of San Anselmo and San Pedro, transportation to Iquitos is more expensive and slower; many visit the city only once or twice a month.

### ***Initial data and implications for further research***

In-depth interviews and direct observations I helped carry out as part of the January 1999 to June 2000 project provide a starting point for much of the research described here.<sup>35</sup> The following section summarizes relevant findings from that study.

### **Social and economic activities**

As described earlier, principal economic activities in the project area include subsistence agriculture, small-scale commercial farming, fishing, and production of charcoal and bricks. In addition to daylight hours, a significant amount of work takes place before sunrise and after dusk. This coincides with some of the peak biting hours of *An. darlingi*. Nighttime worship by members of certain religious groups may also increase exposure to



infective bites. As part of this project, we looked more closely at how different economic and cultural activities might affect risk of malaria infection.

### **Insecticide impregnated nets**

During 2000, we carried out in-depth interviews with 14 residents of the project area who had received insecticide-impregnated nets from the Ministry of Health. Recipients liked the appearance of the fabric when new and the protection provided by the insecticide.

However, users reported that they did not like the fabric's open weave because it allows breezes to pass through, leaving them cold at night. As one informant explained:

Tocuyo is better because not much air gets in, it protects you better, it's nice and warm. Nylon is good when you have a really well built house (*una casa bien segura*), but when it's made of wood like this, the air gets in, and you know that we're humble people here and we don't have a lot of sheets to keep us warm, so the air hits you in the face and you get sick... especially the kids, they're always getting the flu or bronchitis (*se enferman de los pulmones*). (Woman, age 46)

The fabric's transparency was another drawback. In many households, all family members sleep together in a single room. An opaque *tocuyo* net offers the only privacy. Some informants report that children and even some adults feel exposed, vulnerable, and afraid sleeping in a transparent net: the opacity of *tocuyo* provides a sense of security at night. The white color was also a negative since the net quickly becomes stained with dirt and smoke. For all these reasons, some recipients elected not to use their polyester nets at all.

Based on this data, we conducted small-scale tests to determine what type of weave and color would be most acceptable to the study population. We then conducted household trials in three villages to test home-based treatment of existing *tocuyo* nets and use of a colored multifilament polyester net with a denser weave than the WHO standard.

## Detailed data collection methods

Table 1 summarizes the different data collection activities carried out over the course of the project. Data collection instruments for all project activities are included in Appendix C. The methods used for carrying out each activity are described in more detail below.

**Table 1: Summary of research activities completed, 2000–2002**

|                                                                 | Sample size | Santa Catalina | El Manantial | Villa Buendía | San Anselmo | San Pablo |
|-----------------------------------------------------------------|-------------|----------------|--------------|---------------|-------------|-----------|
| <b>Research activities included in this dissertation</b>        |             |                |              |               |             |           |
| Nighttime observations on bed net use                           | 60*         | X              | X            | X             | X           |           |
| Ethnographic interviews on bed net use                          | 28          |                | X            | X             | X           |           |
| Ranking: bed net fabric and color preferences                   | 28          |                | X            | X             | X           |           |
| Household Trials 1: Insecticide impregnated <i>toctuyo</i> nets | 15*         |                |              | X             | X           | X         |
| Household Trials 2: Testing of Jersey cloth nets                | 15*         |                |              | X             | X           | X         |
| Media use survey                                                | 170         |                |              | X             | X           | X         |
| <b>Additional research activities not described here</b>        |             |                |              |               |             |           |
| <b>1. Semi-structured interviews</b>                            |             |                |              |               |             |           |
| Malaria etiology—illness narratives                             | 19          |                | X            | X             | X           | X         |
| Re-emergence of malaria; antimalarial resistance                | 11          |                |              | X             | X           | X         |
| Illness classification; traditional vs. modern medicine         | 8           |                |              | X             | X           | X         |
| <b>2. Structured interviews</b>                                 |             |                |              |               |             |           |
| Seasonal calendars                                              | 15          |                |              | X             | X           | X         |
| Free-listing: preventing mosquito bites & malaria               | 79          |                |              | X             | X           | X         |
| Perceived efficacy: methods for preventing mosquito bites       | 30          |                |              | X             | X           | X         |
| Ranking & pile sorts: knowledge and use of antimalarials        | 28          |                |              | X             | X           | X         |
| Malaria treatment norms (health promoters, 2001)                | 10          | X              |              | X             | X           | X         |
| New <i>P. falciparum</i> treatment (health promoters, 2002)     | 10          | X              |              | X             | X           | X         |

\* The sampling unit for activities marked with an asterisk was a household. Season calendars were completed through small-group interviews with 3–8 participants. In all other cases, sample size refers to the number of individuals interviewed.

## Nighttime household observations

Between February 4 and June 21, 2000, I worked with three other observers to complete continuous monitoring observations in 60 different households in the four study villages. Our objective was to determine:

- The proportion of area residents sleeping under some type of bed net;
- What types of bed nets were in use including the percentage of each type;
- What types of beds were in use and how type of bed and manner of bed net use might affect exposure to infective mosquito bites;
- The times at which people bathed and went to bed and the extent to which these times were consistent with MOH recommendations;
- What other nighttime activities might affect exposure to infective bites.

Each observer worked individually, arriving at the household to be observed between 17:30 and 18:30 in the evening and remaining until between 06:30 and 07:30 the following morning. Upon arrival, the observer introduced himself or herself to all household members present and explained that the purpose of the visit was to better understand how people in the village lived on a daily basis so as to determine better ways to prevent malaria. To avoid drawing undue attention to bed net use, observers were instructed to avoid specific mention of bed nets in their introduction and instead to focus on the project's need to learn more about general living conditions in order to design prevention strategies appropriate to the lives of area residents. The observer then asked an index individual—generally the female head of household—to list the name, age, sex, and relationship of each household member. After recording this information, the observer requested a tour of the house, noted the number and type of beds and bed nets, and asked their “guide” to indicate which household members slept in which beds. Following the introduction, the observer stationed herself or himself in as inconspicuous a place as possible within the household, tried to minimize contact with household members, and made a running description of all household activities at intervals of five minutes throughout the night. In addition to these

free-form notes, we recorded the time at which each bed net was set up, if and how the net was secured, the time at which each household member went to bed, and any discrepancies between reported and observed behavior.

We selected observation households purposively to represent the different geographic areas and environmental conditions of each village: close to and up to 45 minutes walk away from the village center, near and more distant from the riverbank, larger and smaller household sizes, and so on. Socioeconomic status was another selection criteria. Though all households in the study villages were poor, some were relatively better or worse off. We tried to maximize socioeconomic variation in each village. Observers obtained written informed consent from each participating household before carrying out observations.

All field notes were first expanded by each observer then typed into word-processing files. Working with my field coordinator, Maribel Paredes, I read each transcript individually and made notes on themes of potential interest. We discussed each potential theme among ourselves and with other co-investigators (PW and EL). I then coded and made a thematic analysis of the transcripts using ATLAS.ti version 5.0. I describe this process in detail in paper #1. We used Stata version 8.2 to carry out a descriptive analysis of household characteristics including family composition, number and type of beds and bed nets, and the hour at which household members bathed and went to bed when this was possible to observe. This, too, I describe in detail in paper #1.

## Structured interviews

### ***Bed net fabric and color preferences***

Given the dissatisfaction reported with 156-mesh IBNs distributed by the MOH during 1999–2000, we decided to test the acceptability and feasibility of home-based treatment of existing nets (mostly *tocuyo*) as well as use of a different type of pre-treated synthetic net. To determine what netting material would be most acceptable to residents of the project area, we had study participants examine swatches of several different colors and weaves and tell us what they thought would be the advantages and disadvantages of using each type of fabric for a bed net. For these tests, we obtained swatches of fabric from Siamdutch Mosquito Netting Company, the manufacturer from which the Peruvian MOH had purchased nets for distribution in Loreto. From the market in the Belen district of Iquitos, where most residents of the study area purchase their *tocuyo* nets, we also obtained swatches of the three most commonly used local fabrics.

Siamdutch produces polyester nets in five colors: light blue (*celeste*), pink, lime green, olive drab (*verde olivo*), and white. They make fabric in four densities: 156 mesh (12x13 holes per square inch), 196 mesh (14x14 holes per square inch), tri cot (about 15x15), and jersey-cloth (about 20x36). The three most popular local fabrics are single ply *tocuyo* (“*tocuyo simple*”), double ply *tocuyo* (“*tocuyo doble*”), and a more finely finished bleached cotton often used for embroidery (“*tela playa*”). *Tela playa* is considered the most desirable netting fabric by many because of its brighter white color and its soft feel after washing. However, it is used much less frequently than *tocuyo* because of its higher cost.

To make clear which fabric characteristics we were testing, we assembled two separate sets of swatches, one for colors, the other for weaves. Each swatch measured approximately 16x20 cm. Color swatches were all of identical material: 156-mesh 75-

denier multifilament polyester. Weave swatches were all white or, in the case of *tocuyo*, off-white. Both *tocuyo* and *tela playa* are heavily starched and quite stiff when new. To make the swatches of these fabrics more closely resemble bed nets in everyday use, we hand washed them with water and a locally popular brand of soap. Since some of the fabrics with different density weaves are quite similar in appearance, we labeled the border of each swatch with a code to help the interviewers distinguish between them. We then mounted each swatch on an identical cardboard strip. The cardboard strip concealed the codes so that the fabrics, when presented to an interviewee, were identical in appearance except for the characteristic being tested.

Interviews consisted of a structured questionnaire with the same questions asked of each interviewee in the same order. We developed the questionnaire, field tested it in non-study communities, then revised it before beginning interviews. Each interview included the following steps: after obtaining the interviewee's informed consent, the interviewer would explain the exercise guided by a written script printed on the data collection form. The interviewer would then present the different color swatches to the interviewee in random order, ask the interviewee to examine each swatch, and then choose the best, most appropriate color for a mosquito net.

Once the interviewee selected his or her first preference, the interviewer would ask him or her to select the second best color, then the third best, and so on until the interviewee had ranked all colors from best to worst. The interviewer would then pull out the interviewee's first choice and ask him or her what about this color made it best or most practical for a mosquito net. After recording the interviewee's answer, the

interviewer would select the interviewee's last choice and ask what made it a poor or impractical color for a bed net.

The interviewer would then put away the color swatches, present the interviewee with the weave swatches, and follow a similar procedure. Each interviewee would examine and rank the swatches and explain the benefits of his or her first preference in fabrics and the drawbacks of his or her last preference. Since we were particularly interested in identifying a culturally acceptable polyester material with a denser weave, we also asked each interviewee to discuss the pros and cons of the tri cot and jersey-cloth swatches if these were not chosen as a first or last option. After completing each interview, the interviewer would shuffle the fabric swatches so as to present them to the next interviewee in a newly randomized order.

Interviewees were chosen purposively from among the populations of El Manantial, Villa Buendía, San Anselmo, and San Pablo. Selection criteria included:

- that all interviewees be permanent residents of communities within the study area;
- that there be a roughly equal number of men and women;
- that the sample include a range of ages; and
- that each interviewee be potentially capable of making decisions for themselves or their family about what type of mosquito net to use.

Our target sample size for this activity was approximately 30 individuals. As described by Weller and Romney, 20–30 interviews of this type is sufficient to accurately determine a cultural preference or value within a fairly homogeneous population such as that of our study area.<sup>88</sup>

Interview responses were entered into Microsoft Access. Numerical data from the interviews were then analyzed using Microsoft Excel. Average scores were calculated

for each color and fabric type. These scores were then ranked from lowest to highest, lowest being the most preferred choice, highest the least preferred. Textual data (explanations of each interviewee's choices) were analyzed by hand.

## **Household trials of improved practices (“TIPs”)**

### ***Phase 1: Home-based treatment of tocuayo nets***

Trials of improved practices (TIPs) are a form of operations research used to test and refine potential health interventions on a small scale before introducing them broadly. Through TIPs, health researchers enter into a dialogue with the target population: a small number of individuals agree to try several different practices over a period of time and discuss with the investigators the pros and cons of each practice. Working together, researchers and participants identify interventions that both address the health problem and are feasible and culturally acceptable to the target population. By drawing on the experience of TIPs participants, researchers can pinpoint potential obstacles to implementation, develop strategies for overcoming these obstacles and discard those components of an intervention for which the obstacles appear insurmountable. TIPs have been applied in the fields of nutrition, vector-borne disease prevention, and other areas of health.<sup>89-91, 92</sup>

Field trials show that synthetic netting fabric maintains residuality longer than cotton when impregnated. Even so, we decided to test home-based treatment of cotton nets because of the overwhelming popularity of *tocuyo* in the project area. Objectives for our trial of home-based *tocuyo* net treatment included:

1. Test the feasibility of individuals treating their nets with insecticide at home;
2. Test the perceived efficacy of impregnated *tocuyo* nets on the part of people who use them;



3. Test the feasibility of asking net users to take down their net every morning and store it in a dark place (pyrethroid insecticides are photosensitive and exposure to light shortens their effective life); and
4. Determine how long net users would be willing to use a treated net before washing it.

At the request of the Ministry of Health's National Malaria Control Program, we decided to use deltamethrin in a concentration of 25mg/m<sup>2</sup>, the insecticide and concentration in use by the Ministry itself at the time of the study. After reviewing the different formulations in which deltamethrin is available, we decided a tablet form would be the most convenient and safest for household application. We contacted Aventis (now a division of Bayer), the manufacturer of deltamethrin, to purchase a quantity of its tablets known as KO-Tab™. After learning about our research aims, Aventis agreed to donate 100 tablets for study use.

Our protocol called for a sample of five households to participate in the TIPs in each of our three principal villages. With the approval of village authorities and to avoid any appearance of favoritism, we decided to select the five households in each village by means of a lottery held at a public meeting called for that purpose. All village residents were informed well in advance of the scheduled meeting date. Those attending the meeting and interested in participating submitted one entry per household. Village officials then drew names to select the five participating households.

To prepare for home-based net treatment, project staff visited each selected family, inventoried all mosquito nets in the household, and established a date for treating the nets in each household. Families were advised to wash their nets one day prior to the established date for treatment so that they would be clean and dry on the appointed date. Participants

were also asked to have ready a 2-liter disposable plastic soda bottle for mixing the insecticide. Participants were invited to treat all mosquito nets in the household. Project staff provided instruction and supervision.

Project staff asked each participating family to decide which adults would treat the household's nets. We also asked each household to arrange for young children to be away during treatment to avoid exposing them to the insecticide. On the day of treatment, a project staff member would arrive at the participating household and ask if nets had been washed and dried the previous day. If the nets were ready for treatment, the staff person would present participating household members with written treatment instructions. Participants had several minutes to read the instructions or, in the case of non-literates, have someone read the instructions to them. The staff member then reviewed the instructions line-by-line with the participants and answered any questions. Once confident that participants fully understood the instructions, the project staff person distributed the following supplies:

- 1 envelope containing a deltamethrin tablet (KO Tab™) for each net to be treated;
- 1 30-liter black plastic bag in which to treat and later store the net(s);
- 1 pair of disposable latex gloves for each participant.

Once staff and participating household members had put on their gloves, the participant mixed the insecticide in the plastic bottle using a quantity of water appropriate to the size of the net to be treated. We used the manufacturer's instructions to determine the amount of water needed for a target deltamethrin concentration of 25 mg/m<sup>2</sup>. When the tablet was fully dissolved, the participant placed the first net to be treated in the plastic bag and poured the insecticide over it. The participant then closed the bag and kneaded it for 5–10 minutes to thoroughly soak the net with insecticide.

Once the insecticide solution was thoroughly absorbed and uniformly distributed, the participant removed the net from the bag and hung it to dry in a shady location. Additional nets from the household were treated in the same fashion. After all nets were treated, project staff supervised the burning of the disposable gloves and plastic bottle to avoid any possibility of re-use that might lead to poisoning. Participants were instructed to allow the plastic bag to dry and then to use it to store each net when it was not in use. Participants were warned not to use the plastic bag to store clothing or food—only the mosquito net.

Staff members then provided each family with written instructions for net care. The instructions reminded participants not to wash their nets for three months, to protect them from sunlight and smoke, and to store them in the black plastic bag when not in use. On each instruction sheet, the field worker wrote the date on which the nets had been treated and the date, three months hence, when the participant could wash them for the first time. The field worker then asked the participant to repeat back the instructions, corrected any misunderstandings, and answered any questions.

The field worker made a return visit to each household 1–3 days after treatment. At this first visit, she reviewed net care instructions with the selected household member and answered questions about the impregnation process and net care. Then the field worker applied a 37-item questionnaire about whether and how household members had used the treated net, whether it had dried completely, what time it was put up and taken down, what various family members thought of the net, and whether anyone had experienced an adverse reaction after treating, coming into contact with, or sleeping under a net. Over the course of the next three months, a field worker visited each

participating family once per week and completed a similar questionnaire, recording details about each household's perceptions of the net, whether they were using it, storing it in a dark place by day, whether they had washed it, and so on.

The weekly surveillance included questions about what time the interviewee had bathed the previous day and what time they had gone to bed the previous night and woken up in the morning. We collected this information to test empirically whether people were following MOH recommendations about when to bathe and when to go to bed so as to minimize exposure to infective mosquito bites. If the interviewee or another household member had washed one of the nets, the field worker asked why they had decided to wash it, how they had washed it, and whether they had dried it in shade.

Once a family had washed all its nets or at the end of three months, whichever came first, the field worker conducted an exit interview asking the selected member of each household whether, given the opportunity, they would want to treat their net again and how much they would be willing to pay for the insecticide to treat it. The field worker also asked how long the insecticide seemed to be effective, whether and when the interviewee began to notice a diminishing effect, and how often they would recommend retreating a net. Finally, participants were asked whether they would recommend net treatment to their neighbors and if they had any suggestions for the investigators. Household-based net treatment took place in late May and early June 2001. Surveillance continued through September 2001.

### ***Phase 2: Testing of pretreated polyester nets***

After completing surveillance of the home-treated nets, the project distributed the new pretreated polyester nets. The same families in each village participated in this second phase of household trials. We chose these nets based on the bed net fabric preference

interview results described in paper #2. We provided each household half as many new nets as it already owned. We asked participating families to use their own nets and the project nets simultaneously so that they could compare the advantages and disadvantages of each. Each family decided on its own who would use the new nets and who would use the old.

Along with the new nets, each family received written instructions on their use and care. Following the manufacturer's recommendations, we told families that they could wash their nets after six weeks if absolutely necessary but that they should wait longer if possible. This was based on field data demonstrating that the insecticide could maintain its residual effect on a multifilament nylon net for up to three washings.<sup>93</sup> We also provided specific washing and drying instructions and asked families to store their nets in a dark place during the day, to protect them from exposure to smoke and dust, and to avoid using any type of light with a flame (kerosene lamp, candle, match) inside the net. After distribution, the field worker visited each family within 1–3 days, interviewed family members about their initial reactions, and continued with weekly surveillance visits for three months using a structured questionnaire similar to that used in Phase 1. Distribution of the new nets took place during September 2001. Surveillance continued through mid-December.

### **Mass media use survey**

We conducted a random sample survey of mass media use and health information in Villa Buendia, San Anselmo, and San Pedro between October 15 and December 20, 2002. The survey instrument consisted of 37 questions\* related to radio, television, newspaper, and magazine use in the study communities as well as sources of health-related information.

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\* The media use survey should not be confused with the TIPs day-after treatment surveillance instrument described earlier. Coincidentally, both contain 37 items, but they address different themes and appear separately in Appendix C.

Using the census from each village and the random sample select command from SPSS™ 11.5, we selected respondents from among all residents ages 16–75. We calculated sample sizes separately for each village using Epi-Info. All surveys were completed by a single interviewer who visited each respondent in his or her home. Detailed results from the survey are reported elsewhere.<sup>43</sup> I include it here as a basis for triangulation of media consumption data from the direct observations discussed in paper #1.

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# Paper 1

## Nighttime observations to assess bed net use and malaria risk factors in the Peruvian Amazon

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## **Abstract**

Direct observation of nighttime activities is a data collection method rarely discussed in the anthropological literature. We used nighttime observations to better understand risk of exposure to malaria in the Peruvian Amazon. Over a 9-month period, we observed 60 households in four semi-rural villages outside the city of Iquitos, Peru. Observers arrived at each household around 6:00 p.m. and carried out continuous monitoring of all household activities until approximately 6:30 the following morning. We documented several common social, religious, and economic activities likely to increase risk. We also documented several aspects of bed net use likely to decrease the protective effect of nets. Observing at night was key to recognizing these potential risk factors which may have significant implications for malaria control programs in Peru and in areas with even higher malaria transmission.

## Introduction

Nearly 20 years ago, Richard Scaglione published an article in *American Ethnologist* arguing for the importance of nighttime observations.<sup>1</sup> Scaglione's interest was time allocation among the Samukundi Abelam of Papua New Guinea. He concluded both that nighttime activities were significant and that they differed substantially from daytime activities. A study limited to daytime hours would present an incomplete picture.

In the intervening decades, anthropologists have not exactly flocked to Scaglione's approach. Reports of nighttime observation remain quite rare in the anthropological literature. In this article, we present what we believe to be another important use of nighttime observations: to better understand how human activity can affect exposure to vector-borne disease, in particular malaria. Based on the results of nighttime observations carried out in the Peruvian Amazon, we argue that a clear understanding of the mechanisms through which nighttime activities increase risk of infective mosquito bites is essential to developing an effective malaria prevention program.

Malaria nearly disappeared from the Americas in the 1970s, a result of the worldwide malaria eradication campaign carried out from 1957–1969. It re-emerged as an important public health problem in Peru during the mid-1990s.<sup>2</sup> In 1997, the Department of Loreto reported over 120,000 cases, and while incidence has declined in subsequent years, Loreto continues to bear a disproportionate share of Peru's malaria burden.<sup>3,4</sup> Though it occupies nearly 30% of the country's landmass—making it Peru's largest department geographically—Loreto houses less than four percent of the country's inhabitants.<sup>5</sup>

In response to the 1997 outbreak, the Peruvian Ministry of Health (MOH) began widespread distribution of insecticide-impregnated bed nets (IBNs) and developed a



health education campaign encouraging Loreto's rural population to avoid activities that might increase exposure to infective mosquito bites.<sup>6</sup> Thus one objective of the observations discussed in this paper was to better understand how human behavior might impact the effectiveness of IBNs in the study area. Another was to document the extent to which area residents were following MOH recommendations such as bathing before dusk and going to bed (protected by a mosquito net) by 18:30 or shortly thereafter. Intuitively, both recommendations seemed unlikely to be practical for village residents.

The effectiveness of IBNs at preventing malaria depends to a great extent on the behavior of the vector species: if malaria transmitting mosquitoes in a given area tend to bite late at night after most of the population goes to bed, IBNs can be quite effective. If, on the other hand, the mosquitoes bite at dusk or in the early evening when most people are still active, IBNs may provide little protection. Similarly, IBNs are more effective when malaria transmitting mosquitoes bite mostly inside human dwellings (endophagy) and less effective when they feed mostly outside (exophagy). Limited information about the mosquito feeding patterns in the Americas is one reason why the effectiveness of IBNs remains somewhat controversial in this hemisphere.<sup>7, 8</sup>

The principal malaria vector in the Peruvian Amazon and much of the Amazon basin is a mosquito known as *Anopheles darlingi*, a species ubiquitous throughout Loreto.<sup>9</sup> Unfortunately, data on this mosquito's feeding behavior is rather ambiguous: some studies have observed biting peaks around dusk and dawn, others have recorded a single peak around 23:00 or midnight, still others have found that feeding patterns vary with the season and with environmental conditions.<sup>10-13</sup> Recent studies in Loreto show similarly varying behavior: Flores (2003) found a biting peak beginning before sunset and continuing until

21:00 with a smaller peak of activity at midnight; Vittor (2003) recorded peak biting between 21:00–22:00.<sup>14, 15</sup> Despite these differences, there seems to be consensus that the mosquito continues feeding at some level throughout the night. Further, though some biting may take place outdoors, *An. darlingi* does a considerable amount of its feeding inside. Taken together, these points suggest that IBNs should offer significant protection against infective bites, even if the extent of that protection has not been quantified.

## Methods

### ***Study site characteristics***

The city of Iquitos is located at 3.75° S, 73.2° W in northeastern Peru at the confluence of the Amazon, Nanay, and Itaya Rivers. The study activities discussed here took place in four rural villages outside the city. Three of the villages, El Manantial, San Anselmo, and Villa Buendía, are located along the Iquitos-Nauta Highway, a 90 kilometer two-lane road linking the departmental and the provincial capitals.\* Construction on the highway began in 1985. At the time of the study, the first 50 kilometers had been paved. While all three study villages were settled before highway construction began, rural settlement and deforestation have ballooned as the highway has moved progressively further into the jungle. Highway construction has also facilitated out-migration from the city that began with an economic downturn in the region following the petroleum boom in the late 1980s and early 1990s.

El Manantial, San Anselmo, and Villa Buendía share similar socio-economic characteristics: a mestizo population and an economy based on subsistence and small

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\* All personal and village names used in this paper are pseudonyms unless otherwise noted. Iquitos, Nauta and Varillal are actual place names.

market swidden agriculture, fishing, hunting, and charcoal and firewood production. A few families in El Manantial and Villa Buendía distill and sell cane liquor. El Manantial—closer to the city and slightly more urbanized than San Anselmo and Villa Buendía—is also the site of a brick factory which operates sporadically.

At the time of the study, El Manantial and Villa Buendía were accessible by car during most of the year except when heavy rains washed out the 2–3 km. unpaved access roads from the highway. This occurred rarely in El Manantial but more frequently in Villa Buendía where army vehicles entering and leaving a military outpost opposite the village carve deep ruts in the road, often making it impassible to lighter vehicles. San Anselmo was accessible on foot, about five km from the last point where a motorized vehicle could enter. Located on the banks of the Itaya River, San Anselmo can also be reached by boat from the port of Iquitos, a journey of about three hours. San Anselmo is the most sparsely populated, most rural, and poorest of the study villages.

Houses in El Manantial, San Anselmo, and Villa Buendía are of similar design: thatched roofs of braided palm leaves and walls made of a slender, bamboo-like palm known locally as *pona* (*Socratea exorrhiza*). Some are built directly on the ground and generally have dirt floors; others are built on a *pona* platform one to three meters off the ground. A gap of about 750 cm between the top of the walls and the roof provides ventilation. The edges of the *pona* slats used for walls and floor are fitted up against one another, but not sealed. Windows, on houses that have them, are open and lack screens and panes. None of these villages had plumbing or electricity at the time of the study, but many households owned battery-operated radios and a few had televisions.

The fourth village, Santa Catalina, is located on the banks of the Nanay River. Closest of all the study sites to Iquitos, Santa Catalina is more densely populated and considerably more urban than the other three. A large percentage of houses are made of cinderblock with corrugated metal roofs. Almost all have electricity. The streets are unpaved, but many have functioning streetlights. A potable water system was installed in mid-2001. Many residents travel back and forth to Iquitos several times a week or even daily. Though some Santa Catalina residents engage in subsistence cultivation, many work in the city. The Santa Catalina port, which serves as a transportation hub for many smaller villages along the Nanay, is another source of employment. Some Santa Catalinians also earn a living catching ornamental fish for export to tropical aquarium enthusiasts in industrialized countries.

Access to Santa Catalina is via an approximately five-kilometer unpaved road leading from the main highway that runs between the city of Iquitos and its airport. In dry weather, the trip from Iquitos takes 30–45 minutes in one of the heavy duty combination passenger/cargo trucks that leave every half hour from the city's central market. In rainy weather, mud can make the last several kilometers of the access road impassable to motorized vehicles. At these times, access is by foot and may take up to an hour from the last point reachable by truck.

Villa Buendía and San Anselmo each have a volunteer health promoter, a village resident selected with community input by the doctor in charge of the nearest health center. When residents of these two villages have a health problem that cannot be treated by the health promoter, an indigenous practitioner or a home remedy, they go to the Varillal Health Center which serves many communities along the first 25 km of the

highway.\* Some residents of San Anselmo also use the health post in San Martin de Porres, another small village located on the banks of the Itaya River about a two hour walk or one hour canoe-ride away. El Manantial has a health post supervised by the Varillal Health Center. At the time of the study, the village had no volunteer health promoter and the post was staffed sporadically by an auxiliary nurse. When the post is closed, or in case of a problem beyond its capabilities, El Manantial residents would also walk or take a taxi to Varillal. Santa Catalina has a more complete health center similar to the one in Varillal, with a doctor, a small nursing staff, a small pharmacy, and basic laboratory facilities. Being a larger community, Santa Catalina has several volunteer health promoters who live in and serve different sections of the village. All four villages have primary schools, constructed and staffed by the municipal government of Iquitos.

Based on a census taken in each village between 1999–2000 and updated in 2002, El Manantial had a population of 780, Villa Buendía a population of 311, San Anselmo a population of 154, and Santa Catalina a population of 2,569. All four villages are situated in clearings surrounded by secondary-growth tropical rain forest. The area receives an average 4,500 mm precipitation annually. Daily temperatures fluctuate between an average low of 24.0°C and an average high of 31.3°C. While river level and rainfall vary considerably by season, there is minimal seasonal variation in temperature.<sup>16</sup>

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\* Staffed by a nurse, a nurse midwife, an auxiliary nurse and a laboratory technician, the Varillal Health Center provides basic primary care. It has a microscope for diagnosing malaria, but during the two years of field work associated with this study, there was rarely a microscopist available to read the slides. Instead, slides were sent to another health center about 15 km away, often resulting in a 1–2 day delay in diagnosis. From San Anselmo, getting to Varillal entails about a 90 minute walk to the highway, then a short ride in one of the shared mini-vans that pass every 30–45 minutes. Walking the entire way would take about 2–2 ½ hours. From Villa Buendía, the walk would be about 40 minutes less.

We selected study villages purposively with MOH input. Selection criteria included a high incidence of malaria over the two years prior to the study, location within roughly two hours' travel from the city, socioeconomic characteristics reasonably typical of the semi-rural and rural communities around Iquitos, and consent from village authorities and residents. After coordinating with village officials, we held community meetings in each village to present the project to residents, answer questions, and request community consent. The four participating villages were the first four selected: all agreed to participate.

The study protocol, including all data collection instruments and informed consent procedures at the community, household, and individual level, were reviewed and approved by the Johns Hopkins Bloomberg School of Public Health Committee on Human Research, the Ethics Committee of the *Asociación Benéfica PRISMA*, a Peruvian NGO, and the MOH.

### ***Observation of nighttime activities***

Between February 4 and June 21, 2000, four observers—including two of the authors (SH and MP)—carried out continuous monitoring observations in 60 different households in the four study villages. Our objective was to determine:

- The proportion of area residents sleeping under some type of bed net;
- What types of bed nets were in use including the percentage of each type;
- What types of beds were in use and how type of bed and manner of bed net use might affect exposure to infective mosquito bites;
- The times at which people bathed and went to bed and the extent to which these times were consistent with MOH recommendations; and
- What other nighttime activities—economic, religious, or social—might affect exposure to infective bites.

Each observer worked individually, arriving at the selected household between 17:30 and 18:30 (mean start time 18:01, SD 25 minutes) and remaining until between 06:30 and 07:30 the following morning (mean end time 06:42, SD 22 minutes). Upon arrival, the observer introduced himself or herself to all household members present and explained the purpose of the visit. To avoid drawing undue attention to bed net use, observers were instructed to avoid specific mention of bed nets in their introduction and instead to focus on the project's need to learn more about general living conditions in order to design malaria prevention strategies more appropriate to the lives of area residents. The observer then asked an index individual—generally the female head of household—to list the name, age, sex, and relationship of each household member. After recording this information, the observer requested a tour of the house, noted the number and type of beds and bed nets, and asked the family member guiding them to indicate which household members slept in which beds. Subsequent to the tour, observers stationed themselves as inconspicuously as possible within the household, worked to minimize contact with household members, and kept a written log of all household activities at five-minute intervals throughout the night. In addition to these free-form notes, observers noted the time at which each bed net was set up, if and how the net was secured, the time at which each household member went to bed, and any discrepancies between reported and observed behavior.

A common concern with direct observation in anthropological research is reactivity, a change in the behavior of those being observed due to the presence of the observer.<sup>17</sup> Since we were working in communities that had been exposed to MOH health education and malaria prevention campaigns, we thought that people in observation households might be more likely to follow MOH recommendations in our

presence than under normal conditions: sleeping under a mosquito net when they normally would not, for instance, or going to bed earlier than they would have otherwise. To evaluate the extent to which this might be happening, we instructed observers to take detailed notes about every interaction between themselves and any household members, even if it was just a greeting.

Houses for observation were chosen purposively to represent the different geographic areas and environmental conditions of each village: close to and up to 45 minutes walk away from the village center, near and more distant from the riverbank, larger and smaller household sizes, and so on. Observers obtained written informed consent from each participating household prior to each observation.

### ***Media use survey***

About 18 months after our last nighttime household observation, we conducted a random sample survey of mass media use in Villa Buendía, San Anselmo, and San Pedro, a village with similar characteristics located along the banks of the Nanay River. The survey contained 37 questions related to radio, television, newspaper, and magazine use in the study communities. Using the census from each village and the random sample select command from SPSS 11.5, we selected respondents from among all residents ages 16–75. We calculated sample sizes separately for each village using Epi-Info. All surveys were completed by a single interviewer who visited each respondent at his or her home. This survey was useful for triangulating data on television watching obtained from the observations discussed in this paper. Detailed survey results are reported elsewhere.<sup>18</sup>



## ***Preparation and analysis of data***

All field notes were first expanded by the observer and typed into Microsoft Word. Next, two of the authors (SH and MP) read each transcript individually, made notes on themes of potential interest and discussed each potential theme among themselves and with other authors (PW and EL). One author (SH) then read each transcript a second time and formatted it for assignment to ATLAS.ti version 5. Once all observations were imported into ATLAS.ti, the first author read the transcripts a third time and assigned codes corresponding to half-hour intervals of time from the beginning of the observation until 22:00 and then hour intervals from 22:00 to the end of the observation. The first author developed a coding scheme for all observed activities by selecting a mix of 16 observations spanning all observers and villages. Initially the scheme grew with each additional observation coded. By the 16<sup>th</sup> observation, there was little need to add new codes: the scheme seemed complete enough to cover almost all observed activities in all households.

After finalizing the coding scheme, the first author went back through the first 16 transcripts to update and standardize the approach. He then went on to code the remaining 44 observations. The coding scheme continued to evolve and change slightly throughout the coding process. All changes were documented in memos and comments within ATLAS.ti. The final scheme contained 94 codes grouped into six categories or ‘families.’ Of these, 20—grouped into a family called “time of day”—represented the different time intervals applied to each transcript. Groupings for the remaining 74 codes included: (1) household activities, (2) social activities, (3) work activities, (4) activities related specifically to bed net use, and (5) instances of interaction with the observer (reactivity). Table 1 lists codes for the first four of these five groupings.

**Table 1: Final coding scheme applied to nighttime household observations <sup>a</sup>**

| <b>Household activity</b>                                  | <b>Social activity</b>    | <b>Work activity</b>                | <b>Bed net related</b>   |
|------------------------------------------------------------|---------------------------|-------------------------------------|--------------------------|
| Care for baby/child                                        | Attend a <i>fiesta</i>    | Ambulatory vending                  | Get into bed net         |
| Care for domestic animals                                  | Attend a funeral          | Care for domestic animals           | Get out of bed at night  |
| Clean house                                                | Attend religious services | Distill liquor                      | Get out of bed net       |
| Cook                                                       | Listen to music           | Fish                                | Leave bed net unsecured  |
| Cover oneself (i.e., with a sheet or blanket) <sup>b</sup> | Listen to the radio       | Garden                              | Prevent malaria          |
| Create smoke <sup>c</sup>                                  | Talk with family members  | Household vending ( <i>bodega</i> ) | Prevent mosquito bites   |
| Domestic chores (other than cleaning)                      | Talk with neighbors       | Make charcoal                       | Put away (store) bed net |
| Eat                                                        | Watch television          | Take produce to market              | Secure bed net           |
| Enter the house                                            |                           | Work in the fields                  | Set up bed net           |
| Garden                                                     |                           | Other work activity                 | Sleep without bed net    |
| Get out of bed at night                                    |                           |                                     | Use bed net for privacy  |
| Go to bed                                                  |                           |                                     |                          |
| Leave the house                                            |                           |                                     |                          |
| Listen to the radio                                        |                           |                                     |                          |
| Nap (sleep during the day)                                 |                           |                                     |                          |
| Play                                                       |                           |                                     |                          |
| Read                                                       |                           |                                     |                          |
| Rest                                                       |                           |                                     |                          |
| School homework                                            |                           |                                     |                          |
| Talk with family members                                   |                           |                                     |                          |
| Watch television                                           |                           |                                     |                          |
| Other non-specific activity                                |                           |                                     |                          |

a Some codes are members of more than one grouping or ‘family’ and thus appear more than once in the table.

b Covering oneself with a blanket was noted because it is one method identified by areas residents for preventing mosquito bites though this is not its only purpose.

c Creating smoke or “smoking out” the house (humear) is a practice for driving away insects, especially mosquitoes. It is accomplished by burning rubber, plastic, trash or other material that generates smoke either inside or (in the case of houses built on a platform) underneath the house.

The fifth grouping (reactivity) began as a single code. Once coding was complete, we carried out a sub-analysis to determine the extent to which reactivity broadly defined reflected changes in behaviors specifically related to malaria exposure or prevention, the real focus of our observations. Differentiating the types of reactivity noted by the observers provided an internal check on the likely extent of bias in the observation results.

We used Stata 8.2 and SPSS 13.0 to carry out a descriptive analysis of household characteristics including family composition, number and type of beds and nets, and the hour at which household members bathed and went to bed when this was possible to observe.

## **Results**

### ***Household characteristics***

The households we observed included a mixture of nuclear and extended-families. Three or more generations rarely live permanently under the same roof in the study area, but we saw many varieties of provisional extended-family households: parents living with grown and married children (and often grandchildren) who had not yet established a separate household; elderly parents no longer fully capable of caring for themselves who had come back to live with grown children; single siblings of either sex living with a married brother or sister, and so on. Among our observation households, the mean number of occupants was 7.4, but household sizes ranged from 2–24 individuals. Ten of the 60 households observed had 10 or more members, and 26 (43.3% of the sample) had between six and nine members. More details on household characteristics by village appear in Table 2.

## ***Beds and bed net use***

Most beds we observed fit into one of four categories. The most common (67 out of 201 total beds noted) was a wooden platform topped by wooden planks. Occupants sleep directly on top of the planks without a mattress or other covering underneath. Since the wood is finished rather roughly and there are large gaps between the planks, mosquitoes can bite from underneath the bed. Absence of a mattress also makes it difficult to secure the edges of a mosquito net to the bed. To ameliorate these two drawbacks, some people line their beds with corrugated cardboard. The second most frequently observed “bed” is not really a bed at all: people simply hang their mosquito net above the *pona* floor and sleep directly on the floor. *Pona* is the most common flooring used in houses built on stilts; it is nailed directly to the floor joists of the house in slats about 4–6 cm wide by 1½–2 m long. *Pona* flooring also has gaps through which mosquitoes can bite; to prevent this some people place first a plastic sheet, then a cotton sheet over the floor before hanging their mosquito net. With this type bed, the mosquito net is secured to the floor by placing rags or clothing around its borders once all occupants are inside. A variant on the *pona* floor “bed” and the third most common type observed was a mosquito net hung over a wooden plank floor.

We observed 18 beds consisting of a wooden platform covered by a straw, foam, or (less frequently) spring mattress. Mattresses have the advantage of preventing bites from underneath the bed and nets are easily secured between the mattress and the bed frame. However mattresses are expensive, difficult to transport, and mildew quickly in the high humidity. The final 22 beds were of various types, including mattresses placed on wrought-iron frames and mattresses placed directly on a dirt floor.

**Table 2: Characteristics of observed households including type of bed and bed net**

|                                            | El Manantial | San Anselmo | Villa Buendía | Santa Catalina | Total      |
|--------------------------------------------|--------------|-------------|---------------|----------------|------------|
| Households observed                        | 14           | 12          | 21            | 13             | 60         |
| Persons per household                      |              |             |               |                |            |
| mean (range)                               | 7.07 (2–14)  | 6 (4–9)     | 6.62 (3–12)   | 10.31 (4–24)   | 7.4 (2–24) |
| Beds per household                         |              |             |               |                |            |
| mean (range)                               | 3.78 (1–8)   | 2.08 (1–4)  | 3.05 (2–5)    | 4.31 (2–10)    | 3.3 (1–10) |
| Bed nets per household                     |              |             |               |                |            |
| mean (range)                               | 3.5 (1–6)    | 1.83 (1–3)  | 2.81 (2–5)    | 4.15 (2–9)     | 3.07 (1–9) |
| <b>Type of bed</b>                         |              |             |               |                |            |
| Wooden platform bed                        | 9            | 4           | 27            | 27             | 67         |
| <i>Pona</i> flooring                       | 24           | 15          | 17            | 2              | 58         |
| Wood plank flooring                        | 11           | 6           | 11            | 8              | 36         |
| Platform bed w/ mattress                   | 3            | 0           | 2             | 8              | 13         |
| Other                                      | 8            | 0           | 7             | 12             | 27         |
| <b>Total beds observed</b>                 | <b>55</b>    | <b>25</b>   | <b>64</b>     | <b>57</b>      | <b>201</b> |
| <b>Type of bed net</b>                     |              |             |               |                |            |
| Single-ply muslin ( <i>tocuyo simple</i> ) | 23           | 10          | 34            | 21             | 88         |
| Double-ply muslin ( <i>tocuyo doble</i> )  | 25           | 11          | 20            | 15             | 71         |
| Nylon                                      | 1            | 1           | 5             | 18             | 25         |
| No net                                     | 2            | 2           | 1             | 2              | 7          |
| Not observed                               | 4            | 1           | 4             | 1              | 10         |
| <b>Total beds observed</b>                 | <b>55</b>    | <b>25</b>   | <b>64</b>     | <b>57</b>      | <b>201</b> |

Bed net use is nearly universal in the peri-urban mestizo villages around Iquitos. Asked why they use bed nets, most study area residents respond first by saying something akin to “because we always have.” In 60 households, we observed only seven out of 201 beds (3.5%) with no net. This is consistent with findings from other studies.<sup>19, 20</sup> For 10 beds we have no information about whether a net was present. The most common reason for this lack of information is that a member of the household slept away from home on the night of the observation and the observer failed to ask if the missing person had taken their net with them. People often travel with their nets, particularly if they plan to sleep in the jungle (e.g.,

while hunting or tending a charcoal pile). Even if we assume that none of these 10 beds had nets, it still leaves over 90% of the observed population sleeping under a net.

The bed nets traditionally used among our study population are made of an opaque coarsely-finished muslin known locally as *tocuyo*. Of the 184 nets we actually observed, 159 (over 85%) were *tocuyo* with slightly more made of the light-weight version of the fabric (*tocuyo simple*) than the heavy-weight version (*tocuyo doble*). People either buy these nets ready-made in the central market in Iquitos or buy the material and sew their nets at home. The remaining 25 nets observed were 156-mesh nylon, the most common material used in IBN programs worldwide. Most nylon net owners acquired their nets as part of MOH distributions in 1998–99. The nylon nets were insecticide-impregnated when new, but the insecticide was no longer active by the time of our observations. *Tocuyo* net users do not generally treat their nets and, in any case, the cotton fabric retains insecticide poorly.

Young children sharing a bed with parents or several siblings sharing a single bed is common in the region. Sleeping many people under a single mosquito net can lessen its protective effect since each additional person increases the likelihood that someone will brush up against the side of the net or sleep with an arm or leg partially outside it and thus be bitten repeatedly during the night. Of the beds we observed, 130 (65%) had one or two occupants while 63 (31%) had three or four occupants. Four beds had five occupants and one had six.

Types of beds and nets offer some indication of the differences in the socio-economic status and “urban-ness” of the four villages. El Manantial, San Anselmo, and Villa Buendía all have large numbers of people who sleep directly on *pona* flooring, the cheapest of the

different bedding alternatives we recorded. As shown in Table 2, sleeping on a *pona* floor is quite uncommon in the more urban, more developed Santa Catalina. Similarly, we found only seven nylon nets in El Manantial, San Anselmo, and Villa Buendía combined; Santa Catalina alone accounted for 18 of the 25 total nylon nets observed.

## **Bathing**

Though biting patterns vary considerably between species, anopheline mosquitoes in general feed between dusk and dawn. Thus, despite the lack of definitive data about *An. darlingi* feeding behavior, the MOH has encouraged people in malaria-endemic areas of Loreto to avoid exposure to mosquito bites after sundown. As seen in Figure 1, one facet of the MOH behavior change campaign (BCC) has been to encourage bathing before dusk. Since darkness falls by about 18:30 year-round in the project area, this would mean bathing by around 17:00–17:30. Virtually the entire population of the study area bathes outside in a river or a spring or, if a natural source of water is close enough to the house, in their backyard garden. Children up to about 5 or 6 years old bathe naked, but given the lack of privacy older children and adults generally bathe at least partially clothed.



**Figure 1: Image from a Ministry of Health behavior change campaign. The text says: “Bathe before dusk because the malaria mosquitoes are coming.”**

Our 60 observed households included a total of 432 individuals. Of these 432, we were able to document bathing times for 142, about one-third of the sample. The earliest observed time was 17:45, the latest 21:30, and the mean about 18:45. Reproductive-age

adults (15–49 years old) bathed slightly later, around 19:00, while infants, children under 15, and adults age 50 and above all bathed on average around 18:30. Adults age 15–49 accounted for 73 of the 142 people observed going to bathe and thus had more influence on the overall mean bathing time than any other age group.

Perhaps the more intriguing question, however, is what about the two-thirds of the individuals for who we could not document bathing times? It is quite possible that the observers missed some people going out to bathe, particularly in larger households where it would have been difficult to keep track of 10 or more people's activities at once. But the most obvious possibility, since our observations began around 18:00, is that many people had bathed earlier in the day. Based on data we collected in a follow-up study, that appears to be exactly what happened.

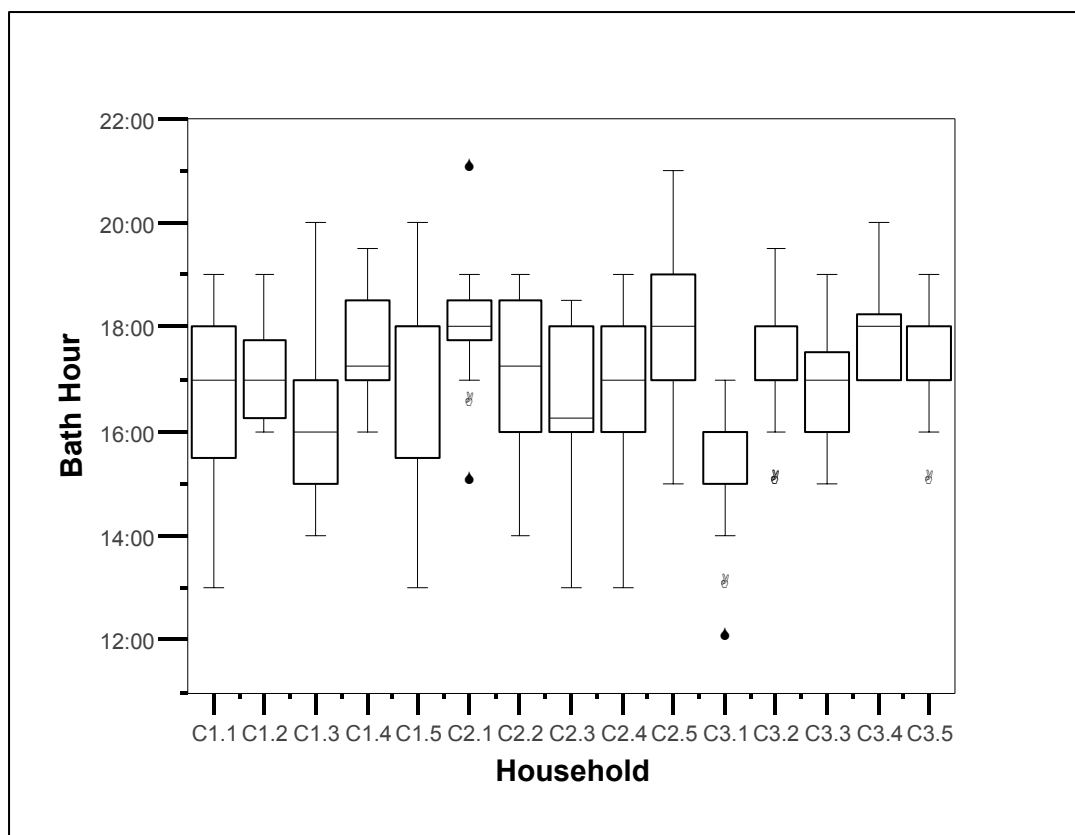
From June to December 2001, we conducted household trials of home-based net treatment and a new style of nylon net. During this time, we carried out weekly structured interviews and spot checks in 15 households, five each in Villa Buendía, San Anselmo, and San Pedro. As part of the interview, we asked an index member of each household what time they had bathed the day prior to each weekly visit. Altogether, we collected 346 reported episodes of bathing. Since we conducted repeated interviews with the same 15 households, these are not independent observations. But as shown in Figure 2, we found considerable variation in bathing times not only between the 15 households but also within each household. This intra-household variation makes us more confident that the reported times are close to representative despite their lack of independence.

In the 2001 surveillance visits, about one-third of the participants (34.1%) reported bathing at 17:00 or earlier. Close to another third (27.7%) reported bathing between 17:00



and 17:59. The remaining group (38.2%) reported bathing at 18:00 or later. Data on bathing times were missing for only six percent of cases in the 2001 survey, compared to 67.1% in the household observations. The mean bathing time reported in 2001 was 17:01, considerably earlier than during the observations, and reported times ranged from 12:00 to 21:00. All this makes sense: since our observations started around 18:00, so we would have missed

**Figure 2: Distribution of mean reported bathing times**  
Index individuals in 15 households, June–December 2001



most bathing prior to that time. In the weekly surveillance, this amounted to 61.8% of the sample compared to 67.1% in the observations, a difference of only around 5 percent. From a disease prevention standpoint, this means most people are bathing prior to 18:00, the start of peak biting hours for *An. darlingi*. Since the Ministry's behavior change campaign

advises people to bathe before dusk, it seems that the majority of area residents either have adopted this recommendation or already were bathing before dusk prior to the campaign.

### ***Bed times***

Along with early bathing, Ministry BCC efforts encourage the population to be inside their mosquito nets—that is to say, in bed—by 18:00–18:30. Here our data indicate a significant discrepancy between local practice and MOH recommendations. In a series of structured interviews independent of the observations reported here, over 70% of the 30 interviewees characterized entering a bed net or going to bed early as a highly effective, but impractical and rarely used strategy to prevent mosquito bites. Participants explained that they engage in many activities in the early evening: talking with family members and neighbors, helping children with homework, preparing for the following day’s work, caring for chickens and other domestic animals, going to church, watching television, and listening to the radio among others. Some simply said they were not accustomed to going to bed that early, that it was still light out, that they were not yet sleepy, and that it was still too hot to enter a mosquito net. Some did say they enter the net early when they are sick or when many mosquitoes are present.

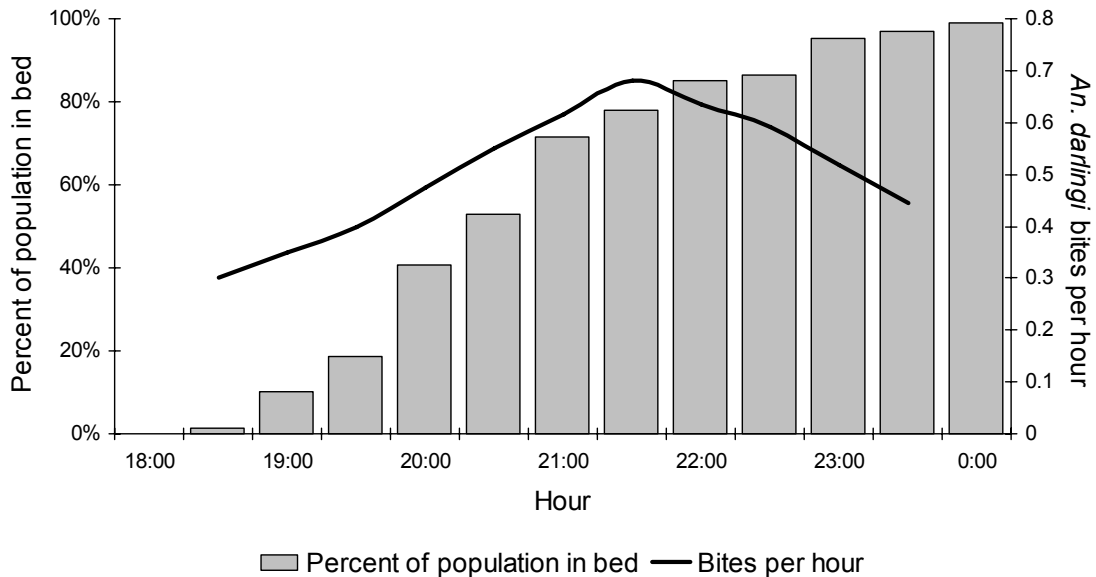
**Table 3: Observed bed times by age group and presence of electric lighting**

| Age (years)  | With lighting |              | Without lighting |              | Difference   | p-value      |
|--------------|---------------|--------------|------------------|--------------|--------------|--------------|
|              | n             | Mean bedtime | n                | Mean bedtime |              |              |
| 0–1          | 10            | 19:54        | 19               | 19:45        | 00:10        | 0.7          |
| 2–5          | 15            | 20:40        | 36               | 19:38        | 01:02        | <0.001       |
| 6–14         | 34            | 20:51        | 90               | 20:13        | 00:38        | 0.07         |
| 15–49        | 56            | 21:03        | 127              | 20:22        | 00:41        | 0.12         |
| 50+          | 16            | 21:17        | 28               | 21:10        | 00:07        | .785         |
| <b>Total</b> | <b>131</b>    | <b>20:54</b> | <b>300</b>       | <b>20:16</b> | <b>00:38</b> | <b>0.005</b> |

Our observations were consistent with these interview comments. We recorded bed times for all but one of the 432 people included in the observation sample. As shown in Table 3, the mean bed time was 20:54 in areas with electric lighting (Santa Catalina) and 20:16 in areas without (the other three villages). As might be expected, infants and children under five go to bed earlier than older children and adults.

Another way to look at this data is in terms of its relationship to *An. darlingi* feeding behavior. Figure 3 shows that about half the population is in bed by 20:30 and about 75% by 21:00, the observed biting peak reported by Vittor.<sup>15</sup> If there is a second peak around 02:00 and lower-level feeding throughout the night, as entomologists have observed in Brazil and elsewhere, over 90% of the population would be protected by a mosquito net from 22:30 onward.<sup>10-13</sup>

**Figure 3: Percentage of the population under a mosquito net compared to *An. darlingi* feeding behavior**



But calculating average bed times or the percentage of the population under a net at a given time turns out to be misleading because many people enter and leave their nets

repeatedly throughout the night. When several people share a net, the frequency of entering and leaving increases. During one observation in Santa Catalina, household members got in and out of a single net a total of 16 times over the course of the night. Four individuals shared this bed and net: a 63 year-old grandmother, her 75 year-old husband, and two male grandchildren ages 8 and 10. Table 4 contains the observer’s field notes documenting this activity.

**Table 4: Entering and leaving a bed net many times during the night may lessen its protective effect\***

| Hour  | Activity                                                                                                                                                                   |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18:25 | Grandmother sets up her mosquito net, but first spreads a sheet over the wooden planks of the bed (bed #1). She enters the net and checks carefully for mosquitoes inside. |
| 18:42 | Grandmother gets out of mosquito net, sets up another net over bed #3.                                                                                                     |
| 18:50 | Grandmother gets into bed, covers herself completely, says she feels cold.                                                                                                 |
| 19:12 | Grandmother gets out of bed, goes to talk with her 24 year-old grandson who is watching TV.                                                                                |
| 19:24 | Grandmother gets back into bed, secures the borders of her mosquito net, and covers herself with a sheet.                                                                  |
| 21:30 | 8 year-old grandson gets into bed playing with a battery and a toy and making noise.                                                                                       |
| 21:37 | 8 year-old grandson has stopped making noise and appears to be sleeping.                                                                                                   |
| 22:13 | Grandmother gets out of bed and goes into another room.                                                                                                                    |
| 22:20 | Grandmother gets back into bed and covers herself well.                                                                                                                    |
| 22:50 | 14 year-old grandson gets into bed.                                                                                                                                        |
| 22:55 | Grandmother gets up, looks for something in a box by the side of the bed, takes out a sheet with which she covers the mosquito net and then gets back into bed.            |
| 23:10 | Grandfather gets into bed.                                                                                                                                                 |
| 02:45 | Grandfather gets out of bed and goes out into the street. He is wearing only pants, no shirt and no sandals.                                                               |
| 02:47 | Grandfather comes back into the house and gets back into bed.                                                                                                              |
| 02:52 | 8 year-old calls out: “mama, mama, mama... I need to urinate.”                                                                                                             |
| 03:30 | Grandfather gets up again and leaves the house.                                                                                                                            |
| 03:43 | Grandfather comes back inside and goes back to bed.                                                                                                                        |
| 06:00 | Grandmother and grandfather wake up and get out of bed.                                                                                                                    |
| 06:50 | Observer leaves the house; 8 and 14 year-old grandsons remain asleep in bed.                                                                                               |

\* Field notes from Santa Catalina, 16–17 February 2000

People get in and out of their nets for a wide variety of reasons: to do chores after other family members are asleep, to talk with someone who has just come home, to buy medicine, to check on their children at night, and, of course, to relieve themselves. The field notes taken by a different observer in El Manantial (Table 5), illustrate some of

these patterns. The four beds in this household all consist of a sheet or blanket spread directly on the *pona* floor with a bed net hung over the top. The occupants of these beds secured their nets by tucking them underneath the sheets.

As with the first example, members of this household get in and out of bed repeatedly. Each time someone enters or leaves a net, all net occupants face increased odds of being bitten. Further, even if occupants take great pains to secure the net when they first enter, an individual getting in or out of it late at night is less likely to re-secure it carefully, particularly if there is no light and if they are drowsy from sleeping.

**Table 5: Another example of entering and leaving bed nets many times\***

| Hour  | Bed #1                                                                                                                                                                                           | Bed #2                                                                                                                | Bed #3                                                                                                                                                                                 | Bed #4                                                                 |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 19:05 |                                                                                                                                                                                                  |                                                                                                                       | 37 y/o sister-in-law and 16 y/o cousin are lying on bed with sides of net raised. 11 y/o cousin joins them.                                                                            | 14 y/o cousin lies down, leaves his head and shoulders outside the net |
| 19:10 |                                                                                                                                                                                                  | 12 y/o son is lying on bed (in the rafters) playing his <i>quena</i> [traditional Andean flute] with no net over him. |                                                                                                                                                                                        | 14 y/o cousin gets out of net and sits down on bench #4                |
| 19:15 | 14 y/o cousin tells 12 y/o son (whose body is half outside his net), “watch out, you’re going to let the mosquitoes in.” 14 y/o cousin gets into net. 37 y/o sister-in-law tells him to get out. |                                                                                                                       |                                                                                                                                                                                        | 14 y/o gets out of net #1 and goes to net #4 where 12 y/o son is.      |
| 19:17 | 13 y/o son gets into net #1.                                                                                                                                                                     |                                                                                                                       |                                                                                                                                                                                        |                                                                        |
| 19:19 | 12 and 13 y/o sons are inside net #1 playing with a flashlight.                                                                                                                                  |                                                                                                                       | 37 y/o sister-in-law lowers the sides of net #3, secures the edges under blanket.                                                                                                      |                                                                        |
| 19:30 | 43 y/o mother gets into net #1. 54 y/o father says “I don’t feel any mosquitoes now.” 14 y/o cousin says that when he was cutting sugar cane he felt a ton of mosquitoes on his back.            |                                                                                                                       | 37 y/o sister-in-law tells 11 y/o cousin not to get too close to the sides of the net because the mosquitoes will bite her [through the net]. She tells the 11 y/o to say her prayers. |                                                                        |

**Table 5: Another example of entering and leaving bed nets many times\***

| Hour  | Bed #1                                                                                                                                                                     | Bed #2                                                                                                                    | Bed #3                                           | Bed #4 |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------|
| 19:32 | 43 y/o mother gets out of net and looks for something on the shelf. 12 y/o son is inside net #1 with his head outside.                                                     |                                                                                                                           |                                                  |        |
| 19:35 | 43 y/o mother brushes her teeth near the table. 43 y/o mother gets back into net and tells 12 and 13 y/o sons to get in their own beds.                                    |                                                                                                                           |                                                  |        |
| 19:40 | 12 y/o son gets out of net and urinates out the back of the house. Father takes a drink of water from the bucket on table #2, then gets into net.                          |                                                                                                                           |                                                  |        |
| 19:45 |                                                                                                                                                                            | 12 and 13 y/o sons climb up to the platform in the rafters and set up bed net #2.                                         |                                                  |        |
| 20:00 | Father turns on flashlight inside and seems to be looking for mosquitoes inside the net.                                                                                   |                                                                                                                           |                                                  |        |
| 21:10 | Father gets out of net and takes a drink of water from the bucket on table #2. Then he gets back in the net with his flashlight lit and finds and kills a mosquito inside. |                                                                                                                           |                                                  |        |
| 21:45 |                                                                                                                                                                            | From the rafters, 12 or 13 y/o son (I can't see which) urinates off the back of the platform, then gets back into net #2. |                                                  |        |
| 23:15 | It begins to rain                                                                                                                                                          |                                                                                                                           |                                                  |        |
| 23:30 | Mother gets out of net and brings clothes in out of the rain.                                                                                                              |                                                                                                                           | Sister-in-law and 16 y/o cousin talk inside net. |        |
| 24:10 | I get out of my net because the roof is leaking on me. Father and mother get out of their net very concerned and help me move my net to a dry spot.                        |                                                                                                                           |                                                  |        |
| 04:15 | Father and mother talk to each other inside net.                                                                                                                           |                                                                                                                           |                                                  |        |

Field notes from El Manantial, 4-5 April 2000

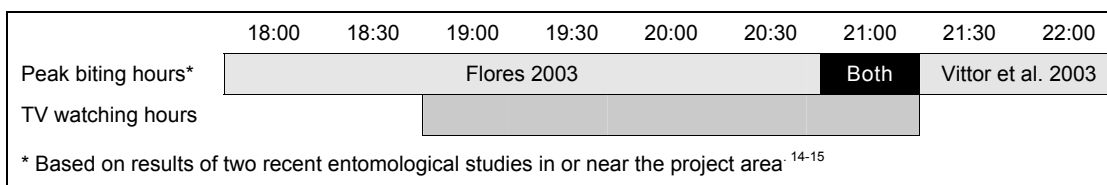
## Other potential risk factors

In addition to documenting bathing and bed net use, the household observations made it possible for us to catalogue other evening activities that might increase risk of exposure to infective bites. Based on these observations, watching television, attending nighttime religious services, and evening or nighttime vending stand out as likely culprits.

## Watching television

Watching TV is a common evening activity in the study communities. We recorded television viewing in 14 of the 60 observation households, eight in Santa Catalina and six in El Manantial. This makes intuitive sense since Santa Catalina has electricity and since residents of both these communities are somewhat better off than those of the other two. However, even in the poorest and most remote villages, one or two households generally own a television set powered by a car battery. With TV ownership rare, viewing becomes a social activity in which friends and neighbors gather around television-owning households and watch through doorways or windows as well as from inside the living area. Thus TV viewing takes place in Villa Buendía and San Anselmo even though we did not observe it directly.

**Figure 4: Overlap of *An. darlingi* biting behavior & television watching**



Families in the television-owning households we observed typically watched for about 2½ hours, beginning around 18:30 or 19:00. Our data on ending times are somewhat

skewed because on a single night, observers in three separate households recorded TV-viewing until midnight. On that particular night, the Peruvian national soccer team was competing in a world-cup match, and people stayed up late to watch. After adjusting for this unusual circumstance, the average observed end-time was about 21:30. As shown in Figure 4, TV-watching seems risky because these hours fall within the peak *An. darlingi* biting period. Both household members and neighbors wander in and out during this time, but it is common to see 8–10 people or more clustered around the TV closely attending the evening *telenovela* or news show and ignoring the mosquitoes hovering about them. Though people occasionally watch TV from inside a mosquito net, the usual practice is to sit out in the open. The following 25 minute excerpt from field notes illustrates the point.

Nine household members are watching TV:

- 21:45 In the living room, head of household (HOH), spouse, son, workers #1, 2, 3, and 4, cook, and cook's son are eating bread, drinking coffee and watching TV.
- 21:48 HOH enters bedroom #1, turns on flashlight (seems to be looking for something), comes back out w/flashlight in left hand, picks up the kerosene lamp on the stair rail, and walks out.
- 21:50 Spouse goes to bedroom #1, closes door, then sits back down on bench #3. Son slaps himself on his left leg. Cook slaps herself on right leg. Spouse slaps herself on left leg.
- 21:55 Worker #2 puts on t-shirt (was in shorts & sandals). Cook slaps herself again on right leg. Spouse slaps herself on left leg. Worker #2 scratches left ankle. Cook slaps self on right leg.
- 22:10 Son slaps self on left leg & then on right knee. Worker 4 slaps self on left leg and scratches right leg.

Findings from the media use survey are entirely consistent with our observation data.

While only 17% of those surveyed own a television, 45% (52% in San Anselmo) report watching TV at least once a week. Twenty percent overall (28% in Villa Buendía and 14% in San Anselmo) report watching every day. Among TV viewers, 37% report watching at home while 63% report watching at a friend's or neighbor's house. Respondents describe



watching from about 18:00–19:00 until about 20:00–21:00 and the majority list 19:00 as the hour at which their favorite program begins.

## **Evening worship**

In the Peruvian Amazon as in many parts of South and Central America over the last decades, participation in evangelical Christian movements has been increasing. More than half the population of Villa Buendía and San Anselmo classify themselves as evangelicals, along with a substantial proportion of the residents in El Manantial and Santa Catalina. The evangelical services we observed in these communities typically take place three nights per week beginning around 19:00 and ending around 22:00. As in the case of TV-watching, this schedule overlaps with the peak *An. darlingi* biting period. Participants in these services may be somewhat better protected than TV-watchers: while many people wear shorts, a t-shirt, and use rubber flip-flops or go barefoot around the house, they tend to dress up for church. Men wear long pants and long-sleeved shirts along with socks and shoes. Women wear long skirts and avoid sleeveless shirts, but are more likely than men to wear short sleeves and open-toed shoes, thus leaving more skin exposed to bites.

One well-established group in Santa Catalina and another in El Manantial hold services in cement buildings with wooden doors and windows but no screens. More commonly, though, people meet in the house of a group member or in a building constructed in the same style as the local houses: a wooden frame and a palm-thatched roof with no walls or half-height walls on one or two sides. In addition to their thrice-weekly evening services, many groups also conduct all night prayer vigils several times a year. These are often held away from the normal place of worship, in the forest or in a distant community where the group is proselytizing. These activities, which concentrate a relatively large number of

people in a small, mostly unprotected, space, seem ideal for maximizing human-vector contact. Indeed, a volunteer health promoter who lives near Villa Buendía commented during the study that prayer vigil participants often develop malaria within a week or so of participating. This volunteer has several years' experience working with malaria prevention and diagnosis and is also a lay evangelical minister.

## **Economic activities**

As in most of the project area, the four study communities have no formal market. There is little in the way of structured commerce. Villagers travel to Iquitos to buy clothes, household items, most supplies, and most processed food items they consume. However—as is also typical—the four study communities each have several *bodegas*, small shops that sell basic necessities such as soap, matches, and bread, plus a few luxury items like soda or canned tuna. Such shops are usually run out of the owner's house. While an important supplement to household earnings, they rarely constitute the family's principal income-producing activity. An observer describes a typical *bodega* in Villa Buendía:

The house is located on the main road, just across from the Otorongo military camp. It is constructed of rustic material, with wooden board walls, a dirt floor, and a palm thatch roof. In the front part of the house, the right half serves as the living area and the left half as the second bedroom. The front and right-side walls of the living area are nothing more than cane railings about one meter high. Towards the middle part of the back wall, a window opens onto the *bodega*, and towards the left of this wall is the door that leads to the other part of the house. In the middle of the front wall (the railing) is the door, also made of cane, and to the left of the door, a small table with a round tray containing *juanes* [a local dish of chicken, egg, yellow rice, and olives steamed in a banana leaf] which the family sells for 0.50 or 1.00 *nuevos soles*. There is also a transparent bucket, about 30 cm high by 20 cm in diameter, with a spout at the bottom. The bucket contains *masato de pijuayo* [a fermented beverage of ground palm nuts], also for sale. Near the tray is a small blue plastic container with onion sauce for the *juanes*. The *bodega* is small, about 1 x 2 meters, and has three walls: front, back, and right-side. On the front wall are a pair of large speakers [for a battery-operated portable stereo] and towards the back wall a large set of shelves where the family stores the products they sell: sugar, toilet paper, rice.

Families who run a *bodega* attend customers at any hour. We recorded several instances of people getting out of bed at 2:00 or 3:00 in the morning to sell cigarettes to a soldier

on guard duty at the military camp. In addition, some families peddle *juanes* and other prepared foods at early evening social events such as soccer or volleyball games or even door-to-door. Since our observations began around 18:00 we do not have data on daytime vending, but nighttime sales are most active until about 20:30 or 21:00. As with television watching, these hours correspond closely to the *An. darlingi* biting peak. Though we cannot demonstrate a quantitative association between these activities and risk of contracting malaria, such a relationship seems quite plausible.

Other nighttime income producing activities include baking, fishing, hunting, and charcoal production. A few families bake small cracker or pretzel-like snacks of manioc flour which they sell during the day to passersby or take to the market in Iquitos. Most baking takes place for an hour or two after sundown. Many men fish at night after tending their fields during the day. On one occasion, a resident of San Anselmo took an observer fishing along the Itaya River, leaving at 19:00 and returning at 01:20 the next morning. The observer and resident spent almost this entire time in a dugout canoe, first paddling for 90 minutes to the fisherman's preferred spot, then setting and hauling in nets. The observer describes the scene at 21:30:

After setting the nets, we wait in the distance. At this moment, you can really feel the great number of mosquitoes because we have to keep still and stay in the dark [to avoid scaring the fish]. Sometimes there are so many I can't stand it.

The fisherman and observer stay in this spot until 23:00, then set the net for another 30 minutes before retrieving it at 23:30 and heading home with their catch. We were unable to observe hunting, but this, too, often takes place at night since many of the animals hunted are nocturnal. A hunter leaves after dark and may come home the next morning or remain in the forest for several days, depending on his luck.

Many families produce charcoal as a quick source of income between harvests. Though cutting trees for this purpose is illegal, the laws to prevent deforestation are rarely enforced, especially against individual families. To make charcoal, the producer cuts enough trees to make a pile of branches about 3 meters in diameter by 2 meters high, then covers it with packed earth and leaves to prevent the wood from burning to ash. The producer ignites the pile and then must tend it while it smolders for 2–3 days, packing more earth onto the pile any time it erupts into flames. People produce charcoal at the edges of their fields which can be anywhere from 15 minutes to 2 hours walk from their houses, and sleep by the pile overnight during the burning process. During two observations we conducted specifically to learn about charcoal production, those producing it brought *tocuyo* bed nets with them. They stayed awake tending the wood pile until 21:00–22:00, then went to sleep inside their nets which they hung from a provisional shelter constructed for that purpose. They rose 3–4 times during the night to check on the pile.

## ***Reactivity***

In 60 observations, we recorded 339 instances of reactivity. This made our initial reactivity code the third most frequently applied of all 94 codes. After analyzing each instance, we divided reactivity into six categories. Gittelsohn, et al. used a similar approach while studying Nepali childhood feeding practices.<sup>21</sup> Our first category comprises salutations: for instance, the observer greeting household members. Observers recorded this type of interaction 63 different times, likely an underestimate since each observer must have greeted and said goodbye to household members at least once per observation.

The second category—recorded 100 times—involves interaction with an adult in a way clearly unrelated to malaria prevention. In this category we included conversation

about unrelated topics, offers of food, and showing the observer a backyard garden or domestic animals. The third—noted 85 times—involves interaction with a child in a way unrelated to malaria prevention. Often children express curiosity about the observer’s work or want to play. Occasionally, a child also shows fear, believing the observer has come to draw blood or give an injection. The fourth category of reactivity—observed 94 times—includes behavior changes among household members unrelated to malaria prevention, but probably due to the observer’s presence. For example, in one household when a daughter comments that she wants to take a bath, the mother teases: “*You* want to take a bath? I don’t believe it! We’re going to have to ask this young lady [the observer] to come every day!” [29 March, El Manantial]

The field notes contain 25 cases of category 5 reactivity: household members talking with the observer about malaria in a way unrelated to the focus behaviors. For instance, people often comment on the Ministry’s residual insecticide spraying program or on entomologists collecting mosquitoes in the area. They also discuss family members’ malaria episodes and their participation in a concurrent malaria prevalence survey. Occasionally, participants make comments specifically related to bed nets, asking, for example, when Ministry-distributed IBNs will arrive in their community or remarking that the observer’s bed net is different from their own. However, there is no indication that such comments influence malaria prevention behavior.

In fact, of the 339 notes on reactivity, only two illustrate a change in a *focus behavior* per se. One observer records that, in response to a question from a village resident, she has explained that malaria is transmitted by mosquitoes and not by drinking contaminated water as the resident had believed. A few minutes later, the observer puts on

a long-sleeved shirt because there are many mosquitoes present. She notes that the resident immediately follows suit, adding, “I think he did it because he saw me put on mine.” In the second instance, a different observer describes a scene from a different village:

The 23-year old sister goes into her room and comes back carrying a sheet with which she completely covers the hammock, but I don't know if it's because she saw me put on a long-sleeved shirt or because she always does this. She tells me she always covers the hammock because the mosquitoes keep her son from sleeping and make him cry. She says they're unlikely to get malaria because they always bathe early and always go to bed early, too. At this moment, the house fills up with smoke from the wood stove and she tells me that she always makes smoke in the house [*“humear”*] around this time of day to drive away the mosquitoes. [13 March, Villa Buendía]

The woman's comments sound like a Ministry of Health behavior change campaign script. Clearly, she is modeling “correct” behaviors for the observer. This example is most notable, however, because it is so unusual. While we saw a range of bathing times, many people bathed later than recommended by the Ministry. Household members rarely entered their mosquito nets by the recommended hour. Many characterized these recommendations as impossible to follow given the demands of work and the hot humid climate. We did see some people smoking out their houses to drive off mosquitoes (a practice the Ministry discourages because of its association with acute respiratory infection in young children), but it was not something people do on a daily basis. In sum, the analysis suggests that our observers' presence produced a negligible change in malaria prevention behaviors among members of observed households.

## **Discussion**

Through his nighttime observations in Papua New Guinea, Scaglione documented the importance of both income-producing and leisure-time activities carried out at night in the community he studied. Scaglione concluded that limiting observations to daylight hours would have produced a biased picture of how the Samukundi Abelam spend their time.

Given his focus on time allocation, Scaglione produced quantitative measures to determine the average number of hours per day devoted to the various activities he observed.

Our objective was not to determine the proportion or amount of time devoted to certain activities, but rather to identify what activities take place at what times in order to assess their potential effect on malaria exposure. While our data are more qualitative, they also reveal some patterns that would be difficult or impossible to document were observations limited to daylight hours. Some of what we observed—for instance the time of day and number of hours that people watch television or the time at which people bathe—corresponds closely to data collected in interviews or surveys. Given this high correlation, we might conclude—at least for these phenomena—that data based on reported behavior is just as valid as that based on observed behavior. Thus, in the future we might limit data collection on some behaviors to interviews or surveys, and skip the more costly, labor-intensive, and invasive approach of sitting in participant's homes and taking notes all night long.

But surveys or interviews alone would be unlikely to produce accurate information about other phenomena, such as the number of times people get in and out of a mosquito net at night, the difference between reported and observed bed times, or the social context in which people view television: groups of neighbors gathering around doorways and windows and watching from outside rather than, say, from within a mosquito net. In a survey or an interview, it would be difficult to develop a clear and detailed picture of nighttime fishing, vending, charcoal production or religious observance. Similarly, it would be difficult to determine what type of clothing people wear during peak biting hours and how this might influence risk. Without observation, for instance, how would

one determine that many men wear shorts and go shirtless and barefoot at home, but put on long pants, a long-sleeved shirt, and socks and shoes for nighttime religious services?

These findings, while potentially important, are not quantitative measures of malaria risk. To quantify risk, public health practitioners typically employ one of two methods. The first involves active surveillance for malaria cases combined with collection of information about pre-determined risk factors. Roper and colleagues carried out such a study in Padre Cocha, a village of 1,400 inhabitants located on the Nanay River a few kilometers from both Santa Catalina and San Pedro.<sup>20</sup> Roper's study included a risk-factor survey administered to 89% of Padre Cocha residents. Respondents were asked about 16 potential risk factors including bed times, bathing times, television-watching, and evening church attendance. Roper's team found relatively weak associations between malaria in adults and walking around the village after 18:00, rising before 06:00, and working in Padre Cocha. The team also found a weak association between malaria in children and nighttime church attendance. The authors noted three potential reasons why they might have missed associations between malaria and other evening activities. First, their survey could not control for the geographical distribution of malaria in the village despite their findings that *An. darlingi* activity and malaria cases tended to cluster in certain locations. For instance, in Roper's study respondents who reported watching TV in the evening actually had a *lower* likelihood of becoming infected with malaria. The authors speculate that this protective effect was due to the fact that electricity is available only in the center of the village which is farther from water and *An. darlingi* breeding sites than the peripheral areas where more malaria cases were documented. Second, the authors postulate that respondents might have underreported behaviors they perceived as undesirable. Given the



Ministry's behavior change campaign, this could have included bathing or going to bed late or taking part in other activities after dusk. Finally, the survey provided no information about the magnitude of people's participation in activities they reported. A survey respondent who reported watching TV could not specify whether he or she did so once a week or daily, for a few minutes or for many hours.

The second quantitative method used to ascertain malaria risk is to determine the number of infective mosquito bites to which an individual might be exposed in a given setting over a given period of time. The most reliable method for estimating infective bites per unit time is to conduct human landing collections: one field worker sits for a defined period in a defined location with their legs bared up to the knees while a companion traps all mosquitoes that land on the first worker's legs. The mosquitoes are later identified by species and tested to determine the percentage of anophelines infected with the plasmodium parasite.<sup>22, 23</sup> Schoeler and Flores used human landing collections to determine the geographic distribution of *An. darlingi* in the Peruvian Amazon and the proportion of mosquitoes infected with *P. falciparum* or *P. vivax*.<sup>9, 24</sup> Carrying out human landing collections might be possible while watching television, but would be much less practical for any activity that involved considerable movement on the part of participants. It would be impractical if not impossible during bathing, walking around the village at night, getting in and out of a bed net, or participating in a sports activity such as the soccer and volleyball games that are common at dusk in the study villages. Vittor attempted such a collection in 1999. She found that estimated exposure based on having a collector shadow a villager participating in any one of 10 different activities was much lower than exposure estimated by the standard approach of having a stationary

collector sit inside or outside a dwelling.<sup>25</sup> Vittor usually employed a single collector rather than a team. She does not discuss the relative efficiency of a collector capturing mosquitoes while moving compared with remaining still, or with one collector versus two, but it seems likely that the lower exposure she recorded might be explained by the greater difficulty of collecting mosquitoes under these conditions.

Nighttime observations, then, might supplement risk-factor surveys by providing more detailed information about potentially risky activities. Using an approach similar to Scaglione's, one could quantify the amount of time dedicated to each activity. Researchers designing risk-factor surveys could develop more precise questions that would yield better measures of risk because they better reflect the way in which activities take place.

Observations are also always useful to assess the validity of reported behavior especially where there is no previous measure of this validity or where outside factors, such as a behavior change campaign, might introduce biases. As shown by our reactivity analysis, well trained observers applying a well designed observation instrument can provide researchers with an additional tool to assess and control for bias. Observations can also aid in identifying behaviors that might otherwise be excluded from a survey because they are unknown to researchers only superficially familiar with the social and economic context of a community, or so routine that community informants don't think to mention them in interviews. Observations can provide a qualitative assessment of risk in situations where mosquito collection is impractical or impossible. Finally, by providing contextual detail, nighttime observations can be useful in designing or modifying malaria prevention interventions to better fit the needs of the target communities.

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## Paper 2

### **‘The whole world will be able to see us’:**

Determining the characteristics of a  
culturally appropriate bed net  
among mestizo communities  
of the Peruvian Amazon

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## Abstract

Insecticide-impregnated bed nets (IBNs) are an important component of malaria control programs worldwide. In response to a 1997 epidemic outbreak of malaria, the Peruvian Ministry of Health began distributing IBNs in the country's Amazon region. Net use is nearly universal among mestizo communities in this area of the country, but most residents use non-impregnated nets made of an opaque muslin fabric known locally as *tocuyo*. We carried out semi-structured interviews to evaluate the cultural acceptability of Ministry-distributed IBNs among net recipients. Based on the results of these interviews, we assembled netting fabric swatches in different colors and weaves and used a ranking exercise to determine what attributes might make IBNs more acceptable. Our results show that bed nets serve a variety of functions for net users in the area. In addition to protection against insect bites of all kinds, nets provide warmth, privacy, and a sense of security for young children. Since the open-mesh polyester fabric of Ministry-distributed nets cannot fulfill these functions as well as *tocuyo*, many IBN recipients disliked or rejected the IBNs they received. Also, to comply with local standards of hygiene, users typically wash their nets every 2–3 weeks. Since the white IBN fabric stains rapidly in the dust- and smoke-filled household environment, IBN recipients found it difficult to refrain from washing their IBNs for the six-month period requested by the Ministry. We propose a two-pronged approach that balances user and health system expectations of bed nets and that should lead to more widespread and effective IBN use in the study communities.

## Introduction

Insecticide impregnated bed nets (IBNs) have been used to reduce malaria morbidity and mortality in Africa and Asia for over a decade.<sup>1,2</sup> Though the effectiveness of IBNs for malaria control in the Americas remains somewhat controversial, a recent study in Colombia has demonstrated a significant effect.<sup>3-5</sup> Among mestizo (Spanish-Amerindian) communities in the Peruvian Amazon, bed net use is nearly universal.<sup>6-8</sup> Most residents of these communities use non-impregnated nets made of an opaque muslin-like cotton fabric known locally as *tocuyo*. As part of its response to an epidemic outbreak of malaria in the region in 1997, the Peruvian Ministry of Health (MOH) introduced IBNs that were different in size, shape, material, and color from the nets with which area residents were familiar.

Acceptance of IBNs can depend on a wide variety of social and cultural factors.<sup>9-11</sup> The purpose of the research activities described here was to evaluate the cultural acceptability of the MOH-distributed nets and to develop recommendations that might improve IBN uptake. We employed semi-structured interviews to determine what nets recipients in rural villages around the city of Iquitos liked and disliked about the IBNs compared to their traditional *tocuyo* nets. Based on the data collected in these interviews, we then used a ranking exercise as described by Weller and Romney to determine what net characteristics might improve IBN acceptance.<sup>12</sup> The results discussed in this paper were part of a larger study on socio-anthropological aspects of malaria control in the Peruvian Amazon. The study took place in the Loreto, the largest department in Peru's Amazon region, between January 2000 and December 2002.

The Ministry began indoor residual spraying during the 1997 outbreak. At the same time, the Ministry purchased *tocuyo* nets and distributed them to heavily affected communities. Meanwhile, malaria control program staff conducted a literature review to identify programs in other countries that might serve as models for a more systematic approach.<sup>13</sup> After considering various options, the program settled on an approach used successfully in China: application of deltamethrin to treat existing bed nets and to serve as a residual insecticide on the roofs and walls of houses.<sup>14-16</sup>

As an outgrowth of this strategy, the National Malaria and Vector-Borne Disease Control Program purchased 37,000 deltamethrin-impregnated bed nets in 1999 which the MOH distributed that same year. In 2000, the MOH acquired and distributed another 45,000 IBNs. The IBNs distributed in Loreto were manufactured by Siamdutch Mosquito Netting Company, one of the world's largest IBN suppliers. They were made of white 156-mesh, 100-denier multifilament polyester, and treated with 25 mg/m<sup>2</sup> of K-Othrin<sup>®</sup> (deltamethrin). The MOH used annual malaria incidence rates to prioritize IBN distribution. Of the communities involved in this study, the MOH had distributed IBNs in Nuevo Amanecer, Cocha Negra, Santa Catalina, San Mateo, and Arenal. No nets were distributed in El Manantial, Villa Buendía or San Anselmo.\*

## **Methods**

### ***In-depth interviews on bed net use***

To better understand study zone residents' experience with bed nets, particularly the IBNs distributed by the MOH, we carried out 28 in-depth semi-structured interviews,

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\* Unless otherwise noted, all individual and place names used in this paper are pseudonyms. Iquitos and Nauta are actual names.



14 with IBN recipients and 14 with community officials, volunteer community health workers (CHWs) and MOH personnel involved in the 1999 net distribution. Interviews with net recipients took place in the villages of Nuevo Amanecer (population 300), Cocha Negra (1,100), Santa Catalina (2,600), San Mateo (1,110) and Arenal (675). All these communities are located between the city of Iquitos and kilometer 21 of the Iquitos–Nauta highway. Interviews with health workers and officials also took place in these communities or in the health facilities serving them. The main selection criteria for net recipients was having received an MOH-distributed IBN in the 12 months prior to the study and being a permanent resident of a community selected by the MOH for net distribution. Volunteer community health workers helped identify potential interviewees. The main selection criteria for health workers was personal participation in the previous year’s net distribution. This sample included three doctors, three local officials, four nurses, and five CHWs. All interviews took place in April and May of 2000.

Interviewers kept detailed notes during each interview which they expanded into long-hand reports at the interview’s conclusion. These reports were entered into a word-processor, formatted as RTF files, and then imported into ATLAS.ti version 5.0. In ATLAS.ti, the first author developed a series of 33 codes related to positive and negative attributes of both *tocuyo* nets and MOH-distributed nylon IBNs. He used open coding to code each interview and then analyzed the contents of text segments by code to determine what positive and negative attributes were most salient to interviewees.

### ***Ranking exercises for color and texture preference***

As described in the results section below, IBN recipients expressed dissatisfaction with the MOH-distributed nylon nets for several reasons. In light of this dissatisfaction, we

decided to determine if a different type of polyester netting material might be more acceptable. To this end, we had study participants examine fabric swatches of several different colors and weaves and tell us what they thought would be the benefits and drawbacks of using each type of fabric for a bed net. We obtained polyester swatches from Siamdutch. We obtained swatches of the three most commonly used local fabrics from Belen, the central market district in Iquitos where most study area residents purchase their *tocuyo* nets.

Siamdutch produces polyester nets in five colors: light blue, pink, lime green, olive drab, and white. They make fabric in four densities: 156 mesh (12x13 holes per square inch), 196 mesh (14x14 holes per square inch), tri cot (about 15x15) and jersey cloth (20x36). The three most popular local fabrics are single ply muslin ("*tocuyo simple*"), double ply muslin ("*tocuyo doble*") and a more finely finished bleached cotton cloth often used for embroidery ("*tela playa*"). *Tela playa* is considered the most desirable netting fabric by many because of its brighter white color and its soft feel after washing. However, it is used much less frequently than *tocuyo* because of its higher cost.

To make clear which fabric characteristics we were testing, we assembled two separate sets of swatches, one for colors, the other for weaves. Each swatch measured approximately 16x20 cm. Color swatches were all of identical material: 156-mesh 75-denier multifilament polyester. Weave swatches were all white or, in the case of *tocuyo*, off-white. Both *tocuyo* and *tela playa* are heavily starched and quite stiff when new. To make the swatches of these fabrics more closely resemble bed nets in everyday use, we hand washed them with water and a locally popular brand of laundry soap. Since some of the fabrics with different density weaves are quite similar in appearance, we labeled

the border of each swatch with a code to help the interviewers distinguish between them. We then mounted each swatch on an identical cardboard strip. The cardboard strip concealed the codes so that the fabrics, when presented to an interviewee, were identical in appearance except for the characteristic being tested.

Interviews consisted of a structured questionnaire with the same questions asked in the same order of each interviewee. We developed the questionnaire, field tested it in non-study communities, then revised it before beginning interviews. Each interview included the following steps: after obtaining the interviewee's informed consent, the interviewer would explain the exercise guided by a written script printed on the data collection form. The interviewer would then present the different color swatches to the interviewee in random order, ask the interviewee to examine each swatch and then choose the best, most appropriate color for a mosquito net.

Once the interviewee selected his or her first preference, the interviewer would ask him or her to select the second best color, then the third best and so on until the interviewee had ranked all colors from best to worst. The interviewer would then pull out the interviewee's first choice and ask him or her what about this color made it best or most practical for a mosquito net. After recording the interviewee's answer, the interviewer would select the interviewee's last choice and ask what made it a poor or impractical color for a bed net.

The interviewer would then put away the color swatches, present the interviewee with the weave swatches and follow a similar procedure. Each interviewee would examine and rank the swatches and explain the benefits of his or her first preference in fabrics and the liabilities of his or her last preference. Since we were particularly interested in identifying a

culturally acceptable polyester material with a denser weave, we also asked each interviewee to discuss the advantages and disadvantages of the tri cot and jersey-cloth swatches if these were not chosen as a first or last option. After completing each interview, the interviewer would shuffle the fabric swatches so as to present them to the next interviewee in a newly randomized order.

We wanted to identify a polyester fabric that would be as acceptable (or nearly as acceptable) as *tocuyo* to the local population because polyester has two important advantages over cotton for use in IBNs.<sup>17</sup> First, it absorbs less liquid. As a result, it requires less insecticide than cotton, making it less expensive to treat. Second, the multifilament polyester used by most IBN manufacturers is designed to retain insecticide between the filaments of each thread. As a result, it remains effective much longer than when applied to cotton.<sup>17-19</sup> The synthetic nets in use at the time of the study could be washed a few times and still retain enough insecticide to offer protection. More recently, some manufacturers have begun to market “permanently” treated nets on which the insecticide supposedly remains effective throughout the 4–5 year lifespan of the net, or for up to about 30 washings.<sup>20</sup> By contrast, cotton nets shed most or all of their insecticide when first washed.

Interviewees were chosen purposively from among the populations of four additional villages: Villa Buendía, San Anselmo, El Manantial, and San Pedro. The first three of these villages are located along the Iquitos–Nauta Highway, the third on the Nanay River. Selection criteria included the following:

- that all interviewees be permanent residents of communities within the study area;
- that there be a roughly equal number of men and women;
- that the sample include a range of ages; and

- that each interviewee be potentially capable of making decisions for themselves or their family about what type of mosquito net to use.

Our target sample size for this activity was approximately 30 individuals. As described by Weller and Romney, 20–30 interviews of this type is sufficient to accurately determine a cultural preference or value within a fairly homogeneous population such as that of our study area.<sup>12</sup>

Interview responses were entered into Microsoft Access. Numerical data from the interviews were then analyzed using Microsoft Excel. Average scores were tabulated for each color and fabric type. These scores were then ranked from lowest to highest, lowest being the most preferred choice, highest the least preferred. Textual data (explanations of each interviewee’s choices) were analyzed by hand.

## **Results**

### ***Advantages and disadvantages of MOH-distributed IBNs***

#### **Protection against insect bites**

Among interviewees who had received an MOH-distributed IBN, the most frequently mentioned positive characteristic was the protection provided against mosquito bites. Some commented that the IBNs were more effective than *tocuyo* at keeping mosquitoes out; others noted the numbers of mosquitoes and other insects that died after coming into contact with the net. Some specifically mentioned the net’s efficacy in preventing malaria. In the words of a 69 year old man from Nuevo Amanecer, “it’s hard to believe, but I haven’t been sick since I’ve been using this bed net. I think the illness runs away every time it sees the net [laughs].” Some users liked what they reported as the insecticide’s repellent effect: “The remedy [insecticide] keeps

mosquitoes from getting too close,” said one resident of San Mateo, “that’s one advantage of this net over the others.” For others, the main benefit of the insecticide was its ability to kill: “no sooner does an insect touch the net than it dies.”

### **Other positive aspects**

Other positive characteristics mentioned by IBN users were the net’s size (large enough to cover a double bed), its aesthetic appeal (“better looking than the other net... more elegant and prettier”) and even that the insecticide had an agreeable smell. Many expressed appreciation for the net having come at no cost: “I really do appreciate this gift,” said a woman from Arenal, “because a lot of times people here don’t get much help, so we can’t even buy a bed net in Belen.” [P3: 34] This sense of appreciation made some interviewees reluctant to say anything negative about the net or admit that they were not using it. As the woman from Arenal put it, “the bad thing is that the material is very thin, but you just have to make do with what they give you, you can’t go complaining about a gift.” [PD3:74]

### **Refreshing or too cold?**

Some net users liked the fact that the MOH IBN kept them cool at night, but many more complained that they felt too cold sleeping in it. Many interviewees observed that the nylon net would be comfortable in very hot weather or in other special circumstances (“when you’re pregnant, you feel hot all the time”), but most maintained that in an open structure like a rural house, it left them uncomfortably cold, especially late at night.

*Tocuyo* is better because not much air gets in, it protects you better, it’s nice and warm. Nylon is good when you have a really well built house (*una casa bien segura*), but when it’s made of wood like this, the air gets in, and you know that we’re humble people here and we don’t have a lot of sheets to keep us warm, so the air hits you in the face and you get sick... especially the kids, they’re always getting the flu or bronchitis (*se enferman de los pulmones*). Woman, age 46 [PD9:94]

A teenage girl from Nuevo Amanecer admitted that because of the cold, her family had decided not to use the IBN. “They had put it up, but since so much air came in we got cold. That same day, my mother put it back in the package and there it is, nice and clean, just like when they gave it to us.” [PD6:70–72] Nine of the 14 net recipients interviewed complained about the net being too cold; this was the most frequent of all complaints raised in the interviews.

## **Transparency**

Transparency, the fact that one can see through a nylon net, was also a frequently mentioned negative attribute for several reasons. One is that children who use a transparent net get scared when they wake up in the middle of the night and can see out. Amazon communities have many stories about malevolent supernatural beings, ghosts, and wild animals in the jungle. A real or imagined encounter with such a being can cause a child to get *susto*, a potentially fatal illness in many Latin American ethnomedical systems.<sup>21</sup> Further, traditional Amazonian cosmology holds that seeing the ghost of a recently deceased relative or neighbor is one potential ‘cause’ of malaria. So sleeping inside an opaque net helps children feel protected. Another negative aspect of transparency is failure to block out the sun. One interviewee reported that she had started using the MOH net because her nine year old daughter was afraid to sleep in it. But the woman found she didn’t like the net either because it let in too much light “and I have to sleep during the day because of my baby.” Finally, transparency also relates to privacy. In one interview, a health worker explained that bed net use in study area communities was something that had been passed down through many generations and would continue for many more. When the interviewer asked why this was so, the health worker responded:

Look, can't you see that it's the only way to have any privacy? Since everyone sleeps in the same room, one right next to the other, if you have a partner, everyone's going to be watching you. So the bed net becomes your 'room.' [PD22:66–70]

A net recipient explained that her son-in-law got very upset with the transparent IBN.

“He said that everyone in the world was going to see them, so my poor daughter had to take down her [new] net and put back up the old worn out *tocuyo* net.” [PD3:74]

## **Color**

The most frequent comment about the MOH-distributed IBNs with respect to color was that they become soiled rapidly because they are white. Many interviewees mentioned the fact that they cook with wood and that the smoke from the fire discolors the material in short order. Another source of stains is the small home-made kerosene lamps (*mecheros*) that for many are the only source of illumination in villages without electricity. Parents with babies and toddlers often leave their *mecheros* burning throughout the night to make it easier to change diapers. Some people read with *mecheros* alongside or inside their nets. Even without young children, some families sleep with a kerosene lamp lit simply to have light at night. Dust, especially in houses with dirt floors, also contributes to dirtying nets, especially since children often go to bed without washing their hands or feet. Stains from dust, smoke, or soot are the most commonly mentioned reasons for washing the white IBNs frequently. *Tocuyo* nets also require frequent washing; indeed most households in the study area report washing their nets about every two weeks. But *tocuyo* nets have not traditionally been treated with insecticide, so there is no drawback to frequent washing. IBN recipients instructed not to wash their nylon nets for as long as six months found this advice nonsensical and impossible to follow.



## **Insecticide smell**

If interviewees did not mention it in their description of the IBN, we asked about whether the net had any smell. We wanted to determine if the acrid odor from the insecticide was a factor in anyone's decision about whether to use their net. For most interviewees, odor seemed relatively unimportant. Few mentioned it spontaneously. When asked about it, some said they had not noticed any particular smell. Others described it as "light," "agreeable," or "pleasant." In the words of one 12 year old girl, "it just had that smell of new cloth, of something clean, like when someone buys you something new." One 34 year old woman reported having a light headache after first using the net, but said she would put up with it again because she was able to sleep much more peacefully after the insecticide had killed all the mosquitoes. Two net recipients described the smell as kind of bad (*'medio feo'*) or a little unpleasant (*'un poco desagradable'*). Three health workers reported hearing complaints about the smell from net recipients. One said he had stored his nets until the odor faded. A 69 year old woman reported that her net had no smell, but added, "if I had smelled anything, I wouldn't have used it no matter how good they told me it was." This opinion, however, was very much in the minority.

## ***Bed net fabric preferences***

We completed 38 structured interviews on fabric preferences, 20 with men and 18 with women. The informants included 10 residents each from Villa Buendía, San Anselmo and El Manantial plus eight residents from San Pedro. Average informant age was 44.4 years (range 20–75). Average length of time each informant had lived in his or her community was 18.3 years (range 1–71). El Manantial residents tended to have lived in their

village significantly longer (mean 29.8 years, range 1–71) than residents of the other three communities (mean 14.2 years, range 1–31), so the average of the sample combined is slightly higher than it would have been were only the three principal communities included. Otherwise, there appear to be no significant differences between informants from the different communities in terms of age, length of residence or gender balance.

Weave and color rankings appear in Table 1. *Tela playa* was the favorite choice among netting fabrics and light blue was the favorite color. Interestingly, light blue was the first choice of colors and pink

the second choice for both men and women. Among the synthetic fabrics, jersey cloth was most popular. 156-mesh and 196-mesh were clearly least favored as can be seen from the large difference in score between tricot (ranked 5<sup>th</sup>) and the other two.

**Table 1: Bed net fabric preferences (n=38)**

| Rank | Weave (Mean score)   | Color (Mean score) |
|------|----------------------|--------------------|
| 1    | Tela playa (2.11)    | Light blue (1.95)  |
| 2    | Tocuyo simple (2.58) | Pink (2.42)        |
| 3    | Jersey cloth (3.45)  | Lime green (3.11)  |
| 4    | Tocuyo doble (3.61)  | White (3.66)       |
| 5    | Tri Cot (3.92)       | Olive drab (3.87)  |
| 7    | 156-mesh (6.16)      |                    |
| 7    | 196-mesh (6.16)      |                    |

Note: scores indicate interviewee preference order (1 = first preference, etc.), so a lower score indicates a higher preference and vice-versa. Score was tied for 156- and 196-mesh.

Beyond the rankings themselves, participant comments about the different color and weave choices provided much useful information about the necessary attributes of a more culturally appropriate nylon IBN. Participants described light blue, the top choice in colors, as “beautiful,” “elegant,” “bright,” and “cheerful.” They said it would make the house look more attractive and would look pretty hanging over the bed. The other frequent comment about the blue color is that it would show dirt less readily and therefore require less frequent washing. By contrast, participants described olive drab, the least popular color, as “tired,” “ugly,” “too dark,” “depressing,” and “lifeless.” For

many, it conjured up unpleasant military connotations. “It would make me sad,” said a 52 year old woman from San Anselmo, “it seems like a color for soldiers... for them it’s OK, but I don’t like it.” “It’s not an attractive color,” explained a 37 year old man from El Manantial. “It wouldn’t stand out in your house, it wouldn’t look good in your room.” Some respondents also said it would be difficult to know when a net of this color needed washing, as it would seem dirty all the time. Though olive drab was least favorite overall, 12 of the 38 interviewees selected white as their least preferred color. All 12 said the same thing: it shows dirt too quickly and requires frequent washing.

Participants expressed a preference for *tela playa* over other fabric choices because of its tight weave and soft feel. They noted that, like *tocuyo*, *tela playa* would protect them against even the small biting sand fleas (*manta blanca*) common to the area, but that unlike *tocuyo* the fabric’s texture was not hard or rough. *Tela playa* allows enough airflow to remain relatively cool during the day, but not get too cold to use at night. Finally, the fabric’s opaqueness provided good privacy and good protection for children. “No one would be able to see you,” commented a 28 year old man from Villa Buendía, “I have my kids, but we sleep in the same room, so [with a lighter fabric] they would be able to see their mother and me.” “With this fabric, you wouldn’t be exposing [your children’s] souls to the night air (*no les vas a airear el alma*),” said a 30 year old woman from San Anselmo. “Here in the jungle, the souls [of the dead] are wandering about... the spirits, what we call here ‘*el tunchi*,’ loves to come after children and they get frightened.”

The 156- and 196-mesh netting swatches look almost identical which probably explains their tied ranking for least preferred fabric. Comments about 156-mesh were almost

the exact opposite of those about *tela playa*: a net made of this material would provide inadequate protection against insects, would be too cold, and would wear out quickly. “Mosquitoes, flies, biting fleas could all get in at night,” said a 30 year old woman from San Anselmo. “I couldn’t sleep in a bed net like this.” “The mesh is too big,” explained a 23 year old man from El Manantial. “That might be OK for stuck-up people (*pitucos*) in the city, but not for us: with holes this big, the mosquitoes and flies would eat us alive.”

Interviewees had mixed reactions to the jersey cloth. Though it ranked third in terms of fabric preferences after *tela playa* and *tocuyo simple*, the absolute distance (0.87) between jersey cloth and the *tocuyo simple* was nearly twice that of the distance (0.47) between options one and two (*tela playa* and *tocuyo simple*). Participant comments reflect this less clear consensus: interviewees described the material as too transparent, but also said its tighter weave would provide good protection against even the smallest insects. Some noted that it would be easier to wash and quicker to dry than *tocuyo*, others thought it might be too cold at certain times of year. Some described the material as much more durable than 156 mesh, others expressed concern that it would melt if it got too close to a *mechero* flame or if they tried to kill a mosquito that had slipped inside.\*

## Discussion

Our findings provide strong evidence that use of insecticide-impregnated bed nets as a strategy for malaria control is culturally feasible in mestizo communities of the Peruvian Amazon. Recipients of Ministry-distributed IBNs expressed enthusiasm for the protection provided by the insecticide, reported few adverse effects, and did not seem to

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\* Many people kill insects that get inside a bed net by burning them with a cigarette, a match, or a *mechero* flame. As one informant explained, “when you want to burn a mosquito that’s landed on the net, you wind up burning the fabric. A cigar would put a hole in the net, melt it.”

find the smell of the insecticide bothersome. However, in-depth interviews with net users demonstrate that white 156-mesh polyester is not the most appropriate netting material in this population, and that nets made of this material are likely to be underutilized or not used at all. Our ranking exercises on fabric and color preferences confirm these findings.

**Table 2: Bed net functions and attributes (a health system vs. user perspective)**

|                                                          | Health officials                                                                                                      | Users                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Functions</b>                                         | <ul style="list-style-type: none"> <li>• Protection against infective mosquito bites at key times</li> </ul>          | <ul style="list-style-type: none"> <li>• Protection against:               <ul style="list-style-type: none"> <li>- All insect bites</li> <li>- Cold</li> <li>- Malevolent spirits</li> </ul> </li> <li>• Privacy</li> <li>• Esthetic appeal               <ul style="list-style-type: none"> <li>- Remains clean (unstained, free of unpleasant odors)</li> <li>- Adds beauty to the house</li> </ul> </li> </ul> |
| <b>Net attributes necessary to fulfill this function</b> | <ul style="list-style-type: none"> <li>• Insecticide impregnation</li> <li>• Good retention of insecticide</li> </ul> | <ul style="list-style-type: none"> <li>• Opaque or semi-opaque fabric that reduces air-flow</li> <li>• Stain &amp; odor resistance</li> <li>• Color other than white</li> </ul>                                                                                                                                                                                                                                    |
| <b>Behaviors necessary to fulfill these functions</b>    | <ul style="list-style-type: none"> <li>• Widespread use</li> <li>• Infrequent washing</li> </ul>                      | <ul style="list-style-type: none"> <li>• Individual or family use</li> <li>• Frequent washing</li> </ul>                                                                                                                                                                                                                                                                                                           |

Our data also show that bed nets serve a number of functions beyond protection against insect bites and disease: they provide warmth, privacy, and a sense of security for children. Table 2 compares user versus health system perspectives on key net attributes. Users are likely to reject IBNs that fail to fulfill their needs. Aesthetic appeal may not be a decisive factor when choosing whether to use a net, but for net users it is at least an important secondary concern. Potential users are more likely to use a net if they find it attractive and believe it will make their homes more cheerful or beautiful. Cleanliness and hygiene, on the other hand, carry significant weight. Study area residents stress the importance of keeping their nets clean. If the malaria control program hopes to prolong

insecticide residuality by limiting the number of times users wash their nets, it will need to find a color that does not stain or show dirt quickly. As study participants emphasized repeatedly, white fabric is a poor choice: the pervasive smoke, soot, and dust in the household environment will soil the net and lead to frequent washings.

What would constitute an acceptable compromise between the community's need for warmth, privacy, security, aesthetic appeal, and protection from small biting insects and the health system's need to encourage adoption of IBNs and maximize insecticide residuality? Our findings suggest two possible answers. The first would be to promote home-based impregnation of *tocuyo* nets. Treating *tocuyo* nets is not ideal from the perspective of maximizing insecticide residuality, but it better addresses community priorities that are not specifically disease-control related and it probably offers better protection than an untreated *tocuyo* net. The second would be to promote use of a more densely woven multifilament polyester net in a color (or choice of colors) that residents find attractive. Such a net would cost slightly more than 156-mesh white polyester, but area residents would also be more likely to use it. It might only partly address the need for privacy, warmth and security, but it would make insecticide use more efficient, and users would probably feel less need to wash it frequently. Given those options, some households would probably choose one while some would choose the other, but the overall effect would be increased protection.

Based on the findings described here, we went on to conduct a six-month series of household trials to test this two-pronged approach. These trials required yet another compromise. Given the outcome of the ranking exercises, we had hoped to pilot test light blue jersey cloth nets. However, Siamdutch informed us that they did not manufacture blue jersey cloth and that they would dye a special lot of fabric only for an order of at least 3,500

nets, a quantity well beyond our needs and budget. After considerable discussion within the research team and considerable negotiation with Siamdutch, we settled on nets of lime green, this being the only color other than white in which jersey cloth was available.

For our informants, jersey cloth was not the first preference in weaves nor lime green the first preference in colors, but under the circumstances we decided that it was the best available option. We carried out small-scale field trials of both home-treatment and the green jersey cloth nets between June and December of 2001. We report the results of these trials in the following chapter.

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## **Paper 3**

### **Household trials of bed net fabric, care, and insecticide treatment in mestizo communities of the Peruvian Amazon**

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## **Abstract**

### ***Background***

Household trials, often called trials of improved practices (TIPs), are a form of operations research used to test and refine potential health interventions on a small scale before introducing them broadly. We used TIPs to test more effective use of insecticide treated bed nets (IBNs) in a malaria-endemic zone of the Peruvian Amazon. Most area residents use cotton nets, which they prefer for privacy and warmth. Many reject standard nylon IBNs as too transparent, less resistant to wear, too cold, and too quickly soiled. We tested feasibility of household insecticide impregnation of bed nets, worked with study participants to develop practical storage and washing practices that would maximize insecticide residuality, and assessed acceptability of a denser weave nylon net.

### ***Methods***

In the first phase of our trials, 15 households treated their existing mostly cotton nets with deltamethrin 25 mg/m<sup>2</sup> in tablet form (KO-tab™). We then visited each household weekly for three months to observe net use and to interview an index household member about net care and the family's perceptions of the treated nets. In the second phase, we replaced half the nets in each household with a lime green, densely woven, nylon IBN. We asked participants to assess both nets over a second three-month period, during which we continued weekly surveillance. Since deltamethrin and other pyrethroid-based insecticides lose their effectiveness with each washing and when exposed to light, two key questions were whether participants would store their nets in the dark by day and how long they would wait between washings.

## ***Results***

All participating households reported that they found home-based insecticide treatment easy and practical and that given the opportunity they would continue to treat their nets at home. Most households were able to store their nets during the day, and were inventive about discovering convenient ways to do this. Most reported that the insecticide lost its effectiveness on the cotton nets within eight weeks of treatment. Participants liked the new nylon nets better than standard nylon IBNs, but not as well as their traditional cotton nets. Users reported that as compared to the standard nylon nets, the new nets offered better protection against biting sand fleas and could be used longer between washings. However, though warmer and less transparent than standard nylon, the new nets still offered less warmth and privacy than cotton.

## ***Conclusions***

Trials of improved practices helped us work with people at risk of malaria in the Peruvian Amazon to identify ways to make bed net use more effective. In addition to testing the feasibility of home-based treatment, we identified and were able to resolve some barriers to acceptance of nylon IBNs. Given the continued preference for cotton nets, we recommend making home-treatment available for both cotton and nylon nets. We also recommend promotion of the more acceptable nylon net. While the factors that influence net acceptability will vary, TIPs can help IBN program managers in other settings identify these factors prior to making large-scale net purchases.

## Introduction

Trials of improved practices (TIPs) are a form of operations research used to test and refine potential health interventions on a small scale before introducing them broadly.<sup>1</sup>

Through TIPs, health researchers enter into a sort of dialogue with the target population: a small number of individuals agree to try several different practices over a period of time and discuss with the investigators the pros and cons of each practice. Working together, researchers and participants identify interventions that both address the health problem and are feasible and culturally acceptable to the target population. By drawing on the experience of TIPs participants, researchers can pinpoint potential obstacles to implementation, develop strategies for overcoming these obstacles, and discard those components of an intervention for which the obstacles appear insurmountable.

TIPs were developed as a method for involving mothers in identifying infant feeding practices that were both healthy and culturally acceptable in different settings.<sup>1,2</sup> In a typical recent example, Bhandari et al. used TIPs during the formative research phase of a community randomized trial to promote exclusive breast feeding and appropriate complementary infant feeding practices in Haryana State, India.<sup>3</sup> TIPs have also been used to test interventions for reducing childhood diarrhea by limiting contact between young children and domestic poultry.<sup>4</sup> There are relatively few examples describing the approach in peer-reviewed journals, but the method is widely used by non-governmental organizations (NGOs) and other entities in planning international health programs, so it is widely discussed in the so-called “grey literature” of project reports. Saving Newborn Lives (SNL) has used TIPs to improve newborn care.<sup>5</sup> Others have used it to identify ways to improve indoor air quality and thus reduce acute respiratory infection, to test

methods for killing mosquito larvae in household water containers for dengue prevention, and with health workers to reduce medical transmission of HIV.<sup>6-8</sup> We used trials of improved practices to identify culturally acceptable ways to promote effective use of insecticide treated bed nets (IBNs) in a malaria-endemic zone of the Peruvian Amazon.

Malaria began to re-emerge as a significant public health problem in the Peruvian Amazon during the early 1990s.<sup>9</sup> Though it accounts for only four percent of Peru's population, the Amazonian Department of Loreto bears a disproportionate share of the country's malaria burden.<sup>10, 11</sup> Following an epidemic outbreak in 1997, the Peruvian Ministry of Health, Regional Directorate of Health for Loreto (MOH) began distributing IBNs in areas with a high malaria incidence. Between 1999–2000, the MOH distributed 82,000 bed nets treated with deltamethrin (25 mg/m<sup>2</sup>). The nets conformed to WHO-recommended specifications: 156-mesh, 100-denier white multifilament polyester.

An evaluation of the MOH IBN distribution program conducted in 2000 found that many recipients disliked these nets because they were too transparent, let in too much air, and failed to protect against biting sand fleas which were small enough to get through the mesh. In addition, area residents reported that the nylon IBNs became soiled quickly and wore out sooner than the cotton nets to which they were accustomed.<sup>12, 13</sup> Participants in the earlier research had expressed a strong preference for these traditional nets made of an opaque muslin known locally as *tocuyo*. Based on this information, we mounted a two-part series of household trials. During Phase 1, we tested home-based insecticide impregnation of existing nets. In addition to determining the feasibility of home treatment, we also wanted to know how long owners of treated *tocuyo* nets would be willing to use them between washings, their perceptions about how long the insecticide continued to be effective, and whether users would

be able to store their nets in a dark place during the day since the insecticide degrades quickly when exposed to light. In the second phase, we asked participants to test a different type of nylon net, chosen to address the deficiencies reported with the standard 156-mesh IBNs.

## **Methods**

### ***Study site characteristics***

The trials took place in three rural villages, Villa Buendía, San Anselmo, and San Pedro (all pseudonyms). All are less than two hours distance from Iquitos, Loreto's capital city. Villa Buendía and San Anselmo are located along the Iquitos–Nauta highway. San Pedro is located on the Nanay River and is reached by motorized canoe. The villages have similar socio-economic characteristics: a mestizo (Spanish-Amerindian) population, an economy based on subsistence and small-market agriculture, and houses of rough-hewn wood with palm thatch roofs. At the time of the study, all were surrounded by secondary growth tropical rain forest and none had electricity, plumbing, or potable water. The villages were chosen purposively with input from the MOH. Selection criteria included a high malaria incidence over the two years prior to the study, socio-demographics reasonably typical of rural mestizo communities around Iquitos, consent from village authorities and residents, and that at least one site be located in the Nanay River basin. Based on a census taken in each village between 1999-2000 and updated in 2002, Villa Buendía had a population of 311, San Anselmo a population of 154, and San Pedro a population of 255.

### ***Household trials Phase 1: Home-based treatment of tocuyo nets***

Field trials show that synthetic netting fabric maintains residuality longer than cotton when impregnated.<sup>14</sup> Nevertheless, we decided to test home-based treatment of cotton nets

because of the overwhelming popularity of *tocuyo* in the project area. At the request of the MOH National Malaria Control Program, we used deltamethrin 25mg/m<sup>2</sup>, the insecticide and concentration in use by the Ministry itself at the time of the study. After reviewing the different available formulations of deltamethrin, we decided a tablet form would be the most convenient and safest for household application. We contacted Aventis, the manufacturer of deltamethrin, to purchase a quantity of its tablets known as KO-Tab™. After learning about our research aims, Aventis agreed to donate 100 tablets for study use.

Our protocol called for a sample of five households in each of our three principal villages. With the approval of village authorities, we decided to select the five households in each village by means of a lottery held at a public meeting called for that purpose. All village residents were informed well in advance of the scheduled meeting date. Those attending the meeting and interested in participating submitted one entry per household. Village officials then drew names to select the five participating households.

To prepare for home-based net treatment, we visited each selected family, inventoried all mosquito nets in the household, and established a date for treating the nets. We advised participants to wash their nets one day prior to the established date so that they would be clean and dry for treatment. We also asked participants to have ready a 2-liter disposable plastic soda bottle for mixing the insecticide. Participants were invited to treat all mosquito nets in the household. Project staff provided instruction and supervision.

Each participating family decided which adults would treat the household's nets. We asked each household to arrange for young children to be away during treatment to avoid exposing them to the insecticide. On the day of treatment, a project staff member would arrive at the participating household and ask if nets had been washed and dried the previous



day. If the nets were ready for treatment, the staff person would present participating household members with written treatment instructions. Participants had several minutes to read the instructions or, in the case of non-literates, have someone read the instructions to them. The staff member then reviewed the instructions with the participants line-by-line and answered any questions. Once confident that participants fully understood the instructions, the project staff person distributed the following supplies:

- 1 envelope containing one deltamethrin tablet (KO Tab™) for each net to be treated;
- 1 30-liter black plastic bag in which to treat and later store the net;
- 1 pair of disposable latex gloves for each participant.

Once staff and participating household members had put on their gloves, the participant mixed the insecticide in the plastic bottle using a quantity of water appropriate to the size of the net to be treated. We used the manufacturer's instructions to determine the amount of water needed for a target deltamethrin concentration of 25 mg/m<sup>2</sup>. Once the tablet was fully dissolved, the participant placed the net in the plastic bag, poured the insecticide over it, then closed the bag, and kneaded it for 5–10 minutes to thoroughly soak the net.

After the insecticide solution was thoroughly absorbed and uniformly distributed, the participant removed the net from the bag and hung it to dry in a shady location. Additional nets from the household were treated in the same fashion. After all nets were treated, project staff supervised the burning of the disposable gloves and plastic bottle to avoid any possibility of re-use that might lead to poisoning. Participants were instructed to allow the plastic bag to dry and then to use it to store each net when it was not in use. Participants were warned not to use the plastic bag to store clothing or food—only the mosquito net.

Staff members then provided each family with written net care instructions reminding participants not to wash their nets for three months, to protect them from sunlight, dust, and smoke, and to store them in the black plastic bag when not in use. On each instruction sheet, the field worker wrote the net treatment date and the date, three months hence, when the participant could wash it again. The field worker then asked the participant to repeat back the instructions, corrected any misunderstandings, and answered any questions.

A field worker made a return visit to each household 1–3 days after treatment. At this first visit, the field worker reviewed net care instructions with the selected household member and answered questions about the impregnation process and net care. Then the field worker applied a 37-item questionnaire about whether and how household members had used the treated net, whether it had dried completely, what time it was put up and taken down, what various family members thought of the net, and whether anyone had experienced an adverse reaction after treating, coming into contact with, or sleeping under a net. Over the course of the next three months, a field worker visited each participating family once per week and completed a similar questionnaire, recording details about each household's perceptions of the net, whether they were using it, storing it in a dark place by day, whether they had washed it, and so on. Logistics prevented scheduling these surveillance visits completely at random. Nevertheless, the field worker varied the day and time of each successive visit to each household; participants had no advance notice of her arrival.

The weekly surveillance questionnaire included questions about what time the interviewee had bathed the previous day and what time they had gone to bed the previous night and woken up in the morning. We collected this information to test empirically whether people were following MOH recommendations about when to bathe and when to go to bed so

as to minimize risk of exposure to infective mosquito bites. If the interviewee or another household member had washed one of the nets, the field worker asked why they had decided to wash it, how they had washed it, and whether they had dried it in shade.

Once a family had washed all its nets or at the end of three months, whichever came first, the field worker conducted an exit interview asking the selected member of each household whether they would want to treat their net again and how much they would be willing to pay for the insecticide to treat it. The field worker also asked how long the insecticide seemed to be effective, whether and when the interviewee began to notice a diminishing effect, and how often they would recommend retreating a net. Finally, participants were asked whether they would recommend net treatment to their neighbors and if they had any suggestions for the investigators. Household-based net treatment took place in late May and early June 2001. Surveillance continued through September 2001.

### ***Household trials Phase 2: Testing of pretreated polyester nets***

Upon completing Phase 1, we distributed the new pretreated polyester nets. The same five families in each village participated in this second phase of household trials. Based on findings from previous research about fabric preferences, the nets chosen were lime green in color and made of a fabric known as jersey cloth.<sup>13</sup> With 20x36 holes per square inch, jersey cloth has a much denser weave than the 12x13 holes per square inch of 156-mesh nylon. We provided each household half as many new nets as it already owned. We asked participating families to use both their own nets and the project nets simultaneously so that they could compare what they liked and disliked about each. Each family decided on its own who would use the new nets and who would use the old.

Along with the new nets, each family received written instructions on their use and care. Following the manufacturer's recommendations, we told families that they could wash their nets after six weeks if absolutely necessary but that they should wait longer if possible. This was based on field data demonstrating that the insecticide could maintain its residual effect for up to three washings.<sup>15</sup> We also provided specific washing and drying instructions and asked families to store their nets in a dark place during the day, to protect them from exposure to smoke and dust, and to avoid using any type of light with a flame (kerosene lamp, candle, match) inside the net. After distribution, the field worker visited each family within 1–3 days, interviewed family members about their initial reactions, and continued with weekly surveillance visits for three months using a structured questionnaire similar to the one used during Phase 1. Distribution of the new nets took place during September 2001. Phase 2 surveillance continued through mid-December.

## **Results**

### ***Net washing practices***

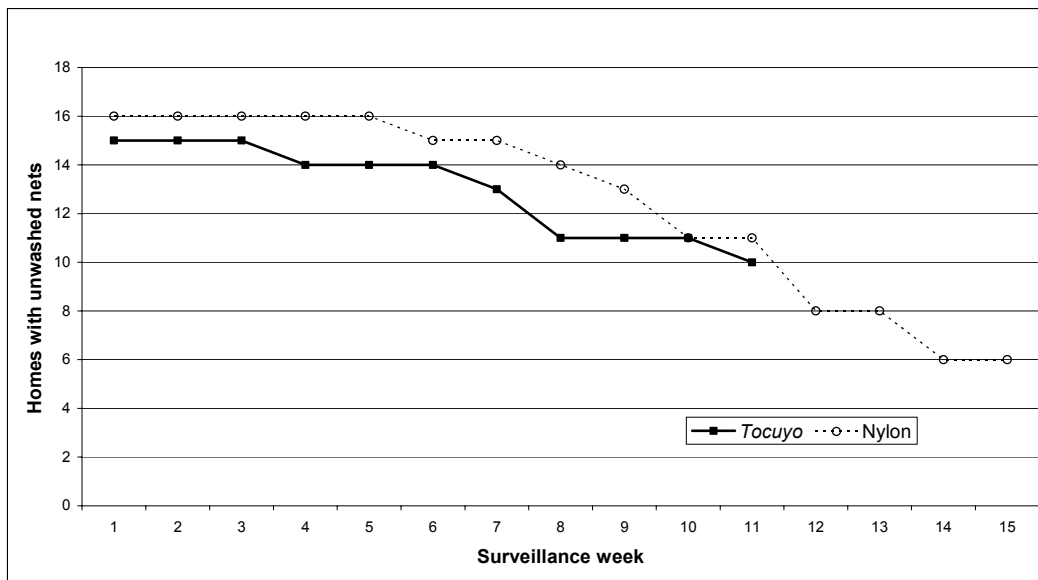
In baseline interviews, most families reported washing their mosquito nets about every 15 days. The most commonly mentioned reasons for frequent net washing were that nets get stained from dirt and smoke and that they begin to smell after a few weeks. Several interviewees added that nets needed to be washed frequently to maintain good hygiene. As one informant explained:

I wash my bed net every 15 days, a month at most, because we sleep with the kerosene lamp lit all night long. This makes the mosquito net smoky, it turns black, a disgusting black, and you're not going to use something that's filthy, so it has to be washed. You wait for a hot sunny day and you take the opportunity to wash the net so it has time to dry, and that night you sleep in a net that's nice and clean and smells fresh.  
(Woman, age 52)

Concern for cleanliness—‘*higiene*’ was the Spanish word used by participants—extended beyond the aesthetic. Interviewees mentioned the importance of hygiene both for disease prevention and as a social norm: like keeping a dirty house, sleeping in a stained bed net would be evidence to one’s neighbors that one was a filthy individual (‘*cochino*’).

We tracked length of time to first washing during the 11-week *tocuyo* net surveillance and again during the 15-week surveillance of the new polyester nets. As shown in Figure 1, all households refrained from washing their nets for the first three weeks of both periods. However, the first household washed its *tocuyo* nets on week 4; all polyester nets remained unwashed until week 6. Between week 6 and week 9, fewer households washed their polyester than their *tocuyo* nets each week. By week 11, when *tocuyo* surveillance ended, 10 of the 15 participating households (67%) had refrained from washing their *tocuyo* nets.

**Figure 1: Weeks to first washing of bed net (*tocuyo* and nylon)**



However, in exit interviews most participants reported that their nets were too dirty and smelly to use longer than two months without washing. Most also reported that the effectiveness of the insecticide was minimal after two months. Some families who had

refrained from washing their nets throughout the surveillance said they did so only because they were participating in the study. Under normal circumstances, these participants told us, they would have washed their nets much sooner.

The first household to wash its polyester nets (during Phase 2, week 6) explained that a heavy rain had soaked their floor and dirtied the net. Those who washed their nets in weeks 7–10 said that the net smelled or looked dirty or that an infant had defecated on it. Those who washed their nets during the last weeks of surveillance reported that they decided to do it because the nets were dirty or because they had refrained from washing them for the agreed-upon time. This was correct, since the Phase 2 surveillance continued beyond the initially contracted 12 weeks.

### **Home-based treatment of nets**

The 15 project households owned 45 nets, 28 *tocuyo* and 17 nylon. For various reasons, participants in five households declined treatment for a total of seven nets, all *tocuyo*. For a few households, we had to reschedule treatment because the family had not washed its nets prior to the appointed date. Participants treated a total of 38 nets, 21 *tocuyo* and 17 nylon.

Project families had varying prior experience with IBNs. In Villa Buendía, the MOH had distributed treated polyester nets to some families in 2000–2001. Four families owned one polyester net; one family owned only *tocuyo* nets. In San Anselmo, two of the five households owned one nylon net each, but the community had not been part of any IBN distribution program. Most families had never used an impregnated net. In San Pedro, almost all participants currently owned or had used pre-treated polyester nets provided either by the MOH or an NGO.

All participants said that treating their nets at home was easy to do. Users reported that the nets killed all or most mosquitoes, other insects, and spiders for several weeks after treatment, though the perceived effect lessened over time. Participants also commented that

**Figure 2: Participant mixes insecticide just prior to treating his net**



they slept better because of not being bothered by insects. Although all nets were treated in the morning to allow plenty of time to dry in the shade, some participants reported that their *tocuyo* nets dried very slowly and were still wet or damp on the first night after treatment. Despite this problem, it appears that all participants complied with the request to dry their nets in shade. The usual practice in the study area is to dry nets in bright

sunlight so that they can be used again on the same day they are washed. Of the 15 participating households, there were a few reports of adverse effects: strong odor, headache, burning eyes, or itching. However, most said these symptoms disappeared after a few days and were bearable given the beneficial effects of the insecticide.

Almost all participants reported that they would buy more insecticide tablets to treat their nets again if the product were available for sale. Most said they would be willing to pay about 1–2 Peruvian *nuevos soles* per tablet (U.S. \$ 0.30–0.60 at the time of the study). Many asked where they could buy additional tablets and were disappointed to learn that the insecticide was not currently available for sale in Peru.

Most study participants were able to store their nets and protect them from exposure to sunlight during the day. Not all participants used the black plastic bags provided by the project—some developed other ways of protecting their nets. However, observation showed that some participants also left their nets pitched over their beds during the day and did not store them.

### ***Pretreated polyester nets***

Participants mentioned several positive characteristics of the jersey cloth net. Many liked the net's large size. Users said it provided sufficient room to roll over at night without touching the sides, that it accommodated 2–3 people without feeling crowded, and that it was spacious enough that young children did not fall out of bed or wind up outside the net while sleeping. Most users characterized it as cool and well ventilated, found it comfortable in very hot weather, and comfortable to sleep in during the day. Most reported that the insecticide (*el veneno, el remedio*) offered good protection against insect bites and killed mosquitoes and other insects. The small size of the holes kept biting sand flies (*manta blanca*) from entering. This had been a major complaint about the 156-mesh net. Some users also reported that the denser mesh kept them from getting cold:

The weave is nice and tight, you can sleep peacefully, not even the smallest bugs get in. I don't get cold, it's just as warm as the *tocuyo*, maybe because the room is pretty well closed up. It protects me and I don't feel cold like I did with the other nylon net. (Man, age 68, Villa Buendía)

Due to the previously mentioned characteristics, most users said they were able to get a good night's sleep (*se duerme tranquilo*) inside the net. Finally, many users mentioned that the color was bright and attractive and that it seemed to get dirty less quickly and not to show dirt, meaning they could use it longer between washings.



Several participants reported that the new net was much easier to wash: dirt came out quickly with minimum effort, and the net dried rapidly and could be used the same day. They compared this favorably with their *tocuyo* nets, which become quite heavy and difficult to maneuver when wet, require a great deal of scrubbing, and may take 2–3 days to dry completely. Some also commented that the net did not require bleach or detergent like a *tocuyo* net, but could be washed with regular soap. After 14 weeks of use, a participant gave this as one reason he preferred the new net over the old:

We've been using it now for quite a while and it doesn't get dirty. This helps with the economy of the household, too, because you don't have to buy soap.  
(Man, age 58, San Pedro)

There were fewer comments about negative characteristics of the new nets. Participants in five of the 15 households said that they sometimes felt cold at night under the new net, especially when it was raining. In four households some family members still found it too transparent. As one participant explained, “it's pretty thin... for a married couple it should be darker so people aren't watching us.” Members of two households reported reactions to the insecticide. In one case the informant said that symptoms disappeared after two hours; in the second, two people reported that the net caused an itching and burning sensation on their face and retained an unpleasant odor for six weeks.

Before the study, most households in Villa Buendía and San Anselmo, used *tocuyo* nets. For these participants, the main advantage of *tocuyo* over the new polyester nets was the thicker material with its added privacy, better protection against the wind and cold, and longer useful lifespan. Some participants reported that they could sleep better in a *tocuyo* net because it blocked out more light. Not being able to see out was also mentioned as an advantage. By contrast, in San Pedro most households had used white polyester 156-mesh

nets before participating in the study. San Pedro participants expressed a universal preference for the new net. As one explained:

Frankly, comparing it [the old net] to the green one, there's no advantage, because the white one is inferior, very open, all kinds of bugs get in... it gets dirty quickly, it lets in too much air, and it's more transparent. (Woman, age 37, San Pedro)

Asked after 14 weeks of surveillance whether they favored their old net or the new one, nine of the original 15 households chose the new, while five said they had no strong

**Fig. 3: Participants knead bed net inside plastic bag to thoroughly impregnate it with insecticide**



preference. One household was lost to follow-up on week 9 when the family moved out of the area, but as of their last interview, this household also preferred the new net. No one reported preferring their old net. By the

end of the trial, all 14 remaining families said they would recommend use of a net like the new one to their neighbors. The household in which two members had reported adverse effects from the insecticide said on a few occasions during the surveillance that they would not recommend the new net to others because they could not sleep in it comfortably. Though at the end the spokesperson for this household said that she, too, would recommend it, she and her family remained somewhat ambivalent.

During Phase 2, only two of the 15 families had their nets stored properly (protected from exposure to light, dust, smoke, and rain) 100% of the time when the observer arrived.

Six families had their nets stored properly on more than 90% of surveillance visits, six had them stored on between 50–89% of visits, and four on less than 50% of visits. Among households with nets stored properly 90% or more of the time, the two reasons given for not storing nets were that a member of the household was sick and thus sleeping under the net during the day or that someone had left the house particularly early that day and had not had time to put away their net. Some households who did not have nets properly stored reported that a family member—often a child—had forgotten or had been too lazy to put their net away. The two households that stored their nets least often explained that family members were accustomed to resting inside them throughout the day and that they were inside a closed room and so not exposed to light.

## **Discussion**

### ***Home-based net treatment***

Given our participants' universally positive response, home-based treatment of bed nets seems well worth pursuing in Loreto. A key question to be addressed before moving forward is whether home-based treatment will work best as a private- or public-sector initiative. Social marketing initiatives to promote bed net treatment and re-treatment through the private sector have met with limited success in other areas of the world. The poor results of programs in sub-Saharan Africa have led Roll Back Malaria and others to recommend limiting private-sector initiatives to bed nets themselves with the public sector providing free treatment and re-treatment services.<sup>16, 17</sup> This approach has worked well in China and Vietnam and is showing initial success in Tanzania. Nevertheless, given our participants' requests to purchase additional insecticide tablets for re-treatment, it is worth exploring private-sector social marketing of home-based treatment in Loreto. Our results

indicate that people may be willing to buy their own insecticide if it is promoted effectively and made available at a cost of around two Peruvian *nuevos soles* per tablet.

A social marketing approach to home-based treatment would offer two important advantages. First, it would give families more control over malaria prevention and enable them to take action to protect themselves rather than waiting for the MOH. Second, it would avoid increasing public dependence on the MOH as the source of all disease prevention efforts. This would protect the MOH from becoming a target of public frustration by first establishing the expectation that it will provide a service, and then having to cut back or eliminate that service when central funding declines or when other health priorities arise. If successful, social marketing would make home-based treatment more sustainable, and would give the community the opportunity and the responsibility to participate in the promotion of its own health.

Before mounting a broad initiative, it would be wise to conduct a small-scale social marketing trial of home-based treatment in one or two provinces. Beyond determining whether private-sector social marketing of insecticide is feasible, such a trial should address the following questions:

1. Should the product to be marketed include just the insecticide itself or a complete re-treatment kit including disposable gloves, a plastic bag in which to soak the net, and perhaps a container in which to mix the insecticide? Marketing insecticide alone would be cheaper and thus more accessible to the target population. But the added expense of a complete kit might be worthwhile if it led to safer and more effective application. End-users might find the added convenience worth the additional expense.

2. What type of instructions are needed? Whether insecticide is promoted as a complete kit or a stand-alone product, users will need instructions about how to apply it. Instructions must be appropriate for a low-literacy audience and incorporate locally appropriate terms and concepts. Instructions would need to be field tested thoroughly prior to dissemination.
3. If net treatment materials are to be made available through the private sector, by what type of merchants should materials be sold and in what locations? During exit interviews, we asked if participants would prefer to buy insecticide in Iquitos or in their own village. While some preferred the convenience of buying insecticide in the village, most expressed a preference for the merchants in the city. Village shopkeepers, they reported, often have very low turnover and therefore sometimes sell expired products.
4. What type of promotional messages, packaging, and branding would be most effective in the target communities?

The KO-Tab™ formulation worked well for home-based treatment because the tablets are easy to handle and apply. Other products come in liquid form which is bulkier and more subject to spills both en route and at the application site. The product introduced for home-based use in Loreto should be determined by appropriate national authorities based on entomological considerations. If the residual insecticide of choice continues to be deltamethrin, KO-Tab™ offers a convenient presentation.

### ***Acceptability and promotion of synthetic nets***

The green jersey-cloth nets tested during Phase 2 of our household trials were much better received than the standard 156-mesh nylon. The tighter weave and the color seemed to successfully address two principal problems with the standard nets: getting dirty quickly and

letting biting insects smaller than mosquitoes pass through the netting. Users also seemed willing to wait longer between washings with jersey cloth than with *tocuyo*, but the comparison is confounded by the fact that we allowed participants to wash their jersey-cloth nets after six weeks rather than waiting the full three months. Of course, residual insecticide applied to multi-filament polyester remains effective after a few washings, whereas on *tocuyo* it loses its effect after a single washing. Since the end of this study, permanently impregnated nets have become available. The insecticide on these nets can remain effective for about 30 washings. Using a permanently treated net would reduce the problem of multiple washings.

The jersey-cloth nets did not completely resolve the problem of transparency. Some users continued to express privacy concerns. While less transparent than 156 mesh, the new nets are not opaque. Some users reported feeling less cold in jersey cloth than in 156 mesh. Others said the new nets were not as warm as *tocuyo* in cold weather, though they were more comfortable in hot weather.

Overall, however, the majority of users reported that the new nets were satisfactory. If the MOH distributes more synthetic nets in the future, jersey cloth in a color other than white would be greatly preferable to white 156-mesh nylon. Area residents will more readily accept and use a colored jersey-cloth net, and will refrain from washing it longer. The lime-green color was generally well received. It is worth considering offering a different color—or a choice of colors—keeping in mind that light tones show dirt faster.

Whatever the decision about net distribution and color, it will be important to provide specific washing and care instructions. Since *tocuyo* nets are durable but stain and absorb body odors easily, users not only wash them frequently but also typically soak them in bleach and beat them on the rocks or scrub them with a stiff brush to get them clean.

This type of washing would rapidly wear out a nylon net, but our participants found it unnecessary with their jersey cloth nets. Indeed, the fact that nylon nets require less frequent washing and are much easier to clean could be cited as advantages in social marketing of such nets. But net care instructions should explain this difference for the benefit of those used to caring for *tocuyo* nets.

Another difference for those accustomed to *tocuyo* relates to the use of open flame within the net. In houses without electricity, people often bring a candle or kerosene lamp into the net with them to read before going to sleep. Many also sleep with matches in case they need light during the night. When a buzzing insect inside the net disturbs their sleep, they light a match first to find the insect and then to incinerate it. If the intruder alights on the net wall, the flame and net come into direct contact. Brief contact with a flame may result in some minor singeing of a *tocuyo* net, but will not harm the fabric's integrity. But even close proximity to flame will cause a nylon net to melt, leaving a gaping hole.

Users also should be encouraged to protect their nets from exposure to light, dust, and smoke by storing them appropriately during the day. We suggested untying the net from the bed each morning and storing it in a black plastic bag. Some participants found this cumbersome, but once they understood the objective, they found more convenient but equally effective ways to achieve it. These included covering the still hanging net with an opaque blanket, or rolling it up, hanging it from the wall, and covering it there with any opaque material. Instructing users to refrain from washing their nets for six months is futile. People are much more likely to comply with a request to wait 8–10 weeks between washings. As a memory aid, we provided participants a simple calendar

printed on a sheet of paper. We marked the treatment date and the date the net could be washed again on the calendar, then had participants hang the calendar on their wall.

## **Conclusions**

Trials of improved practices helped us work with the people at risk of malaria in the Peruvian Amazon to identify ways to make bed net use more effective. In addition to testing the feasibility of home-based treatment, we were able to identify and work through some issues that had been barriers to acceptance of nylon IBNs. By asking a small number of families to try a different type of net, we resolved concerns about the need for frequent washing and about protection against small biting insects. We only partially resolved concerns about cold and lack of privacy.

These findings are useful for net manufacturers as well as malaria control program managers and net users. Both the standard 156-mesh nets initially distributed by the MOH and the jersey cloth nets used in this trial were manufactured by Siamdutch Mosquito Netting Co., one of the largest IBN manufacturers worldwide. Siamdutch was initially reluctant to provide us with jersey cloth nets: the company's experience in Africa and Asia suggested that users would reject the nets as uncomfortably hot.<sup>18</sup> But this previous experience was based on promoting IBN use among populations not accustomed to using nets. For these groups, even the relatively open-weave 156-mesh net allowed less airflow than sleeping with no net at all. After presenting our preliminary data in which residents of our study area characterized 156-mesh nets as too cold, we were able to convince Siamdutch to provide us with the more densely woven material. Our participants' responses to the jersey-cloth nets leaves little doubt that among this population, a denser weave is preferable.



## ***Limitations and transferability***

Qualitative research is often faulted for its lack of generalizability. Since sampling is purposive rather than probabilistic, quantitative researchers sometimes argue that qualitative findings are applicable only to study participants themselves: without random sampling it is not possible to draw inferences about a larger population. In answer to this, some qualitative researchers have developed a mathematical model to demonstrate that with as few as four reasonably well enculturated informants, it is possible to determine with a 95 percent confidence level that 80 percent of information provided by these informants about a particular cultural domain is generalizable throughout that particular cultural setting.<sup>19</sup> Not all the elements of this model are applicable to the study described here. Nevertheless we are confident that the findings *are* generalizable to similar settings in the Peruvian Amazon for several reasons. First, we developed the variables included in our trials—fabric characteristics such as degree of transparency, warmth, ability to protect against small biting insects, need for frequent washing—from a base larger than the three study communities. In addition to Villa Buendía, San Anselmo, and San Pedro, we conducted formative research that yielded the same results in three additional villages. During and after the trials, research in several more communities also confirmed our findings. Second, both the three included villages and the participating households within those villages span the range of socio-economic characteristics in the region. The communities are geographically separate and the participating households include both large and small families, both the relatively well-off and the extremely poor, and cover all ages, occupations, and educational levels. Third, despite this relative demographic and geographic diversity, participant responses

from all three villages were remarkably similar. The fact that consensus about the benefits and drawbacks of both the old and new nets was so strong, despite the different characteristics of the participants, gives us confidence that the findings are reasonably representative of similar communities in the region.

Whatever their diversity, however, our communities were entirely mestizo. The Peruvian Amazon is also home to a large number of indigenous peoples. In general, the indigenous population lives farther from urban areas and maintains less contact with the larger society than do our study participants. Bed net use is lower among indigenous communities, and the factors that influence it may be quite different than those described here. As a result, we do not believe that our results are applicable to the indigenous population. Determining the best way to promote effective IBN use among this population would require further research.

Qualitative researchers also often focus on the *transferability* rather than the generalizability of their research.<sup>20, 21</sup> Transferability refers to the idea that, while it may not be possible to extrapolate the findings from one cultural setting to another, it is possible to transfer the research questions and the methods that generated those findings in order to answer similar questions in a different setting. The issues that influence IBN acceptability may vary greatly from one setting to another. This research demonstrates that small scale household trials can be useful for negotiating those issues with the target population. The MOH began its IBN distribution program in response to an epidemic outbreak, so health officials had little time—at least initially—to carry out formative research before purchasing nets. In a non-epidemic setting, a small formative research

investment could have identified users' objections to 156-mesh nets prior to the purchase and distribution of 82,000 units.

The now extensive literature on IBN promotion and use has already identified color and fabric preferences as factors managers should consider before initiating a program.<sup>14</sup> We identified additional issues that have not been widely discussed: users' reasons for frequent washing, their style of washing, privacy, warmth, and the use of open flame inside nets. Our findings should aid in promoting effective care for IBNs in the project area. They may also be useful to program managers in other areas as added items on the checklist to be investigated before making large-scale net purchases.

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# Appendix A: Summary of research activities not included in the dissertation

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## Malaria etiology

The purpose of our initial set of ethnographic interviews was to develop a context in which to better understand the response of study area residents to different malaria prevention and treatment methods by learning more about local knowledge related to malaria etiology, diagnosis, treatment, and prevention. This information would serve as a foundation for the rest of the project.

Various ethnographic studies have shown how local knowledge of malaria etiology can influence care-seeking practices with important public health consequences.<sup>76</sup> In the Bagamoyo Bed Net Project in Tanzania, Winch, et al. found that uncomplicated malaria and cerebral malaria were seen as two unrelated illnesses. While area residents classified uncomplicated malaria (locally term: *homa ya malaria*) as a common illness best treated by the formal health sector, they categorized symptoms compatible with severe malaria in children (convulsions, very high fever, etc.; local name: *degedege*) as an unconnected illness

of spiritual origin requiring treatment by a traditional healer. Winch, et al. also found that area residents saw fever as a normal occurrence in pregnancy and did not associate it with *homa ya malaria*. Based on these findings, the project incorporated local illness terminology into behavior change campaign (BCC) interventions in the hope of encouraging more rapid and appropriate treatment for pregnant women and young children, the two groups most at risk of dying from malaria.<sup>77, 78</sup> Brieger, et al. found spiritual notions of malaria etiology very rare among Yoruba speakers in Oyo State, Nigeria. Nevertheless, area residents reported pluralistic causes for malaria (common local term: *iba*) including mosquitoes, dust, and excess exposure to the sun or heat. As in Tanzania, Brieger's informants saw the convulsions caused by cerebral malaria in children to be an unconnected illness with a different name (*giri*). Though people treat both *iba* and *giri* at home, the household remedies for the two are different. Those for *giri* not only cause delays in seeking biomedical care for children, but also can aggravate the condition and lead to death.<sup>79</sup>

Collecting illness narratives is a technique often used to develop a general picture of how people within a given population understand and manage a particular illness. Baume used this approach in Zaire to learn how caretakers of young children with malaria make decisions about when to seek care, what type of care to seek and how closely to follow the treatment regimen recommended by the formal health sector.<sup>80</sup> We developed a semi-structured interview guide designed to explore the following questions through individual illness narratives:

- How do study area residents know they have malaria? Do they recognize diagnostic methods other than the thick blood smear used by the formal health sector?
- What different types of malaria do people identify? What differences do people see between these different types of malaria?

- What steps do they take when they have a fever to decide what type of illness they have? What are the preferred options for treating febrile illnesses?
- At what point do people decide to seek care from the formal health sector? What motivates them to seek this care?
- What alternatives exist to the formal health sector?
- To what extent do those diagnosed with malaria adhere to the treatment regimen recommended by the formal health sector?
- How frequent is abandonment of treatment? What reasons do people give for abandoning treatment?
- What, according to project area residents, are the causes of febrile illnesses?
- Are some febrile illnesses seen as preventable? If so, what prevention measures do people take?

To pursue these questions, we identified adults ages 18 and older who had experienced a case of malaria within the previous three months. After obtaining written informed consent from each participant, we asked him or her to tell us about their last episode of malaria in as much detail as possible. We then asked additional questions tailored to the issues raised by each interviewee. As is typical with semi-structured ethnographic interviews, we focused on slightly different themes with each informant, guided by that informant's knowledge and experience.<sup>81, 82</sup>

All informants for this activity were purposively selected. In addition to having had malaria within the previous three months, selection criteria were that the overall sample include a range of ages, an approximately equal number of men and women, a mix of *P. vivax* and *P. falciparum* cases and that interviewees have no formal training in health or medicine. Our target sample size was 12-16 interviews total across several different communities in the project area. All interviews were recorded on audiotape, transcribed as text files and analyzed by hand. Further analysis will be performed using ATLAS-ti.



## **Re-emergence of malaria; antimalarial resistance**

This second round of interviews grew out of a number of themes raised by informants in the course of relating their most recent malaria episode. For instance, several informants reported severe adverse reactions to quinine, and said that they were unable to complete the full dose. However, it was not entirely clear from their descriptions if they had actually stopped taking the medication or if they had taken smaller doses over a longer period of time. Others told us that after finishing their malaria medication, it was necessary to take an herbal remedy to complete the cure. These informants distinguished between drugs that actually cure (*curar*) and drugs that only temporarily alleviate the symptoms (*calmar*). Some then added that the antimalarials provided by the health system only alleviate symptoms and that their malaria would recur unless they took a purgative afterward. Some told us that malaria was a growing problem in the region. Others said that it had been a problem a few years ago, but now had almost disappeared. Therefore, some people explained, it was no longer necessary to worry about how to prevent malaria. This made us wonder how people perceived the re-emergence of malaria in the region: to what extent people were conscious of the recent changes in incidence and, if they recognized it, to what they attributed it.

To explore these issues further, we decided to re-interview a number of our previous informants. While based on a semi-structured interview guide like the first set of interviews, these second interviews varied considerably depending on what a particular informant said during our first meeting. As in the first round, all interviews were recorded on audiotape and transcribed into text files for manual and computer analysis.

## Seasonal Calendars

Medical anthropologists have used seasonal calendars to investigate local understandings about how patterns of illness change over the course of a year. Information gathered from these calendars can then be incorporated into disease prevention efforts. In Tanzania, Winch et al. showed that residents of malarious areas were less likely to use mosquito nets when the density of mosquitoes declined, even though the fewer mosquitoes present were more likely to be infected with the malaria parasite.<sup>2</sup> Based on this finding, the Tanzanian malaria control program designed BCC campaigns to promote year-round bed net use.<sup>18</sup>

In recent years *P. falciparum* has followed a hypoendemic transmission pattern in Loreto, with peaks in incidence occurring roughly two months after the rivers reach their maximum height.<sup>1,19</sup> Our objective in using seasonal calendars with this project was to determine whether local understandings of the seasonality of malaria transmission matched patterns recorded through epidemiological surveillance. We also wanted to explore whether seasonal patterns of work or cultural activities might affect risk of exposure. Finally, we wanted to know if residents of our project area would have more economic resources available for malaria prevention in some months than in others.

Our approach to constructing seasonal calendars followed methods similar to those described by Almedom, Selener and Winch.<sup>2,20,21</sup> We invited groups of 4-6 individuals to fill in a chart describing differences in activities, weather patterns, illnesses, and density of mosquito populations during different months of the year. A reproduction of the seasonal calendar we used can be seen in Figure 1. Our sample size for this activity was 3-4 groups per village. In each village at least one group was to consist entirely of men, one entirely of

women and one of both men and women. In this manner we hoped to determine if there were different perceptions or different emphases on seasonal phenomena based on gender.

**Figure 1: Reproduction of a seasonal calendar**

| Nombre de la época | Cantidad de lluvia / Nivel del río | Enfermedades importantes de nuestros adultos | Enfermedades importantes de nuestros niños | Mes       | Cantidad de zancudos | Actividades económicas que hacemos | Plata (mas / menos) | Fiestas, Feriados, Actividades Culturales de <u>nuestro caserío</u> |
|--------------------|------------------------------------|----------------------------------------------|--------------------------------------------|-----------|----------------------|------------------------------------|---------------------|---------------------------------------------------------------------|
|                    |                                    |                                              |                                            | Enero     |                      |                                    |                     |                                                                     |
|                    |                                    |                                              |                                            | Febrero   |                      |                                    |                     |                                                                     |
|                    |                                    |                                              |                                            | Marzo     |                      |                                    |                     |                                                                     |
|                    |                                    |                                              |                                            | Abril     |                      |                                    |                     |                                                                     |
|                    |                                    |                                              |                                            | Mayo      |                      |                                    |                     |                                                                     |
|                    |                                    |                                              |                                            | Junio     |                      |                                    |                     |                                                                     |
|                    |                                    |                                              |                                            | Julio     |                      |                                    |                     |                                                                     |
|                    |                                    |                                              |                                            | Agosto    |                      |                                    |                     |                                                                     |
|                    |                                    |                                              |                                            | Setiembre |                      |                                    |                     |                                                                     |
|                    |                                    |                                              |                                            | Octubre   |                      |                                    |                     |                                                                     |
|                    |                                    |                                              |                                            | Noviembre |                      |                                    |                     |                                                                     |
|                    |                                    |                                              |                                            | Diciembre |                      |                                    |                     |                                                                     |

### Methods for preventing mosquito bites and malaria

Knowing how the members of a community affected by malaria perceive the efficacy of different prevention or treatment methods can help us understand why people use some methods and not others. Some researchers have looked at the perceived efficacy of the insecticide used for treating bed nets.<sup>83</sup> Others have examined the perceived efficacy of the nets themselves.<sup>84</sup> Recent studies have used perceived efficacy to measure community acceptance of new malaria treatment guidelines in chloroquine resistant areas or to determine acceptable intervals for washing and re-treating IBNs.<sup>80, 85, 86</sup>

In this study, our goal was to develop two lists: one of all methods to prevent mosquito bites and the second of all methods to prevent malaria known to and practiced by the target population. Using these lists, we then hoped to determine the perceived efficacy of each method for members of our study communities. However, perceived

efficacy *per se* is not the only factor influencing an individual's decision about whether to use a particular method or practice a particular behavior. A person may perceive a particular behavior to be extremely effective and still not practice it because it is too costly or inconvenient. Thus, in addition to efficacy, we were interested to know how our target population's perceptions about cost and ease of use might influence their decisions about which methods to use in which circumstances.

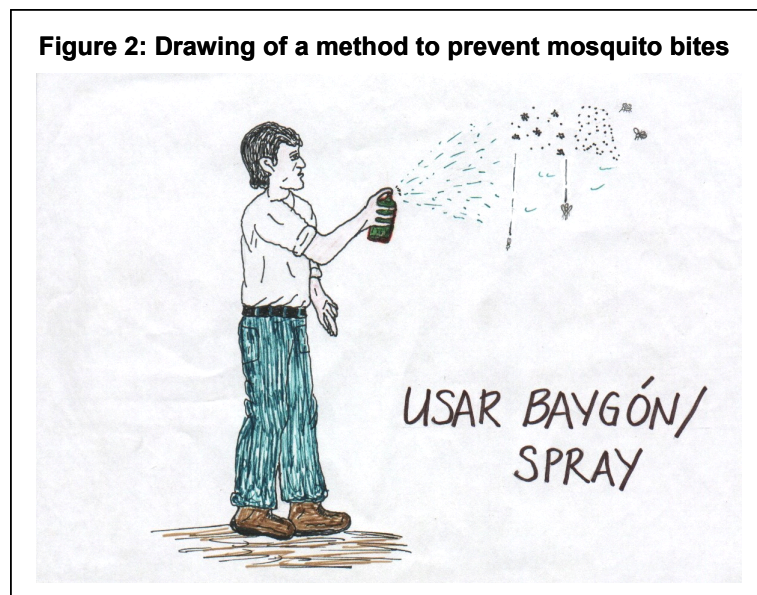
Our first step in collecting this information was to ask 20-30 members of our study population to free-list all the methods they knew to prevent mosquito bites, following the standard approach for this technique.<sup>81,87</sup> We then asked each informant to free-list all the methods they knew to prevent malaria. We tabulated the frequency and average rank of each item using Anthropac.<sup>88</sup> To choose informants for this exercise, we used Stata's "sample" command to randomly select 10 participants from the population census of each of the three principal project villages.<sup>89,90</sup>

### **Perceived efficacy: methods for preventing mosquito bites)**

Based on the free-listing results, we decided to further investigate practices for preventing mosquito bites. We focused on mosquito bites because the question about bites generated answers that public health practitioners would categorize as primary malaria prevention methods. In other words, a typical answer to the question "What are all the ways you know to prevent mosquito bites?" would generate responses such as "wear long pants and a long-sleeved shirt" or "sleep under a mosquito net." In contrast, the question "What are all the ways you know to prevent malaria?" would often generate responses such as "ask the health promoter for a blood test" or "take the pills they give you at the health post." Public health practitioners would categorize these types of responses as secondary

prevention: steps to be taken once one is already sick rather than steps to prevent becoming ill in the first place.

To further explore methods for preventing mosquito bites along the dimensions of efficacy, ease of use and cost, we used pile sorting and ranking exercises.<sup>81, 87</sup> Using the free-list output generated by Anthropac, we combined some methods that were equivalent but that the computer program read as distinct (e.g., “gorro,” “gorra,” and “gorro/sombrero” or “aventarse” and “aventarse con trapo”). We then re-tabulated this revised list and selected for further testing the 21 methods mentioned by three or more informants. We hired a local artist to prepare drawings of people practicing each method. Figure 2 illustrates one of these



drawings. We tested the drawings with residents of communities similar to those included in the study to see whether people would understand them as illustrations of the behaviors we intended. Based on these initial field

tests, the artist made necessary modifications. We then tested the drawings a second time. Once the illustrations themselves were clear, we added a caption explaining each one.

Once again, we used Stata to draw a random sample of 30 residents, 10 from each of the three principal communities. Field workers conducted the interviews as follows: After obtaining informed consent from the interviewee, the field worker would explain that we were doing interviews about different things people do to prevent mosquito bites.

The field worker would present the interviewee with the 21 drawings, which had been previously shuffled to create a random order. The field worker and interviewee would review each illustration together and come to agreement its meaning. Then the field worker would ask the interviewee to separate the drawings into three piles: (1) those things that they do or use frequently, (2) those things that they do or use occasionally and (3) those things that they never do or use. Once the interviewee had sorted the cards, the field worker would ask follow-up questions. For instance, did the interviewee consider certain methods more appropriate in some circumstances than in others?

Next, the field worker re-shuffled the cards and asked the interviewee to sort them into three new piles, this time based on effectiveness: (1) methods that are very effective, (2) methods that are somewhat effective and (3) methods that are not effective at all in preventing mosquito bites. The field worker instructed the interviewee to group methods solely on the basis of effectiveness without considering cost or other characteristics. Once the interviewee had sorted the cards, the field worker would ask which of the methods in the first pile worked best of all and what made that method more effective than the others. They also asked which of the methods in the third pile was least effective and what made it less effective than the others.

The field worker would then separate the cards into two piles, one with methods involving a cost to the participant (e.g., “use repellent” or “use a treated mosquito net”) the other with methods involving no cost (e.g., “cover water buckets,” “fan yourself with a rag,” “bathe early”). For the seven methods involving a cost, the interviewee was asked to sort the cards into three piles: (1) methods that were economical, (2) methods that the interviewee could afford, but only with some difficulty, and (3) methods that the interviewee could not

afford. It took a fair amount of testing to come up with language for these three categories that both explained the concept clearly and was neutral enough not to embarrass some interviewees who might not want to admit that they could not afford something. Translated into English, the question went something like this:

Now I'm going to ask you to sort the cards into three groups one more time. The first group is for things that would be economical for you (*las que le sale a cuenta*), things that you would be able to buy. The second group is for things that are a little expensive, things that you could buy, but only after saving the money. The third group is for things that would be very expensive for you, things that you wouldn't be able to buy, OK?

Once the interviewee had sorted the cards into their three piles, the field worker would ask which of the methods in the first pile was most economical (“¿cuál le sale más a cuenta?”) and what made it economical. The field worker would then ask which of the methods in the third pile seemed least economical (“¿cuál le sale el más caro?”). Finally the field worker would ask the interviewee to describe the meaning, for him or her, of economical, a little expensive, and unaffordable (“¿Qué quiere decir ‘sale a cuenta’ para Ud.?” etc.) and to estimate what the cost of each method would be.

For the remaining 14 methods that did not involve a cost, the field worker asked the interviewee to select the one that was easiest to do and the one that was most difficult to do and, for the latter, to explain in what way it was difficult.

Quantitative variables for this exercise were analyzed using SPSS v. 11.5. We coded each variable so that a higher score would always indicate a more favorable rating. For example, on the dimension of effectiveness, answers were coded as: 1 not effective (“no funciona”); 2 somewhat effective (“funciona más o menos”) and 3 very effective (“funciona muy bien”). On the dimension of cost, answers were coded as: 1 very expensive (“me sale muy costoso”); 2 a little expensive (“es un poco costoso”); and 3 it's affordable

("me sale a cuenta"). Qualitative variables were entered into Microsoft Access and analyzed by hand.

### **Structured Interviews: Knowledge and Use of Antimalarials**

To further explore local understandings of antimalarials, we assembled a set of all medications then in use by the DISA Loreto to treat malaria and conducted structured interviews to ask informants about the characteristics of each medication. These interviews took place in July 2002, a short time after the DISA had changed its first-line treatment for *P. falciparum* in resistant areas to mefloquine and artesunate. We were particularly interested to learn whether people realized that the treatment scheme had changed and whether they reported any adverse effects from the new medications.

The antimalarials used for these interviews included generic chloroquine (250 mg tablet), Aralen™ (250 mg tablet), primaquine (7.5 and 15 mg tablet), Fansidar™ (500mg/25mg tablet), quinine (500 mg tablet), tetracycline (250 mg capsule), clindamycin (300 mg green and white capsule, 300 mg pink capsule), mefloquine (250 mg tablet) and artesunate (50 mg tablet). Except for the Aralen™ and Fansidar™, which we purchased from a pharmacy in the city of Iquitos, we obtained all medications from health centers or health posts in the study area. We included both Aralen™ and the generic CQ used by the MOH because in many places people identify the two as different drugs or as having different levels of potency. We included two different color capsules of clindamycin because we were not sure, given the different colors, if people would identify it as the same drug.

During the interviews field workers presented each informant with tablets or capsules of each medication in its original blister pack enclosed in a transparent, re-sealable plastic bag. Each medication was assigned a code to help the field worker recognize it during the



interview. This code was written on the outside of the plastic bag, which had no other marks or identifying information. The field worker explained that the purpose of the interview was to understand, from the perspective of people affected by malaria, the effectiveness of each drug and its benefits and drawbacks. The field worker assured the informant that there were no correct or incorrect answers; that we were only interested in his or her experience and opinions.

The interview included pile sorts of the type previously described as well as open- and closed-ended questions. The interviewer first reviewed each pill or tablet with the informant and asked whether he or she or any member of his or her family had ever taken it. Next, the field worker asked the informant to sort the medicines into piles based on which were most similar. The informant could make as many or as few piles as desired using any criteria they deemed appropriate. Once the informant finished sorting, the field worker recorded the composition of each pile and asked the informant to explain in what way the medicines in each pile were similar to one another and different from those in other piles.

The interviewer then explained to the informant that, while all these medications were used to treat malaria, people had told us that some also had other uses. As an example, the interviewer showed the informant a paracetamol tablet and explained that paracetamol has various uses: headache, fever, muscle pain, and so on. The interviewer asked the informant to divide the medications into two groups: those that serve only for malaria and those that, based on the informant's understanding and experience, also have other uses. Once the informant had selected medications with other uses, the interviewer asked him or her to explain these additional uses. Since CQ is used informally in many places as an anti-

pyretic—a practice that has contributed significantly to CQ resistance—we were particularly interested to see whether anyone identified this use for CQ or Aralen™.

To further explore the issue of drugs which cure (“*curar*”) versus drugs that only alleviate symptoms (“*calmar*”), the field worker next asked the informant to group the drugs by these criteria. In addition, the field worker asked the informant to explain the difference between being “cured” and being “calmed.” The fieldworker then went back through the medications one by one asking about the good and bad aspects of each and probing about adverse effects. Finally, the field worker asked if the informant had noticed that any of the medications were less effective than they once had been, if so, why, and if it was necessary to take something else with or after taking each medication.

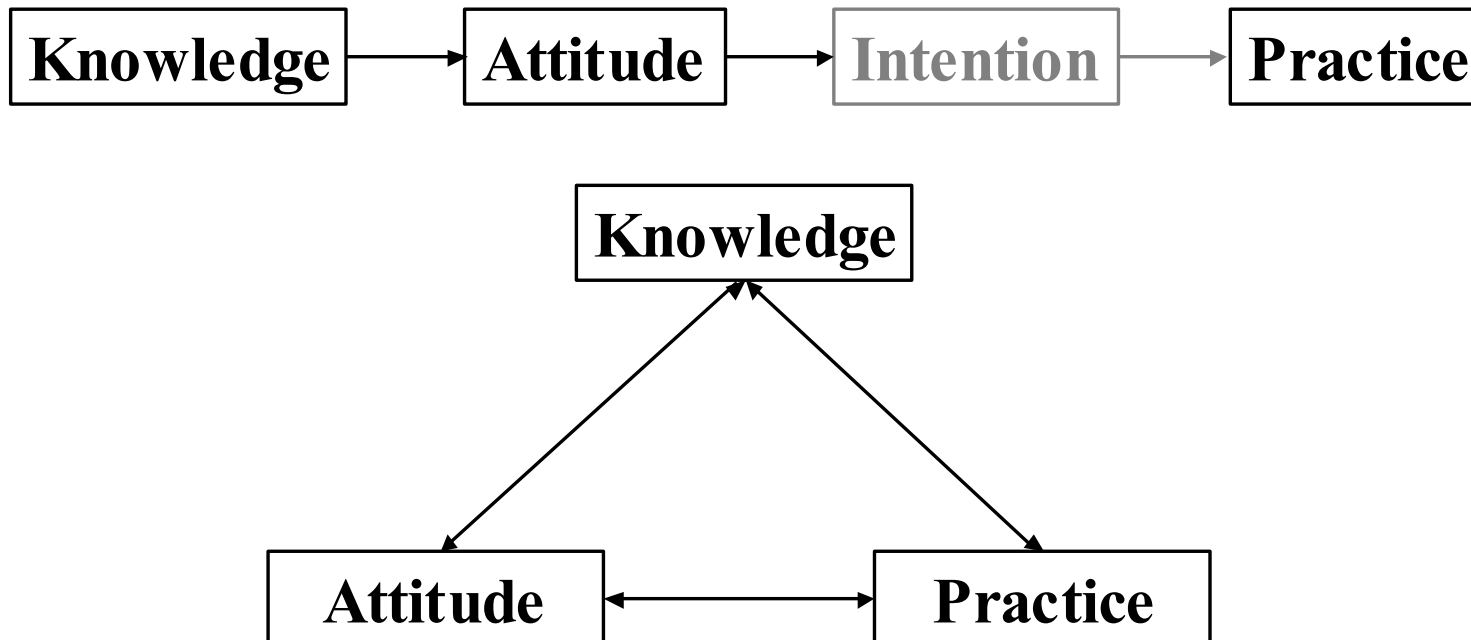
All answers to these questions were recorded by hand on a pre-printed form. The interview instrument was field tested with informants from non-study communities and revised for clarity prior to data collection. The data was entered into Microsoft Access. Quantitative variables were transferred to SPSS™ for analysis; qualitative variables were grouped by theme and analyzed by hand. The target sample size for this exercise was 30 interviews, 10 from each of the three key communities. Informants were selected purposively. Selection criteria included having had a diagnosis of vivax or falciparum malaria within the previous three months and that the sample include a relatively equal number of men and women.

## **Appendix B: Schematics of Behavior Change Models**

|                                                                                                                           |     |
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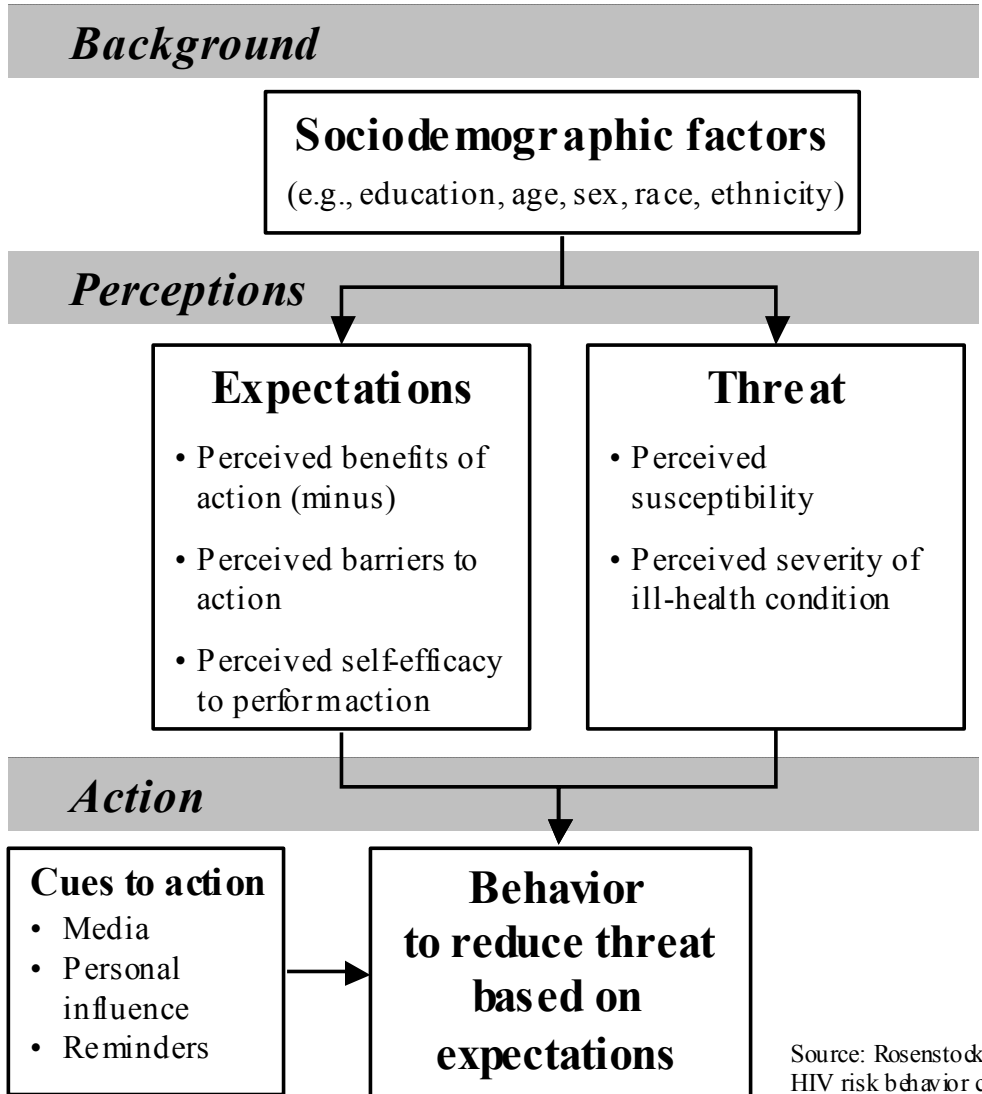
# KAP Surveys

(‘default’ biomedical approach to behavior change)



Two versions of the ‘KAP’ framework. Top: a linear model that assumes a one-way relationship beginning with knowledge and ending with behavior change. Bottom: a more sophisticated model that acknowledges that each element may have effects on the other in both directions

# The Health Belief Model



## Limitations

- More sophisticated than “KAP,” but offers limited ability to address:
- Pluralistic health models (e.g., competing etiologies)
  - Situations where principal motivation for BC may be non-health related (e.g., IBNs)
  - Climate & environment (could be categorized as a barrier to action)
  - Systemic factors (access)
  - Social norms such as hygiene (could be categorized as a barrier to action)
  - On-going as opposed to discrete ‘cross-sectional’ behaviors (TB, mammography screening)
  - Political & economic superstructure

Source: Rosenstock I, Strecher V, & Becker M (1994). The Health Belief Model and HIV risk behavior change. In RJ DiClemente & JL Peterson (Eds), Preventing AIDS: Theories and methods of behavioral interventions (p. 5-24) New York: Plenum Press.

# The Theory of Reasoned Action/Planned Behavior

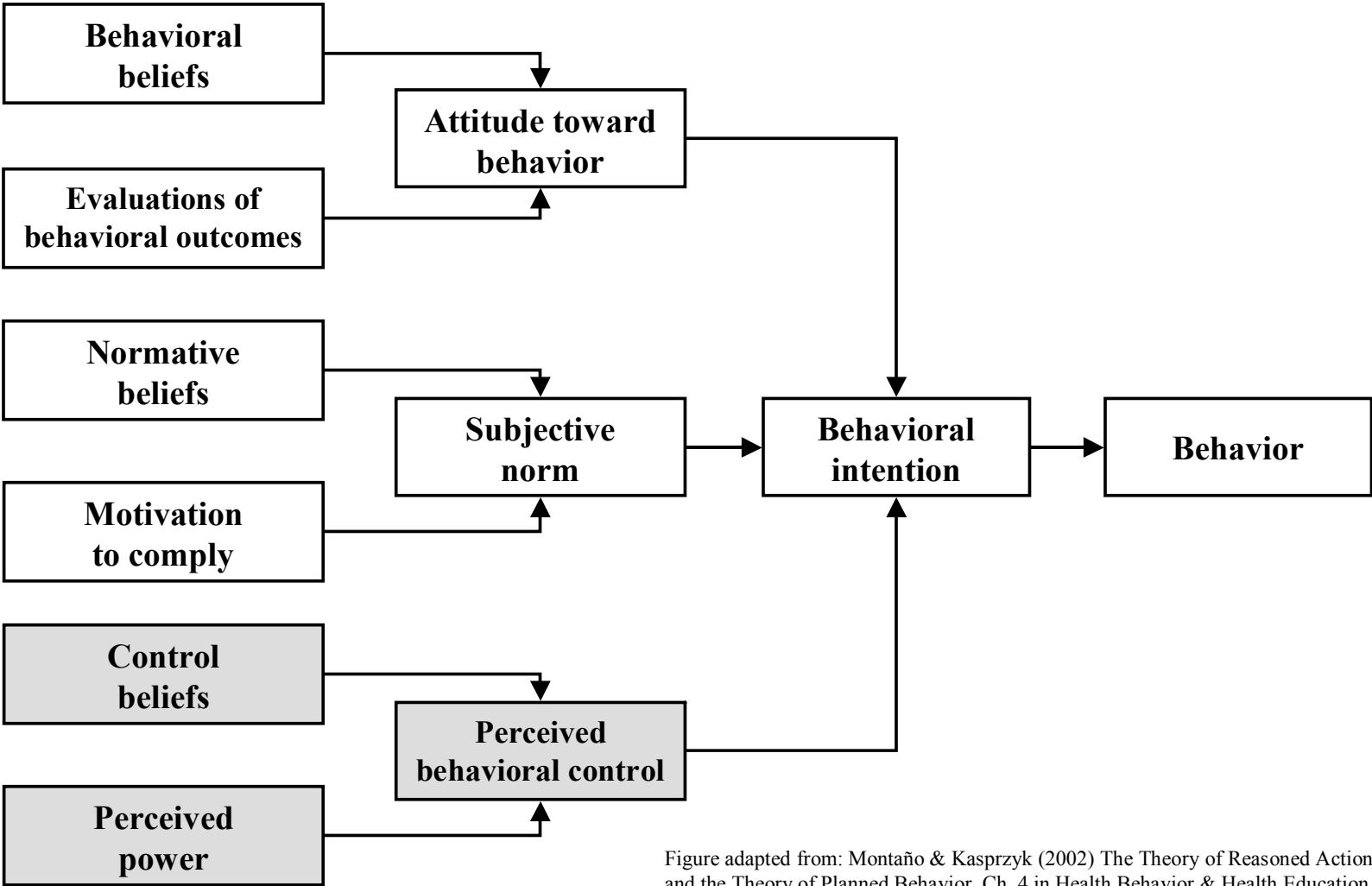


Figure adapted from: Montaño & Kasprzyk (2002) The Theory of Reasoned Action and the Theory of Planned Behavior. Ch. 4 in Health Behavior & Health Education, Theory, Research & Practice. K. Glanz, et al., eds. San Francisco: Jossey-Bass, p. 68

## Malaria and the Amazon: theoretical perspectives from medical anthropology as applied to this project

### Ethnomedical

Pluralistic models of health/illness

- Humoral (Spanish/Greek)
- Animist (indigenous)
- Biomedical

### Etiologies (naturalistic)

- Imbalance/disequilibrium (hot/cold, foods)
- ‘Microbios’
- Mosquitoes
- Water

### Etiologies (personalistic)

- Forest spirits, Witchcraft, God

### Pluralistic patterns of recourse

↑  
 Biomedical remedy  
 Home remedy  
 Herbalist  
 “Curioso”  
 Shaman  
 ↓  
 Brujo

### Ecological

Deforestation → ↑ contact w/vector  
 Re-emergence of malaria after eradication campaign  
 Migration patterns

- From Sierra
- From urban areas

### Etiology & patterns of recourse

Personalistic etiology & use of herbal remedies  
 an adaptation to environmental conditions:  
 contact with forest, migration patterns,  
 swidden agriculture

### Critical

Regional economic history:

- Rubber boom/bust early 1900s
- Petroleum boom/bust 1980s-90s
- Current expropriation of rainforest for cattle ranching
- Current LGN development project (CAMISEA)

### Etiology

Unemployment  
 → Dislocation  
 → Migration  
 → ↑ Deforestation  
 → Cycle repeats

→ ↑ Exposure to vector  
 → ↑ In naïve population  
 → ↑ Disease burden

Must address structural & super-structural issues to decrease risk

Lack of access to health services (disenfranchisement)

Structural adjustment:

- Disinvestment in health sector
- Unemployment/poverty due to international economic forces/pressures

## Appendix C: Study instruments

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**Observación directa del uso de mosquiteros en las comunidades blancos**

*Toda la información debe ser según observación no según reporte sino que la pregunta se indique al contrario*

1. Estilo de cama

| Composición                     | Cama #1 | Cama #2 | Cama #3 | Cama #4 | Cama #5 |
|---------------------------------|---------|---------|---------|---------|---------|
| Piso de madera (planchas)       |         |         |         |         |         |
| Piso de pona                    |         |         |         |         |         |
| Piso de tierra                  |         |         |         |         |         |
| Tarima con planchas de madera   |         |         |         |         |         |
| Tarima con planchas de pona     |         |         |         |         |         |
| Tarima con colchón de espuma    |         |         |         |         |         |
| Tarima con otro tipo de colchón |         |         |         |         |         |
| Otro tipo de cama (describe)    |         |         |         |         |         |

2. ¿Hay huecos/grietas en la cama? (ej.: entre planchas o ponas)

|                | Cama #1 | Cama #2 | Cama #3 | Cama #4 | Cama #5 |
|----------------|---------|---------|---------|---------|---------|
| Sí = 1; No = 2 |         |         |         |         |         |

3. ¿Usa sábana encima de la cama?

|                | Cama #1 | Cama #2 | Cama #3 | Cama #4 | Cama #5 |
|----------------|---------|---------|---------|---------|---------|
| Sí = 1; No = 2 |         |         |         |         |         |

4. Según *reporte de la Sra. de la casa* ¿quién duerme en cada cama?

|                                                                 | Cama #1 | Cama #2 | Cama #3 | Cama #4 | Cama #5 |
|-----------------------------------------------------------------|---------|---------|---------|---------|---------|
| Apunta relación y edad<br>(ej.: madre, hijo 2 años, hija 1 año) |         |         |         |         |         |

5. Según *observación directa* ¿quién duerme en cada cama?

|                                                                 | Cama #1 | Cama #2 | Cama #3 | Cama #4 | Cama #5 |
|-----------------------------------------------------------------|---------|---------|---------|---------|---------|
| Apunta relación y edad<br>(ej.: madre, hijo 2 años, hija 1 año) |         |         |         |         |         |

6. ¿Qué tipo de mosquitero tiene cada cama?

|                                | Cama #1 | Cama #2 | Cama #3 | Cama #4 | Cama #5 |
|--------------------------------|---------|---------|---------|---------|---------|
| Tocuyo simple                  |         |         |         |         |         |
| Tocuyo doble                   |         |         |         |         |         |
| Nylon                          |         |         |         |         |         |
| Otro (describe a continuación) |         |         |         |         |         |
| Ninguno                        |         |         |         |         |         |

Descripción:

7. **Según observación directa** ¿a qué hora tiempla el mosquitero?

|                                                                                                                 | Cama #1 | Cama #2 | Cama #3 | Cama #4 | Cama #5 |
|-----------------------------------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|
| Hora<br>(si todas las personas en una cama no se acuestan a la vez, apunta la hora que se acuesta cada persona) |         |         |         |         |         |

8. ¿Con qué asegura los bordes del mosquitero a la cama?

|                                                                     | Cama #1 | Cama #2 | Cama #3 | Cama #4 | Cama #5 |
|---------------------------------------------------------------------|---------|---------|---------|---------|---------|
| Describe manera de asegurar bordes o si no los asegura, apunta eso. |         |         |         |         |         |

9. ¿A qué hora se acuesta cada miembro de la familia?

| Padre | Madre | Hijo #1 | Hijo #2 | Hijo #3 | Hijo #4 | Hijo #5 | Hijo #6 |
|-------|-------|---------|---------|---------|---------|---------|---------|
|       |       |         |         |         |         |         |         |

10. Apunta la actividad de cada miembro de la vivienda desde 5:30 p.m. hasta que se hayan acostado todos. Nota cada cambio de actividad apuntando el tiempo en que ocurre añadiendo una nota por lo menos cada 5 minutos. Presta atención especialmente a cualquiera actividad que pueda afectar contacto entre humano y zancudo (ej.: persona saliendo del mosquitero después de acostarse; persona saliendo de la casa durante la noche; regresando después de 5:30 p.m. ó saliendo temprano en la mañana.

| Hora (apunta hora y minuto) | Actividad |
|-----------------------------|-----------|
|                             |           |

## **Formulario No. 1: Entrevistas con recipientes de mosquiteros impregnados repartidos por el MINSA.**

### Última distribución de mosquiteros

1. Cuéntame por favor todo que Ud. recuerda de la última distribución de mosquiteros por el Ministerio de Salud. Me interesaría saber todo acerca de la experiencia que tuvieron Ud. y su familia, todo que sucedió con lujo de detalles—lo más que me puede contar.

Sondeos si la entrevistada no mencionara:

- ¿qué le gustó? ¿qué no le gustó? ¿Qué soluciones recomendaría Ud.?
- ¿recuerda alguna calidad o característica del mosquitero(s) que recibió?
- ¿se dio cuenta de algún olor? ¿Cómo fue? (agradable, desagradable, fuerte, leve) Si había algún olor ¿por cuánto tiempo duró? ¿Alguna reacción física? [Algún problema?] ¿Cómo era? ¿Por cuánto tiempo duró?
- ¿Qué es lo bueno de un mosquitero de nylon comparado a otras telas? ¿Qué es lo malo?
- Si una organización quisiera repartir mosquiteros acá en alguna ocasión en el futuro ¿qué debería hacer igual? ¿qué debería mejorar? ¿Cómo lo mejoraría?
- ¿Cuándo fue realizada la última distribución? (mes/año)

### Uso actual del mosquitero del Ministerio

2. ¿Quién está usando el/los mosquitero(s) proveído(s) por el Ministerio? ¿Por qué fue elegida esta persona?
3. ¿Hay algunos miembros de la familia que requieren más protección de los zancudos que otros? ¿Quiénes son? ¿Por qué?

Sondeos si la entrevistada no mencionara:

- ¿niños? ¿Hasta qué edad?
  - ¿mujeres gestantes?
4. ¿Cuáles son las épocas del año cuando no se necesita el mosquitero?
  5. ¿Habrá alguna ventaja de usar diferentes tipos de mosquiteros en diferentes épocas del año? (ej.: tocuyo en alguna época, nylon en otra?)

### Cuidado/limpieza de mosquitero

6. ¿Cuáles son las ocasiones indicadas para lavar el mosquitero? ¿Cada cuánto tiempo lo lava? ¿Por qué?
7. ¿Cuándo lo lavó por primera vez? ¿Por qué lo lavó para entonces?
8. ¿Cuáles son las circunstancias indicadas para echar de nuevo insecticida en el mosquitero? Si tuviera la oportunidad ¿cada cuánto tiempo lo haría?
9. ¿Qué más me puede decir acerca de su experiencia con el mosquitero?

**Formulario No. 2: Entrevistas con oficiales del MINSA que participaron en la última campaña de mosquiteros**

*Presentación: este estudio tiene que ver con como mejorar el uso de mosquiteros y hacerlos más efectivos para prevenir la malaria. En otros lugares del mundo problemas o fallas con programas de repartición de mosquiteros han disminuido su efectividad. No queremos repetir los errores o las fallas de otros—más bien, queremos aprender de la experiencia previa e inclusive captar la experiencia/sabiduría del MINSA y su personal.*

¿Puede Ud. describir, según su experiencia, la última campaña del Ministerio de distribuir mosquiteros? Me interesaría saber todos los detalles de la campaña que Ud. conoce: qué hizo, cómo lo hizo, lo que salió bien, lo que aprendió. Si tuviera Ud. la oportunidad de diseñar la próxima campaña, lo que haría igual y lo que cambiaría.

Preguntas específicas:

¿Quiénes fueron la población blanco/elegida para la campaña? ¿Por qué escogió el Ministerio esta población?

¿Fueron los mosquiteros impregnados? Fueron tratados antes de llegar a la comunidad o frente la comunidad? ¿Con qué insecticida? ¿Cómo escogió el Ministerio la tela y la insecticida? ¿Hay ciertos miembros de la familia indicadas para recibirlos? ¿Por qué ellos?

Después de repartir los mosquiteros ¿Ha tratado los mosquiteros de nuevo? ¿Después de cuánto tiempo?

Al repartir los mosquiteros ¿qué instrucciones o recomendaciones les dio el Ministerio a la población? ¿En qué forma? (ej.: reuniones, panfletos, escuelas, otro) ¿Hasta qué punto siguió la población estas instrucciones? ¿En qué manera/a qué punto fallaron? ¿Cómo podría mejorar la orientación para la población la próxima vez?

A través de nuestras recorridos en los caseríos alrededor de la carretera, hemos observado ciertas características que pueden limitar la efectividad de mosquiteros como una medida de prevención de malaria. ¿Qué sugerencias tiene Ud. acerca de como manejar o reducir la importancia de estas limitaciones?

| Problema/Limitación                                                                                                          | Sugerencia |
|------------------------------------------------------------------------------------------------------------------------------|------------|
| Diseño de camas: espacio entre las tablas o ponas— aunque mosquitero este templado, zancudo puede entrar y picar desde abajo |            |
| Actividades nocturnas fuera del mosquitero que aumentan exposición (ej.: adoración nocturna, actividades sociales, trabajos) |            |
| Dificultad en asegurar bordes de mosquitero (muchos los aseguran con trapos o ropa—un proceso laborioso que demora mucho)    |            |

¿Qué más debemos saber acerca del uso de mosquiteros acá? ¿Acerca de las creencias y prácticas de los pobladores?

¿Qué más puede Ud. agregar?

## Formulario # 4. Experiencia local con el uso de insecticidas

Edad, género, comunidad-centro/penetración, en qué se dedica la familia actualmente y durante el transcurso del año

Introducción:

Estamos en un proyecto de mejoramiento de protección contra los zancudos, y por lo tanto nos interesa conocer su experiencia con venenos y otros químicos tanto contra el zancudo como en forma más general.

¿Qué tipos de químicos se está usando en esta casa? [Venenos de varios tipos, desinfectantes, solventes, insecticidas, todo que la persona menciona].

¿Me los puede mostrar?

[Apunte el nombre y descripción breve de cada producto]

[Para cada uno, y empezando por los insecticidas, si hay, pregunte:]

¿Para qué propósito es tal \_\_\_\_\_?

[Si la persona menciona para matar insectos/zancudos], ¿porqué es importante eliminarlos?

¿Cómo funciona?

¿Qué tan efectivo es?

¿Quiénes son los usuarios directos?

¿Porqué le gusta?

¿Qué es lo que no le gusta?

[Si la persona habla de daños o peligros, sondea sobre adultos, niños, animales domésticos, etc.] Cuénteme más de eso, por favor. ¿Cómo evita Ud. que pase tal?

[Si la persona habla de mal olor o de alergias,] ¿porqué lo aguanta entonces? ¿Qué solución da Ud. al problema del olor/alergia?

¿De dónde lo compró?

¿Cuánto gasta en eso, mensualmente? ¿Hay algún tiempo/estación durante el año en que Ud. no lo usa?

¿Cuándo? Explíqueme.

¿Lo recomendaría a otras personas? ¿Cómo les convencería a usarlo?

[REPITE LAS PREGUNTAS SOBRE LOS QUÍMICOS QUE SE USA FUERA DE LA CASA, LA CHACRA, LA PISIGRANJA, ETC. SI LA PERSONA ENTREVISTADA NO ES LA USUARIA DIRECTA, SIEMPRE OBTENGA SU OPINIÓN Y ADEMÁS HACER CITA PARA ENTREVISTAR EL USUARIO DIRECTO]

¿Qué tipos de químicos está usando Ud. o su familia, fuera de la casa? [Venenos de varios tipos, desinfectantes, solventes, insecticidas, larvicidas (conocidos como abatización), todo que la persona menciona].

¿Me los puede mostrar?

[Apunte el nombre y descripción breve de cada producto]

[Para cada uno, y empezando por los insecticidas y larvicidas, si hay, pregunte:]

¿Para qué propósito es tal \_\_\_\_\_?

[Si la persona menciona para matar insectos/zancudos], ¿porqué es importante eliminarlos?

¿Cómo funciona?

¿Qué tan efectivo es?

¿Quiénes son los usuarios directos?

¿Porqué le gusta?

¿Qué es lo que no le gusta?

[Si la persona habla de daños o peligros, sondea sobre adultos, niños, peces, animales domésticos o de la selva, etc.] Cuénteme más de eso, por favor. ¿Cómo evita Ud. que pase tal?

[Si la persona habla de mal olor o de alergias,] ¿porqué lo aguanta entonces? ¿Qué solución da Ud. al problema del olor/alergia?

¿De dónde lo compró/consiguió?  
¿Cuánto gasta en eso, mensualmente? ¿Hay algún tiempo/estación durante el año en que Ud. no lo usa?  
¿Cuándo? Explíqueme.  
¿Lo recomendaría a otras personas? ¿Cómo les convencería a usarlo?

[SI NO HUBO MENCIÓN DE INSECTICIDAS O LARVICIDAS HASTA EL MOMENTO, PREGUNTE DIRECTAMENTE]

¿Ha oído hablar de insecticidas/venenos para insectos para uso familiar? ¿Qué ha oído?  
¿Ud usa insecticida? ¿Porqué sí/no?  
¿Para qué propósito (insecto/animal etc.) se usa?  
[Si la persona menciona para matar insectos/zancudos], ¿porqué es importante eliminarlos?  
¿Cómo funciona?  
¿Qué tan efectivo es?  
¿Quiénes son los usuarios directos?  
¿Qué es lo que no le gusta?  
[Si la persona habla de daños o peligros, sondea sobre adultos y sobre niños aparte.] Cuénteme más de eso, por favor. ¿Cómo se puede evitar que pase tal?  
[Si la persona habla de mal olor o de alergias,] ¿porqué la gente lo aguanta entonces? ¿Cómo se puede solucionar el problema del olor/alergia?

¿Lo recomendaría a otras personas? ¿Cómo les convencería a usarlo?

[SI NO HUBO MENCIÓN TODAVÍA, IGUAL PREGUNTE SOBRE LARVICIDAS. LA GENTE LOS CONOCE COMO ABATIZACIÓN]

¿Ha oído hablar de abatización/larvicidas para insectos para uso comunitario? ¿Qué ha oído?  
¿Ud/esta comunidad usa abatización? ¿Porqué sí/no?  
¿Para qué propósito (insecto/animal etc.) se usa?  
¿Cómo funciona?  
¿Qué tan efectivo es?  
¿Quiénes son los usuarios directos?  
¿Qué es lo que le gusta?  
¿Qué es lo que no le gusta?  
[Si la persona habla de daños o peligros, sondea sobre adultos, niños, peces, animales domésticos o de la selva.] Cuénteme más de eso, por favor. ¿Cómo se puede evitar que pase tal?  
[Si la persona habla de mal olor/alergias/daño en la piel o cualquier otro daño,] ¿porqué la gente lo aguanta entonces? ¿Cómo se puede solucionar el problema/los problemas mencionados?  
¿Lo recomendaría a otras personas? ¿Cómo les convencería a usarlo?

[PREGUNTE SOBRE LA EXPERIENCIA CON EL ROCÍO RESIDUAL EN LAS PAREDES DE LA CASA POR FUNCIONARIOS DE SALUD]

¿Ha oído/visto las aplicaciones de químico/veneno en las paredes de casas por el personal de salud?  
¿Qué piensa de esta práctica?  
¿Qué es lo que están aplicando?  
¿Cuál es el propósito de esta práctica?  
¿Cómo funciona el veneno?  
¿Qué importancia tiene para Ud. aplicarlo?  
¿Ha permitido que lo hagan en su casa?  
Describeme cómo lo hacen [Sondear por fuera, por dentro, por debajo de la casa y porqué]  
¿Con qué frecuencia pasan a hacerlo? ¿En qué temporada?  
¿Cuánto tiempo dura el efecto?  
¿Qué es lo que le gusta de estas aplicaciones?  
¿Qué es lo que no le gusta de estas aplicaciones?

[Si la persona habla de daños o peligros, sondea sobre adultos, niños, peces, animales domésticos, etc.]  
Cuénteme más de eso, por favor. ¿Cómo se puede evitar que pase tal?

[Si la persona habla de mal olor/alergias/daño en la piel o cualquier otro daño,] ¿porqué el personal de salud sigue aplicandolo entonces? ¿Cómo se puede solucionar el problema/los problemas mencionados?  
¿Lo recomendaría a otras personas para sus casas? ¿Cómo les convencería aceptarlo?  
¿Qué recomendaría al Ministerio de Salud/Personal de Salud sobre las aplicaciones? [Sondear si deben continuar con estas, dejar de hacerlas, mejorarlas de cualquier forma, cambiar algo, etc.]

#### [PREGUNTE SOBRE EL TRATAMIENTO DE MOSQUITEROS CON INSECTICIDA]

¿Ha oído de tratamiento especial de mosquiteros con químico/veneno antes de entregarse?

¿Porqué se hace?

¿Qué es lo que aplican?

¿Quién lo hace?

¿Qué piensa de este tratamiento?

¿Ud, ha probado mosquiteros tratados así?

¿Cómo se comparan con los no tratados?

¿Cómo funciona el tratamiento?

¿Cuánto tiempo dura el efecto?

¿Qué es lo que le gusta de los mosquiteros tratados?

¿Qué es lo que no le gusta?

[Si la persona habla de daños o peligros, sondea sobre adultos, niños, peces, animales domésticos, etc.]  
Cuénteme más de eso, por favor. ¿Cómo se puede evitar que pase tal?

[Si la persona habla de mal olor/alergias/daño en la piel o cualquier otro daño,] ¿Cómo se puede solucionar el problema/los problemas mencionados?

¿Lo recomendaría a otras personas para sus casas? ¿Cómo les convencería aceptarlo?

¿Qué recomendaría al Ministerio de Salud/Personal de Salud sobre la distribución de mosquiteros tratados?  
[Sondear si deben continuar repartiéndolos, dejar de hacerlo, mejorarlas de cualquier forma, cambiar algo, etc.]

[Si la persona no ha probado mosquiteros tratados] ¿Estaría dispuesta de probar un mosquitero tratado?

¿Porqué? ¿Porqué no?

[Para todos:] ¿Tendría interés de tratar sus mosquiteros con veneno Ud. solo/a? Explíqueme.

¿Qué ventajas podría tener esta práctica?

¿Qué desventajas podría tener esta práctica y cómo se podrían evitarse?

¿Qué peligros podría tener esta práctica y cómo se podrían evitarse?

FIN.



Preferencias de telas para mosquiteros I: Color

***Instrucciones al entrevistador:***

1. *Antes de llegar a la entrevista, mezcla las muestras de tela para que tengan un orden diferente que la que tuvieron para la última entrevista, tratando de ordenarlas aleatoriamente.*
2. *Enséñale al entrevistado las muestras una por una, colocándolas sueltas (no en línea) en una mesa, banca o silla y dile::*

“Tengo aquí muestras de tela de varios colores que se usa para mosquiteros. Por favor, revísalas todas. Para un mosquitero de tül ¿cuál sería el mejor color o el color más práctico?”

3. *Deja que el entrevistado revise y toque cada muestra y seleccione su color de preferencia. Ponga al lado la muestra seleccionada y dile:*

“De los colores que quedan ¿cuál sería tu segunda preferencia para un mosquitero?”

4. *Sigue así preguntando y ordenando en una línea cada color seleccionado al lado del anterior hasta que el informante haya seleccionado todos los colores.*
5. *Confirma el orden de los colores, preguntándole al informante:*

“¿Este es el color que para ti sería mejor para un mosquitero de tül?” etc. para los 5 colores. “¿Tienes algún cambio?”

6. *Hacer los cambios, si hay, y después anota el orden de las preferencias en la tabla, usando un número 1 para la primera preferencia, un número 2 para la segunda, etc.*
7. *Agarra la muestra que era la primera preferencia y pregúntale al informante:*

“¿Por qué seleccionaste este como tu primera preferencia? ¿Por qué sería un buen color para un mosquitero?”

Anota la respuesta literalmente y sondea para entender lo más completamente posible la razón para la selección. Por ejemplo si dice que es práctico, pregúntale “¿cómo práctico? ¿práctico en que sentido?”

8. *Agarra la última preferencia y pregúntale al informante:*

“¿Por qué es este el color tu última preferencia? ¿Por qué no es un buen color para un mosquitero?”

Una vez terminado anotando los comentarios, continua con la segunda parte de la entrevista.

Factores socio - antropológicos que afectan la prevención de malaria en zonas seleccionadas de la Provincia de Maynas, Departamento de Loreto, Perú

| <u>Preferencias de color</u> |             |
|------------------------------|-------------|
|                              | Orden (1-5) |
| A. Blanco                    |             |
| B. Rosado                    |             |
| C. Azul                      |             |
| D. Verde claro               |             |
| E. Verde petróleo            |             |

|                                 |     |     |     |
|---------------------------------|-----|-----|-----|
| TC:                             |     |     |     |
| Fecha:                          | Día | Mes | Año |
| Caserío:                        |     |     |     |
| Genero:                         | 1 M | 2 F |     |
| Edad:                           |     |     |     |
| Años vividos en esta comunidad: |     |     |     |

Razones por primera preferencia:

Razones por última preferencia

## Factores socio - antropológicos que afectan la prevención de malaria en zonas seleccionadas de la Provincia de Maynas, Departamento de Loreto, Perú

### Preferencias de telas para mosquiteros II: Tejido

#### ***Instrucciones al entrevistador:***

1. *Mezcla las muestras de tela para que tengan un orden diferente que la que tuvieron para la última entrevista, tratando de ordenarlas aleatoriamente.*
  2. *Explica la tarea al entrevistado:*  
“Ahora te voy a enseñar muestras de tela de diferentes tejidos. Quiero que revises las muestras y selecciones la tela que más te gustaría para un mosquitero.”
  3. *Una vez que el entrevistado haya seleccionado un tejido, ponga al lado la muestra seleccionada y dile:*  
“Ahora, de las muestras que quedan ¿cuál sería tu segunda preferencia?”
  4. *Sigue así preguntando y colocando cada muestra seleccionada a lado de la última hasta que el informante haya seleccionado todos los tejidos.*
  5. *Confirma la preferencia preguntándole al informante:*  
“¿Para ti, este es el tejido que sería mejor para un mosquitero? ¿Este es tu segunda preferencia?” etc.  
¿Tienes algún cambio?
  6. *Hacer los cambios, si hay, y después anota el orden de las preferencias en la tabla, usando un número 1 para la primera preferencia, un número 2 para la segunda, etc.*
  7. *Luego, agarra la muestra que era la primera preferencia y pregúntale al informante:*  
“¿Por qué seleccionaste este como tu primera preferencia? ¿Qué te gusta de esta tela? ¿Por qué sería buena para un mosquitero?”  
Anota la respuesta literalmente y sondea para entender lo más completamente posible la razón para la selección. Por ejemplo, si dice “es tupido”, pregúntale “¿y qué es lo bueno de ser tupido?”
  8. *Agarra la última preferencia y pregúntale al informante:*  
“¿Por qué es este el tejido que menos prefieres? ¿por qué no sería bueno para un mosquitero?”
  8. *Después de sondear y anotar las respuestas, agarra la muestra de “Jersey” (Muestra C) y pregúntale:*  
“¿Cuál sería lo bueno y lo malo de tener un mosquitero de esta tela?”
  9. *Luego de anotar la respuesta, pregúntale*  
“Si tuvieras un mosquitero de esta tela ¿lo usarías? ¿Por qué o por qué no? ¿En qué oportunidades sería bueno usar un mosquitero de esta tela?”
  10. *Hágale las mismas preguntas sobre la muestra de “Tri Cot” (Muestra D). Varia el orden de estas 2 muestras con cada informante.*
- ***Ojo: Si el informante ya ha contestado las últimas preguntas a través de su primera ó última selección, no hay que volver a hacerle las mismas preguntas para la muestra correspondiente.***

***UNA VEZ TERMINADA LA ENTREVISTA, LLENA UNA FICHA DEMOGRÁFICA PARA EL INFORMANTE SI TODAVÍA NO TENEMOS UNA.***

Factores socio - antropológicos que afectan la prevención de malaria en zonas seleccionadas de la Provincia de Maynas, Departamento de Loreto, Perú

| Preferencias de tejido |             |
|------------------------|-------------|
|                        | Orden (1-7) |
| A. Mesh 156            |             |
| B. Mesh 196            |             |
| C. Jersey              |             |
| D. Tri Cot             |             |
| E. Tocuyo simple       |             |
| F. Tocuyo doble        |             |
| G. Tela playa          |             |

Razones por primera preferencia:

Razones para última preferencia

Factores socio - antropológicos que afectan la prevención de malaria en zonas seleccionadas de la Provincia de Maynas, Departamento de Loreto, Perú

|                                                                                                                                                               |                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Lo bueno de “Jersey”                                                                                                                                          | Lo malo de “Jersey” |
| <p><i>“Si tuvieras un mosquitero de esta tela ¿lo usarías? ¿Por qué o por qué no? ¿En qué oportunidades sería bueno usar un mosquitero de esta tela?”</i></p> |                     |

|                                                                                                                                                               |                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Lo bueno de “TriCot”                                                                                                                                          | Lo malo de “TriCot” |
| <p><i>“Si tuvieras un mosquitero de esta tela ¿lo usarías? ¿Por qué o por qué no? ¿En qué oportunidades sería bueno usar un mosquitero de esta tela?”</i></p> |                     |

## **Entrevista etiología**

Guía para entrevistas semi-estructuradas sobre etiología, diagnóstico y tratamiento de malaria

OJO: Como siempre con entrevistas semi estructuradas, esta guía es un punto de partida. Conduce la entrevista guiado también por las respuestas del entrevistado/a, siguiendo temas mencionadas por el o ella y haciendo sondeos cuando sea apropiado. Procura pedir definiciones desde la perspectiva del entrevistado/a asegurándote que entiendes lo que el o ella quiere decir con cierta palabra o cierto termino y no asumiendo que el sentido es obvio.

Explica al entrevistado que quieres que te hable como si hablara a un amigo o a otro morador del caserío, usando las palabras que manejan ellos. Trata de llegar más allá de las palabras y los conceptos que el entrevistado puede haber aprendido del sector salud. Deja que el o ella hable hasta que haya terminado con su pensamiento, evitando interrumpir a menos que sea absolutamente necesario. Anota ideas o preguntas que te ocurran mientras hable el entrevistado para formar nuevas preguntas o sondeos.

### 1. Apertura

Hola, me llamo \_\_\_\_\_, estoy trabajando con una investigación de la prevención de la malaria. ¿Está disponible ahora para hablar por más o menos una hora?

**[Léele el formato de consentimiento informado a este punto]**

### 2. Ultimo episodio de malaria

[El objetivo de esta parte de la entrevista es el de entrar en el tema de etiología, diagnóstico y prevención de la malaria usando el último episodio del entrevistado como eje para entablar la conversación.]

*Estamos hablando con personas de este caserío que ha tenido la malaria últimamente para entender mejor como es la malaria acá. Cuénteme por favor todo que puede recordar de la última vez que se le ha dado la malaria.*

*¿Cómo era la malaria que tenía? ¿Qué le pasó?*

Preguntas adicionales y sondeos si no son mencionados:

### 3. Etiología

*¿Cómo se contagió de la malaria la última vez?*

[Especialmente si el entrevistado dice que se contagio con una picadura de zancudo, pregunta:]

*¿Qué otras maneras hay de contagiarse con la malaria?* [Tratar de sondear lo más posible para determinar si el entrevistado realmente cree que es el zancudo o si está repitiendo lo que ha escuchado en una charla de salud. Para cada manera mencionada, pregunta:]

*¿Cómo se contagia con \_\_\_\_\_?* [tratar de sacar la idea que tiene el entrevistado del mecanismo del contagio]

### 4. Diagnóstico

*¿Cómo sabía o cómo sospechaba que tenía la malaria? ¿Cómo puede saber uno que tiene la malaria?*

*¿Cómo se siente? ¿Qué señales hay? ¿Qué otras enfermedades hay que le hace sentir igual?* [Evitar usar la palabra “síntomas” si el entrevistado no la menciona]

*¿Qué hacía después de saber que tenía malaria (o después de pensar que la podía tener)? Cómo puede estar seguro que es la malaria y no otra cosa?*

*¿Que tipos de malaria hay por acá?* [Si el entrevistado menciona otros tipos, pregunta para cada uno:]

¿Cómo sabes que tienes \_\_\_\_\_? ¿Que te pasa con \_\_\_\_\_?  
¿Qué debes hacer si tienes \_\_\_\_\_?

5. Tratamiento

Después de saber que tenías la malaria ¿qué hiciste para curarte/sanarte? ¿Adónde fuiste? ¿Qué otros lugares hay por acá donde puedes ir si tienes la malaria? ¿Quién te puede ayudar?

[Si menciona una medicina hacer las siguientes preguntas incorporando el nombre de la medicina mencionada por el entrevistado pero NO INTRODUCIENDO OTRO NOMBRE.

¿Funcionó bien? ¿Cuánto de \_\_\_\_\_ tuviste que de tomar? ¿Por cuántos días? ¿Cómo te cayó?  
¿Qué te pasó? ¿Qué otras maneras hay para curarte? [Para cada manera mencionada pregunta:]

¿Cómo haces para usar/curarte con \_\_\_\_\_?  
¿Por cuánto tiempo hay que tomar \_\_\_\_\_?  
¿Qué tan efectivo es \_\_\_\_\_?

6. Prevención

¿Qué haces ahora para protegerte de la malaria? ¿Cuales son las otras maneras de protegerte?

[De ser necesario, pide una descripción de la medida. Para cada medida mencionada, pregunta:]

¿Cómo se usa \_\_\_\_\_? ¿Qué tan efectivo es \_\_\_\_\_?  
¿Qué problemas hay con usar \_\_\_\_\_?

## **Entrevista con pobladores: Re-emergencia y resistencia de la malaria**

El propósito de esta serie de entrevistas es entender las percepciones de los pobladores de la zona del estudio relacionados a varios temas:

1. *La re-emergencia de la malaria después de unas décadas en que no hubo casos de malaria en el Perú*
2. *Si se percibe que la malaria está aumentando ó disminuyendo ahora y por qué*
3. *La emergencia de resistencia a ciertos antimaláricos*
4. *La utilidad de varios medicamentos—algunas de la posta, otras vegetales ó naturales—para paliar ciertos síntomas o curar ciertas condiciones*
5. *El uso casero de medicamentos y si hay un almacenaje de medicamentos en la casa*
6. *Los efectos adversos de varios medicamentos*

Dado el número y la complejidad de estos temas, es probable que será necesario realizar más de una entrevista para tocar todos.

*Esta serie de entrevistas será realizada con personas que ya ha participado en entrevistas anteriores de etiología. Por lo tanto, no es necesario pedirles firmar un nuevo formato de consentimiento. Sin embargo, **sí es necesario** recordarles de los objetivos del estudio, explicarles que necesitaremos más o menos una hora de su tiempo, explicarles los riesgos y beneficios de participación y hacerles entender que su participación es voluntaria.*

*Finalmente y **muy importante**: algunas preguntas ó temas de estas entrevistas se hace en base a las respuestas anteriores de la persona. Por lo tanto, **es muy importante leer la primera entrevista antes de salir para realizar la segunda, tercera, etc.***

### 1. Apertura

Hace tiempo conversábamos de su último episodio de la malaria: como fue, que le pasó, que tipo de tratamiento tomaba, etc. Ahora tengo algunas preguntas más generales sobre la malaria acá en esta zona. ¿Está disponible por más o menos una hora ahora?

### 2. Re-emergencia de la malaria y resistencia a antimaláricos

#### a. re-emergencia de la malaria

Según lo que Ud. ha visto ¿cómo ha cambiado la malaria acá durante los últimos años? ¿Cómo era la malaria cuando Ud. por primera vez vino a vivir acá? ¿Cómo ha cambiado desde entonces?

Sondeos:

- ¿Hace cuánto tiempo que hay malaria acá?
- ¿A qué se debe la reaparición de la malaria en esta zona?
- Comparado a hace 10 años ¿se está dando más casos o menos? ¿A qué se debe este cambio?
- Comparado a hace 2-3 años ¿se está dando más casos o menos? ¿A qué se debe este cambio?
- Comparado al año pasado ¿se está dando más casos o menos? ¿A qué se debe este cambio?
- ¿Qué cambios ha notado desde que se abrió la carretera?

OJO: Desde este punto, es difícil programar sondeos ó preguntas adicionales porque las respuestas pueden variar mucho. Puede ser que el entrevistado relaciona cambios en la malaria con cambios del clima, crecimiento de la población, construcción de la carretera, ó deforestación. Puede ser que la relaciona con parásitos (o el “virus”) más fuertes o personas más débiles. En este caso, tenemos que preguntarles ¿por qué? ¿a qué se debe el hecho de que el parásito ha vuelto más fuerte? El objetivo es seguir sondeando lo más posible sobre las ideas mencionadas por el entrevistado.



b. Resistencia a antimaláricos (si no mencionado antes por el entrevistado)

¿Qué cambios ha notado en las pastillas/remedios que se usa para la malaria últimamente?

¿Qué cambios ha notado a través de los últimos 3-4 años?

¿Cómo ha cambiado la efectividad de las drogas que se dan en la posta?

Sondeos:

- Hemos visto que algunas remedios que antes curaban la malaria ya no curan. Según su punto de vista ¿a qué se debe este cambio?
- Con estos cambios en la malaria (usa los términos del entrevistado acá)¿qué cambios ha notado en el uso de medicina vegetal?
- ¿Siguen tomando los mismos vegetales que antes o han cambiado? Toman más que antes, menos que antes ó igual? Si el uso ha cambiado ¿por qué?
- Con los cambios en la malaria (usa términos del entrevistado) ¿cómo ha cambiado la efectividad de los remedios naturales?

3. Más sobre etiología, prevención, proceso de sanarse, estar “curado”

**OJO: las preguntas siguientes son generales y deben ser modificadas tomando en cuenta las respuestas anteriores de cada entrevistado relacionado a la prevención y el tratamiento.** El objetivo de la primera pregunta es entender si hay una idea de estacionalidad relacionada a las causas de la malaria, por ejemplo si viene mayormente del zancudo en el invierno y del agua en el verano. Después queremos saber cual es el agente de la enfermedad (ej.: un “virus” en la sangre) y si es algo que está presente siempre en el organismo o si desaparece después de tratamiento.

a. etiología

La última vez, hablábamos de donde viene la malaria. Ud. me decía que una manera de contagiarse es de la picadura de un zancudo. ¿Qué pasa cuando no hay muchos zancudos? Según su perspectiva ¿cómo es que a algunas personas les da la malaria cuando hay muy pocos zancudos?

Sondeo: ¿hay oportunidades en que la malaria viene mayormente de los zancudos y oportunidades en que viene mayormente de otras causas? Explíqueme...

b. proceso de sanarse, estar “curado”

Ahora, la última vez me decía que al tener la malaria, hay que tomar pastillas para sanarse. De su modo de pensar ¿qué hace las pastillas con el virus exactamente? (usa la palabra “virus” ó “enfermedad” o lo que sea que usó el entrevistado)

En la posta te dan pastillas para la malaria. Después de terminar de tomar estas pastillas ¿qué pasa con el “virus” (usa la palabra del entrevistado)? ¿Dónde está?

Algunos toman remedios vegetales para la malaria como raíz de huasaí o remocaspi. ¿Cuál es la diferencia entre estos medicamentos y los medicamentos que les dan en la posta?

Sondeos:

Se puede sanarse solamente con remedios vegetales?

Se puede sanarse solamente con las pastillas de la posta?

¿Hay razones para tomar los dos tipos de medicamentos a la vez o uno después del otro?

Explíqueme, por favor.

Para Ud. ¿qué quiere decir exactamente “estar sano” después de tener la malaria?

Algunos dicen que después de tomar medicamentos, no te da la malaria nuevamente. ¿Cómo entiende Ud. eso? ¿Cómo funciona?

Después de estar enfermo ¿cómo sabe Ud. que está sano? ¿Cómo se nota que ya no está enfermo?

Según su perspectiva ¿es posible estar enfermo sin darse cuenta? ¿es posible estar enfermo sin tener ningún síntoma? Explíqueme al respecto...

Hablando de enfermedades en general, no necesariamente de la malaria, si está tomando una medicina ¿cómo decide que puede dejar de tomar la medicina?

¿Hay alguna razón para seguir tomando una medicina / un remedio si ya no se siente enfermo?

Ahora, en cuanto específicamente a la malaria ¿cómo sabe que puede dejar de tomar el tratamiento?

¿Hay alguna razón para seguir tomando la medicina para la malaria si ya no se siente enfermo?





## Prevención de picaduras: dividir en grupos los métodos para prevenir picaduras

### Instrucciones

→ Antes de llegar a cada entrevista, mezcla las tarjetas para que tengan un orden aleatorio.

#### 1. Presentación del ejercicio

*Pide permiso al informante para hacerle la entrevista. Saca un formato de consentimiento informado, revíselo con el / ella y déjale la oportunidad de pensar y decidir si quiere participar. Si está de acuerdo, presenta el ejercicio al informante más o menos así:*

Como Ud. sabe, tenemos un proyecto de malaria aquí en la zona. Hoy estamos realizando unas entrevistas de zancudos. Le voy a enseñar unos dibujitos de diferentes cosas que se hace para prevenir picaduras del zancudo. Todas estas fueron mencionadas por gente de la comunidad. Vamos a revisarlos juntos y luego voy a hacerle unas preguntas. No hay respuesta correcta ni incorrecta, solamente lo que piensa Ud. Si no explico algo bien o si Ud. no entiende algo, por favor pregúntame.

#### 2. Datos demográficos

*Llena la parte del formulario con los datos demográficos y la ficha demográfica*

#### 3. Presentación de las tarjetas

*Revisa las tarjetas una por una con cada informante. Pregúntale que significa el dibujo para el / ella. Explícale que significa la tarjeta para nosotros y ponte de acuerdo con el / ella sobre el significado de cada uno. Las explicaciones no deben ser muy largas... de lo contrario esta parte de la entrevista puede demorar bastante.*

#### 4. Presentación de las preguntas y anotación de las respuestas

### **USO**

Mi primera pregunta es si Ud. usa o no usa la cosa que está en la tarjeta. Quiero que Ud. divida los dibujos en 3 grupos. El primer grupo va a ser cosas que Ud. usa o hace frecuentemente. El segundo grupo va a ser cosas que Ud. usa o hace solamente de vez en cuando. El tercer grupo va a ser cosas que Ud. no usa o no hace nunca. Puede revisar las tarjetas las veces que quiera. Recuérdese que no hay respuestas "buenas" ni respuestas "malas", solamente lo que hace o no hace Ud. No dude en preguntarme si hay una duda.

*No intervenga mientras el informante arregle las tarjetas en 3 grupos. Una vez terminada revisa los grupos con el / ella:*

- ¿en este primer grupo están las cosas que Ud. hace o usa frecuentemente?
- ¿en este segundo grupo están las cosas que Ud. hace o usa solamente de vez en cuando?
- ¿en este tercer grupo están las cosas que Ud. no hace o usa nunca?"

*Déjale al informante la oportunidad de cambiar su agrupación si el / ella quiere. Luego, agarra las tarjetas en el primer grupo. Enséñale al informante la primera tarjeta y pregúntale lo siguiente:*

- ¿En que momentos es más apropiado usar / hacer \_\_\_\_\_?  
(sondear para profundizar más la respuesta cuando sea apropiado)
- ¿En que momentos u oportunidades hay que dejar de usar / hacer \_\_\_\_\_?  
(sondear para profundizar más la respuesta cuando sea apropiado)  
(OJO: estas preguntas no necesariamente aplica a todos los métodos)

*Anota sus respuestas en la columna de "comentarios" para cada tarjeta. Repite las preguntas para cada tarjeta en el 1º grupo. Una vez revisada el 1º grupo, repite el proceso con el 2º grupo. Luego, agarra las tarjetas en el 3º grupo. Enséñale al informante la primera tarjeta y pregúntale:*

## Prevención de picaduras: dividir en grupos los métodos para prevenir picaduras

- ¿Por qué no usa / hace Ud. \_\_\_\_\_?
- ¿En qué oportunidad lo usaría?
- ¿Qué hace Ud. en este horario (en caso de no querer bañarse o entrar en el mosquitero temprano)

### EFECTIVIDAD

*Una vez terminado las preguntas del 3º grupo, sigue con la 2ª categoría (efectividad):*

Muy bien, ahora vamos a la 2ª parte. Quiero que Ud. olvida de todo lo que hemos conversado hasta ahora. Imagínese también que tuviera toda el dinero posible. Por ahora, solo quiero saber si cada medida de prevención es buena o no es buena para prevenir picaduras.

Vamos a hacer 3 grupos nuevos. En el 1º grupo van las cosas que funcionan muy bien para prevenir picaduras de zancudos. **Es decir, si uso o si hago eso, casi no me va a picar ningún zancudo.** En el 2º grupo van las cosas que funcionan más o menos. **Si uso o hago una de estas cosas, voy a recibir menos picaduras que antes pero todavía voy a recibir algunas.** En el 3º grupo van las cosas que no funcionan para nada. **Si uso o hago una de estas, igual me van a picar.**

Revise las tarjetas las veces que quiera para decidir. Otra vez quiero recordarle que no hay respuestas buenas ni respuestas malas—solamente me interesa la experiencia de Ud. No dude en preguntarme si tuviera una duda.

*Una vez agrupadas las tarjetas sigue el mismo proceso que antes. Luego, agarra las tarjetas en el 1º grupo y pregúntale:*

- ¿De estos que funcionan bien ¿cuál es el que funciona mejor de todos?
- ¿Qué característica tiene \_\_\_\_\_ que hace que sea mejor que los otros métodos de prevención?

*Anota las respuestas en la columna de comentarios. Luego agarra las tarjetas en el 3º grupo y pregúntale:*

- De estos que no funcionan ¿cuál es el que funciona peor que todos los demás?
- ¿Qué característica tiene \_\_\_\_\_ que hace que sea peor que los otros métodos de prevención?

### ECONOMIA

*Una vez terminado los sondeos, sigue con la 3ª categoría (economía):*

Muy bien, vamos ahora a la última parte: la parte económica. Muchos de estos métodos no generan gastos, pero unos sí. Vamos a trabajar ahora solamente con las cosas que hay que comprar. Voy a pedirle que divida otra vez las tarjetas en 3 grupos. En el 1º grupo van las que le sale a cuenta, las que Ud. podría comprar. En el 2º grupo van las que son un poco costosas, las que podría comprar pero ahorrando el dinero. En el 3º grupo van las que le sale muy caros, las que no podría comprar. ¿de acuerdo?

*Sigue el mismo proceso que las veces anteriores: no intervenga mientras el / la informante agrupe las tarjetas, revisa los grupos con el / ella y déjale la oportunidad de cambiar la agrupación si quiere. Luego de terminar la agrupación, agarra las tarjetas del primer grupo y pregúntale al informante:*

- ¿De todos los que Ud. me ha mencionado que le sale a cuenta ¿cuál le sale más a cuenta?

## Prevención de picaduras: dividir en grupos los métodos para prevenir picaduras

- ¿Qué hace que sea más a cuenta que los otros métodos de prevención?
- ¿Qué quiere decir “sale a cuenta” para Ud.? ¿Qué quiere decir “un poco costoso?”

*Anota las respuestas, agarra las tarjetas del 3º grupo y pregúntale al informante:*

- De todos los que Ud. me ha mencionado que salen muy caros ¿cuál le sale el más caro?
- ¿Qué hace que sea más caro que los otros métodos de prevención?
- Para Ud. ¿qué quiere decir “muy caro”?

*Ahora junta las 7 tarjetas. Revisándolas uno por uno, pregúntale al informante para cada una:*

- Para Ud. ¿qué sería el precio de este método?

*Anota la respuesta, mezcla las 14 tarjetas restantes del grupo y pregúntale al informante:*

- De todas estas tarjetas ¿cuál es el más fácil de realizar para Ud.?
- ¿Qué es lo que hace que sea más fácil que las otras?
- De todas estas tarjetas ¿cuál es el más difícil de realizar para Ud.?
- ¿Qué es lo que hace que sea más difícil que las otras?

OJO: Hay muchas maneras en que una cosa puede ser difícil: una tarea puede ser difícil para mi **porque implica mucho labor y demora mucho tiempo**. También puede ser difícil porque **es algo tedioso o aburrido**. O puede ser difícil para mi simplemente porque **es algo que no me gusta hacer, que no me agrada**.

*Anota la respuesta, agradecerte al informante por su colaboración y despedirte de el / ella.*

|     |  |
|-----|--|
| TC: |  |
|-----|--|

|        |     |     |     |
|--------|-----|-----|-----|
| Fecha: |     |     |     |
|        | día | mes | año |

**Presentación:**

Hoy día estamos realizando unas entrevistas sobre diferentes medicamentos. El propósito de estas entrevistas es llegar a entender mejor de las personas afectadas qué tan efectivos son y también lo bueno y lo malo de tomar cada uno. Si Ud. está de acuerdo, voy a enseñarle varias pastillas y luego voy a hacerle unas preguntas sobre cada uno. No hay respuestas correctas ni incorrectas a estas preguntas, mi único interés es la experiencia y la valoración de Ud. ¿Está bien?

| 1. ¿Ha tomado una vez esta pastilla? | Sí [1] | No [2] | NS/ NR [3] |
|--------------------------------------|--------|--------|------------|
| 1. Primaquina 7.5 mg.                |        |        |            |
| 2. Quinina sulfato 300 mg.           |        |        |            |
| 3. Artesunato 50 mg.                 |        |        |            |
| 4. Aralen 250 mg.                    |        |        |            |
| 5. Tetraciclina 250 mg.              |        |        |            |
| 6. Cloroquina fosfato 250 mg.        |        |        |            |
| 7. Clindamicina 300 mg verde         |        |        |            |
| 8. Mefloquina 250 mg.                |        |        |            |
| 9. Fansidar SP. 500 mg/25mg          |        |        |            |
| 10. Primaquina 15 mg.                |        |        |            |
| 11. Clindamicina 300 mg. (rojo)      |        |        |            |
|                                      |        |        |            |
|                                      |        |        |            |

| 2. ¿La ha tomado un familiar o un vecino? | Sí [1] | No [2] | NS/ NR [3] | ¿Quién? |
|-------------------------------------------|--------|--------|------------|---------|
| 1. Primaquina 7.5 mg.                     |        |        |            |         |
| 2. Quinina sulfato 300 mg.                |        |        |            |         |
| 3. Artesunato 50 mg.                      |        |        |            |         |
| 4. Aralen 250 mg.                         |        |        |            |         |
| 5. Tetraciclina 250 mg.                   |        |        |            |         |
| 6. Cloroquina fosfato 250                 |        |        |            |         |
| 7. Clindamicina 300 mg verde              |        |        |            |         |
| 8. Mefloquina 250 mg.                     |        |        |            |         |
| 9. Fansidar SP. 500 mg                    |        |        |            |         |
| 10. Primaquina 15 mg.                     |        |        |            |         |
| 11. Clindamicina 300 mg.                  |        |        |            |         |
|                                           |        |        |            |         |
|                                           |        |        |            |         |

3. Agrupación libre

a. Ahora vamos a pedirle a Ud. que divida las pastillas en grupos según cuales son más similar. Puede hacer el número de grupos que Ud. quiera y aplicar los criterios que Ud. quiera. Solamente le pedimos que cada pastilla va con las otras pastillas que son similares para Ud. *Deja que el informante haga sus grupos sin que intervengas. Si el informante pregunta, puedes volver a explicar que lo que quieres es que el agrupe las pastillas según su similitud pero no puedes decirle nada de cuantos grupos debe hacer ni de que criterios usar al hacerlos. Más allá de contestar esta pregunta, no puedes decir nada hasta que termine el informante.*

*Después de que el informante haya terminado anota el número de grupos y pregúntale:* **Nro. de grupos:** \_\_\_\_\_

b. ¿En que manera son similares las pastillas del grupo \_\_\_\_\_? ¿En que manera son diferentes a las pastillas de las otros grupos? *(Volver a hacer esta pregunta para cada grupo. Sondear los mas posible sobre las características de cada grupo.)*



4. Ahora vamos a hacer unos grupos nuevos. Todas estas pastillas que le he enseñado son usadas para la malaria. Algunas sirven solamente para la malaria. Pero varias personas nos han dicho que algunas pastillas se puede usar para otras cosas. *Enséñale tabletas de Paracetamol y dile:* Aquí, por ejemplo, tengo unas tabletas de Paracetamol. El Paracetamol sirve para dolor de cabeza, fiebre, dolor de cuerpo y muchas otras cosas. Lo que quiero ahora es que Ud. divida las pastillas en dos grupos: los que sirven solamente para la malaria y los que tienen otros usos para Ud. No hay respuestas correctas ni incorrectas para esta pregunta... solamente me interesa saber cuales tienen otros usos para Ud.

| ¿Tiene otro uso la pastilla?  | Sí[1] | No[2] | NS [3] | ¿Tiene otro uso la pastilla?    | Sí[1] | No[2] | NS [3] |
|-------------------------------|-------|-------|--------|---------------------------------|-------|-------|--------|
| 1. Primaquina 7.5 mg.         |       |       |        | 7. Clindamicina 300 mg (verde)  |       |       |        |
| 2. Quinina sulfato 300 mg.    |       |       |        | 8. Mefloquina 250 mg.           |       |       |        |
| 3. Artesunato 50 mg.          |       |       |        | 9. Fansidar SP. 500 mg/25mg     |       |       |        |
| 4. Aralen 250 mg.             |       |       |        | 10. Primaquina 15 mg.           |       |       |        |
| 5. Tetraciclina 250 mg.       |       |       |        | 11. Clindamicina 300 mg. (rojo) |       |       |        |
| 6. Cloroquina fosfato 250 mg. |       |       |        |                                 |       |       |        |
|                               |       |       |        |                                 |       |       |        |

5. Ahora para cada pastilla identificada por el informante como una pastilla que sirve para otra cosa, pregúntale: Para qué mas sirve esta pastilla? ¿Qué otro uso tiene?

| Medicamento                     | Otro uso que tiene |
|---------------------------------|--------------------|
| 1. Primaquina 7.5 mg.           |                    |
| 2. Quinina sulfato 300 mg.      |                    |
| 3. Artesunato 50 mg.            |                    |
| 4. Aralen 250 mg.               |                    |
| 5. Tetraciclina 250 mg.         |                    |
| 6. Cloroquina fosfato 250 mg.   |                    |
| 7. Clindamicina 300 mg (verde)  |                    |
| 8. Mefloquina 250 mg.           |                    |
| 9. Fansidar SP. 500 mg/25mg     |                    |
| 10. Primaquina 15 mg.           |                    |
| 11. Clindamicina 300 mg. (rojo) |                    |
|                                 |                    |
|                                 |                    |
|                                 |                    |

6. Muy bien. Para la próxima parte vamos a hacer 2 grupos nuevos. Muchas personas nos han explicado que ciertas pastillas te curan mientras otras solamente te calman. Ahora le voy a pedir que divida las pastillas entre las que realmente curan y las que solamente calman. Acuérdesse que no hay respuestas correctas ni incorrectas, solamente la experiencia que tiene Ud.

| Grupos*                       | [1] | [2] | NS [3] | Grupos                          | [1] | [2] | NS [3] |
|-------------------------------|-----|-----|--------|---------------------------------|-----|-----|--------|
| 1. Primaquina 7.5 mg.         |     |     |        | 7. Clindamicina 300 mg (verde)  |     |     |        |
| 2. Quinina sulfato 300 mg.    |     |     |        | 8. Mefloquina 250 mg.           |     |     |        |
| 3. Artesunato 50 mg.          |     |     |        | 9. Fansidar SP. 500 mg/25mg     |     |     |        |
| 4. Aralen 250 mg.             |     |     |        | 10. Primaquina 15 mg.           |     |     |        |
| 5. Tetraciclina 250 mg.       |     |     |        | 11. Clindamicina 300 mg. (rojo) |     |     |        |
| 6. Cloroquina fosfato 250 mg. |     |     |        |                                 |     |     |        |
|                               |     |     |        |                                 |     |     |        |

\* 1 = Te cura; 2 = Te calma; 3 = No sabe

(OJO: Puede ser que ciertas pastillas pueden curar ciertas enfermedades pero solamente pueden calmar otras. Si alguien responde así o con otra respuesta inesperada, anótalo a continuación o de ser necesario al dorso.)

7. Para Ud. ¿qué significa estar “curado”? ¿qué significa estar “calmado”? (Sondeos: ¿cómo sabría yo si estoy curado o calmado? Si estoy curado ¿quiere decir que nunca más me puede repetir la misma enfermedad? ¿qué pasa si me enfermo del agua estancada? Si me curo y tomo el mismo otra vez tomo la misma agua ¿quiere decir que no voy a volver a enfermar? ¿Estoy ahora protegido?)

8. Ahora vamos a pasar por las pastillas una por una. Según su experiencia quiero que Ud. me indica ¿qué es lo bueno y lo malo de tomar cada pastilla? *Enséñale al informante la primera pastilla y pregúntale: ¿qué es lo bueno y lo malo de tomar \_\_\_\_\_? (Sondear: ¿Es fácil o difícil de tomar? ¿qué te puede pasar al tomarla?)*  
*Continúa hasta terminar todas las pastillas*

| Medicamento                     | Lo bueno (1) | Lo malo (2) | N/S |
|---------------------------------|--------------|-------------|-----|
| 1. Primaquina 7.5 mg.           |              |             |     |
| 2. Quinina sulfato 300 mg.      |              |             |     |
| 3. Artesunato 50 mg.            |              |             |     |
| 4. Aralen 250 mg.               |              |             |     |
| 5. Tetraciclina 250 mg.         |              |             |     |
| 6. Cloroquina fosfato 250 mg.   |              |             |     |
| 7. Clindamicina 300 mg (verde)  |              |             |     |
| 8. Mefloquina 250 mg.           |              |             |     |
| 9. Fansidar SP. 500 mg/25mg     |              |             |     |
| 10. Primaquina 15 mg.           |              |             |     |
| 11. Clindamicina 300 mg. (rojo) |              |             |     |
|                                 |              |             |     |
|                                 |              |             |     |
|                                 |              |             |     |

9. Muy bien. Hemos visto en otras oportunidades que ciertas medicinas pierden su poder después de un tiempo y dejan de ser efectivos. No sabemos como ha sido acá con estas pastillas. Por esto me gustaría que Ud. me indique cuales de estas pastillas funcionan mejor que antes, igual que antes o peor que antes.

| Grupos*                       | [1] | [2] | [3] | [4] | Grupos*                         | [1] | [2] | [3] | [4] |
|-------------------------------|-----|-----|-----|-----|---------------------------------|-----|-----|-----|-----|
| 1. Primaquina 7.5 mg.         |     |     |     |     | 7. Clindamicina 300 mg (verde)  |     |     |     |     |
| 2. Quinina sulfato 300 mg.    |     |     |     |     | 8. Mefloquina 250 mg.           |     |     |     |     |
| 3. Artesunato 50 mg.          |     |     |     |     | 9. Fansidar SP. 500 mg/25mg     |     |     |     |     |
| 4. Aralen 250 mg.             |     |     |     |     | 10. Primaquina 15 mg.           |     |     |     |     |
| 5. Tetraciclina 250 mg.       |     |     |     |     | 11. Clindamicina 300 mg. (rojo) |     |     |     |     |
| 6. Cloroquina fosfato 250 mg. |     |     |     |     |                                 |     |     |     |     |
|                               |     |     |     |     |                                 |     |     |     |     |

\* 1 = Mejor que antes; 2 = igual que antes; 3 = peor que antes; 4 = No sabe

10. ¿A qué se debe los cambios en efectividad que Ud. ha visto? ¿A qué se debe el hecho de que ciertas de estas pastillas ya no funcionan como antes? *OJO: hacer esta pregunta solamente si el informante ha notado que unas pastillas ya no funcionan como antes. De lo contrario, pasa a la pregunta nro. 11.*

11. Con ciertos remedios es necesario tomar otra cosa. Con otros remedios hay que dejar de tomar o hacer ciertas cosas. (Si te parece que el informante no capta la idea, puedes agregar: "por ejemplo, a veces hay que tomar otra pastilla o algún vegetal o una comida especial. A veces no hay que comer ciertas comidas o no hay que hacer ciertas actividades".) *Enséñale la primera pastilla y pregúntale* ¿Qué hay que tomar con \_\_\_\_\_? ¿Cuándo hay que tomarlo? ¿Qué hay que dejar de tomar? ¿Qué hay que dejar de hacer?

| Medicamento                     | Lo que hay que tomar (2) | Lo que hay que dejar (2) | N/S |
|---------------------------------|--------------------------|--------------------------|-----|
| 1. Primaquina 7.5 mg.           |                          |                          |     |
| 2. Quinina sulfato 300 mg.      |                          |                          |     |
| 3. Artesunato 50 mg.            |                          |                          |     |
| 4. Aralen 250 mg.               |                          |                          |     |
| 5. Tetraciclina 250 mg.         |                          |                          |     |
| 6. Cloroquina fosfato 250 mg.   |                          |                          |     |
| 7. Clindamicina 300 mg (verde)  |                          |                          |     |
| 8. Mefloquina 250 mg.           |                          |                          |     |
| 9. Fansidar SP. 500 mg/25mg     |                          |                          |     |
| 10. Primaquina 15 mg.           |                          |                          |     |
| 11. Clindamicina 300 mg. (rojo) |                          |                          |     |
|                                 |                          |                          |     |
|                                 |                          |                          |     |



## Factores socio - antropológicos que afectan la prevención de malaria

### Encuesta de consumo de medios masivos

6. ¿Cada qué tiempo escucha Ud. la radio? (indique con "X" una sola respuesta)

- |                                                           |                                                           |
|-----------------------------------------------------------|-----------------------------------------------------------|
| <input type="checkbox"/> Todos los días [1]               | <input type="checkbox"/> Menos de una vez a la semana [4] |
| <input type="checkbox"/> Varias veces por semana [2]      | <input type="checkbox"/> No sabe / no contesta [-9]       |
| <input type="checkbox"/> Al menos una vez a la semana [3] |                                                           |

7. ¿Qué radioemisoras escucha Ud. frecuentemente? (indique todos mencionados por el informante ESPONTÁNEAMENTE)

- |                                               |                                                  |
|-----------------------------------------------|--------------------------------------------------|
| <input type="checkbox"/> a La Voz de la Selva | <input type="checkbox"/> h Karibeña              |
| <input type="checkbox"/> b Arpegio            | <input type="checkbox"/> i Tigre                 |
| <input type="checkbox"/> c Atlántida          | <input type="checkbox"/> j RF                    |
| <input type="checkbox"/> d Loreto             | <input type="checkbox"/> k Americana             |
| <input type="checkbox"/> e Iquitos            | <input type="checkbox"/> l Otra (¿cuál?): _____  |
| <input type="checkbox"/> f Astoria            | <input type="checkbox"/> m No sabe / no contesta |
| <input type="checkbox"/> g Diez               |                                                  |

8. ¿Cuál es su radioemisora / canal favorito? (No sugerir—indicar solamente una respuesta)

- |                                                 |                                                       |
|-------------------------------------------------|-------------------------------------------------------|
| <input type="checkbox"/> La Voz de la Selva [1] | <input type="checkbox"/> Karibeña [8]                 |
| <input type="checkbox"/> Arpegio [2]            | <input type="checkbox"/> Tigre [9]                    |
| <input type="checkbox"/> Atlántida [3]          | <input type="checkbox"/> RF [10]                      |
| <input type="checkbox"/> Loreto [4]             | <input type="checkbox"/> Americana [11]               |
| <input type="checkbox"/> Iquitos [5]            | <input type="checkbox"/> Otro [12]<br>(¿cuál?): _____ |
| <input type="checkbox"/> Astoria [6]            | <input type="checkbox"/> No tengo favorita [0]        |
| <input type="checkbox"/> Diez [7]               | <input type="checkbox"/> No sabe / no contesta [-9]   |

9. ¿Cuál es su programa de radio favorito? (Anote nombre del programa mencionado por informante. Si el informante no tiene ningún programa favorito, anote "ninguno" y SALTA A LA PREGUNTA #13)

10. ¿A qué hora están dando este programa?

:   
hh m  
m

11. ¿Cuáles son los días de la semana en que dan este programa? (respuestas múltiples permitidas)

## Factores socio - antropológicos que afectan la prevención de malaria

### Encuesta de consumo de medios masivos

- |                            |           |                            |                       |
|----------------------------|-----------|----------------------------|-----------------------|
| <input type="checkbox"/> a | lunes     | <input type="checkbox"/> e | viernes               |
| <input type="checkbox"/> b | martes    | <input type="checkbox"/> f | sábado                |
| <input type="checkbox"/> c | miércoles | <input type="checkbox"/> g | domingo               |
| <input type="checkbox"/> d | jueves    | <input type="checkbox"/> h | No sabe / no contesta |

12. ¿Cada qué tiempo escucha Ud. este programa? (indique con "X" una sola respuesta)

- |                                                           |                                                           |
|-----------------------------------------------------------|-----------------------------------------------------------|
| <input type="checkbox"/> Todos los días [1]               | <input type="checkbox"/> Menos de una vez a la semana [4] |
| <input type="checkbox"/> Varias veces por semana [2]      | <input type="checkbox"/> No sabe / no contesta [-9]       |
| <input type="checkbox"/> Al menos una vez a la semana [3] |                                                           |

13. ¿Qué otros programas escucha Ud. frecuentemente?  
(NO SUGERIR—anote nombres de los programas mencionados ESPONTÁNEAMENTE)

- |                            |                       |
|----------------------------|-----------------------|
| <input type="checkbox"/> a | <input type="text"/>  |
| <input type="checkbox"/> b | <input type="text"/>  |
| <input type="checkbox"/> c | <input type="text"/>  |
| <input type="checkbox"/> d | <input type="text"/>  |
| <input type="checkbox"/> e | <input type="text"/>  |
| <input type="checkbox"/> f | Ninguno               |
| <input type="checkbox"/> g | No sabe / no contesta |

14. ¿Cuáles son las horas del día en que Ud. escucha la radio, generalmente?  
(respuestas múltiples permitidas, véase instrucciones)

- |                            |                        |                      |                            |                        |                      |
|----------------------------|------------------------|----------------------|----------------------------|------------------------|----------------------|
| <input type="checkbox"/> a | <input type="text"/> : | <input type="text"/> | <input type="checkbox"/> a | <input type="text"/> : | <input type="text"/> |
| <input type="checkbox"/> b | <input type="text"/> : | <input type="text"/> | <input type="checkbox"/> a | <input type="text"/> : | <input type="text"/> |
| <input type="checkbox"/> c | <input type="text"/> : | <input type="text"/> | <input type="checkbox"/> a | <input type="text"/> : | <input type="text"/> |
| <input type="checkbox"/> d | <input type="text"/> : | <input type="text"/> | <input type="checkbox"/> a | <input type="text"/> : | <input type="text"/> |
|                            | hh                     | mm                   |                            | hh                     | mm                   |

**Instrucciones:** lo más probable es que el informante mencione algo general como "en la tarde" o "en la noche". En este caso, hay que pedir información más específica: "Ud. me dice durante la tarde, pero ¿más o menos de qué hora a qué hora?" No es necesario sacar una respuesta exacta—es poco probable que alguien diga "de 7:15 a 9:20". Pero hay que establecer un rango aproximado. Si el informante dice "bueno, desde 6 o 6:30 hasta 9 o 10 de la noche", podemos anotar 18:00 a 22:00. Hay 4 espacios disponibles para anotar la hora en caso de que un informante suela escuchar a la radio en diferentes momentos del día.

- e No sabe / no contesta

## Factores socio - antropológicos que afectan la prevención de malaria

### Encuesta de consumo de medios masivos

15. ¿Cuales son los días de la semana en que Ud. escucha la radio, generalmente?  
(Anote todos que mencione. Si dice "todos los días", marcar todas las casillas.)

- |                            |           |                            |         |                            |                       |
|----------------------------|-----------|----------------------------|---------|----------------------------|-----------------------|
| <input type="checkbox"/> a | lunes     | <input type="checkbox"/> d | jueves  | <input type="checkbox"/> g | domingo               |
| <input type="checkbox"/> b | martes    | <input type="checkbox"/> e | viernes | <input type="checkbox"/> h | No sabe / no contesta |
| <input type="checkbox"/> c | miércoles | <input type="checkbox"/> f | sábado  |                            |                       |

16. ¿Dónde escucha Ud. la radio, generalmente?  
(respuestas múltiples permitidas—No sugerir: deje que el informante responda ESPONTANEAMENTE)

- |                            |                                             |                            |                                |
|----------------------------|---------------------------------------------|----------------------------|--------------------------------|
| <input type="checkbox"/> a | En mi propia casa                           | <input type="checkbox"/> d | Otro lugar<br>(describe) _____ |
| <input type="checkbox"/> b | En casa de un vecino                        | <input type="checkbox"/> e | No sabe / no contesta          |
| <input type="checkbox"/> c | En un lugar comunal (colegio, casa comunal) |                            |                                |

17. ¿Cuántas radios propias tiene su casa que se encuentren en buen estado, funcionando?  
(Anote nro. mencionado por informante. Si no hay ninguno, anote 0)

18. ¿Ve Ud. a veces la televisión? (indique con "X" una sola respuesta)

- |                                 |                                                          |
|---------------------------------|----------------------------------------------------------|
| <input type="checkbox"/> Sí [1] | <input type="checkbox"/> No [2] → salta a la pregunta 30 |
|---------------------------------|----------------------------------------------------------|

19. ¿Cada qué tiempo ve Ud. a la televisión? (indique con "X" una sola respuesta)

- |                                                      |                                                           |
|------------------------------------------------------|-----------------------------------------------------------|
| <input type="checkbox"/> Todos los días [1]          | <input type="checkbox"/> Al menos una vez a la semana [3] |
| <input type="checkbox"/> Varias veces por semana [2] | <input type="checkbox"/> Menos de una vez a la semana [4] |

20. ¿Cuál es su canal favorito? (Marque con "X" una sola respuesta. No sugerir—deje que responda ESPONTANEAMENTE)

- |                                                        |                                                      |
|--------------------------------------------------------|------------------------------------------------------|
| <input type="checkbox"/> Canal 2 [1]                   | <input type="checkbox"/> Canal 21 UHF [5]            |
| <input type="checkbox"/> Canal 5 / Panamericana [2]    | <input type="checkbox"/> No tengo canal favorito [0] |
| <input type="checkbox"/> Canal 16 (canal de cable) [3] | <input type="checkbox"/> No sabe / no contesta [-9]  |
| <input type="checkbox"/> Canal 7 [4]                   |                                                      |



## Factores socio - antropológicos que afectan la prevención de malaria

### Encuesta de consumo de medios masivos

21. ¿Qué otros canales puede Ud. ver frecuentemente? (*respuestas múltiples permitidas—NO SUGERIR*)

- |                                                      |                                                  |
|------------------------------------------------------|--------------------------------------------------|
| <input type="checkbox"/> a Canal 2                   | <input type="checkbox"/> e Canal 21 UHF          |
| <input type="checkbox"/> b Canal 5 / Panamericana    | <input type="checkbox"/> f No veo ningún otro    |
| <input type="checkbox"/> c Canal 16 (canal de cable) | <input type="checkbox"/> g No sabe / no contesta |
| <input type="checkbox"/> d Canal 7                   |                                                  |

22. ¿Cuál es su programa favorito? (*Anote nombre del programa mencionado por informante. Si el informante no tiene ningún programa favorito, anote "ninguno" y SALTA A LA PREGUNTA #26*)

23. ¿A qué hora están dando este programa?

|    |   |   |
|----|---|---|
|    | : |   |
| hh |   | M |
|    |   | m |

24. ¿Cuáles son los días de la semana en que dan este programa? (*respuestas múltiples permitidas*)

- |                                      |                                    |                                                  |
|--------------------------------------|------------------------------------|--------------------------------------------------|
| <input type="checkbox"/> a lunes     | <input type="checkbox"/> d jueves  | <input type="checkbox"/> g domingo               |
| <input type="checkbox"/> b martes    | <input type="checkbox"/> e viernes | <input type="checkbox"/> h No sabe / no contesta |
| <input type="checkbox"/> c miércoles | <input type="checkbox"/> f sábado  |                                                  |

25. ¿Cada qué tiempo ve Ud. este programa? (*anote una sola respuesta*)

- |                                                           |                                                           |
|-----------------------------------------------------------|-----------------------------------------------------------|
| <input type="checkbox"/> Todos los días [1]               | <input type="checkbox"/> Menos de una vez a la semana [4] |
| <input type="checkbox"/> Varias veces por semana [2]      | <input type="checkbox"/> No sabe / no contesta [-9]       |
| <input type="checkbox"/> Al menos una vez a la semana [3] |                                                           |

26. ¿Qué otros programas ve Ud. frecuentemente? (*NO SUGERIR—anote nombres mencionados ESPONTÁNEAMENTE*)

- |                                                  |  |
|--------------------------------------------------|--|
| a                                                |  |
| b                                                |  |
| c                                                |  |
| d                                                |  |
| e                                                |  |
| <input type="checkbox"/> f Ninguno               |  |
| <input type="checkbox"/> g No sabe / no contesta |  |

## Factores socio - antropológicos que afectan la prevención de malaria

### Encuesta de consumo de medios masivos

27. ¿Cuáles son las horas del día en que Ud. ve a la televisión, generalmente?  
(respuestas múltiples permitidas; no hay que especificar hora exacta)

|                        |                        |                      |                        |                        |                      |
|------------------------|------------------------|----------------------|------------------------|------------------------|----------------------|
| <input type="text"/> a | <input type="text"/> : | <input type="text"/> | <input type="text"/> a | <input type="text"/> : | <input type="text"/> |
| <input type="text"/> b | <input type="text"/> : | <input type="text"/> | <input type="text"/> a | <input type="text"/> : | <input type="text"/> |
| <input type="text"/> c | <input type="text"/> : | <input type="text"/> | <input type="text"/> a | <input type="text"/> : | <input type="text"/> |
| <input type="text"/> d | <input type="text"/> : | <input type="text"/> | <input type="text"/> a | <input type="text"/> : | <input type="text"/> |
|                        | hh                     | mm                   |                        | hh                     | mm                   |
| <input type="text"/> e | No sabe / no contesta  |                      |                        |                        |                      |

**Instrucciones:** lo más probable es que el informante mencione algo general como "en la tarde" o "en la noche". En este caso, hay que pedir información más específica: "Ud. me dice durante la tarde, pero ¿más o menos de qué hora a qué hora?" No es necesario sacar una respuesta exacta—es poco probable que alguien diga "de 7:15 a 9:20". Pero hay que establecer un rango aproximado. Si el informante dice "bueno, desde 6 o 6:30 hasta 9 o 10 de la noche", podemos anotar 18:00 a 22:00. Hay 4 espacios disponibles para anotar la hora en caso de que el informante suela ver a la televisión en diferentes momentos del día.

28. ¿Cuáles son los días de la semana en que Ud. ve a la televisión, generalmente?  
(Anote todos que mencione. Si dice "todos los días", marcar todas las casillas.)

|                            |           |                            |         |                            |                       |
|----------------------------|-----------|----------------------------|---------|----------------------------|-----------------------|
| <input type="checkbox"/> a | lunes     | <input type="checkbox"/> d | jueves  | <input type="checkbox"/> g | domingo               |
| <input type="checkbox"/> b | martes    | <input type="checkbox"/> e | viernes | <input type="checkbox"/> h | No sabe / no contesta |
| <input type="checkbox"/> c | miércoles | <input type="checkbox"/> f | sábado  |                            |                       |

29. ¿Dónde ve Ud. a la televisión, generalmente?  
(Respuestas múltiples permitidas—No sugerir: deje que el informante responda ESPONTANEAMENTE)

|                            |                                             |                            |                             |
|----------------------------|---------------------------------------------|----------------------------|-----------------------------|
| <input type="checkbox"/> a | En mi propia casa                           | <input type="checkbox"/> d | Otro lugar (describe) _____ |
| <input type="checkbox"/> b | En casa de un vecino                        | <input type="checkbox"/> e | No sabe / no contesta       |
| <input type="checkbox"/> c | En un lugar comunal (colegio, casa comunal) |                            |                             |

30. ¿Cuántos televisores propios tiene su casa que se encuentren en buen estado, funcionando?  
(Anote nro. mencionado. Si no hay ninguno, anote 0.)

31. ¿En los últimos seis meses, recuerda Ud. haber visto algún mensaje sobre la salud?

|                          |        |                          |        |                          |                  |
|--------------------------|--------|--------------------------|--------|--------------------------|------------------|
| <input type="checkbox"/> | Sí [1] | <input type="checkbox"/> | No [2] | <input type="checkbox"/> | No contesta [-9] |
|--------------------------|--------|--------------------------|--------|--------------------------|------------------|

(OJO: En esta pregunta "no" equivale a "no recuerda". Marca la última casilla SOLAMENTE si el informante NO CONTESTA la pregunta.)

32. ¿Dónde vio esto(s) mensaje(s)?  
(NO SUGERIR—marque todas las respuestas mencionadas por informante ESPONTANEAMENTE)

|                            |                            |                            |                                                              |
|----------------------------|----------------------------|----------------------------|--------------------------------------------------------------|
| <input type="checkbox"/> a | Folletos / volantes        | <input type="checkbox"/> e | Servicio de salud (especifica posta, centro, hospital, etc.) |
| <input type="checkbox"/> b | Póster o afiche            | <input type="checkbox"/> f | Parroquia u otra iglesia                                     |
| <input type="checkbox"/> c | Rótulos en la ciudad       | <input type="checkbox"/> g | Otro (especifique) _____                                     |
| <input type="checkbox"/> d | Centro educativo (colegio) | <input type="checkbox"/> h | No sabe / no contesta                                        |

**Factores socio - antropológicos que afectan la prevención de malaria**  
**Encuesta de consumo de medios masivos**

**33. ¿De qué tema de salud trató el mensaje?**  
**(NO SURGERIR--marcar todas las respuestas que salgan ESPONTANEAMENTE)\***

- |                                                                         |                                                      |
|-------------------------------------------------------------------------|------------------------------------------------------|
| <input type="checkbox"/> a Salud reproductiva                           | <input type="checkbox"/> f Malaria                   |
| <input type="checkbox"/> b Salud materna / maternidad segura / embarazo | <input type="checkbox"/> g Dengue                    |
| <input type="checkbox"/> c Vacunas                                      | <input type="checkbox"/> h Violencia doméstica       |
| <input type="checkbox"/> d EDAs                                         | <input type="checkbox"/> i Otro (especifique) _____  |
| <input type="checkbox"/> e IRAs                                         | <input type="checkbox"/> j No recuerda / no contesta |

**\* OJO: Al aplicar la encuesta, hay que clasificar las respuestas dadas por el informante en nuestras categorías. Por ejemplo, si el informante menciona "cólera" o "diarrea", marque EDAs. Si el informante menciona "tos" o "bronquios", marque IRAs, etc.**

**34. ¿En los últimos seis meses, recuerda Ud. haber escuchado algún mensaje sobre la salud?**

- Sí [1]       No [2]       No contesta [-9]

**(OJO: En esta pregunta "no" equivale a "no recuerda". Marca la última casilla SOLAMENTE si el informante NO CONTESTA la pregunta.)**

**35. ¿Dónde escuchó esto(s) mensaje(s)?**  
**(NO SUGERIR--marque todas las respuestas mencionadas por informante ESPONTANEAMENTE)**

- |                                                                 |                                                                                         |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <input type="checkbox"/> a Oyó en la radio                      | <input type="checkbox"/> f Servicio de salud (especifica posta, centro, hospital, etc.) |
| <input type="checkbox"/> b Evento comunitario (fiesta, reunión) | <input type="checkbox"/> g Parroquia u otra iglesia                                     |
| <input type="checkbox"/> c Alguien le habló (¿quién?)           | <input type="checkbox"/> h Otro (especifique) _____                                     |
| <input type="checkbox"/> d Centro educativo                     | <input type="checkbox"/> i No sabe / no contesta                                        |
| <input type="checkbox"/> e Personal de salud                    |                                                                                         |

**36. ¿De qué tema de salud trató el mensaje?**  
**(NO SURGERIR--marcar todas las respuestas que salgan ESPONTANEAMENTE)\***

- |                                                                         |                                                      |
|-------------------------------------------------------------------------|------------------------------------------------------|
| <input type="checkbox"/> a Salud reproductiva                           | <input type="checkbox"/> f Malaria                   |
| <input type="checkbox"/> b Salud materna / maternidad segura / embarazo | <input type="checkbox"/> g Dengue                    |
| <input type="checkbox"/> c Vacunas                                      | <input type="checkbox"/> h Violencia doméstica       |
| <input type="checkbox"/> d EDAs                                         | <input type="checkbox"/> i Otro (especifique) _____  |
| <input type="checkbox"/> e IRAs                                         | <input type="checkbox"/> j No recuerda / no contesta |

**\* OJO: Al aplicar la encuesta, hay que clasificar las respuestas dadas por el informante en nuestras categorías. Por ejemplo, si el informante menciona "cólera" o "diarrea", marque EDAs. Si el informante menciona "tos" o "bronquios", marque IRAs, etc.**

**Factores socio - antropológicos que afectan la prevención de malaria**  
**Encuesta de consumo de medios masivos**

37. Aparte del periódico, la radio y la televisión ¿cómo es que se puede enterar sobre temas de salud?  
(NO SUGERIR—anote lugares mencionados ESPONTÁNEAMENTE)

a

b

c

d

e

f  Ningún otro sitio

g  No sabe / no contesta

Casero: \_\_\_\_\_ TC: \_\_\_\_\_ Fecha: \_\_\_/\_\_\_/\_\_\_ Código de familia: \_\_\_\_\_  
 [ dd / mm / yy ]

**1. Integrantes de la vivienda**

*(anota parentesco relacionado al jefe de la familia)*

| Nro. de persona | Apellido Paterno | Apellido Materno | Nombres | Fecha de Nacimiento [dd/mm/yy] | Sexo (1=M, 2=F) | Parentesco | Edad | Grado de instrucción | Ocupación / Actividad económica | Religión | ¿Cuántos años ha vivido en este casero? | ¿Dónde vivía antes? | ¿En qué cama duerme? (Anota número) | ¿Durmio en casa anoche? (1=SI, 2=No) | Si no durmió en casa ¿dónde durmió? |
|-----------------|------------------|------------------|---------|--------------------------------|-----------------|------------|------|----------------------|---------------------------------|----------|-----------------------------------------|---------------------|-------------------------------------|--------------------------------------|-------------------------------------|
| 1               |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 2               |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 3               |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 4               |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 5               |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 6               |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 7               |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 8               |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 9               |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 10              |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 11              |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 12              |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 13              |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 14              |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |
| 15              |                  |                  |         |                                |                 |            |      |                      |                                 |          |                                         |                     |                                     |                                      |                                     |

**Parentesco**

|             |                      |               |
|-------------|----------------------|---------------|
| 1 = Jefe    | 6 = Sobrino          | 11 = Hijastro |
| 2 = Hijo    | 7 = Padre            | 12 = Obrero   |
| 3 = Esposo  | 8 = Primo            | 13 = Otro     |
| 4 = Hermano | 9 = Familia Política | 14 = No sabe  |
| 5 = Tio     | 10 = Nieto           |               |

**Grado de instrucción terminado**

|                   |                     |                        |
|-------------------|---------------------|------------------------|
| 0 = Ninguno       | 5 = 5 de primaria   | 10 = 4 de secundaria   |
| 1 = 1 de primaria | 6 = 6 de primaria   | 11 = 5 de secundaria   |
| 2 = 2 de primaria | 7 = 1 de secundaria | 12 = estudios técnicos |
| 3 = 3 de primaria | 8 = 2 de secundaria | 13 = superior          |
| 4 = 4 de primaria | 9 = 3 de secundaria | 14 = No sabe           |

## 2. Relación de camas & mosquiteros de la vivienda

Caserío: \_\_\_\_ TC: \_\_\_\_ Fecha: \_\_\_\_/\_\_\_\_/\_\_\_\_  
d d / m m / y y

2 = Villa Buen Pastor    10 = Cuyana  
 3 = San Carlos

Nro. de camas total: \_\_\_\_

- Tipo de cama:**
- 1 = Tarima planchas de madera (sin colchón)
  - 2 = Piso de pona
  - 3 = Piso de madera
  - 4 = Tarima colchón de paja
  - 5 = Tarima colchón resortes
  - 6 = Tarima colchón espuma
  - 7 = Piso de tierra
  - 8 = plataforma de pona
  - 9 = Otro (describe)

- Tipo de mosquitero:**
- 1 = Tocuyo simple    4 = Otro
  - 2 = Tocuyo doble    5 = Ninguno
  - 3 = Nylon

| Nro. de cama                | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------------------------|---|---|---|---|---|---|---|---|---|----|
| <b>Tipo de cama</b>         |   |   |   |   |   |   |   |   |   |    |
| <b>Tamaño de cama</b>       |   |   |   |   |   |   |   |   |   |    |
| <b>Nro. personas</b>        |   |   |   |   |   |   |   |   |   |    |
| Persona 1                   |   |   |   |   |   |   |   |   |   |    |
| Persona 2                   |   |   |   |   |   |   |   |   |   |    |
| Persona 3                   |   |   |   |   |   |   |   |   |   |    |
| Persona 4                   |   |   |   |   |   |   |   |   |   |    |
| Persona 5                   |   |   |   |   |   |   |   |   |   |    |
| Persona 6                   |   |   |   |   |   |   |   |   |   |    |
| <b>Tipo de mosquitero</b>   |   |   |   |   |   |   |   |   |   |    |
| <b>Tamaño de mosquitero</b> |   |   |   |   |   |   |   |   |   |    |

Nro. de dormitorios total: \_\_\_\_

- 1 = 1 plaza    4 = Otros
- 2 = Plaza y media    5 = No hay
- 3 = 2 plazas    cama

## 3. Otra información de la casa

¿En qué dormitorio se encuentra cada cama?

| Nro. de cama        | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---------------------|---|---|---|---|---|---|---|---|---|----|
| <b>Dormitorio 1</b> |   |   |   |   |   |   |   |   |   |    |
| <b>Dormitorio 2</b> |   |   |   |   |   |   |   |   |   |    |
| <b>Dormitorio 3</b> |   |   |   |   |   |   |   |   |   |    |
| <b>Dormitorio 4</b> |   |   |   |   |   |   |   |   |   |    |
| <b>Dormitorio 5</b> |   |   |   |   |   |   |   |   |   |    |
| <b>Dormitorio 6</b> |   |   |   |   |   |   |   |   |   |    |
| <b>Dormitorio 7</b> |   |   |   |   |   |   |   |   |   |    |
| <b>Dormitorio 8</b> |   |   |   |   |   |   |   |   |   |    |

¿Cuántas radios hay en la casa? \_\_\_\_

Comentarios sobre ubicación de radios y televisores:

¿Cuántas televisores hay en la casa? \_\_\_\_

**Preguntas adicionales**

1. ¿Hace cuánto tiempo lavó su mosquitero por última vez?

2. ¿Cada cuánto tiempo los lava generalmente?

3. Cómo sabe que hay que lavar el mosquitero? ¿Qué le indica que hay que lavarlo?

4. ¿Cómo los lava? ¿Dónde los lava?

5. ¿Dónde están los mosquiteros ahora? ¿Dónde los guarda de día? ¿Me los puede mostrar?

6. ¿A qué hora se bañó anoche? \_\_\_\_ : \_\_\_\_

7. ¿Dónde se bañó anoche?

8. ¿A qué hora se acostó anoche? \_\_\_\_ : \_\_\_\_

9. ¿Dónde compra medicinas cuando las necesita?

10. ¿Qué toma Ud. y su familia para la fiebre?

11. ¿Cada cuánto tiempo sale a la ciudad?

## Hoja de observación estructurada: Impregnación de mosquiteros de tocuyo

OJO: Usar una hoja nueva para cada mosquitero tratado

|                         |                       |          |
|-------------------------|-----------------------|----------|
| Código de familia: ____ | Fecha: ____/____/____ | TC: ____ |
|-------------------------|-----------------------|----------|

|                                        |                          |                           |                            |
|----------------------------------------|--------------------------|---------------------------|----------------------------|
| Código de participante principal: ____ | Hora empezada: ____:____ | Hora terminada: ____:____ | Tiempo demorada: ____:____ |
|----------------------------------------|--------------------------|---------------------------|----------------------------|

¿Quiénes más participaron? ¿Qué hicieron?

¿Cuánto tiempo demoró en leer las instrucciones? \_\_\_\_ minutos

¿Parece que entendió las instrucciones? \_\_\_\_ Sí \_\_\_\_ No

¿Qué problemas hubo en entender las instrucciones?

### Mosquitero a ser tratado:

### Medidas (cm):

Tipo: \_\_\_\_

(1 = Tocuyo simple, 2 = Tocuyo doble, 3 = Nylon, 4 = Otro)

Tamaño: \_\_\_\_

(1=1 Plaza, 2=1.5 Plazas, 3=2 Plazas, 4=Otro)

Alto: \_\_\_\_

Largo: \_\_\_\_

Ancho: \_\_\_\_

### Pasos del tratamiento:

| Paso                                      | ¿Lo hizo?<br>Sí = 1, No = 2 | Orden en lo<br>que hizo: | Comentarios |
|-------------------------------------------|-----------------------------|--------------------------|-------------|
| 1. Juntar insumos necesarios              |                             |                          |             |
| 2. Ponerse guantes                        |                             |                          |             |
| 3. Medir agua en botella                  |                             |                          |             |
| 4. Preparar insecticida en botella        |                             |                          |             |
| 5. Tratar el mosquitero                   |                             |                          |             |
| a. Abrir mosquitero y meterlo en la bolsa |                             |                          |             |
| b. Echar insecticida en la bolsa          |                             |                          |             |
| c. Amasar bolsa por 2 minutos             |                             |                          |             |
| 6. Secar en sombra                        |                             |                          |             |
| 7. Quemar insumos usados                  |                             |                          |             |

Cantidad de agua usada: \_\_\_\_ litros

Dilución: \_\_\_\_ (1=insuficiente, 2=correcta, 3=demasiada)

Al sacar el mosquitero de la bolsa ¿goteaba? \_\_\_\_ (1=Mucho, 2=Poco, 3=Nada)

¿Había solución en la bolsa al sacar el mosquitero? \_\_\_\_ (1=Mucha, 2=Poca, 3=Ninguna)

### Disposición de insumos:

|         | Quemado | Enterrado | Lavado y guardado | Guardado sin lavar | Descartado otra manera | (Describe) |
|---------|---------|-----------|-------------------|--------------------|------------------------|------------|
| Botella |         |           |                   |                    |                        |            |
| Bolsa   |         |           |                   |                    |                        |            |
| Guantes |         |           |                   |                    |                        |            |
| Sobre   |         |           |                   |                    |                        |            |

Otros comentarios (usar el dorso si se necesita mas espacio):



**Instrumento de vigilancia: día después del tratamiento**

|                         |                               |                       |          |                  |
|-------------------------|-------------------------------|-----------------------|----------|------------------|
| Código de familia: ____ | Código del entrevistado: ____ | Fecha: ____/____/____ | TC: ____ | Iteración Nro. 1 |
|-------------------------|-------------------------------|-----------------------|----------|------------------|

|                          |                           |                                |
|--------------------------|---------------------------|--------------------------------|
| Hora empezada: ____:____ | Hora terminada: ____:____ | Hora del ocaso ayer: ____:____ |
|--------------------------|---------------------------|--------------------------------|

**Preguntas sobre la noche anterior:**

1. ¿A qué hora se bañó por última vez el entrevistado? \_\_\_\_ : \_\_\_\_

2. ¿Usaron el mosquitero tratado? \_\_\_\_ (1) Sí, toda la familia; (2) Sí, algunos; (3) No, nadie

3. ¿A qué hora se templó el mosquitero? \_\_\_\_ : \_\_\_\_

4. ¿A qué hora entró al mosquitero? \_\_\_\_ : \_\_\_\_

5. ¿Usó luz adentro de mosquitero? \_\_\_\_ (1) Sí; (2) No

6. ¿Qué tipo de luz? \_\_\_\_ (1) mechero; (2) vela; (3) luz eléctrica; (4) otra

7. ¿A qué hora se durmió? \_\_\_\_ : \_\_\_\_

8. ¿A qué hora se levantó hoy? \_\_\_\_ : \_\_\_\_

**Percepciones del entrevistado sobre mosquitero**

9. En caso de que no usaron uno o más de los mosquiteros ¿por qué? (sondear sobre olor, afectos adversos, tiempo que demoró en secar, etc.)

10. En caso de que el / la entrevistado / a usó el mosquitero ¿a el / ella le gustó? \_\_\_\_ (1) Sí; (2) No

11. ¿Qué le gustó de dormir en el mosquitero tratado? (palabras claves, no una descripción detallada)

12. ¿Qué no le gustó de dormir en el mosquitero tratado? (palabras claves)

13. ¿Notó alguna diferencia? (molestia de zancudos ú otra)

14. ¿Le parece que el insecticida (veneno) está funcionando? \_\_\_\_ (1) Sí; (2) No

15. ¿Qué le indica que está ó no está funcionando?

**Percepciones de la familia sobre el mosquitero**

16. ¿Cómo respondió la familia a lo(s) mosquitero(s) tratado(s)? ¿Quienes hicieron comentarios? ¿Qué dijeron?

**Mantenimiento de los mosquiteros**

17. ¿Está(n) guardado(s) el / los mosquitero(s) en sus bolsas de plástico? \_\_\_\_ (OJO: Contesta por observación)  
(1) Sí, todos (2) Sí, algunos (3) No, ninguno

18. ¿Se observa que siguen en buen estado las bolsas de plástico? \_\_\_\_ (OJO: Contesta por observación)  
(1) Sí, todas; (2) Sí, algunas; (3) No, ninguna; (4) No se puede observar

19. Si algún mosquitero se encuentra no guardado, pregúntale a la Sra. ¿por qué? y anota su respuesta.

20. ¿Continuará guardándolo(s) en un lugar oscuro de día? \_\_\_\_ (1) Sí; (2) No; (3) No sabe / no contesta

21. ¿Por qué?

22. ¿Ha lavado el / los mosquitero(s) tratado(s) desde que lo(s) trató? \_\_\_\_ (1) Sí, todos; (2) Sí, algunos; (3) No, ninguno

23. Si ha lavado alguno ¿por qué?

24. Si lo(s) lavó ¿cómo?

25. ¿Cómo lo(s) secó?

26. ¿Lo(s) secó en sombra? \_\_\_\_

(1) Sí; (2) No; (3) No se sabe / no se puede determinar

27. ¿Algún miembro de la familia ó vecino hizo comentarios sobre las prácticas de mantenimiento? ¿Quién(es)? ¿Qué dijo?

28. ¿Modificó alguna recomendación ó práctica? ¿Cuál? ¿Cómo? ¿Por qué?

29. ¿Recomendaría a otros que usen un mosquitero así? \_\_\_\_ (1) Sí; (2) No; (3) No sabe / no comenta

30. ¿Cómo les convencería usarlo?

31. ¿Otros comentarios por parte del entrevistado?

**Preguntas sobre el proceso de tratar el mosquitero**

32. ¿Qué le gustó acerca del tratamiento del mosquitero?

33. ¿Qué no le gustó? ¿Por qué?

34. ¿Recomendaría a otras personas que trataran sus mosquiteros así? \_\_\_\_ (1) Sí; (2) No; (3) No sabe / No contesta

35. ¿Por qué?

36. En caso de que lo recomendaría ¿cómo les convencería hacerlo, en sus propias palabras?

37. ¿Qué otros comentarios hay sobre el tratamiento?

**Instrumento de vigilancia semanal: tratamiento de mosquiteros de tocuyo**

OJO: este instrumento se aplica una vez a la semana con cada familia hasta que la familia haya lavado sus mosquiteros

|                         |                               |                           |          |                      |
|-------------------------|-------------------------------|---------------------------|----------|----------------------|
| Código de familia: ____ | Código del entrevistado: ____ | Fecha: ____ / ____ / ____ | TC: ____ | Iteración Nro.: ____ |
|-------------------------|-------------------------------|---------------------------|----------|----------------------|

|                            |                             |                                  |
|----------------------------|-----------------------------|----------------------------------|
| Hora empezada: ____ : ____ | Hora terminada: ____ : ____ | Hora del ocaso ayer: ____ : ____ |
|----------------------------|-----------------------------|----------------------------------|

**Preguntas sobre la noche anterior:**

1. ¿A qué hora se bañó por última vez el entrevistado? \_\_\_\_ : \_\_\_\_

2. ¿Usaron el mosquitero tratado? \_\_\_\_  
(1) Sí, toda la familia; (2) Sí, algunos; (3) No, nadie

3. ¿A qué hora se templó el mosquitero? \_\_\_\_ : \_\_\_\_

4. ¿A qué hora entró al mosquitero? \_\_\_\_ : \_\_\_\_

5. ¿Usó luz adentro de mosquitero? \_\_\_\_ (1) Sí; (2) No

6. ¿Qué tipo de luz? \_\_\_\_  
(1) mechero; (2) vela; (3) luz eléctrica; (4) otra

7. ¿A qué hora se durmió? \_\_\_\_ : \_\_\_\_

8. ¿A qué hora se levantó hoy? \_\_\_\_ : \_\_\_\_

**Percepciones del entrevistado sobre mosquitero**

9. En caso de que no usaron uno o más de los mosquiteros ¿por qué? (sondear sobre olor, afectos adversos, etc.)

10. En caso de que el/la entrevistado/a usó el mosquitero ¿a el/ella le gustó? \_\_\_\_ (1) Sí; (2) No; (3) No comenta / No sabe

11. ¿Qué le gustó de dormir en el mosquitero tratado? (palabras claves, no una descripción detallada)

12. ¿Qué no le gustó de dormir en el mosquitero tratado? (palabras claves)

13. ¿Notó alguna diferencia? (molestia de zancudos ú otra)

14. ¿Cómo está funcionando el veneno ahora comparado a cuando recién trató el mosquitero? \_\_\_\_  
(1) Mejor que antes; (2) Igual que antes; (3) Ya no tan bien que antes; (4) Ya no sirve; (5) No sabe / no comenta

15. ¿Qué le indica que está/no está funcionando como antes?

**Percepciones de la familia sobre el mosquitero**

16. ¿Qué dice la familia ahora de los mosquiteros tratados? ¿Quienes hicieron comentarios? ¿Qué dijeron?

**Mantenimiento del mosquitero(s)**

17. ¿Está(n) guardado(s) el/los mosquitero(s) en sus bolsas de plástico? \_\_\_\_ (OJO: *Contesta por observación*)  
(1) Sí, todos (2) Sí, algunos (3) No, ninguno

18. ¿Se observa que siguen en buen estado las bolsas de plástico? \_\_\_\_ (OJO: *Contesta por observación*)  
(1) Sí, todas; (2) Sí, algunas; (3) No, ninguna; (4) No se puede observar

19. Si algún mosquitero se encuentra no guardado, pregúntale a la Sra. ¿por qué? y anota su respuesta.

20. ¿Continuará guardándolo(s) en un lugar oscuro de día? \_\_\_\_ (1) Sí; (2) No; (3) No sabe / no contesta  
21. ¿Por qué?

22. ¿Ha lavado el/los mosquitero(s) tratado(s) desde que lo(s) trató? \_\_\_\_ (1) Sí, todos; (2) Sí, algunos; (3) No, ninguno  
23. Si ha lavado alguno ¿por qué?

24. Si lo(s) lavó ¿cómo?

25. ¿Cómo lo(s) secó?

26. ¿Lo(s) secó en sombra? \_\_\_\_  
(1) Sí; (2) No; (3) No se sabe / no se puede determinar

27. ¿Algún miembro de la familia ó vecino hizo comentarios sobre las prácticas de mantenimiento? ¿Quién(es)? ¿Qué dijo?

28. ¿Modificó alguna recomendación ó práctica? ¿Cuál? ¿Cómo? ¿Por qué?

29. ¿Recomendaría a otros que usen un mosquitero así? \_\_\_\_ (1) Sí; (2) No; (3) No sabe / no comenta  
30. ¿Cómo les convencería usarlo?

31. ¿Otros comentarios por parte del entrevistado?

**Entrevista de clausura: tratamiento de mosquiteros de tocuyo**

| Código de familia: _____                                                                                                                                                                                                                                                   | Código del entrevistado: _____ | Fecha: ____/____/____ | TC: _____ | Iteración Nro.: _____ |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------|-----------|-----------------------|
| 1. Si tuviera la oportunidad ¿volvería a tratar sus mosquiteros? _____ (1) Sí; (2) No; (3) No sabe / indeciso<br>2. ¿Por qué o por qué no? Otros comentarios:                                                                                                              |                                |                       |           |                       |
| 3. Si tuviera que comprar veneno para volver a tratar sus mosquiteros ¿lo haría Ud.? _____ (1) Sí; (2) No; (3) No sabe / indeciso<br>4. ¿Por qué o por qué no? Otros comentarios:                                                                                          |                                |                       |           |                       |
| OJO: Pregunta solo si la respuesta a #1 es negativa.<br>5. Si alguien le regalara más insecticida ¿trataría otra vez sus mosquiteros? _____ (1) Sí; (2) No; (3) No sabe / indeciso<br>6. ¿Por qué o por qué no? Otros comentarios:                                         |                                |                       |           |                       |
| 7. Si tuviera que comprar veneno para volver a tratar los mosquiteros ¿preferiría poder comprarlo aquí en el pueblo o preferiría salir a Iquitos para comprarlo? _____ (1) Pueblo; (2) Iquitos; (3) No sabe / indeciso; (4) No contesta<br>8. ¿Por qué? Otros comentarios: |                                |                       |           |                       |
| 9. Si tuviera que comprar veneno para volver a tratar los mosquiteros ¿cuánto pagaría por cada tableta? _____                                                                                                                                                              |                                |                       |           |                       |
| 10. ¿Recomendaría a sus vecinos que compren el veneno para sus mosquiteros? _____ (1) Sí; (2) No; (3) No sabe / indeciso<br>11. ¿Qué les diría para convencerles comprarlo? (solo si la respuesta a #8 es positiva)                                                        |                                |                       |           |                       |
| 12. ¿Por cuánto tiempo funcionó bien el veneno? ¿Cuándo notó que ya no funcionaba como funcionó el 1º día?                                                                                                                                                                 |                                |                       |           |                       |
| 13. Muchas personas dejó de lavar sus mosquiteros por mucho tiempo y aguantaron mosquiteros sucios porque participaban en el estudio. Inclusive, algunos miembros de la familia se quejaron del olor de los mosquiteros y querían lavarlos. Si no participab               |                                |                       |           |                       |
| 14. Pensando en el tiempo que fue efectivo el veneno, el costo que dijo que podría pagar, y el tiempo que podría aguantar un mosquitero sucio ¿cada cuánto tiempo quisiera volver a tratar su mosquitero?                                                                  |                                |                       |           |                       |
| 15. A algunas personas les fue difícil desatar sus mosquiteros y guardarlos en las bolsas de plástico todos los días. Aunque sea fastidioso, guardarlos en un lugar oscuro de día es muy importante para mantener el efecto del veneno. ¿Que otras maneras h               |                                |                       |           |                       |
| 16. ¿Qué otras sugerencias tiene Ud.?                                                                                                                                                                                                                                      |                                |                       |           |                       |

**Instrumento de vigilancia: día después de la entrega**

|                            |                               |                                  |          |                  |
|----------------------------|-------------------------------|----------------------------------|----------|------------------|
| Código de familia: ____    | Código del entrevistado: ____ | Fecha: ____ / ____ / ____        | TC: ____ | Iteración Nro. 1 |
| Hora empezada: ____ : ____ | Hora terminada: ____ : ____   | Hora del ocaso ayer: ____ : ____ |          |                  |

**Preguntas sobre la noche anterior:**

1. ¿A qué hora se bañó por última vez el entrevistado? \_\_\_\_ : \_\_\_\_
2. ¿Usaron los mosquiteros nuevos? \_\_\_\_ (1) Sí, todos; (2) Sí, algunos; (3) No, ninguno
3. ¿A qué hora se templó el mosquitero? \_\_\_\_ : \_\_\_\_
4. ¿A qué hora entró al mosquitero? \_\_\_\_ : \_\_\_\_
5. ¿Usó luz adentro de mosquitero? \_\_\_\_ (1) Sí; (2) No
6. ¿Qué tipo de luz? \_\_\_\_ (1) mechero; (2) vela; (3) luz eléctrica; (4) linterna; (5) otra
7. ¿A qué hora se durmió? \_\_\_\_ : \_\_\_\_
8. ¿A qué hora se levantó hoy? \_\_\_\_ : \_\_\_\_
9. ¿Qué tipo de mosquitero usaba antes? \_\_\_\_ (1) Tocuyo; (2) Nylon; (3) Otro; (4) Ninguno

10. ¿Qué notó Ud. de los mosquiteros nuevos? (*sondear sobre olor, afectos adversos, color, transparencia, frío, tejido, etc.*)

11. ¿Qué dice el esposo / la esposa? (*sondear sobre los mismos temas.*)

12. ¿Qué dicen los niños? (*sondear sobre los mismos temas.*)

13. ¿Qué dicen los otros miembros de la familia? (*sondear sobre los mismos temas.*)

14. ¿Qué comentarios han hecho los vecinos o visitantes que han visto el mosquitero? (*sondear--mismos temas.*)

15. ¿Al entrevistado le gustó dormir en el nuevo mosquitero? \_\_\_\_ (1) Sí; (2) No

16. ¿Qué le gustó? (palabras claves)

17. ¿Qué no le gustó? (palabras claves)

18. Si Ud. tuviera que escoger entre el mosquitero nuevo y el mosquitero que usaba antes ¿cuál preferiría? \_\_\_\_ (1) preferiría el nuevo; (2) Preferiría el antiguo; (3) Me da igual; (4) No sabe / no contesta

19. ¿Por qué?

|                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>20. ¿Le parece que el insecticida (veneno) está funcionando? ____ (1) Sí; (2) No</p> <p>21. ¿Qué le indica que está ó no está funcionando?</p>                                                                                                                                                                   |
| <p>22. ¿Quién está usando los mosquiteros nuevos? __1; __2; __3; __4; __5; __6; __7; __8; __9; __10; __11<br/> <small>Ojo: marca con aspa ("X") el número que corresponde a cada persona durmiendo en el nuevo mosquitero.</small></p> <p>23. ¿Por qué ellos? (ó in caso de que nadie está usando ¿Por qué no?)</p> |
| <p>24. ¿Están guardados los mosquiteros en un lugar oscuro? ____ <b>(OJO: Contesta por observación)</b><br/> <small>(1) Sí, todos (2) Sí, algunos (3) No, ninguno</small></p>                                                                                                                                       |
| <p>25. Si algún mosquitero se encuentra no guardado, pregúntale a la Sra. ¿por qué? y anota su respuesta.</p>                                                                                                                                                                                                       |
| <p>26. ¿Continuará guardándolos en un lugar oscuro de día? ____ (1) Sí; (2) No; (3) No sabe / no contesta</p> <p>27. ¿Por qué?</p>                                                                                                                                                                                  |
| <p>28. ¿Ha lavado los mosquiteros tratados desde que los trató? ____ (1) Sí, todos; (2) Sí, algunos; (3) No, ninguno</p> <p>29. Si ha lavado alguno ¿por qué?</p>                                                                                                                                                   |
| <p>30. Si los lavó ¿cómo? <i>(sondear sobre uso de lejía)</i></p>                                                                                                                                                                                                                                                   |
| <p>31. ¿Cómo los secó?</p> <p>32. ¿Los secó en sombra? ____<br/> <small>(1) Sí; (2) No; (3) No se sabe / no se puede determinar</small></p>                                                                                                                                                                         |
| <p>33. ¿Algún miembro de la familia ó vecino hizo comentarios sobre las prácticas de mantenimiento? ¿Quién? ¿Qué dijo?</p>                                                                                                                                                                                          |
| <p>34. ¿Modificó alguna recomendación ó práctica? ¿Cuál? ¿Cómo? ¿Por qué?</p>                                                                                                                                                                                                                                       |
| <p>35. ¿Recomendaría a otros que usen un mosquitero así? ____ (1) Sí; (2) No; (3) No sabe / no comenta</p> <p>36. ¿Cómo les convencería usarlo?</p>                                                                                                                                                                 |
| <p>37. ¿Otros comentarios por parte del entrevistado?</p>                                                                                                                                                                                                                                                           |



**Instrumento de semanal: mosquitero de tela Jersey**

|                         |                               |                       |          |                |
|-------------------------|-------------------------------|-----------------------|----------|----------------|
| Código de familia: ____ | Código del entrevistado: ____ | Fecha: ____/____/____ | TC: ____ | Iteración Nro. |
|-------------------------|-------------------------------|-----------------------|----------|----------------|

|                          |                           |                                |
|--------------------------|---------------------------|--------------------------------|
| Hora empezada: ____:____ | Hora terminada: ____:____ | Hora del ocaso ayer: ____:____ |
|--------------------------|---------------------------|--------------------------------|

1. ¿A qué hora se bañó por última vez el entrevistado? \_\_\_\_: \_\_\_\_

2. ¿Usaron los mosquiteros nuevos? \_\_\_\_ (1) Sí, todos; (2) Sí, algunos; (3) No, ninguno

3. ¿A qué hora se templó el mosquitero? \_\_\_\_: \_\_\_\_

4. ¿A qué hora entró al mosquitero? \_\_\_\_: \_\_\_\_

5. ¿Usó luz adentro de mosquitero? \_\_\_\_ (1) Sí; (2) No

6. ¿Qué tipo de luz? \_\_\_\_ (1) mechero; (2) vela; (3) luz eléctrica; (4) linterna; (5) o

7. ¿A qué hora se durmió? \_\_\_\_: \_\_\_\_

8. ¿A qué hora se levantó hoy? \_\_\_\_: \_\_\_\_

9. ¿Qué tipo de mosquitero usaba antes? \_\_\_\_  
(1) Tocuyo; (2) Nylon; (3) Otro; (4) Ninguno

10. ¿Qué notó Ud. de los mosquiteros nuevos? *(sondear sobre olor, afectos adversos, color, transparencia, frío, tejido, etc.)*

11. ¿Qué dice el esposo / la esposa? *(sondear sobre los mismos temas.)*

12. ¿Qué dicen los niños? *(sondear sobre los mismos temas.)*

13. ¿Qué dicen los otros miembros de la familia? *(sondear sobre los mismos temas.)*

14. ¿Qué comentarios han hecho los vecinos o visitantes que han visto el mosquitero? *(sondear--mismos temas.)*

15. ¿Al entrevistado le gustó dormir en el nuevo mosquitero? \_\_\_\_ (1) Sí; (2) No

16. ¿Qué le gustó? (palabras claves)

17. ¿Qué no le gustó? (palabras claves)

18. ¿Qué ventajas tiene el mosquitero que Ud. usaba antes comparado al nuevo? ¿Qué características son mejores en el antiguo?

19. ¿Qué ventajas tiene el nuevo mosquitero comparado al mosquitero que usaba antes? ¿Qué características son mejores en el nuevo?

20. Si Ud. tuviera que escoger entre el mosquitero nuevo y el mosquitero que usaba antes ¿cuál preferiría? \_\_\_\_  
(1) preferiría el nuevo; (2) Preferiría el antiguo; (3) Me da igual; (4) No sabe / no contesta

|                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21. ¿Por qué?                                                                                                                                                                                                                                                                                                                                                                         |
| 22. ¿Le parece que el insecticida (veneno) está funcionando? ____ (1) Sí; (2) No<br>23. ¿Qué le indica que está ó no está funcionando?                                                                                                                                                                                                                                                |
| 24. ¿Quién está usando los mosquiteros nuevos? __1; __2; __3; __4; __5; __6; __7; __8; __9; __10; __11<br><i>Ojo: marca con aspa ("X") el numero que corresponde a cada persona durmiendo en el nuevo mosquitero.</i><br>25. ¿Por qué ellos? (ó in caso de que nadie está usando ¿Por qué no? )<br><b>OJO: si hay cambios después de la 1a semana, pregunta ¿por qué ha cambiado?</b> |
| 26. ¿Están guardados los mosquiteros en un lugar oscuro? ____ <b>(OJO: Contesta por observación)</b><br>(1) Sí, todos (2) Sí, algunos (3) No, ninguno                                                                                                                                                                                                                                 |
| 27. Si algún mosquitero se encuentra no guardado, pregúntale a la Sra. ¿por qué? y anota su respuesta.                                                                                                                                                                                                                                                                                |
| 28. ¿Continuará guardándolos en un lugar oscuro de día? ____ (1) Sí; (2) No; (3) No sabe / no contesta<br>29. ¿Por qué?                                                                                                                                                                                                                                                               |
| 30. ¿Ha lavado los mosquiteros tratados desde que los trató? ____ (1) Sí, todos; (2) Sí, algunos; (3) No, ninguno<br><i>Si no han lavado ninguno, salta a pág. #</i><br>31. Si ha lavado alguno ¿por qué?                                                                                                                                                                             |
| 32. Si los lavó ¿cómo? <i>(sondear sobre uso de lejía)</i>                                                                                                                                                                                                                                                                                                                            |
| 33. ¿Cómo los secó?                                                                                                                                                                                                                                                                                                                                                                   |
| 34. ¿Los secó en sombra? ____<br>(1) Sí; (2) No; (3) No se sabe / no se puede determinar                                                                                                                                                                                                                                                                                              |
| 35. ¿Algún miembro de la familia ó vecino hizo comentarios sobre las prácticas de mantenimiento? ¿Quién? ¿Qué dijo?                                                                                                                                                                                                                                                                   |
| 36. ¿Modificó alguna recomendación ó práctica? ¿Cuál? ¿Cómo? ¿Por qué?                                                                                                                                                                                                                                                                                                                |
| 37. ¿Recomendaría a otros que usen un mosquitero así? ____ (1) Sí; (2) No; (3) No sabe / no comenta<br>38. ¿Cómo les convencería usarlo?                                                                                                                                                                                                                                              |
| 39. ¿Otros comentarios por parte del entrevistado?                                                                                                                                                                                                                                                                                                                                    |

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## EDUCATION

Johns Hopkins School of Hygiene & Public Health, PhD International Health, 2006  
Concentration in Behavioral and Community Interventions  
Johns Hopkins School of Hygiene & Public Health, MHS International Health, 2000  
Concentration in qualitative research methods, certificate in Health Communication  
University of Puget Sound, BA *Magna cum laude*, History and Asian Studies, 1984

## EMPLOYMENT HISTORY

|                |                                                  |                                                                                                               |
|----------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 2001 – present | <b>QA Advisor</b>                                | Quality Assurance Project / University Research Co., Bethesda, MD                                             |
| 2000 – 2001    | <b>Consultant</b>                                | Naval Medical Research Institute – Detachment (NAMRID), Lima, Peru                                            |
| 1999 – 2002    | <b>Consultant</b>                                | Johns Hopkins School of Public Health, Iquitos, Peru<br>Tulane University School of Public Health, Lima, Peru |
| 1998 – 1999    | <b>Intern</b>                                    | Center for Communication Programs, JHU School of Public Health,<br>Baltimore, MD                              |
| 1995 – 1998    | <b>Program Manager</b>                           | The Parisky Group, Hartford, CT                                                                               |
| 1994           | <b>Candidate Scheduler</b>                       | Bill Curry for Governor Campaign, Hartford, CT                                                                |
| 1993 – 1994    | <b>Deputy Director</b>                           | Legislative Electoral Action Program, Hartford, CT                                                            |
| 1991 – 1993    | <b>Regional Director</b>                         | Long Island Progressive Coalition/Citizen Action of New York, Long<br>Island, NY                              |
| 1985 – 1991    | <b>Head Organizer</b><br><b>Canvass Director</b> | Association of Community Organizations for Reform Now (ACORN)<br>Los Angeles, CA and Philadelphia, PA         |
| 1984 – 1985    | <b>Travel Coordinator</b>                        | University of Puget Sound Pacific Rim Asia Study-Travel Program                                               |
| 1984           | <b>Editorial Intern</b>                          | <u>The Nation</u> magazine, New York, NY and Washington, DC                                                   |

## PROFESSIONAL EXPERIENCE

### Research and Evaluation

- Principal Investigator (PI): Measuring skilled birth attendant competency in low-resource settings. Quality Assurance Project. Nicaragua and Niger. 2004–present.
- Principal Investigator (PI): Factors influencing women’s decisions to give birth at home or in a health care facility; user perceptions on quality of obstetric care. Maternal health module developed for the Encuesta Demográfica y de Salud Materna e Infantil (ENDEMAIN) 2004. Quality Assurance Project, U.S. Centers for Disease Control and Centro de Estudios de Población y Desarrollo Social (CEPAR), Ecuador.
- Principal Investigator: Formative research on factors influencing women’s decisions to give birth at home or in a health care facility. Quality Assurance Project. Pichincha and Cotopaxi, Ecuador.
- Co-investigator: Developing and testing a generic job aid for malaria rapid diagnostic tests. Waverly Rennie, Principal Investigator (PI). Joint project of the Quality Assurance Project and the WHO Western Pacific Regional Office.
- Co-investigator: Vendor-to-Vendor and Neighbor-to-Neighbor intervention to improve private sector malaria case-management in Bungoma District, Kenya.

- Study coordinator for three USAID-sponsored maternal health studies related to quality of obstetric care, Quality Assurance Project. PI for Skilled Birth Attendant Competency study.
- Medical anthropology consultant & field coordinator: “Insecticide-treated nets for malaria control in the Iquitos region of the Peruvian Amazon - Formative research for an efficacy trial,” Johns Hopkins University School of Public Health, Peter J. Winch, MD, MPH, PI.
- Survey design, validity checks, data cleaning & preliminary analysis for Epidemiology of HIV-1 in South America, Naval Medical Research Institute – Detachment, Lima, Peru, José Sanchez and Kevin Russell, PIs.
- Medical anthropology consultant & field coordinator: “A randomized, controlled trial of the use of chicken coops to prevent *Campylobacter jejuni*-related diarrhea in young children in a Peruvian periurban shantytown,” Tulane University School of Public Health, Richard Oberhelman, MD, PI.
- In-depth interviewer and qualitative coder for Tobacco Control Network, CDC study of youth smoking behavior, Johns Hopkins School of Public Health, Center for Adolescent Health Promotion & Disease Prevention, Joel Gittelsohn and Cheryl Alexander, co-PIs, Spring/Summer 1999.
- Focus group moderator for study on Assessment of Spirituality as a Function of Quality of Life in Prostate Cancer Patients, Dr. Janice V. Bowie, PI, Johns Hopkins School of Public Health, Spring 1999.
- Completed qualitative program evaluation for The Door, a community-based after-school drug prevention program for elementary school children in Baltimore, MD, Spring 1999.
- Coordinated and supervised qualitative research into parent and teen attitudes regarding teen pregnancy for community-based media public education campaign, summer and Fall, 1997.

### **Program Management**

- Coordinator: malaria program and research activities, Quality Assurance Project.
- Helped design & author **computer-based IEC training program on maternal mortality** for use by **Indonesian Ministry of Health** and **National Family Planning Coordinating Board (BKKBN)**
- **Designed, developed, and launched public education media campaign** for city-wide teen pregnancy prevention initiative sponsored by the City of Hartford, Hartford Public Schools, and Hartford Action Plan on Infant Health. Directed media relations and public education for this initiative.
- **Authored bid for, won, and carried out Connecticut State Department of Public Health contract** to analyze migrant farmworker health needs and develop recommendations to address those needs.
- Coordinated and staffed coalition of community residents and human service providers to **improve prenatal care and reduce infant mortality** in Hartford.
- Managed and carried out Connecticut State Department of Environmental Protection contract, enabling the Department and urban residents **identify, research, and address community environmental issues**. Authored public education materials for community participants and final project analysis for client.

## Training and Teaching

- Guest lecturer on cultural competency in obstetric care and factors that influence women's care seeking decisions related to pregnancy and birth, University of Washington School of Public Health and Community Medicine and Johns Hopkins Bloomberg School of Public Health, 2005.
- Guest lecturer on formative research for designing community-based disease prevention interventions (malaria and diarrheal disease), Johns Hopkins Bloomberg School of Public Health, 2003
- Operations Research in Health Programs: Qualitative Techniques and their Application. Five-day workshop for Peruvian Ministry of Health (in Spanish), Iquitos, Peru, March-April 2001 with Elli Leontsini and Peter Winch.
- Training of field staff in qualitative research methods (in Spanish), Lima and Iquitos, Peru, 1999 – 2000
- Guest lecturer on teen pregnancy prevention policy, Urban Semester Program, University of Connecticut School of Social Work, each semester, 1996-1998.
- Seminars on community organizing, campaign management and media relations for ACORN, Citizen Action of New York, and Legislative Electoral Action Program.

## Languages

Fluent in English and Spanish

## Computer Programs

- Statistical analysis capabilities with STATA and SPSS
- ATLAS-ti, AnthroPac, CDC EZ-Text, and N4 (NUD\*IST) for qualitative data analysis

## Publications & Presentations

### Articles and Technical Reports

Ordoñez, J, Stupp P, Monteith D, Ruiz A, Goodwin S, McCracken S, Angeles G, Valle A, Williams D, **Harvey S**, and Fuentes G. 2005. ENDEMAIN 2004 (Encuesta demográfica y de salud materna e infantil): Informe Final. Quito: CEPAR.

Rennie W, Phetsouvanh R, Lupisan S, Vanisaveth V, Hongvanthong B, Phompida S, Alday P, Fulache M, Lumagui R, Jorgensen P, Bell D, and **Harvey SA**. Minimizing human error in malaria rapid diagnosis: Clarity of written instructions and health worker performance. Submitted for publication.

Rennie W and Harvey SA. Developing and testing a generic job aid for malaria rapid diagnostic tests (RDTs). Washington, DC and Manilla: Quality Assurance Project and WHO/Western Pacific Regional Office.

Harvey SA, Ayabaca P, Bucagu M, et al. Skilled birth attendant competence: an initial assessment in four countries, and implications for the Safe Motherhood movement. *Int J Gynaecol Obstet* 2004; 87:203-10.

Ayabaca P, Harvey S, Edson W, Burkhalter B, Antonakas C, & Hermida J. *Estudios de maternidad segura—Resultados del Ecuador: Competencia del personal calificado para la atención al parto; el ambiente viabilizador para la atención calificada al parto; Demoras en el tratamiento de complicaciones obstétricas dentro de los establecimientos de salud (Análisis de la tercera*

- demora*). Bethesda, MD: Published for the United States Agency for International Development (USAID) by the Quality Assurance Project. March 2004.
- Gbangbade S, Harvey S, Edson W, Burkhalter B, & Antonakas C. Safe Motherhood Studies—Results from Benin: Competency of Skilled Birth Attendants, The Enabling Environment for Skilled Attendance at Delivery, and In-Hospital Delays in Obstetric Care (Documenting the Third Delay). Bethesda, MD: The Quality Assurance Project. November 2003.
- Harvey, S. Socio-Anthropological Factors that Affect Malaria Prevention in the Peruvian Amazon: Final Project Report. Baltimore, MD: The Johns Hopkins Bloomberg School of Public Health. November 2003.
- Harvey S., Winch P., Leontsini E., Torres C., López S., Gilman R., & Oberhelman R. Domestic poultry raising practices in a Peruvian shanty town: implications for control of *Campylobacter jejuni*-associated diarrhea. *Acta Tropica* 86(1): 2003.
- Harvey, S, Paredes Olórtegui, M, Winch, P, Leontsini, E, Gilman, R. *Mosquiteros impregnados para el control de la malaria en la región de Iquitos de la amazonía peruana—investigación formativa para una prueba de eficacia: Informe sobre factores sociales, económicos y culturales*. Technical report prepared for Peruvian Ministry of Health, Loreto Region. November 2000.
- Harvey, S., Cullin, J., Parisky, F. Connecticut Migrant Farmworkers. Hartford: Connecticut State Department of Public Health, March 31, 1998.
- The Hartford Neighborhood Environmental Project: A Final Report. Hartford: Connecticut State Department of Environmental Protection, July 1996.
- Preventing Pollution in our Neighborhood: A Plan for Environmental Action in Clay/Arsenal. Hartford: Connecticut State Department of Environmental Protection, July 1996.
- Preventing Pollution in our Neighborhood: A Plan for Environmental Action in Sheldon/Charter Oak. Hartford: Connecticut State Department of Environmental Protection, July 1996.
- What's in Our Backyard? An Environmental Inventory of the Clay/Arsenal Neighborhood. Hartford: Connecticut State Department of Environmental Protection, January 1996.
- What's in Our Backyard? An Environmental Inventory of the Sheldon/Charter Oak Neighborhood. Hartford: Connecticut State Department of Environmental Protection, January 1996.
- Scientific Presentations**
- Winch P and Harvey S, Co-organizers. Bringing the past into the present in maternal health care: Biological and social risks and the negotiation of place, provider and practice. American Anthropological Association 104<sup>th</sup> Annual Meeting. November 30–December 4, 2005.
- Harvey S, Fuentes G, Hermida J and Hermida P. “*El parto no es película*.” Reframing authoritative knowledge about childbirth in Ecuador. American Anthropological Association 104<sup>th</sup> Annual Meeting. November 30–December 4, 2005.
- Harvey S, Hermida J, Fuentes G, Hermida P, Pillajo M, Romero P, and Ayabaca P. Using client perspectives on quality of care to improve cultural adequacy of obstetric care and promote hospital-based childbirth in Ecuador. 22<sup>nd</sup> International Conference: International Society for Quality in Health Care. Vancouver, BC. 25–29 October 2005.

- Harvey SA and Rennie W. Upgrading volunteer community health worker skills in malaria diagnosis: A job aid for malaria rapid diagnostic tests (RDTs). Oral Presentation. 22<sup>nd</sup> International Conference: International Society for Quality in Health Care. Vancouver, BC. 25–29 October 2005.
- Harvey SA. *El mejoramiento continuo de la calidad en los servicios de salud obstétrica*. Facultad de Medicina, Universidad Internacional de Ecuador. 2 August 2005.
- Harvey SA and Rennie W. RDT use by CHWs in high transmission areas: Can a job aid help? Technical consultation to review the roll of laboratory diagnosis to support malaria disease management. World Health Organization and Roll Back Malaria. 25–26 October 2004.
- Harvey SA, Tavrow P, Rennie W. Impact of two community interventions on private-sector malaria case management and consumer demand for appropriate antimalarials in Bungoma District, Kenya. Invited oral presentation. Roll Back Malaria (RBM) Private Sector Case-Management Working Group Consultative Meeting. Accra, Ghana. 26–27 May 2004.
- Harvey S, Ayabaca P, Boucar M, Gbangbade S, McCaw-Binns A, Reynolds-Hedmann E. Are Skilled Birth Attendants Really Skilled? A Multi-Country Study of SBA Competence. Oral Presentation. 20th International Conference: International Society for Quality in Health Care. Dallas, TX. November 3–5, 2003.
- Harvey S, Ayabaca P, Boucar M, Gbangbade S, McCaw-Binns A, Reynolds-Hedmann E. Are Skilled Birth Attendants Really Skilled? A Multi-Country Study of SBA Competence. Oral Presentation. 5th International Conference on the Scientific Basis of Health Services. Washington, DC. September 20–23, 2003.
- Harvey S, Ayabaca P, Boucar M, Bucagu M, Burkhalter B, Djibrina S, Edson W, Gbangbade S, Hedman E, Hermida J, Legros S, McCaw-Binns A, Nicholas, D. *¿Qué tan calificado es el personal calificado? Un estudio de competencia en 4 países*. Oral presentation (in Spanish). Regional Consult on Skilled Attendance at Delivery. Santa Cruz, Bolivia: Pan American Health Organization. June 9–11, 2003.
- Harvey S, Ayabaca P, Boucar M, Bucagu M, Burkhalter B, Djibrina S, Edson W, Gbangbade S, Hedman E, Hermida J, Legros S, McCaw-Binns A, Nicholas, D. Measuring Skilled Birth Attendant (SBA) Competence in 4 Developing Countries: Preliminary Results. Oral presentation. International Conference on Safe Motherhood Best Practices. *Saving Mothers' Lives: What Works*. New Delhi: White Ribbon Alliance for Safe Motherhood. Oct. 3–6, 2002.
- Harvey S, Leontsini E, Winch P, Oberhelman R, Cabrera L, Torres C, Lopez S, Barturén M, Gilman R, & Pérez J. A community-based participatory research study of domestic poultry raising practices in a Peruvian shanty town: Implications for Control of *Campylobacter jejuni* associated diarrhea. Abstract & Poster Presentation. American Society of Tropical Medicine & Hygiene 49<sup>th</sup> Annual Meeting. Oct. 30–Nov. 2, 2000.