



Household Survey Report Kingdom of Cambodia 2009



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Definitions

Antimalarial combination therapy – The simultaneous use of two or more drugs of different classes to treat malaria.

Artemisinin and its derivatives – Artemisinin is a plant extract used in the treatment of malaria. The most common derivatives of artemisinin used to treat malaria are artemether, artesunate, and dihydroartemisinin.

Artemisinin-based Combination Therapy (ACT) – A combination of artemisinin or one of its derivatives with a partner drug. The partner drug is an antimalarial(s) of a different class.

Cocktails [Anti-malarial cocktail/Non Anti-malarial cocktail] – Cocktail treatments refer to small individual packets (plastic bags) containing a "cocktail" of three to five different tablets or drugs. The number of packets, and therefore doses bought, varies according to a number of factors, such as what the buyer can afford. Typically cocktails included antipyretics, antibiotics, anti-malarials, vitamins, antihistamines and/or steroids. Where anti-malarials could be identified in the cocktail (through the interviewer report), they were defined as an 'anti-malarial cocktail'. Where no anti-malarials were identified through the interviewer self report, these were defined as a 'non anti-malarial cocktails'.

First-line treatment – The government recommended treatment for uncomplicated malaria as stipulated in the national guidelines. In this report, indicators referring to 'first-line' treatment refer to artesunate-mefloquine, (50mg/250mg) as indicated in the National Treatment Guidelines.

Since 2000, a co-blistered ACT of artesunate and mefloquine 50mg/250mg (a WHO-recommended, but not prequalified combination) has been the first line treatment for uncomplicated *Pf* malaria and chloroquine has been the first line treatment for *Pv* malaria as set out in Cambodia's National Treatment Guidelines. In addition, alternative first-line drugs are recommended for specific geographical areas or zones in Cambodia as follows:

Zone 1: In areas where Multi-Drug Resistant parasites have been identified (see note below on zones), the recommended first-line drug has been dihydroartemisinin-piperazine since 2008. Zone 1 covers 8 districts in 4 provinces.

Monotherapy – Antimalarial treatment with a single medicine: either a single active compound or a synergistic combination of two compounds with related mechanisms of action, such as sulfadoxine-pyrimethamine.

Multi-Drug Resistant Zones - In Feb/March 2008, WHO convened meetings to identify strategies to address containment and elimination of *P. falciparum* parasites with altered response to artemisinins. One of the meeting outcomes was the classification of Cambodia into three 'Containment Zones': **Zone 1:** Areas where Multi-Drug Resistant (MDR) parasites have been identified; **Zone 2:** Areas where MDR parasites are suspected and where further research is being undertaken; **Zone 3:** Remaining Provinces/Districts in Cambodia where malaria parasites are found, but where no MDR parasites have yet been identified.

Enumeration area – Villages located within selected sub-district.

Health Centre Catchment Area – The primary sampling unit defined as the catchment area of all Health Centres within a district. Each Health Centre Catchment Area covers, on average, two communes.

Outlet definitions

PUBLIC HEALTH FACILITIES	
Referral Hospital	Exist at the district level. A variety of health services (prescription medicines and diagnosis) are offered to people in the hospital catchment area. They are easily identified by sign boards saying “Referral Hospital”.
Health Centre	Exist at the commune level. Health Centres are the next level down from the Referral Hospitals. A variety of health services are offered to people in their catchment area. They are identified by sign boards saying “Health Center”
Health Post	Exist at the commune level. Health Posts provide a limited range of services to people who cannot access the Health Centres.
Village Malaria Worker	Exist at the village level. Village Malaria Workers are volunteers who are selected by their villagers and are officially recognized and trained by CNM. Their role is to provide malaria diagnosis (RDT) and ACT treatment free of charge. They are supervised and re-supplied monthly by the provincial malaria staff.
PRIVATE HEALTH FACILITIES	
Private Clinic	Private Clinics provide diagnosis, treatment and prescriptive medicines to patients and are privately owned.
Pharmacy	<p>Clinical Pharmacy: Clinical pharmacies are typically staffed by qualified or semi-qualified health professionals. They can diagnose and prescribe medicines. These are registered with the Ministry of Health to sell prescription-only drugs, pharmacy-only drugs and over the counter (OTC) drugs. Clinical Pharmacies are identified by a pharmacy signboard with the provider’s name.</p> <p>Pharmacy: Pharmacies are not necessarily staffed by qualified health professionals. They sell non-prescriptive medicine and sometimes cosmetics and household products as well. They should not provide medical consultations or diagnose patients. Some pharmacies are licensed by MoH, others are not. They are identified by a pharmacy signboard.</p>
Drug store	Drug stores are smaller than pharmacies. They are not licensed by MoH and are run by non-qualified providers. They typically sell medicines from a house and store the drugs in small cupboards. They are commonly found in villages or operate from market stalls.
Grocery	These are small businesses operating at the front of a house. They sell pharmaceutical products as well as general consumer goods, including food, beverages and household equipment.
Mobile provider	Mobile providers are predominantly found in the rural areas. They typically work within a radius of their home or a base venue by moto. They can be identified by the Village Chief. Mobile providers often have some medical training and provide medical treatment and diagnosis to individuals as well as distributing anti-malarial products to stores.

ACT definitions

ACT	<p>This includes any type of ACT identified (i.e. any branded or unbranded antimalarial medicines that are identified as ACTs).</p> <p>In Cambodia, this included artesunate mefloquine (Malarine adult, child, or adolescent, Artequin, A+M 1,2,3,4, or 5), dihydroartemisinin-piperaquine (Aretkin or Duo-Cotecxin), and Artemisinin-Piperaquine (Aretquick).</p>
ASMQ	<p>This includes any artesunate mefloquine (Malarine adult, child, or adolescent, Artequin, A+M 1,2,3,4, or 5).</p>
DHA+PPQ A+PPQ [other ACT]	<p>This includes dihydroartemisinin-piperaquine (Aretkin or Duo-Cotecxin), and Artemisinin-Piperaquine (Aretquick).</p>

Legend for tables

Symbol	
--	No data was available
n/a	Not applicable: Indicates ratios cannot be calculated as the numerator is zero
***	Undefined ratio as a non-zero value is being divided by a value of zero
AM	Antimalarial
ASMQ	Artesunate-Mefloquine
MDR	Multi-drug resistance
SP	Sulfadoxine-Pyrimethamine
(R)	Negatively phrased statement that are reversed coded

Country Background

Cambodia is located in South-East Asia and borders Thailand, Vietnam and Laos. It has a population of 13.4 million, predominantly rural [1]. The gross domestic product (GDP) per capita is US\$ 739 [2] and a third of the population live under the poverty line [3]. Most of the employed labour force works in private local enterprises on their own account or as unpaid family workers, indicating the importance of 'the informal or unorganized sector' [1]. The agriculture, forestry and fishing sector includes 72% of the employed population but, still being narrowly focused on paddy production, accounts for only 32% of GDP. By contrast, the wholesale and retail trade sector which accounts for 8% of the employed population contributes nearly 39% of GDP [1].

The importance of the private commercial sector is relatively recent. From 1975 to 1979, the Khmer Rouge regime implemented a form of agrarian socialism, characterized by the abolition of money and private property, and after the fall of the regime, a socialist economic model was implemented. In 1993, the UN-supervised first election marked the start of progress towards recovery, and from 1998, after a second round of elections, economic and political stability returned. Several reforms were then implemented, including market liberalization, complete dollarization of the economy and administrative decentralisation [4].

In the health sector, Cambodia has also engaged in significant reforms: a Health Coverage Plan designed to improve primary health care coverage, the allocation of financial resources to provincial health departments, the creation of operational districts and the establishment of community-based programmes, notably for immunisations and birth spacing.

In terms of health outcomes, however, Cambodia has a persistently high maternal mortality rate at 461 deaths per 100,000 pregnancies [1], and an under-five mortality rate of 66 deaths per 1,000 live births [5]. The public health system continues to face major challenges especially in terms of growing inequities, with relatively low access to public health services, especially amongst the poor [4, 6]. Around 80% of care seeking visits are to the private sector [5, 7], where a wide range of providers operate, including pharmacists, mobile providers, drug shopkeepers and grocery sellers, but also at times government doctors and nurses running their own private practices. Many providers however operate with limited or no health qualifications but are reportedly widely used, especially by poorer groups [8] and in remote forested areas where communities have no access to formal health services [9-10].

The pharmaceutical sector is regulated by the 2007 Pharmaceutical Law. Regulation is overseen and implemented by the Department of Drugs & Food (DDF) of the Ministry of Health, in collaboration with municipal (for Phnom Penh) and provincial health departments to which some tasks have been delegated. The importation of pharmaceutical products is regulated by the DDF and importers are required to be staffed by a pharmacist and to obtain an import permit before each drug shipment. Sales of pharmaceutical products to end-users are regulated by provincial health departments (or the municipality in the case of Phnom Penh) and 3 categories of license are available: (i) pharmacy license for outlets managed by a pharmacist, (ii) depot A license for outlets managed by an assistant pharmacist, and (iii) depot B license for outlets managed by a nurse/midwife. Pharmacy license holders are authorised to wholesale pharmaceutical drugs and all license holders may open one outlet only, implying that integrated chains of drug outlets are not authorised. Registered drug outlets are authorised to sell registered pharmaceutical drugs, hygienic and cosmetic products with preventive and curative properties, and dental, laboratory and medical equipment. The sale of other consumer goods, such as household products or food is forbidden. Prices and mark-ups on pharmaceutical products are not regulated.

In Cambodia, malaria is transmitted by *Anopheles dirus*, *Anopheles minimus* and *sundaicus* mosquitoes [11] breeding in forests and jungles covering 60% of the landmass [12]. Malaria is, therefore, not endemic across the country, although parasite prevalence rates are reported to reach 15% to 40% in remote forested areas compared to 0% to 3% in the plains [13]. Malaria transmission risk is seasonal and associated with the rainy season, with peaks generally around August/September. The total population at risk is estimated at 2.65 million. Around 74% of confirmed cases are *Plasmodium falciparum* (Pf) and 26% *Plasmodium vivax* (Pv) [12].

The national malaria control programme is managed by the National Centre for Entomology, Parasitology and Malaria Control (CNM). Over the past 10 years, the CNM has initiated innovative approaches for controlling malaria. Since 2000, co-blistered ACT of artesunate and mefloquine (a WHO-recommended but not prequalified combination) has been the first line treatment for *Pf* malaria¹ and chloroquine the first line treatment for *Pv* malaria. Before treatment, confirmation of malaria infection using microscopy or rapid diagnostic test (RDT) is recommended in the National Treatment Guidelines, there should be no presumptive treatment. To this effect, a pre-packaged ACT referred as “A+M” and a RDT are to be dispensed free of charge by public health facilities and by village malaria workers (VMW). In the private sector, through the social marketing programme implemented by PSI, the same RDT is distributed (branded as Malacheck) and the same ACT, branded as Malarine is distributed. These products are sold by PSI at subsidized prices to wholesale and retail outlets. Oral artemisinin monotherapies have been banned in Cambodia since 2008².

Cambodia is also one of the 8 countries selected to pilot the Affordable Medicine Facility for malaria (AMFm), a financing mechanism through which public and private importers would be able to purchase ACT at highly subsidized prices, though no implementation had begun at the time of this study.

¹ As part of the Containment Programme for addressing the emergence and spread of multi-drug resistance along the Thai and Cambodia border, co-formulated ACT dihydroartemisinin and piperaquine became the first line treatment for *Pf* malaria in the multi-drug resistance containment zone 1 in 2008.

² Letter from the Ministry of Health, Kingdom of Cambodia (September 2008). Letter reference number 0905DGH.

Executive Summary

Background:

The household survey is one of three ACTwatch research components³. The objective of the household survey is to monitor consumer treatment-seeking behaviors including malaria blood diagnostic testing, choice of antimalarial, and price paid for treatment. Data are also collected on the determinants of appropriate treatment seeking behaviors including knowledge, beliefs and attitudes in household members of all ages.

The first section of this report presents a set of core indicators related to prompt and effective diagnosis, treatment and cost of antimalarials and diagnostic tests. A second expanded section contains indicators on treatment seeking behavior, knowledge, practices and beliefs, and information on acquired antimalarials including source of treatment and relative volumes. Indicators are presented at the person and treatment (antimalarial drug) levels. Core indicators are presented across household wealth quintiles, multi-drug resistant zones, age, gender and education.

Household inclusion criteria for this study included the presence of a household member that experienced malaria fever in the two weeks preceding the survey.

Methods:

This study employs a cross-sectional survey methodology with a national representative sample of households drawn using a three-stage cluster sampling, probability proportional to size (PPS).

Stage 1: Two strata were chosen: Strata 1 = Zone 3, multi drug resistant (MDR) free and Strata 2 = Zone 1 & 2, MDR suspected/confirmed.

Stage 2: Thirty-eight health catchment areas out of 255 across the two strata were selected using probability proportional to size (PPS).

Stage 3: 228 enumeration areas (EAs) were sampled using PPS and a further random sample of households within each of the selected EAs was drawn.

All households included in the study had at least one household member who had had malaria fever in the two weeks preceding the survey. Malaria fever was defined as fever with chills (*krun janh/krun ngak*), rather than other fevers that are commonly reported and can relate to dengue (*krun chhiem*) or other types of fever or symptoms, such as night fever (*krun yop*), high temperature (*kdao gadow/kdao kluan*) or sweating (*krung loap*).

A questionnaire was administered to all eligible adults in the households and caregivers of eligible children for those aged between 0 and 15 years. The questionnaire had two modules both filled in by the adult or the caregiver. Household heads provided information on the household including asset ownership and dwelling characteristics.

Module 1) Treatment seeking and case management

Module 2) Knowledge, beliefs and attitudes

Several validation and data check steps occurred during and after data collection. Double data entry using Microsoft Access (Microsoft Cooperation, Seattle, WA, USA) was carried out. Key indicators are reported using proportions and averages (medians for price indicators). The psychometric scaled items are analyzed using exploratory factor analysis and any items with inter-item correlations of less than 0.4 were dropped from the scale construct. The reliability of the scale was estimated using Cronbach alpha coefficients. Socio-economic wealth quintiles were created using information on asset ownership, housing quality and income. Determinants of malaria diagnosis were analyzed using

³ ACT-watch is composed of Household Surveys, Outlet Surveys and Supply Chain Surveys.

logistic regression. To obtain the national estimates, data were weighted to account for equal allocation stratified sampling from Zone 3 and Zone 1 & 2. All analyses were conducted using stata (StataCorp. 2009, College Station, TX). For more information on the study design log on to www.ACTwatch.info

Results:

Data collection took place during the peak rainy season, from 09th October 2009 to 26th November 2009. A total of 22,371 households were screened and 1,465 households met the inclusion criteria and agreed to participate in the study. In these households, 1,617 individuals reported having had malaria fever in the preceding two weeks.

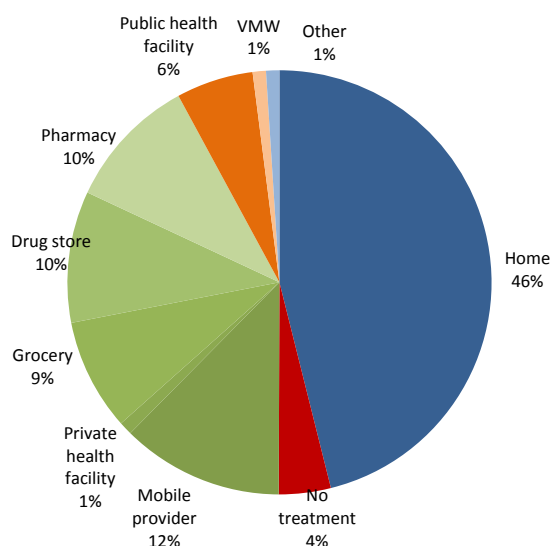
INITIAL TREATMENT SOURCE AMONG ALL MALARIA FEVERS

Almost all people with malaria fever (N=1,617) sought some sort of treatment (96%), most commonly at home (46%). As compared with the private sector (see green color), few people initially sought treatment for malaria fever in the public sector (see orange color: 6% public health facility, 1% village malaria worker).

These results suggest people with malaria fever often treat at home or turn to the private sector for initial treatment. Typically 'at home' treatment includes traditional medicine, home remedies, cupping and coining, however it does not rule out people storing antimalarials at home.

When asked why this first treatment was sought, the majority of respondents reported 'close to home' [57%], or they were 'able to treat at home' (13%). Other responses included reputation for quality (9%), free or inexpensive (8%) or that the illness was not severe (5%) (See Table 8).

Figure 1: Initial Treatment Source

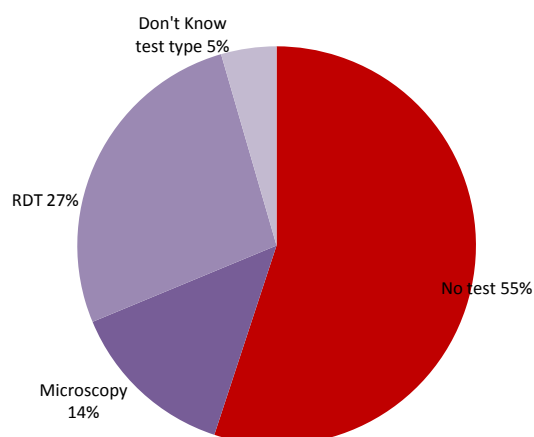


DIAGNOSTIC TESTING AMONG ALL MALARIA FEVERS

Almost half of all people with malaria fever (n=1,551) reported getting a diagnostic test (45%). 27% were tested with an RDT and 14% with microscopy.

These results suggest that many suspected cases of malaria go undiagnosed. When diagnostic testing is accessed, it is most commonly in the form of a RDT.

Figure 2: Diagnostic testing



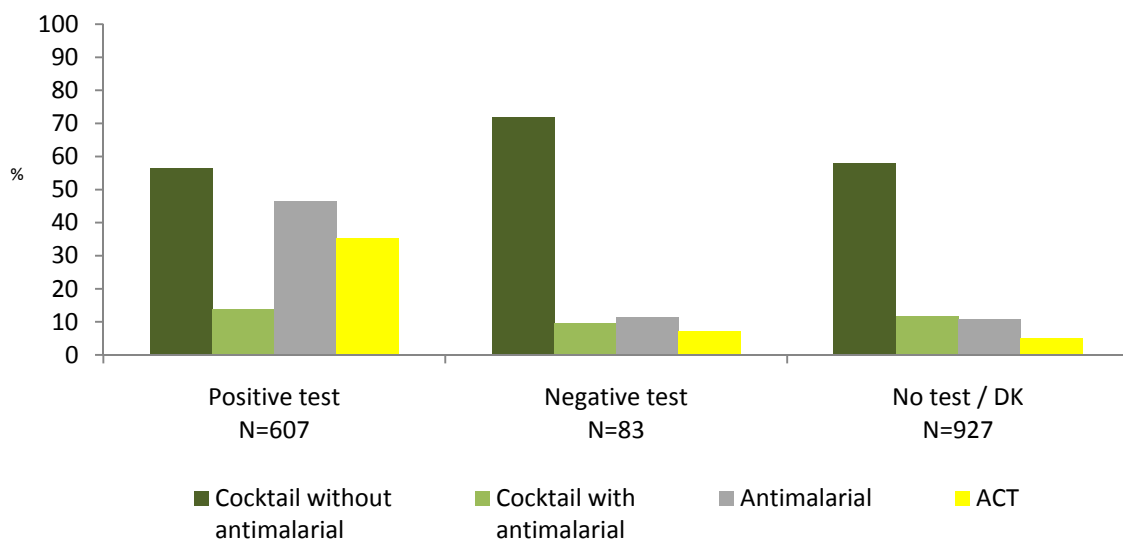
FEVER TREATMENT ACCORDING TO THE REPORTED DIAGNOSTIC TEST RESULTS

Cocktail treatments containing no identifiable antimalarial are the most common type of treatment received among people that received a positive diagnostic test (57%), a negative diagnostic test (72%) and among those who were not tested or who were unsure of the test results (58%).

Of those who tested positive, approximately half were treated with any antimalarial (47%). Of those that tested negative or were not tested or unsure of the results, 11% received any antimalarial. Only 35% of those with a positive diagnosis were treated with an ACT. 7% of those with a negative diagnosis and 5% without a test or unsure of test results also received an ACT.

These results suggest that when people test positive for malaria, providers frequently distribute/sell a combination of medicines that may contain sub-clinical doses of antimalarial drugs, or no antimalarial tablets at all. The results also show that antimalarial drug consumption in Cambodia, including consumption of ACTs, is not limited to confirmed positive cases.

Figure 3: Fever treatment according to reported diagnostic test results



PRICE OF DIAGNOSIS AND TREATMENT

Over half of all ACT treatments acquired in the public sector were obtained for free. In the private sector, the median price of AS+MQ (\$1.44) and ACT (\$1.68) treatments is lower than the median price of artemisinin monotherapies (\$1.92) and higher than the price of chloroquine (\$0.72).

About half of the RDTs and 42% of microscopic tests were provided for free in the public sector. In the private sector, the median price of an RDT is \$0.72, for microscopic testing it is \$1.20.

65% of AS+MQ and any ACT were free in the public sector, as was 64% of chloroquine. No artemisinin monotherapy was free. 49% of RDTs and 42% of microscopic testing were free in the public sector.

Figure 4: Median Price [N]

	Public Sector	Private Sector
AS+MQ	\$0.00 ^[74]	\$1.44 ^[82]
ACT	\$0.00 ^[75]	\$1.68 ^[94]
Artemisinin monotherapy	\$0.24 ^[4] 0%	\$1.92 ^[25]
Chloroquine	\$0.00 ^[14]	\$0.72 ^[36]
RDT	\$0.12 ^[144]	\$0.96 ^[165]
Microscopy	\$0.48 ^[24]	\$1.20 ^[127]

SOURCE OF DIAGNOSTICS AND TREATMENT SERVICES

The private sector was the source of diagnosis, antimalarial and ACT treatment for most people that received these services. Common private sector sources for diagnosis and treatment include:

Pharmacies (30% people diagnosed; 19% people treated with an antimalarial; 20% people treated with an ACT).

Mobile providers (18% people diagnosed; 20% people treated with an antimalarial; 16% of people treated with an ACT).

Drug stores (10% of people diagnosed; 15% of people treated with an antimalarial; 13% of people treated with an ACT).

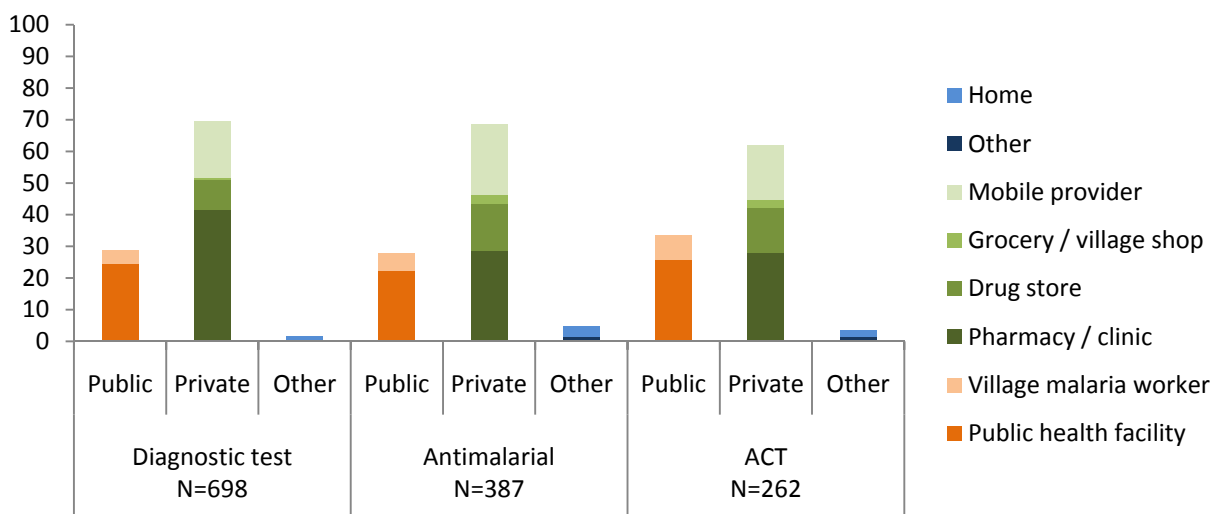
Public health facilities were the source of diagnosis for 25% of people diagnosed; the source of treatment for 22% of people treated with an antimalarial; and the source of treatment for 25% of people treated with an ACT.

Village Malaria Workers accounted for a small percentage of people diagnosed (4%), people treated with an antimalarial (5%) and people treated with an ACT (7%).

A small percentage of people reported diagnosis (2%), antimalarial treatment (3%) and ACT treatment (2%) at home, suggesting that they were storing test kits and full or partial drug regimens at home.

These results highlight the relevance of the private sector in providing diagnosis and treatment for people with malaria fever, but also show a substantial role played by public health facilities. Village malaria workers are not yet playing a large role in diagnosis and treatment of malaria fevers at a national level.

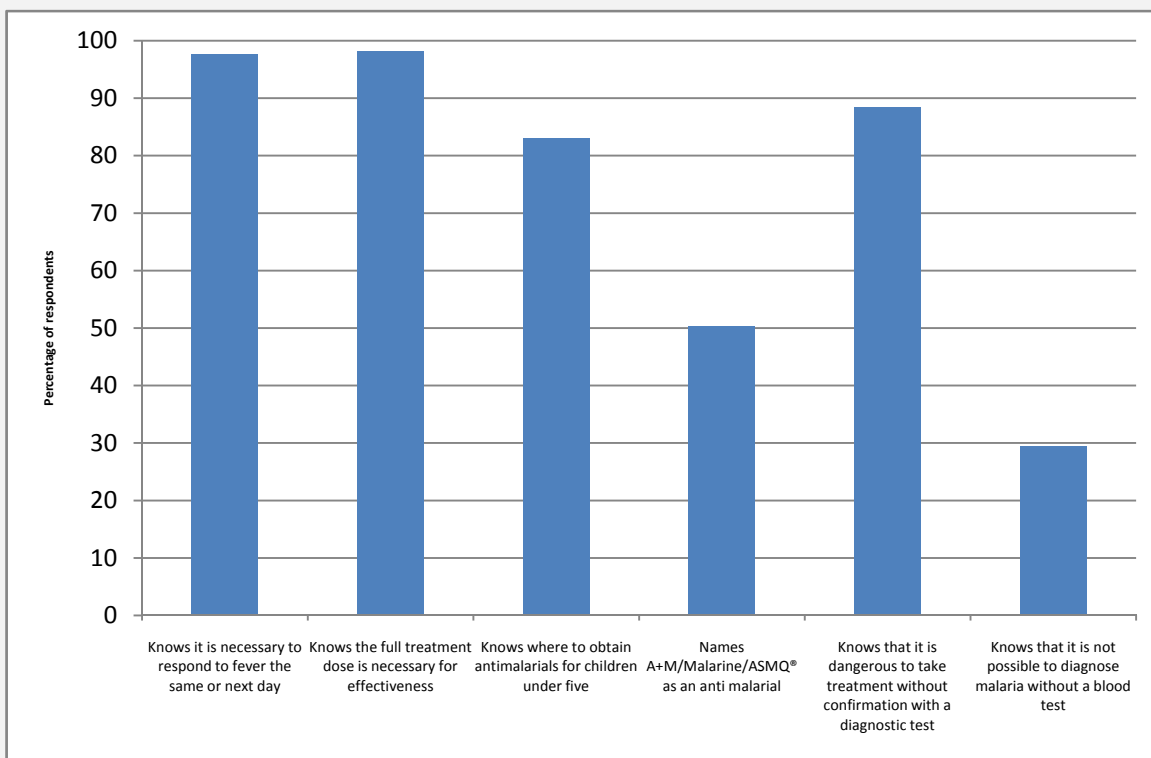
Figure 5: Source of anti-malarial treatment, among people who were given a diagnostic test



RESPONDENT KNOWLEDGE, PRACTICES AND BELIEFS

The majority of respondents knew it was necessary to respond to fever the same or next day and also recognized that taking the full treatment dose was necessary for the treatment to be effective. Around half of respondents could name A+M, Malarine or ASMQ as antimalarials. In terms of diagnosis, knowledge was generally low, with only one in three respondents knowing that malaria can only be diagnosed with a blood test.

Figure 6: Respondent Knowledge, Practices and Beliefs



*ASMQ is the first-line treatment for Pf malaria in the majority of Cambodia

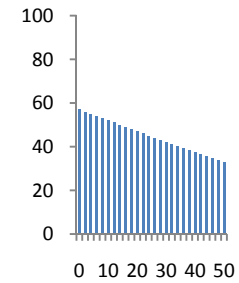
DETERMINANTS OF DIAGNOSTIC TESTING

Potential determinants (factors that influence behavior) of fever diagnosis were identified through qualitative study and then included in the household survey. The factors were tested for significant associations with fever diagnosis using multivariate logistic regression (N=1,525). Constructs with significant associations with fever diagnosis were kept in the final model and adjusted for the age of person with fever, the respondent's education level, and the relative wealth of the household (quintiles). The figures below show the predicted probability of diagnosis for each of the significant determinants and include the full model adjusted odds ratios (AOR).

Results suggest that fever diagnosis is higher among those who:

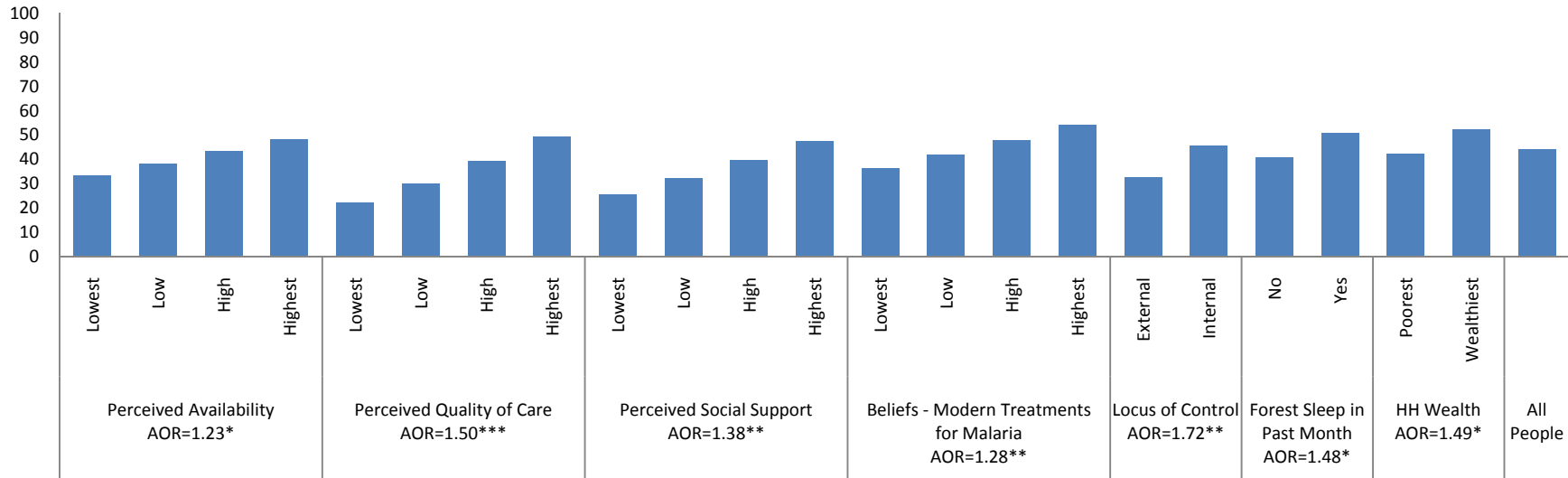
- Perceive diagnostic testing as easily available in the community (AOR=1.23, p<0.01)
- Perceive higher quality of care in local health facilities (AOR=1.50, p<0.001)
- Perceive social support from family and friends to seek diagnostic testing when malaria is suspected (AOR=1.38, p<0.01)
- Have beliefs less favorable to traditional medicines and home remedies for malaria (AOR=1.28, p<0.01)
- Perceive a sense of control over diagnostic testing (i.e. the respondent requests a diagnostic test from the provider) (AOR=1.72, p<0.01)
- Report sleeping in the forest in the past month (AOR=1.48, p<0.05)
- Live in the wealthiest households rather than the poorest households (AOR=1.49, p<0.05)
- Are younger (continuous measure of age AOR=0.98, p<0.001)

Probability of diagnosis



Patient age, AOR=0.98***

Probability of diagnosis



RESULTS for CORE INDICATORS

Table 1. Diagnosis and treatment of positive cases

Percentage of people with malaria fever in the two weeks preceding the survey who received a malaria diagnostic test, by background characteristics. Among those that received a diagnostic test, type of test, result, and treatment with an ACT, by background characteristics.

	Percentage diagnosed*		Type of diagnostic test				Result of Diagnosis				Percentage of positive diagnoses treated with an ACT	
	%	n	RDT	Microscopy	Don't Know		Pos+ ⁴	Neg-	Don't know		%	n
Age (in years)												
Under 5	61.4	154	56.2	32.8	11.0	94	88.7	11.3	-	94	20.5	83
5-14	49.5	303	53.5	38.4	8.1	148	86.9	11.1	1.9	148	26.4	127
15+	41.3	1094	62.2	27.3	10.5	456	87.3	11.6	1.2	456	41.7	397
Strata												
Zone 1 &2, MDR confirmed	45.4	859	63.1	22.8	14.1	390	84.4	14.6	1.0	390	40.4	329
Zone 3, MDR free	44.5	692	56.2	37.7	6.2	308	90.3	8.4	1.3	308	30.9	278
Wealth index												
Poorest	41.9	339	72.0	22.8	5.2	142	86.5	12.1	1.5	142	39.4	121
Second	42.1	309	58.9	24.8	16.3	129	86.6	11.7	1.8	129	40.8	111
Middle	49.7	271	62.0	28.0	10.0	135	83.5	15.8	0.6	135	35.0	113
Fourth	38.0	318	62.2	28.9	9.0	123	84.6	14.7	0.7	123	34.1	104
Richest	54.1	314	45.7	44.5	9.8	169	94.0	4.8	1.2	169	29.5	158
All people	44.9	1,551	59.5	30.5	10.0	698	87.4	11.4	1.2	698	35.4	607

*66 cases of data were missing on diagnosis

Table 2. Treatment of malaria fever

Percentage of people with malaria fever in the two weeks preceding the survey who either did or did not take a test, the type of drug they took and if they took the drug within 48 hours.

	Positive diagnostic test	Negative diagnostic test	No diagnostic test/don't know result	All people with malaria fever
People who took Cocktails				
	%	%	%	%
Percentage who took a cocktail with no-antimalarials	56.5	71.7	57.9	58.1
Percentage who took a cocktail with antimalarials	13.7	9.5	11.7	12.4
Percentage who took any cocktail	66.5	78.9	67.7	67.8
People who took Antimalarials (e.g. chloroquine, A+M, Malarine)				
Percentage who took an antimalarial drug	46.5	11.3	10.9	24.4
Percentage who took an antimalarial drug the same/next day	28.1	2.6	7.6	15.1
People who took ACTs (e.g. Malarine, A+M)				
Percentage who took an ACT	35.4	7.3	5.1	16.6
Percentage who took an ACT the same/next day	20.9	2.6	3.1	9.7
Total number of people	607	83	927	1,617

Table 3. Types of treatment for malaria fever

Percentage of people with malaria fever in the two weeks preceding the survey who received antimalarial treatments and cocktails, among all people with fever and among those diagnosed with malaria, by background characteristics.

	Percentage who received anti-malarials and cocktails, among all people with fever:								Percentage who received anti-malarials and cocktails, among those with a positive diagnosis:							
	# of people with fever	ACTs		Monotherapy			Cocktails		# of people with a pos. diagnosis	ACTs		Monotherapy			Cocktails	
ASMQ		DHA+PPQ A+PPQ	Art Mono	CQ	Quinine/MQ	Non-Antimalarial cocktail	Antimalarail cocktail	ASMQ		DHA+PPQ A+PPQ	Art Mono	CQ	Quinine/ MQ	Non-Antimalarial cocktail	Antimalarail cocktail	
Age (in years)		%	%	%	%	%	%	%	n	%	%	%	%	%	%	%
Under 5	156	12.3	1.3	6.0	4.2	0.0	61.5	8.2	83	19.1	1.4	7.4	5.0	0.0	65.4	5.0
5-14	310	12.6	1.0	4.0	3.9	1.1	64.6	11.7	127	26.4	0.0	7.1	4.2	1.8	67.6	8.7
15+	1,151	16.3	1.6	3.5	5.0	0.5	55.8	13.1	397	37.6	4.1	5.5	8.2	1.1	50.8	17.4
Strata																
Zone 1 &2, MDR confirmed	908	15.5	1.7	2.9	2.5	0.2	58.2	10.4	329	36.5	4.0	6.1	5.8	0.3	60.2	10.9
Zone 3, MDR free	709	14.8	1.3	4.8	6.8	0.9	58.0	14.3	278	29.1	1.8	6.1	7.9	1.8	53.2	16.2
Wealth index																
Poorest	360	16.9	0.3	4.1	3.4	0.0	56.5	11.4	121	38.4	1.0	7.5	5.3	0.0	58.7	11.6
Second	322	17.3	1.6	2.6	4.5	1.0	56.3	15.0	111	38.3	2.6	6.4	6.7	1.0	51.8	18.6
Middle	282	14.8	1.7	4.1	4.0	0.0	58.6	12.7	113	31.7	3.3	5.4	4.3	0.0	59.3	16.4
Fourth	331	12.2	1.0	3.2	5.8	0.4	59.9	12.6	104	31.6	2.5	5.0	11.2	1.1	57.8	12.3
Richest	322	14.5	2.7	5.3	5.9	1.4	59.1	10.1	158	25.3	4.2	6.1	7.4	2.8	55.3	10.9
All people	1,617	15.2	1.5	3.9	4.7	0.5	58.1	12.4	607	32.6	2.8	6.1	6.9	1.1	56.5	13.7

Table 4. Types and timing of treatment of malaria fever

Percentage of people with malaria fever in the two weeks preceding the survey who received antimalarial treatments and non-antimalarial cocktails the same/next day, among all people with fever and among those diagnosed with malaria, by background characteristics.

	Percentage who received anti-malarials and cocktails, same or next day:								Percentage who received anti-malarials and cocktails, same or next day, among those with a positive diagnosis:							
	# of people with fever	ACTs		Monotherapy			Cocktails		# of people with a pos diagnosis	ACTs		Monotherapy			Cocktails	
		ASMQ	Other ACTs [DHA+PPQ A+PPQ]	Artemisinin Monotherapy	Chloroquine	Quinine/ Mefloquine	Non-Antimalarial cocktail	Antimalarial cocktail		ASMQ	DHA+PPQ A+PPQ	Artemisinin Mono-therapy	Chloroquine	Quinine/ Mefloquine	Non-Antimalarial cocktail	Antimalarial cocktail
Age (in years)		%	%	%	%	%	%	%	n	%	%	%	%	%	%	%
Under 5	156	9.4	1.3	4.0	3.4	0.0	43.0	5.6	83	16.4	1.4	5.0	3.7	0.0	41.6	2.7
5-14	310	8.9	0.7	2.4	3.3	1.1	49.7	9.2	127	18.4	0.0	3.3	3.3	1.8	48.7	4.9
15+	1,151	8.9	0.7	2.2	2.9	0.3	42.2	8.6	397	20.2	2.1	3.4	4.2	0.5	32.9	10.2
Strata																
Zone 1 &2, MDR confirmed	908	9.8	1.0	1.9	1.8	0.2	44.6	7.1	329	22.8	2.1	3.7	4.0	1.1	42.3	7.3
Zone 3, MDR free	709	8.2	0.6	3.0	4.2	0.6	42.9	9.7	278	16.2	1.1	3.6	4.0	0.3	33.4	8.6
Wealth index																
Poorest	360	11.2	0.3	2.7	1.7	0.0	41.5	8.0	121	26.1	1.0	4.4	2.2	0.0	33.8	6.1
Second	322	9.6	1.2	1.3	3.5	1.0	44.9	10.0	111	21.2	2.3	2.6	4.9	1.0	38.0	13.5
Middle	282	9.8	0.3	2.9	2.9	0.0	42.3	8.0	113	22.0	0.8	4.3	2.6	0.0	38.3	9.2
Fourth	331	7.6	0.5	1.6	3.5	0.0	47.0	9.3	104	19.9	0.8	2.0	5.9	0.0	38.5	7.3
Richest	322	6.6	1.6	3.8	3.7	1.0	42.8	6.7	158	10.4	2.6	4.4	4.4	2.0	39.0	5.2
All people	1,617	9.0	0.8	2.4	3.0	0.4	43.7	8.4	607	19.3	1.6	3.6	4.0	0.7	37.6	8.0

Table N 1. Types of treatment for malaria fever

Percentage of people with malaria fever in the two weeks preceding the survey who received antimalarial treatments and non-antimalarial cocktails the same/next day among those with negative diagnosis and among those not diagnosed/don't know result, by background characteristics.

	Percentage who received anti-malarials and cocktails, among those with a negative diagnosis:								Percentage who received anti-malarials and cocktails, among those not diagnosed/don't know result:							
	# of people with a neg diagnosis	ACTs		Monotherapy			Cocktails		# of people not diagnosed/ don't know result	ACT		Monotherapy			Cocktails	
		ASMQ	Other ACTs [DHA+PPQ A+PPQ]	Artemisinin Monotherapy	Chloroquine	Quinine/ Mefloquine	Non- Antimalarial cocktail	Antimalarial cocktail		ASMQ	Other ACTs [DHA+PPQ A+PPQ]	Artemisinin Monotherapy	Chloroquine	Quinine/ Mefloquine	Non- Antimalarial cocktail	Antimalarial cocktail
Age (in years)		%	%	%	%	%	%	%	n	%	%	%	%	%	%	%
Under 5	11	0.0	-	0.0	0.0	-	92.2	0.0	62	5.1	1.4	5.1	3.7	0.0	50.7	13.9
5-14	18	0.0	-	0.0	0.0	-	79.4	5.2	165	2.8	1.9	1.9	4.1	0.7	60.7	14.9
15+	54	11.2	-	1.7	4.5	-	64.8	12.8	700	4.7	0.3	2.6	3.2	0.1	57.9	10.7
Strata																
Zone 1 &2, MDR confirmed	57	7.0	-	1.8	0.0	-	68.4	10.5	522	3.3	0.4	1.0	0.8	0.2	55.8	10.0
Zone 3, MDR free	26	7.7	-	0.0	7.7	-	76.9	7.7	405	5.4	1.0	4.2	5.9	0.3	60.0	13.3
Wealth index																
Poorest	19	12.1	-	0.0	0.0	-	89.7	0.0	220	5.3	0.0	2.6	2.6	0.0	52.8	12.2
Second	16	13.2	-	0.0	0.0	-	58.6	30.2	195	5.4	1.2	0.6	3.6	1.0	58.8	11.7
Middle	21	4.0	-	0.0	5.4	-	86.5	0.0	148	3.5	0.8	3.7	3.5	0.0	53.9	11.8
Fourth	18	4.8	-	0.0	6.5	-	50.0	16.1	209	3.4	0.4	2.6	3.1	0.0	61.8	12.4
Richest	9	0.0	-	10.7	0.0	-	67.9	0.0	155	4.0	1.3	4.2	4.6	0.0	62.5	9.9
All people	83	7.3	-	1.1	2.9	-	71.7	9.5	927	4.4	0.7	2.6	3.4	0.2	57.9	11.7

Table N 2. Types and timing of treatment for malaria fever

Percentage of people with malaria fever in the two weeks preceding the survey who received antimalarial treatments and non-antimalarial cocktails among those with negative diagnosis and among those not diagnosed/don't know result, by background characteristics.

	Percentage who took drug same or next day, among those with a negative diagnosis:								Percentage who took drug same or next day, among those not diagnosed/don't know result:							
	# of people with a neg diagnosis	ACTs		Monotherapy			Cocktails		# of people not diagnosed/don't know result	ACTs		Monotherapy			Cocktails	
		ASMQ	Other ACTs [DHA+PPQ A+PPQ]	Artemisinin Monotherapy	Chloroquine	Quinine/ Mefloquine	Non-Antimalarial cocktail	Antimalarial cocktail		ASMQ	Other ACTs [DHA+PPQ A+PPQ]	Artemisinin Monotherapy	Chloroquine	Quinine/ Mefloquine	Non-Antimalarial cocktail	Antimalarial cocktail
Age (in years)		%	%	%	%	%	%	%	n	%	%	%	%	%	%	%
Under 5	11	0.0	-	-	-	-	55.3	0.0	62	1.4	1.4	3.2	3.7	0.0	42.8	10.6
5-14	18	0.0	-	-	-	-	62.1	0.0	165	2.1	1.2	1.9	3.6	0.7	49.2	13.6
15+	54	3.9	-	-	-	-	45.8	7.3	700	3.0	0.0	1.7	2.4	0.1	47.1	7.8
Strata																
Zone 1 &2, MDR confirmed	57	1.8	-	-	-	-	50.9	5.3	522	2.5	0.4	1.0	0.6	0.2	45.4	7.1
Zone 3, MDR free	26	3.9	-	-	-	-	50.0	3.9	405	3.0	0.3	2.7	4.7	0.3	48.9	10.9
Wealth index																
Poorest	19	12.1	-	-	-	-	74.2	0.0	220	2.8	0.0	2.0	1.6	0.0	43.2	9.7
Second	16	0.0	-	-	-	-	45.4	11.3	195	3.6	0.6	0.6	3.0	1.0	49.0	7.9
Middle	21	0.0	-	-	-	-	58.2	0.0	148	2.0	0.0	2.2	3.5	0.0	43.0	8.2
Fourth	18	0.0	-	-	-	-	25.7	11.3	209	2.3	0.4	1.5	2.6	0.0	52.9	10.1
Richest	9	0.0	-	-	-	-	46.5	0.0	155	2.9	0.6	3.4	3.1	0.0	46.9	8.8
All people	83	2.6	-	-	-	-	50.5	4.7	927	2.7	0.3	1.9	2.7	0.2	47.2	9.0

Table 5. Source of diagnosis among those who received diagnosis

Source of diagnosis acquired for people with malaria fever in the two weeks preceding the survey, among people who received a diagnosis, by background characteristics.

	# of people diagnosed	HOME	PUBLIC SECTOR			OTHER	PRIVATE					
		At home	Public Health Facility	Village Malaria Worker	Total Public Sector	Total	Private clinic	Pharmacy	Grocery	Drug store	Mobile provider	Total Private Sector
Age (in years)	n	%	%	%		%	%	%	%	%	%	
Under 5	94	1.2	21.7	4.2	26.2	-	15.2	41.0	1.2	8.6	6.9	73.8
5-14	148	0.8	26.4	4.2	30.9	-	14.3	29.6	0.8	8.9	15.1	69.1
15+	456	1.8	24.4	4.5	29.5	0.3	9.4	28.1	0.3	10.1	21.2	70.5
Residence												
Zone 1 &2, MDR confirmed	390	1.0	25.6	5.9	31.9	-	8.7	37.2	-	7.4	14.1	68.1
Zone 3, MDR free	308	2.0	23.4	2.9	26.9	0.3	13.6	23.7	1.0	11.7	21.4	73.1
Wealth index												
Poorest	142	1.5	31.7	10.4	42.7	-	7.3	25.9	0.8	5.6	16.7	57.3
Second	129	2.4	23.6	6.6	31.0	-	8.0	27.8	-	12.6	19.0	69.0
Middle	135	1.5	34.7	2.1	37.7	0.9	8.5	21.9	0.9	12.8	16.7	62.3
Fourth	123	0.0	24.1	3.5	27.6	-	10.6	31.4	1.0	11.1	18.2	72.4
Richest	169	1.9	11.2	-	11.4	-	19.7	41.5	-	6.9	18.7	88.6
All	698	1.5	24.5	4.4	29.3	0.2	11.3	30.2	0.5	9.6	17.9	70.7

Table 6. Source of Antimalarials, among those who received an Antimalarial treatment

Source of antimalarial treatment acquired for people with malaria fever in the two weeks preceding the survey, among people who received an antimalarial, by background characteristics.

Source of AM treatment among people treated with antimalarials:												
		HOME	PUBLIC SECTOR			OTHER	PRIVATE					
	# of people treated with antimalarial	At home	Public Health Facility	Village Malaria Worker	Total Public Sector	Total	Private clinic	Pharmacy	Grocery	Drug store	Mobile provider	Total Private Sector
Age (in years)	n	%	%	%		%	%	%	%	%	%	%
Under 5	35	12.6	17.3	8.7	26.0	-	6.3	21.2	2.3	5.5	18.2	53.5
5-14	62	4.9	22.9	5.7	28.6	1.3	7.1	7.0	1.8	15.0	29.6	58.7
15+	292	1.9	22.2	4.8	27.0	1.1	8.0	21.6	2.9	15.4	18.3	65.6
Strata												
Zone 1 &2, MDR confirmed	201	3.0	29.4	6.0	35.3	1.0	6.0	29.9	2.0	10.5	9.5	57.2
Zone 3, MDR free	188	3.7	15.9	4.8	20.7	1.1	9.0	10.6	3.2	17.6	28.7	68.1
Wealth index												
Poorest	85	3.8	30.4	15.4	45.8	1.0	4.8	9.2	3.4	12.7	17.2	47.4
Second	79	3.5	17.1	5.3	22.4	-	5.3	18.2	1.0	19.2	24.9	66.1
Middle	66	1.3	27.3	3.9	31.3	1.8	7.9	15.4	4.9	15.4	18.5	62.1
Fourth	71	1.6	22.9	1.2	24.1	2.8	7.2	21.6	3.2	15.3	21.4	68.7
Richest	88	6.0	13.3	-	13.3	-	13.0	30.5	1.3	10.0	19.0	72.4
All	389	3.4	21.9	5.3	27.2	1.0	7.7	19.1	2.7	14.4	20.2	63.3
Positive diagnosed	286	1.3	26.2	7.4	33.5	0.8	7.0	20.7	1.5	13.0	16.9	58.1

Table 7. Source of ACT, among those who received an ACT treatment

Source of antimalarial treatment acquired for people with malaria fever in the two weeks preceding the survey, among people who received an antimalarial, by background characteristics.

Source of ACT among people treated with ACT:												
		HOME	PUBLIC SECTOR			OTHER	PRIVATE					
	# people treated with ACT	At home	Public Health Facility	Village Malaria Worker	TOTAL PUBLIC SECTOR	Total	Private clinic	Pharmacy	Grocery	Drug store	Mobile provider	TOTAL PRIVATE SECTOR
Age (in years)	n	%	%	%		%	%	%	%	%	%	
Under 5	21	10.7	18.7	14.7	33.3	-	5.4	21.2	4.0	4.0	10.7	45.3
5-14	40	5.5	24.6	6.8	31.5	2.0	-	10.9	2.8	15.1	26.8	55.5
15+	209	0.4	25.7	6.4	32.1	1.0	8.8	22.0	2.4	14.1	14.4	61.3
Strata												
Zone 1 &2, MDR confirmed	156	0.6	28.9	6.4	35.3	1.3	6.4	31.4	2.6	12.8	7.7	60.3
Zone 3, MDR free	114	3.5	21.1	7.9	29.0	0.9	7.9	8.8	2.6	14.0	24.6	57.9
Wealth index												
Poorest	61	3.8	33.9	18.7	52.6	1.4	4.8	9.6	4.8	8.1	11.1	38.3
Second	59	3.3	19.9	7.1	27.0	-	5.2	19.4	1.4	16.6	19.5	60.7
Middle	48	-	34.0	5.5	39.5	2.5	11.1	11.1	1.8	16.7	12.3	53.0
Fourth	45	-	25.4	2.0	27.4	2.0	6.5	22.1	2.6	12.5	22.3	66.1
Richest	57	2.1	12.7	-	12.7	-	9.0	39.0	2.1	13.8	16.0	79.9
All	270	2.1	25.0	7.2	32.1	1.1	7.2	20.2	2.6	13.4	16.1	59.1
Positive diagnosed	219	0.4	28.4	8.9	37.3	0.5	6.2	21.3	1.5	12.4	14.3	55.3

Table N 3. Source of AMs, among those with positive diagnosis and who received an AM treatment

Source of antimalarial treatment acquired for people with malaria fever in the two weeks preceding the survey, among people with positive diagnosis and who received an antimalarial

		Source of AM treatment:										
		HOME	PUBLIC SECTOR			OTHER	PRIVATE					
	# people treated with AM/ACT	At home	Public Health Facility	Village Malaria Worker	Total Public Sector	Total	Private clinic	Pharmacy	Grocery	Drug store	Mobile provider	TOTAL PRIVATE SECTOR
	n	%	%	%		%	%	%	%	%		
Received AM	286	1.3	26.2	7.4	33.5	0.8	7.0	20.7	1.5	13.0	16.9	58.1
Received ACT	219	0.4	28.4	8.9	37.3	0.5	6.2	21.3	1.5	12.4	14.3	55.3

Table 8. Cost of AM treatment and diagnostic testing

Median price in USD[†] paid for a single anti malarial drug regimen or a diagnostic test

	ACTs		Monotherapy			Total	Diagnostic tests		
	ASMQ	Other ACTs [DHA+PPQ A+PPQ]	Artemisinin Monotherapy	CQ	Quinine/ Mefloquine	All Antimalarials	RDT	Microscopy	All Diagnostics
Source of treatment	\$	\$	\$	\$	\$	\$	\$	\$	\$
Public health facility	0.00 ^[54]	0.00 ^[01]	0.24 ^[3]	0.00 ^[13]	-	0.00 ^[72]	0.24 ^[112]	0.48 ^[24]	0.24 ^[142]
Village malaria worker	0.00 ^[20]	-	0.24 ^[1]	0.00 ^[1]	-	0.00 ^[22]	0.00 ^[32]	-	0.00 ^[32]
Total public sector	0.00^[74]	0.00^[01]	0.24^[4]	0.00^[14]	-	0.00^[94]	0.12^[144]	0.48^[24]	0.12^[174]
Private health facility	1.68 ^[10]	3.60 ^[03]	-	0.48 ^[6]	-	1.20 ^[21]	0.84 ^[23]	1.20 ^[29]	1.20 ^[54]
Mobile provider	1.44 ^[24]	-	1.92 ^[15]	1.20 ^[10]	-	1.44 ^[49]	0.84 ^[49]	1.20 ^[27]	1.20 ^[81]
Pharmacy	1.20 ^[21]	1.92 ^[04]	2.04 ^[5]	0.96 ^[7]	-	1.20 ^[38]	1.20 ^[64]	1.20 ^[61]	1.20 ^[151]
Drug store	1.92 ^[21]	1.92 ^[05]	0.84 ^[5]	1.14 ^[10]	-	1.80 ^[41]	0.96 ^[26]	1.20 ^[10]	1.20 ^[43]
Grocery	1.44 ^[6]	-	-	0.48 ^[3]	-	1.08 ^[9]	0.48 ^[3]	-	0.48 ^[3]
Total private sector	1.44^[82]	2.40^[12]	1.92^[25]	0.72^[36]	-	1.44^[158]	0.96^[165]	1.20^[127]	1.20^[332]
Don't know price	85	15	25	19	-	146	102	51	153

* Refers to number of drugs for which respondent said they did not know the price and number of people who did not know the price of diagnostic tests

Supplementary Indicators

Table 9. Treatment-seeking behaviour

Primary treatment source and reason for seeking treatment at this source among those who sought treatment, among people with malaria fever in the two weeks preceding the survey.

	Percentage of people/caregivers*
Source of treatment	%
Treatment at home	45.5
Mobile provider	12.2
Pharmacy	10.0
Drug store	9.9
Grocery	8.4
Public health facility	5.8
Private clinic	2.4
Village malaria worker	1.0
Other	1.0
Did not seek treatment	3.9
Number of people	1,617
	%
Reason for treatment source	
Close by or easy to reach/Speed of treatment	56.7
Reputation for quality treatment	9.3
Free/Inexpensive/Provide credit	7.7
Habit	2.6
Illness not severe	4.8
Able to treat at home	12.5
Other	6.5
Number of people that sought treatment	1,551

* The decisions were made by self if age of person with malaria fever was 16+ years and by caregiver if age was 0-15 years

Table 10. Demand for specific antimalarial drugs and diagnostic testing

Among people with malaria fever in proceeding two weeks before the survey who received a treatment or a test, the percentage who reportedly requested an antimalarial treatment or test by name.

	# of people	Percentage of people who received an anti malarial they requested for
Type of AM acquired	n	%
ASMQ	246	5.2
DHA+PPQ/A+PPQ	24	7.4
Art - Mono	60	12.1
Chloroquine	71	12.6
Quinine/MQ	7	42.3
Cocktail non-AM	939	4.9
Cocktail AM	195	4.1
	# of people	Percentage of people who received malaria blood diagnostic they requested for
Type of diagnostic test	N	%
RDT	419	62.1
Microscopy	205	70.6

Table 11. Type of Treatments								
Antimalarial treatments (excluding cocktails), taken by people with malaria fever in the 2 weeks preceding the survey*								
	Zone 3, MDR free			Zone 1 & 2, MDR confirmed			All AMs	
	# of AMs	Relative volumes		# of AMs	Relative volumes		# of AMs	Relative volumes
	n	%		n	%		N	%
AM type								
ASMQ	109	50.7		143	67.8		252	57.9
Other ACT	12	5.6		17	8.1		29	6.6
Art-Monotherapy	37	17.2		26	12.3		63	15.2
Chloroquine	51	23.7		23	10.9		74	18.3
Quinine/Mefloquine	6	2.8		2	1.0		8	2.1
Total	215			211			426	

*The indicators are self if age of person with malaria fever is 16+ years and caregiver's if age of person with fever is 0-15years

Table 12. Respondents fever knowledge on malaria fever, diagnosis and practices *	
	Percentage of people/caregivers
Malaria knowledge	%
Knows that fever is the main symptom of malaria in children under five	61.3
Knows to respond to fever the same or next day	97.7
Knows the full treatment dose is necessary for effectiveness	97.5
Knowledge of treatment source	
Knows where to obtain antimalarials for children under five	83.1
Knowledge of ACTs	
Names A+M/Malarine/ASMQ® as an antimalarial	50.4
Knowledge of malaria diagnostic test	
Knows that it is dangerous to take treatment without confirmation with a diagnostic test	84.8
Knows that it is not possible to diagnose malaria without a blood test	28.2
Number of people	1,590

Table 13. Beliefs on the most effective AM treatment

Type of antimalarial identified by people with malaria fever in the two weeks preceding the survey age 16 and above or caregivers of people with malaria fever age 0-15 as most effective for malaria in children under five, pregnant women and adults.

	Percentage who cite AM type for children under five	Percentage who cite AM type for pregnant women	Percentage who cite AM type for adults
Antimalarial type	%	%	%
ASMQ	16.8	5.3	35.7
Other ACT	17.5	5.4	36.8
Art - mono	2.3	1.1	2.9
Chloroquine	2.2	0.3	2.5
Quinine	2.8	1.0	6.2
Non-AM	2.2	1.7	3.1
Don't know	35.3	55.3	11.0
Number	1,590	1,590	1,590

* The indicators are self if age of person with malaria fever is 16+ years and caregiver's if age of person with fever is 0-15years

Determinants of malaria blood diagnostic testing

The results of the model show that malaria fever diagnosis is higher among those who: perceived diagnostic testing as easily available in the community (AOR=1.23, $p<0.01$), perceive higher quality of care in local health facilities (AOR=1.50, $p<0.001$), perceive social support from family and friends to seek diagnostic testing when malaria is suspected (AOR=1.38, $p<0.01$), have beliefs less favorable to traditional medicines and home remedies for malaria (AOR=1.28, $p<0.01$), and perceive an internal sense of control over diagnostic testing (AOR=1.72, $p<0.01$). In addition, those that live in the wealthiest households, as compared with those in the poorest households (AOR=1.49, $p<0.05$); those who slept in the forest during the last month as compared with those who did not (AOR=1.48, $p<0.05$); and those who are younger (continuous measure of age AOR=0.98, $p<0.001$) are also more likely to get a diagnostic test for their fever.

INDICATORS	Predicted probability : % diagnosed		Adjusted Odds Ratio (95% CI)
Internal locus of control – diagnostic testing			
You always ask for a diagnostic test when you have malaria fever	No	32.59	1.72 (1.21, 2.43)
	Yes	45.34	
Availability of diagnostic tests			
It is easy to obtain a malaria test for malaria in your community There is a public health facility that treats malaria in your community Malaria tests are available at private health facility in your community Pharmacists in your community provide blood tests for malaria Malaria tests are available at the public health facilities in your community	Lowest	33.39	1.23 (1.05, 1.44)
	Low	38.14	
	High	43.13	
	Highest	48.26	
Social support			
Your family encourages you to see a health provider when you are sick Your family encourages you to get a blood test when you think you have malaria Your neighbors encourage you to get a blood test when you think you have malaria You have discussed getting a diagnostic blood test for malaria with others Your friends encourage you to seek diagnostic testing when you think you have malaria	Lowest	25.46	1.38 (1.11, 1.72)
	Low	32.11	
	High	39.57	
	Highest	47.55	
Quality of care			
Private health facilities in your community provide high quality care Malaria treatment at private health facilities is very effective Private health facilities high quality tests for malaria Providers in private health facilities provide good care when you have malaria fever	Lowest	22.2	1.50 (1.23, 1.84)
	Low	30.02	
	High	39.21	
	Highest	49.24	
Beliefs about treatment of Malaria			
Traditional medicines are an ineffective way to treat malaria Drinking boiled herb roots cannot help cure malaria Traditional medicines are not as effective for treating malaria as modern medicine Going to the traditional healer is not effective for treating malaria	Lowest	36.11	1.28 (1.09, 1.49)
	Low	41.90	
	High	47.92	
	Highest	54.00	

	Predicted probability	AOR (95% CI)
POPULATION CHARACTERISTICS		
Age of individual	*	0.98 (0.97, 0.99)
Poor	42.17	-
Second	42.61	0.92 (0.65, 1.31)
Middle	50.43	1.36 (0.96, 1.91)
Fourth	40.79	0.84 (0.61, 1.15)
Richest	52.09	1.49 (1.01, 2.20)
Strata		
Zone 3, MDR Free	44.15	-
Zone 1 & 2, MDR Suspected / Confirmed	44.18	1.00 (0.59, 1.69)
Education		
No education	44.24	-
Some primary	43.56	0.95 (0.70, 1.29)
Primary plus	49.94	1.14 (0.79, 1.64)
Stayed overnight in the forest in the past one month		
No	40.82	-
Yes	50.59	1.48 (1.09, 2.03)
F - Adjusted Mean Residual goodness of fit (DF)	1.70 (14, 26)	
P- value	0.13	

* Included in the model as continuous covariates hence interpretation of predicted probability is probability of diagnosis per unit increase of the covariate

Appendix Table A. Demographic characteristics

Characteristics of people with malaria fever in the two weeks preceding the survey, of children's caregivers, and of households

	Percentage of children under 5	Percentage of people age 5+	Percentage of caregivers
	%	%	%
Residence			
Zone 3, MDR free	54.5	42.7	47.7
Zone 1&2, MDR confirmed	45.5	57.3	52.3
Household wealth index			
Lowest	32.7	21.2	-
Second	14.7	20.5	-
Middle	13.5	17.9	-
Fourth	17.3	20.8	-
Highest	21.8	19.7	-
Age in years			
Under 1	17.3	-	-
1	10.3	-	-
2	25.6	-	-
3	23.7	-	-
4	23.1	-	-
5-15	-	23.7	-
16-24	-	22.6	11.7
25-34	-	20.6	32.1
35-44	-	15.4	30.7
45+	-	17.7	25.5
Sex			
Female	44.2	37.9	87.6
Education*			
No education	-	24.9	34.4
Some primary	-	53.9	51.8
Primary or higher	-	21.3	13.8
Total Number	156	1,461	436

*N=1,435 for education among people with fever aged 5 and above

Appendix Table B. Scale factors and items

Scale Items	Scale Properties
Availability of Diagnostic Tests	
It is easy to obtain a malaria test for malaria in your community	Cronbach's Alpha: 0.79 Range: 1-4 Mean (SD): 3.2 (0.81) Median: 3.4
There is a public health facility that treats malaria in your community	
Malaria tests are available at private health facility in your community	
Pharmacies in your community provide blood tests for malaria	
Malaria tests are available at the public health facilities	
Attitude Towards Diagnostic Testing	
It is important to take a malaria test before taking anti malarial treatment	Cronbach's Alpha: 0.87 Range: 1-4 Mean (SD): 3.9 (0.30) Median: 4.0
It is important to always take a malaria blood test to confirm malaria	
It is necessary to take a malaria test before taking anti malarial treatment	
It is important to confirm symptoms of malaria with a diagnostic blood test	
Most people get a malaria test when they suspect they have malaria	
Malaria diagnostic tests are effective	
Locus of Control	
You always ask for a diagnostic test when you have malaria fever	Mean (SD): 0.9 (0.28)
It is up to your provider to decide whether or not you get a diagnostic test	
It is up to your provider to decide whether or not you get a diagnostic test	Mean (SD): 0.73 (0.45)
Social Support	
Your family encourages you to see a health provider when you are sick	Cronbach's Alpha: 0.79 Range: 1-4 Mean (SD): 3.6 (0.59) Median: 3.8
Your family encourages you to get a blood test when you think you have malaria	
Your neighbors encourage you to get a blood test when you think you have malaria	
You have discussed getting a diagnostic blood test for malaria with others	
Your friends encourage you to seek diagnostic testing when you think you have malaria	
Quality of Care	
Private health facilities in your community provide high quality care	Cronbach's Alpha: 0.85 Range:1-4 Mean (SD): 3.5 (0.67) Median: 3.8
Malaria treatment at private health facilities is very effective	
You don't have to wait long to see a health care provider in a private health facility	
Private health facilities high quality tests for malaria	
Providers in private health facilities provide good care when you have malaria fever	
Beliefs about Treatment of Malaria	
Traditional medicines are an effective way to treat malaria (R)	Cronbach's Alpha: 0.92

Drinking boiled herb roots can help cure malaria (R)	Range: 1-4 Mean (SD): 2.4 (0.98) Median: 2.1
Traditional medicines are as effective for treating malaria as modern medicine (R)	
Going to the traditional healer is effective for treating malaria (R)	
Cupping or coining are effective for treating malaria (R)	
Attitudes Towards Treatment Seeking	
It is important to seek treatment immediately when a person has symptoms of malaria	Cronbach's Alpha:0.82 Range: 1-4 Mean (SD): 3.9 (0.29) Median: 4.0
It is important to seek treatment within 24hrs of malaria symptoms	
It is necessary to seek treatment immediately for symptoms of malaria	
It is necessary to seek treatment immediately when a person has many symptoms of malaria	
It is important to take all the anti malarial medicine that a provider gives	
It is important to take all recommended treatment (full course)	
Threat and Risk for Malaria	
People can die from malaria	Cronbach's Alpha:0.84 Range: 1-4 Mean (SD): 3.9 (0.27) Median: 4.0
Malaria is dangerous for children under five years old	
Malaria is dangerous for pregnant women	
Malaria is dangerous for unborn babies	
Availability of Anti malarial Treatment	
There is a private health facility that treats malaria in/close to your community	Cronbach's Alpha: 0.88 Range: 1-4 Mean (SD): 3.4(0.69) Median: 3.6
Anti malarial drugs are available in your community	
There are health providers who know how to treat malaria in your community	
It is easy to find anti malarial drugs in your community	
Anti malarial drugs are sold by pharmacists in your community	
Anti malarial drugs are available in the market in your community	
Anti malarial drugs are available in the market in your community	
Anti malarial drugs are available at the private health facilities in your area	
Financial Resources	
You are willing to borrow money from family to pay for malaria treatment	Cronbach's Alpha: 0.68 Range: 1-4 Mean (SD):3.7 (0.57) Median: 4.0
You are willing to borrow money from neighbours to pay for malaria treatment	
You are willing to borrow money at the high interest to pay for malaria treatment	
Medicine to treat malaria is affordable	

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