



Outlet Survey Kingdom of Cambodia 2011 Survey Report



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Definitions

Term	Definition
Adult Equivalent Treatment Dose (AETD)	An AETD is the number of milligrams (mg) of an antimalarial drug needed to treat a 60 kg adult. All dosage types found (tablet, suspension, syrup, etc) are converted, regardless of their original presentation (whether for child or adult). The number of mg/kg used to determine the dose is defined as what is recommended for a particular drug combination in the treatment guidelines for uncomplicated malaria in areas of low drug resistance issued by the WHO. Where this does not exist, a product manufacturer's treatment guidelines are consulted.
Antimalarial	Any medicine recognized by the WHO for the treatment of malaria. Medicines used solely for the prevention of malaria were excluded from analysis of key indicators in this report.
Artemisinin-based Combination Therapy (ACT)	An antimalarial that combines artemisinin or one of its derivatives with an antimalarial or antimalarials of a different class. Refer to Combination Therapy (below).
Artemisinin monotherapy	An antimalarial medicine that has a single active compound, where this active compound is artemisinin or one of its derivatives.
A+M	A+M is the name of the Public Sector Artesunate/ Mefloquine ACT for the treatment of uncomplicated <i>P. falciparum</i> malaria. There are 5 regimens for 3 different age groups.
Censused commune	A commune where field teams conducted a full census of all outlets with the potential to sell antimalarials.
Combination therapy	The use of two or more classes of antimalarial drugs/molecules in the treatment of malaria that have independent modes of action.
Dosing/treatment regimen	The posology or timing and number of doses of an antimalarial used to treat malaria. This schedule often varies by patient weight.
Duo-cotecxin	Duo-cotecxin is a DHA-PPQ ACT for the treatment of uncomplicated <i>P. falciparum</i> and <i>P. vivax</i> malaria in areas with known artemisinin tolerance. It is packaged as either 8 or 9 co-formulated tablets in a blister.

First-line treatment The government recommended treatment for uncomplicated malaria. Since 2000, co-blistered artesunate and mefloquine (a WHO-recommended but not prequalified ACT) has been the first line treatment for *P. falciparum* malaria and chloroquine the first line treatment for *P. vivax* malaria. 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 (DHA+PPQ) became the first line treatment for *P. falciparum* malaria in the multi-drug resistance containment zone in 2009. Cambodia's second-line treatment for *P. falciparum* malaria is quinine combined with tetracycline. Before treatment, confirmation of malaria infection using microscopy or rapid diagnostic test (RDT) is recommended.

Malarine The nationally recommended 3-day ACT treatment for uncomplicated *P.falciparum* combines Artesunate and Mefloquine. Malarine is the brand of AS/MQ which is distributed to the private sector through PSI/Cambodia's social marketing campaign. At the time of the survey, the regimen had just been adjusted thus there was an 'old' and a 'new' regimen on the market: Old Malarine included only 2 age regimens: Malarine for Adults and Malarine for Children. New Malarine included 3 regimens: Malarine for Adults, Adolescents, and Children.

Monotherapy An antimalarial medicine that has a single mode of action. This may be a medicine with a single active compound or a synergistic combination of two compounds with related mechanisms of action.

Non-artemisinin therapy An antimalarial medicine that does not contain artemisinin or any of its derivatives.

Outlet Any point of sale or provision of a commodity to an individual. Outlets are not restricted to stationary points of sale and may include mobile units or individuals. Refer to the Appendix 8.2 for a description of the outlet types visited for this survey.

Rapid Diagnostic Test (RDT) for malaria A test used to confirm the presence of malaria parasites in a patient's bloodstream.

Screened An outlet that was administered the screening questions of the outlet survey questionnaire (see Screening criteria).

Second-line treatment The government recommended second-line treatment for uncomplicated malaria. Cambodia's second-line treatment for malaria is quinine combined with tetracycline. However, as few manufacturers package the drugs together and data on tetracycline alone was not collected, indicators related to the second-line treatment are measures of quinine alone, regardless of whether tetracycline was also stocked or sold. Second-line treatment indicators include all dosage forms.

Screening criteria The set of requirements that must be satisfied before the full questionnaire is administered. In this survey, an outlet met the screening criteria if (1) they had antimalarials in stock at the time of the survey visit, or (2) they report having stocked them in the past three months.

Sub-district (SD) The primary sampling unit, or cluster, for the outlet survey. It is an administrative unit determined by the Ministry of Health (MOH) that host a population size of approximately 10,000 to 15,000 inhabitants. These units frequently are defined by geographical, health, or political boundaries, and are based around wards. In Cambodia they were defined as communes.

Key Indicator Descriptions

Acceptable storage conditions for medicines – An outlet is considered to have acceptable storage conditions for medicines if it is in compliance with all the following three standards: (1) medicines are stored in a dry area; (2) medicines are protected from direct sunlight; and (3) medicines are not kept on the floor.

Availability of any antimalarial – The proportion of outlets in which an antimalarial medicine was found on the day of the survey, based upon an audit conducted by the interviewer. For this indicator, all outlets surveyed are included in the denominator.

Public health facilities that had non-artemisinin therapy in stock (n) as a percentage of all public health facilities screened (N) by location.

Availability of specific antimalarial – The proportion of outlets in which an antimalarial medicine of specific type was found on the day of the survey, based upon an audit conducted by the interviewer. For this indicator, only outlets with at least one antimalarial in stock at the time of survey are included in the denominator. Outlets that had non-artemisinin monotherapy or non-artemisinin combination therapy in stock (n) as a percentage of outlets with any antimalarials in stock at the time of the survey visit.

Credit to consumers – An outlet is considered to provide credit to consumers based on response of the provider. Providers in public health facilities were not asked this question.

Disruption in stock – An outlet is considered to have a disruption in stock where any drug is reported to have been out of stock in the three months prior to interview or where a drug is not in stock at the time of the visit but was stocked at some point in the previous three months.

Expired stock – Indicators of expired stock are based upon the expiry information from one sample of each drug audited in an outlet; a full examination of all packages in stock was not conducted.

Health danger signs – Indications considered health danger signs are taken from the World Health Organization, (2005). Handbook: IMCI Integrated Management of Childhood Illness. Available at: <http://whqlibdoc.who.int/publications/2005/9241546441.pdf>. Questions assessing knowledge of health danger signs were not asked of providers at public health facilities.

International reference price – International reference price information taken from: Management Sciences for Health, (2010 Edition). International Drug Price Indicator Guide - http://erc.msh.org/dmpguide/pdf/DrugPriceGuide_2010_en.pdf. The international reference price for ASMQ is US\$3.85 for a full adult treatment and \$5.18 for DHA-PPQ.

Minimum legal daily wage – Minimum daily wage information taken from: United States Department of State, (2007). Country Reports on Human Rights Practices. Available at: <http://www.state.gov/g/drl/rls/hrrpt/2007/index.htm>. In Cambodia, the minimum legal daily wage is US\$1.48.

Microscopic blood or rapid diagnostic testing – An outlet is considered to have microscopic or rapid diagnostic blood testing based on provider response. Functionality of the diagnostic test was not observed by the interviewer.

Most popular antimalarial – The antimalarial with the largest volume of full adult equivalent courses sold or distributed in the past week.

Price – Prices are calculated in terms of purchases required for a full-course treatment. All drug formulations are included in these calculations. Prices are shown in US dollars. The average exchange rate during the data collection period (14th June to 6th August 2011) was 4059.77 Cambodian Riels (KHR) to US\$1 (www.oanda.com).

Statistical significance – Confidence intervals are used to compare proportions between categories and tested at 5% level of significance. The standard errors were adjusted to account for clustering of the outlets within a district

Volumes – Volumes are calculated in terms of purchases required for a full-course adult equivalent treatment dose.

List of Abbreviations

--	No data available
***	Undefined ratio as a non-zero value is being divided by a value of zero
n/a	Not applicable: Indicates ratios cannot be calculated as the numerator is zero
AM	Antimalarial
AETD	Adult Equivalent Treatment Dose
ACT	Artemisinin-based Combination Therapy
ASMQ	Artesunate + Mefloquine
A-PPQ	Artemisinin-Piperaquine
DHA-PPQ	Dihydroartemisinin-Piperaquine
SP	Sulfadoxine-Pyrimethamine
AS	Artesunate
CQ	Chloroquine
RDTs	Rapid Diagnostic Tests
MDR	Multi-drug resistance
VMW	Village Malaria Worker
GPS	Global Positioning System
IQR	Inter-Quartile Range
PPS	Probability Proportional to Size
LSHTM	London School of Hygiene and Tropical Medicine
MoH	Ministry of Health
CNM	National Centre for Parasitology, Entomology, and Malaria Control
MMV	Medicines for Malaria Venture
PMI	President's Malaria Initiative
NGO	Non Governmental Organisation
PSI	Population Services International
UN	United Nations
WHO	World Health Organisation
UNICEF	The United Nations Children's Fund

Executive Summary

Background

The *ACTwatch* Outlet Survey involves quantitative research at the outlet level in *ACTwatch* countries (Cambodia, Uganda, Zambia, Nigeria, Benin, Madagascar and the Democratic Republic of Congo). Other elements of *ACTwatch* research include Household Surveys led by Population Services International (PSI) and Supply Chain Research led by the London School of Hygiene & Tropical Medicine (LSHTM). This report presents the results of a cross-sectional survey of outlets conducted in Cambodia between June and August 2011.

The objective of the outlet survey is to monitor levels and trends in the availability, price, and volumes of antimalarials sold, and providers' perceptions and knowledge of antimalarial medicines at different public/not for profit and private sector outlets. Price and availability data on diagnostic testing services are also collected. This report presents indicators on availability, price, and volumes of antimalarial medicines sold, as well as availability and price of diagnostic tests in outlets. The study also reports on provider knowledge of antimalarials and other provider perceptions.

Methods

A nationally representative sample of all outlets that could sell or provide antimalarials to a consumer was taken through a census approach in 113 communes across three malaria-endemic domains in Cambodia. Sampling was conducted using a one-stage probability proportion to size (PPS) cluster design, with the measure of size being the relative commune population. Oversampling of public health facilities was conducted in districts surrounding the selected communes. Domains were defined using the Cambodia National Centre for Parasitology, Entomology, and Malaria Control's (CNM) artemisinin-resistance containment zoning, specifically:

- Domain 1 = Zone 1, artemisinin tolerance confirmed
- Domain 2 = Zone 2, artemisinin tolerance suspected/buffer area
- Domain 3 = Zone 3, artemisinin tolerance free; and areas without a zone designation

A probability sample of 32 communes out of 45 were selected from domain one, 32 out of 228 from domain two, and 49 out of 928 from domain three, giving a total of 113 sub-districts.

Outlet inclusion criteria for this study included outlets that stocked an antimalarial at the time of survey or in the previous three months. An outlet is defined as any point of sale or provision of commodities for individuals. Outlets included in the survey are as follows: 1) public health facilities (referral hospitals, health centres or sub-health centres, former district hospitals, health posts, and village malaria workers); 2) private not-for-profit health facilities (hospitals and clinics operated by non-governmental or religious organizations); 3) private for profit health facilities (private hospitals, clinics, poly clinics, depot A and B, and cabinets); 5) pharmacies (clinical pharmacies and pharmacies); 6) drug stores; 7) general retailers (grocery stores, village shops); and 8) mobile providers (itinerant providers without a physical location).

Using a structured questionnaire, fieldworkers recorded the outlets' basic details and then asked a screening question about the availability of antimalarials to determine if the outlet was eligible to be

administered the full questionnaire. The questionnaire was administered to a senior person at the outlet to collect data on outlet identification, outlet characteristics, provider knowledge, availability of antimalarials and rapid diagnostic tests (RDTs), stock-outs of antimalarials and availability of cocktails. They recorded information on “audit sheets” for all antimalarials and RDT products stocked in terms of their price and volume sold in the past week.

Several validation and data checking steps occurred during and after data collection. Double data entry was conducted using Microsoft Access (Microsoft Cooperation, Seattle, WA, USA). Data was analysed using StataCorp. 2009 (Stata Statistical software: Release 11. College station, TX: StataCorp LP). The data was weighted at the analysis stage. Survey settings were incorporated to account for clustering of the outlets within the districts.

For more information on the study design log on to www.ACTwatch.info

1. Country Background

1.1 Overview of the country

Cambodia is located in South-East Asia and borders Thailand, Vietnam and Laos. It has a population of 14.7 million, predominantly rural [1]. The gross domestic product (GDP) per capita is US\$ 830 [2] and a third of the population live under the poverty line [1]. 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'. 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 [3].

Figure 1. Map of Cambodia



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 United Nation 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].

1.2 Description of the health care system

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 206 deaths per 100,000 pregnancies, and an under-five mortality rate of 54 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 [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 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 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. Operating alongside these registered outlets are a number of unregistered outlets. A survey conducted by the Cambodian Ministry of Health in 2001 estimated that such outlets far outnumber registered ones [11].

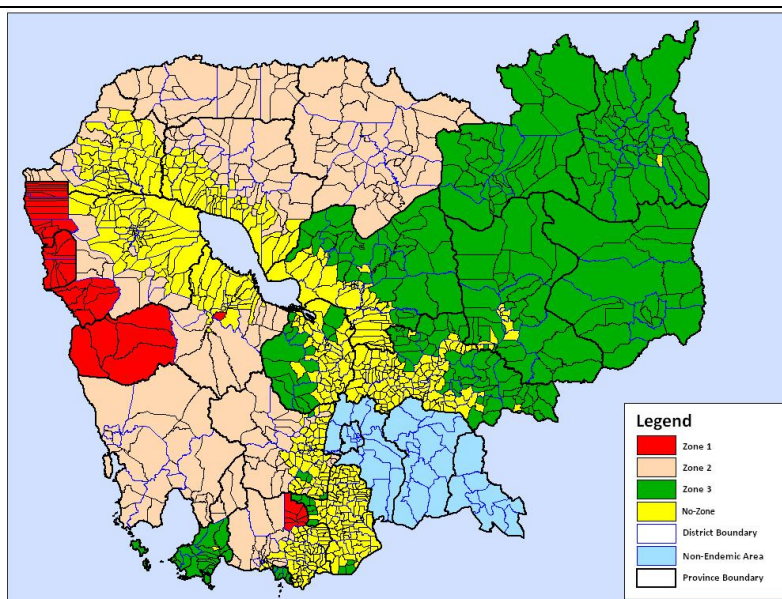
1.3 Epidemiology of malaria

In Cambodia, malaria is transmitted by *Anopheles dirus*, *Anopheles minimus* and *sundaicus* mosquitoes [12] breeding in forests and jungles covering 60% of the landmass [13]. 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 [14]. An estimated 1.6 million people live in the high transmission areas within 1 km of the forest [15]. Adult men experience the highest malaria prevalence rates, reflecting the increased occupational risk associated with forest goers [16]. 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 3.2 million [15]. Around 66% of confirmed cases are *Plasmodium (P.) falciparum* and 34% *P. vivax* [12].

Cambodia has seen a general decline in clinically diagnosed cases of malaria and case fatality over the past decade [15], coupled with a significant and steady decrease in overall malaria prevalence measured with blood slides from 4.4% in 2004 to 0.9% in 2010 [16]. Malaria remains a leading cause of morbidity and mortality in the country. Accordingly, a diverse range of interventions have been undertaken with the goal of achieving pre-elimination of malaria across Cambodia by 2015 and phased elimination of all forms of malaria in Cambodia by 2025 [15].

Given emergence of artemisinin-resistant parasites, CNM delineated areas with confirmed multi-drug resistant parasites. With this strategy, the country's malaria endemic area was classified into three zones; 1) areas where artemisinin tolerance has been detected (this is also a targeted area for elimination) 2) areas with no evidence of tolerance but considered at risk (known as a 'buffer' area) and 3) the remaining malaria endemic provinces. In 2010, the zones were further revised into four areas, referred to as zone 1, zone 2, zone 3, and 'no zone' (CNM's national database – zone designation). This new mapping shows that some of the zones previously demarcated as zone 2, now falling into zone 1. The largest difference is the new demarcation of 'no zone'. No zone areas largely comprise former zone 2 and zone 3 areas. No zone areas buffer zone 2 in western Cambodia and around the Tonle Sap. Figure 2 illustrates the divisions, whose classification is based on the communes.

Figure 2. Cambodia zone designation



Source: CNM, 2011

The CNM has used these zones in their malaria control strategy and employed different strategy in different areas depending on malaria incidence.

1.4 Antimalarial Policies and Regulatory Environment

The national malaria control programme is managed by the National Centre for Entomology, Parasitology and Malaria Control (CNM). Since 2000, co-blistered artesunate and mefloquine (a WHO-recommended but not prequalified ACT) has been the first line treatment for *P. falciparum* malaria and chloroquine the first line treatment for *P. vivax* malaria. 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 (DHA-PPQ) became the first line treatment for *P. falciparum* malaria in the multi-drug resistance containment zone in 2009. Cambodia's second-line treatment for *P. falciparum* malaria is quinine combined with tetracycline. Before treatment, confirmation of malaria infection using microscopy or rapid diagnostic test (RDT) is recommended.

1.5 Malaria control strategy

Evidence of the development of artemisinin-derivate antimalarial drug tolerance began appearing along the Thai-Cambodian border in the mid-2000s [18-22]. Factors believed to be contributing to emerging drug resistance in Cambodia include the unregulated sale of artemisinin monotherapies for over 40 years; limited access to ACTs; co-blistered ACTs that are not co-formulated (facilitating continued use of artemisinin monotherapy); and ubiquitous counterfeit and substandard drugs [9]. Over the past 10 years, the CNM has initiated innovative approaches for controlling malaria and containing artemisinin resistance.

In 2009, the WHO in collaboration with the ministries of health of both Cambodia and Thailand, through funding from the Bill & Melinda Gates Foundation, began implementing a containment program targeting the development of artemisinin drug resistance in malaria parasites along the Thai-Cambodian border. The containment program received \$22.5 million in 2008 for initial activities over two years, with implementation commencing in 2009. The program consists of a number of interventions to facilitate early diagnosis and appropriate treatment of malaria focused specifically on CNM's target zone 1. At the start of implementation, this zone covered about 270,000 people in 4 provinces – all of Pailin and parts of Battambang, Pursat and Kampot. The activities are also implemented in zone 2 where there is no evidence of tolerance yet. Zone 2 covers 9 provinces with a total population of more than 4 million excluding town areas [23].

Containment program activities include a ban on the sale of artemisinin monotherapies introduced in 2009; ongoing efforts to strengthen capacity for drug quality monitoring; a new bureau for policing private drug sellers; and active efforts to close unlicensed pharmacies. To facilitate diagnosis and treatment with national first-line drugs, these services are made available at community level through a village malaria worker (VMW) program. The containment program also distributes long-lasting insecticide-treated mosquito nets free of charge in zone 1 and zone 2, and there is a surveillance program in place to monitor cases of *P. falciparum* after three days of treatment in seven key sites. Cases still positive after three days of treatment will be further treated and closely monitored for 28 days. This allows for mapping drug tolerance.

Specifically, the containment project makes provision for:

1. LLIN distribution
2. Free malaria diagnosis and treatment through VMWs
3. Increased availability of 24-hour facilities for diagnosis and treatment
4. Education on prevention and treatment
5. Close surveillance of drug-resistant cases and increased screening in high-resistance areas
6. Elimination of sale of counterfeit, sub-standard or monotherapeutic antimalarials
7. Targeting of full range of interventions towards mobile populations

In 2001, CNM introduced the Village Malaria Worker (VMW) program in order to improve early diagnosis and treatment of malaria, particularly in remote and forested areas. This project was initiated in a remote province in 2001 and gradually expanded until 2008, identifying malaria-prone villages, where two VMWs were selected through community consensus in each village. Trained VMWs are supposed to perform rapid diagnostic tests on any villager suspected of having malaria, to provide antimalarials for test-positive cases according to the national guidelines, and to refer severe cases to hospitals. They are also encouraged to conduct active case detection, record fever cases and positive

RDT results, follow up patients, and provide information on malaria preventive measures to their villagers. Their services are directly supervised by the CNM staff in two ways: 1) check VMWs' records and resupply RDT kits and medications at monthly meetings held at health centres in each region, and 2) visit each VMW village twice a year to monitor VMW activities and observe their relationship and communication with villagers [18]. The program has been significantly scaled up since 2009 as part of the containment resistance efforts. The project was scaled up in three dimensions: the number of VMWs was increased, the number of villages with VMWs was increased, and the range of the project's health services was expanded (2,000 new VMWs received training and the total number of villages participating increasing from 315 villages in seven provinces to 1394 villages in 17 provinces). Additionally, there has been an attempt to broaden the services provided by the VMWs by integrating with the Cambodia's Integrated Management of Child Illness (ICM) protocol, training VMWs in the initial 315 villages to provide diagnosis and treatment for pneumonia and diarrhoea in collaboration with IMCI programme [17].

Other national malaria control efforts include provision of highly subsidized rapid diagnostic testing (RDT) and ACT treatment in the private sector. The international NGO, Population Services International (PSI) has led private sector malaria treatment in Cambodia since 2003. Private sector artesunate mefloquine (ASMQ) is sold under the brand name Malarine. Rapid diagnostic test kits (RDT) are sold under the brand name Malacheck, which tests for *P. falciparum* infections. In 2010, the diagnostic kit changed to test for both *P. falciparum* and *P. vivax* infections. Malarine and Malacheck are sold in over 1,700 outlets, including private hospitals, clinics, pharmacies, mobile providers and drug stores. These products were sold by PSI at subsidized prices to wholesale and retail outlets (US\$ 0.42 for one pack/dose of Malarine adult and US\$ 0.05 for 1 RDT unit); the recommended selling price for an adult dose of Malarine adult was around US\$ 0.61 (2500 Riel) and for Malacheck was around US\$ 0.24 (1000 Riel). In the public sector, ASMQ is available under the name A+M and is pre-packaged with age-specific dosing regimens for children aged 2 months to 5 years (A+M2), children 6 years to 15 years (A+M3), and adults (A+M4).

Diagnostic testing with Paracheck rapid diagnostic tests, Carestart, and A+M treatment for positive cases are available free of charge in public health facilities and with village malaria workers.

The widespread availability of counterfeit and sub-standard quality drugs, as well as the availability of oral artemisinin monotherapy, has compromised malaria treatment efforts in Cambodia [24, 25]. Both counterfeit artemisinin-based drugs [25] and oral artemisinin monotherapies have historically been cheaper than ACTs [26] in Cambodia, fuelling their consumption. The Cambodian government has taken significant steps to regulate the pharmaceutical industry. Oral artemisinin monotherapies have been banned in Cambodia since 2008 [27] and market authorization for all oral artemisinin monotherapies was withdrawn in March 2009 [28]. The Cambodian Ministry of Health has also targeted unlicensed pharmaceutical outlets, ordering the closure of all unlicensed pharmaceutical outlets resulting in an observed 65% reduction between November 2009 and March 2010 [24]. Efforts are also being made to detect and eliminate poor-quality medicines through surveillance activities in 17 provinces and to raise awareness about drug quality and correct treatment procedures among drug dispensers and the public [29]. Drug inspectors, under the title of "Justice Police", are enforcing the bans through outlet inspections, drug confiscation, fines, and prosecution [28].

Cambodia was also one of the 9 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 ACTs at highly subsidized prices, though no implementation had begun at the time of this study. Issues

with drug efficacy and resistance have delayed the selection of a suitable ACT in Cambodia. Global Fund procurement policies require that only Stringent Regulatory Authority (SRA) approved drugs are eligible for procurement through the AMFm. Until October 2011, no efficacious ACTs in the Cambodia context, specifically DHA-PPQ, had received SRA approval. With the approval of Eurartesim in October 2011, in-country drug regulation, commercial availability and manufacturing capacity remain barriers to procurement and availability of the drug in country.

Results

Data were collected from 14th June to 05th August 2011. A total of 18,584 outlets were sampled (4249, 6492 and 7843 in domains 1, 2 and 3 respectively). 661 outlets were excluded from the analysis; they were either not open during the survey visit, did not have an eligible respondent available, or refused to participate. Therefore, 17,923 outlets were included in the analysis. Of these, 1,529 outlets stocked antimalarials at any point in the three months prior to the interview, but interviews were only completed for 1,516 of these outlets (see Figure 3) Survey flow diagram for reasons 13 outlets were not interviewed). Of the 1,516 outlets interviewed, 1,270 outlets stocked antimalarials at the time of the interview.

2. Outlet survey

2.1 Sampling Approach

The target sampling units were all types of outlets that have the potential to sell or provide antimalarials in Cambodia. The outlets were classified into two main categories:

Category 1: public health facilities (referral hospitals, health centres or sub-health centres, former district hospitals, and health posts)

Category 2: other antimalarial drug sellers, including, village malaria workers, private not-for-profit health facilities, private for profit health facilities (private hospitals, clinics, poly clinics, depot A and B, and cabinets), pharmacies, drug stores, general retailers and mobile providers.

Sampling procedures were employed to select outlets within each category, as described below.

2.1.1 Sample size determination

The proportion of outlets with any ACT, estimated to be 40%, was the primary outcome measure. A minimum of 290 outlets with antimalarials in stock were needed to provide detectable changes in ACT availability per stratum and between the public and private sectors.

The *ACTwatch* survey results from the baseline survey show that there are on average 75 outlets per commune in domain 1 and 2, and 90 outlets per commune in domain 3. By applying these estimated parameters, the ultimate number of clusters required to reach the estimated number of outlets would be a total of 32, 32 and 49 clusters in domains 1 (zone 1), 2 (zone 2) and 3 (zone 3 and areas without a zone designation) respectively, to detect a 20% point increase in availability at 80% power, setting the level of significance at 5% and adjusting for an estimated design effect of 3.

2.1.2 Selection procedure of the communes

The last census was conducted in 2008 and was used as the sample frame for the 2011 outlet survey. The desired cluster size for the outlet survey was approximately 10,000 to 15,000 inhabitants, which corresponded most closely to a commune in Cambodia. The list of communes had population sizes from the 2008 census, and communes were classified as falling into three domains;

- Domain 1 = Zone 1, artemisinin tolerance confirmed
- Domain 2 = Zone 2, artemisinin tolerance suspected/buffer area
- Domain 3 = Zone 3, artemisinin tolerance free; and areas without a zone designation

Any communes that included more than one zone were allocated to the most appropriate domain, on consultation with CNM and other stakeholders. In addition, a facility listing was used to confirm the location of public health facilities, obtained from the Health Coverage Plan 2004-2005, Ministry of Health.

The sample was selected using a stratified cluster design, with the different zones constituting the three strata. A probability sample of 32 locations out of 45 were selected from domain 1, 32 out of 228 from domain 2 and 49 out of 928 from domain three, giving a total of 113 communes. Within domain three, implicit stratification was introduced. The sampling frame was sorted according to the stratification

variables before the sample selection, and then the total sample was selected from the entire sampling frame with PPS within this domain. This approach resulted in a sample with implicit stratification with proportional allocation.

In each selected commune, a census of all Category 1 and Category 2 outlets was conducted. All outlets that stocked antimalarials at the time of the survey or in the past 3 months were eligible for interview.

2.1.3 Selection procedure of the booster sample

The sample was supplemented by a booster sample of Category 1 outlets (public health facilities) operating in the district of the sampled commune. Oversampling ensured adequate representation of relatively rare but important antimalarial outlet type. All public health facilities located in the corresponding district of the sampled commune were included. Village malaria workers were not included in the booster sample given sufficient sample size.

2.2 Data Collection

2.2.1 Preparatory phase

The study initially received ethical clearance from Cambodia's National Ethics Committee for Health Research, Ministry of Health on 8th April 2011.

Questionnaire modules were used in the outlet survey: a screening questionnaire for all outlets, and for eligible outlets: a provider questionnaire, and an antimalarial audit and a RDT audit. The screening questionnaire was used to identify outlets that were eligible for the audit and provider interview.

The provider questionnaire collected information on outlet demographics (e.g. health qualifications of staff, number of staff that prescribe or dispense medicines), provider knowledge of the first-line treatment, provider perceptions of the most effective antimalarial medicine, availability of cocktails, storage conditions and participation in trainings. The antimalarial audit questionnaire collected data for each antimalarial stocked, including information on brand name, generic name and strengths, package type and size, recall of volumes sold over the week before the survey, recall of last purchase price and selling price. The RDT audit questionnaire collected data on each RDT stocked, including information on brand name, recall of volumes sold over the week before the survey, recall of last purchase price and selling price. Separate questions were also asked on microscopic testing availability, recall of price and number administered over the week before the survey. The questionnaire was translated into Khmer.

Paper based questionnaires were administered. The generic ACTwatch questionnaire was provided to the Cambodian team in English. The generic questionnaire was modified to cater for country specific responses and adapted to suit the context of Cambodia (e.g. names of administrative boundaries, types of antimalarial outlets, titles of health worker cadres, first-line antimalarial treatment, inclusion of cocktail-specific questions and local currency).

Forty-eight candidates participated in an eight day outlet survey training between May 30th and June 3rd 2011 in Phnom Penh. Standardised training materials developed by ACTwatch were adapted to the national setting, and administered by PSI/Cambodia research staff. Training sessions covered completing the questionnaire, informed consent, conducting the census, and identifying outlet types. Interviewers were trained to identify antimalarial medicines, including the differences between ACTs and non-ACTs, brand names and generics, packaged and loose tablets, and the various formulations. A field practice

session was undertaken to mimic actual data collection. Of the 48 candidates, 30 were selected as interviewers, 6 as supervisors and 6 as quality controllers.

Supervisors and quality controllers received additional training for one day on the 7th of June 2011, to clarify roles and responsibilities in the field. This training also included a review of logistical procedures to be followed during data collection, field monitoring and questionnaire management.

2.2.2 Fieldwork

Six teams carried out data collection, each consisting of one team supervisor, one quality controller and five interviewers. Three coordinators were responsible for managing the supervisors and ensuring that standardized methods were implemented. Each team received at least eight visits by a coordinator during data collection.

Fieldwork commenced on the 16th of June 2011 and data collection was completed on the 6th of August 2011.

During fieldwork specific outlets were identified in sampled communes using a number of approaches. Official lists of outlets operating in selected communes were obtained from the Ministry of Health prior to fieldwork, and were then used to help verify outlets within each commune. In addition, supervisors identified key informants (such as health officials and other local government officials) and, through discussion with these key informants, obtained a list of potential medicine outlets in their area and worked with them to draw up a rough sketch map of their locations. To estimate the boundaries of each commune, supervisors liaised with commune chiefs and with local guides. The teams were also provided with district and commune maps to further identify boundaries. Road maps were also used where available. Finally, during data collection a snowball technique was used whereby outlets included in the survey were asked to identify other outlets stocking, or with the potential to stock, medicine in the commune.

For each outlet that was identified during the census, the outlet type and location were noted, along with its longitude and latitude coordinates (obtained via hand-held GPS units). The fieldworker then identified the most senior staff member currently present at the outlet, and screening questions were administered. For outlets that were eligible, the interviewer then read the information sheet to the senior staff person and obtained witnessed oral consent to proceed with the full interview.

2.2.3 Quality control

A number of measures were put in place prior to data collection to help ensure good quality data. Interviewers were recruited with prior experience of large scale surveys, including some participants who had participated in the 2009 outlet survey. During the training, participants were divided into smaller groups for some of the sessions and assigned a facilitator to help address questions and answers. Finally, appointments of supervisors and quality controllers were made on merit.

Once questionnaires had been thoroughly checked by both the supervisor and the quality controller, the questionnaires were then sent to PSI/Cambodia headquarters in Phnom Penh. The questionnaires were reviewed again by the research staff in Phnom Penh. Any questionnaires with inconsistencies were sent immediately back to the field within the same week.

The quality controller on each team conducted the back checks. Each quality controller categorized the outlets to be checked into either 'eligible' or 'ineligible' and then randomly selected at least 10% of full

questionnaires and 2% of screening questionnaires for back checks. Special attention was given to refusals, or questionnaires with substantial missing data and/or non response.

Two PSI coordinators also provided close supervision during the data collection, remaining in the field for the duration of the survey. Coordinators reviewed questionnaires and checked for any inconsistencies, irregular skip patterns or large amounts of missing data. Coordinators also verified the booster sample and documented reasons why certain outlets could not be accessed. Daily monitoring figures were also submitted to ACTwatch central, to help monitor progress.

2.3 Data Processing

An ACCESS database was provided by ACTwatch central to enable double data entry of questionnaires. Data was entered by for Cambodia Media & Research for Development Limited between 7th and the 26th of August 2011 by a team of 12 entry clerks. All data are backed up on a central server at ACTwatch central and off-site back-up using external hard drive.

2.3.1 Accounting for survey design in data analysis

We accounted for three aspects of the sampling design during the analysis:

- Sampling weights: Sample weights were calculated for the outlet survey data to allow for 1) differences in sampling probabilities due to variation in the size of strata; 2) the oversampling of the booster sample; and 3) the sampling strategy which involved a census of outlets in communes of varying size selected with probability proportional to size (PPS). Weights were based on sampling probabilities.
- Clustering: The sample was clustered at the level of the district for Category 1 outlets (the booster sample) and the commune for Category 2 outlets. The calculation of standard errors took this clustering into account because outlets in a given cluster are likely to be more similar to each other than to outlets in other clusters. The standard errors did not take into account clustering of products within outlets because a complete list of all relevant products in each outlet was obtained and no sampling was performed.
- Stratification: Communes were sampled separately in each stratum and this was also adjusted for in the calculation of the standard error terms during analysis.

To account for these design features in the tabulations, we used the Stata svy commands for analyzing complex survey data to weight the data and calculate confidence intervals which account for clustering and stratification. We declared the primary sampling unit (district), the weight variable (wt), the strata and the finite population correction (fpc) in the svy command. The fpc equalled the sampling fraction for each stratum (the number of sampled communes in a stratum divided by the total number of communes in the stratum, or 0.5 if the sampling fraction was greater than 50 percent)¹. This was specified as:

```
svyset district [pweight=wt], strata(strata) fpc(fpc)
```

We calculated a proportion and its 95 percent confidence interval (CI) as: *svy: proportion VariableName*

¹ For simplicity we used the district as the primary sampling unit for both booster sample and main sample outlets, as it is rare for there to be more than one main sample commune from the same stratum in a district. However, we defined fpc on the basis of the number of communes in the stratum to present a true picture of the proportion of clusters selected.

2.4 Data Analysis

2.4.1 Calculation of antimalarial volumes, prices and markups

Antimalarial volume and price data are reported in terms of adult equivalent treatment doses (AETDs). An AETD is defined as the number of milligrams (mg) of an antimalarial drug needed to treat a 60kg adult (refer to the [Appendix 8.6](#) for details). The number of mg/kg used to calculate one AETD was defined as what was recommended for a particular drug in the treatment guidelines for uncomplicated malaria in areas of low drug resistance issued by WHO (as of 5 April 2011). Where WHO treatment guidelines did not exist, AETDs were based on the product manufacturer's treatment guidelines. In the case of ACTs, which have two or more active antimalarial ingredients packaged together (either co-formulated or co-blistered), the strength of the artemisinin-based component was used as the basis for the AETD calculations. Information collected on the medicine strength and unit size, as listed on the product packaging, was then used to calculate the number of AETDs contained in each unit.

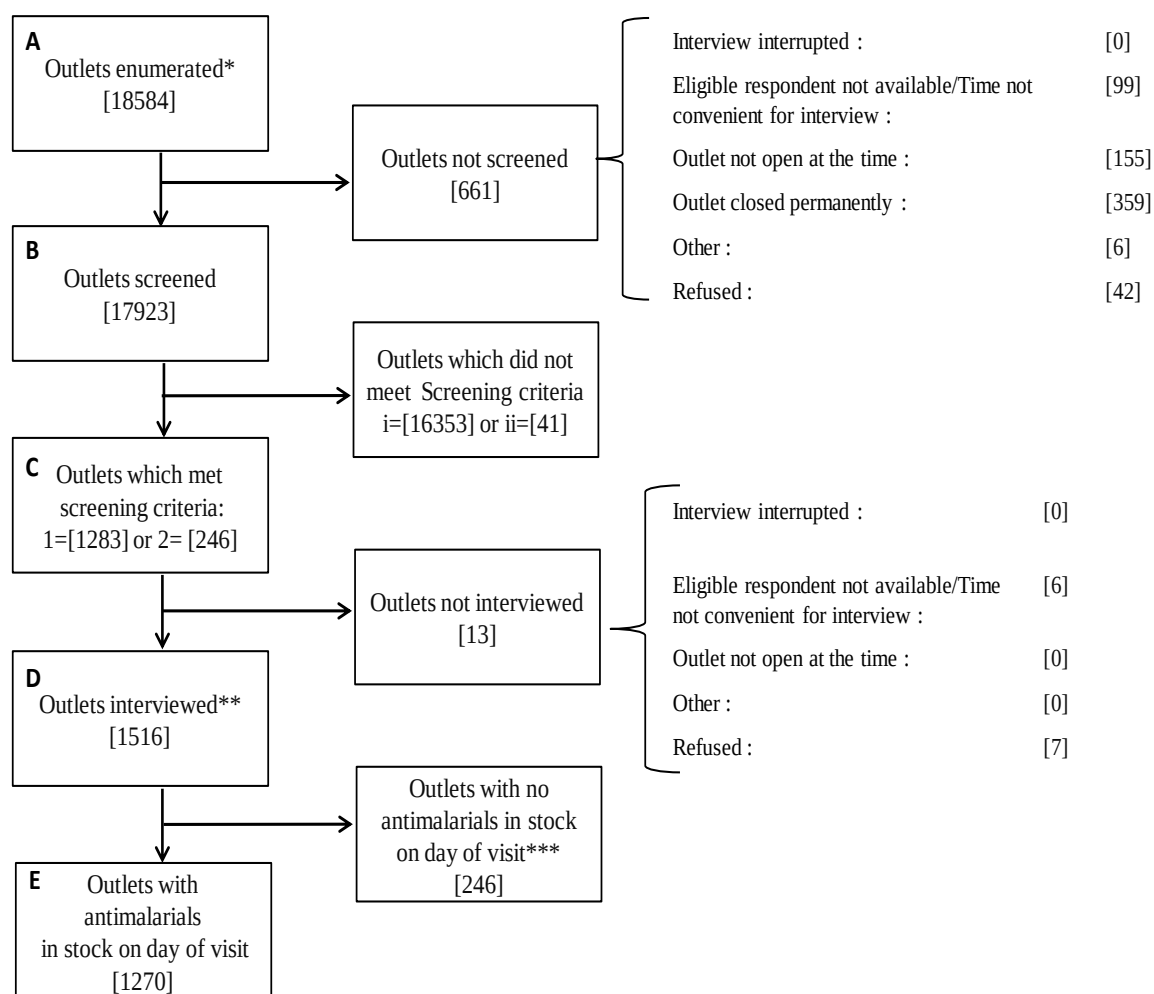
Market share was calculated by dividing the number of AETDs of a particular antimalarial category sold by the total number of AETDs of all antimalarials sold. In cases where outlets stocked antimalarials but some or all sales volumes were missing we did not impute for missing values.

Price data were collected in local currencies and converted to their US\$ equivalent using the average interbank rate for the period of data collection (US\$ = 4059.77 Reil, source: www.oanda.com). Price data are reported using median and inter-quartile range, which are appropriate for describing distributions likely to be skewed.

3. Results – 2011 findings

3.1 Characteristics of the sample

Figure 3. Survey flow diagram



i: Outlet does not meet screening criteria or ii: Outlet stocks cocktails only

1: Antimalarials in stock on day of visit ; 2: No antimalarials in stock on day of visit, but antimalarials in stock in previous 3 months

*Enumerated means were visited and filled in at a minimum basic descriptive information

** Interviewed means that final interview status was 'completed' or 'partially completed' ** but they had stock in previous three months

Table 3.1: Outlets enumerated by location, drugs stocked and final interview status				
Final interview status	Domain 1	Domain 2	Domain 3	Total n
Number of outlets enumerated (Flow Diagram Reference A)	4249	6492	7843	18584
Number of outlets meeting the screening criteria* (Flow Diagram Reference C)	438	550	541	1529
Number of outlets stocking antimalarials at the time of the survey visit (Flow Diagram Reference E)	375	441	454	1270
Number of outlets without antimalarials in stock at the time of the survey visit, but who had antimalarials in stock at some time in the 3 months previous to the survey	62	102	82	246
Final interview status				
Outlet Not Screened (total)	92	356	213	661
Eligible respondent not available	41	32	26	99
Outlet not open at the time	21	74	60	155
Outlet closed permanently	23	228	108	359
Refused	7	17	18	42
Other	0	5	1	6
Outlet did not meet screening criteria (total)	3710	5575	7068	16353
Outlet met screening criteria, but not interviewed (total)	1	7	5	13
Eligible respondent not available	1	1	4	6
Outlet not open at the time	0	0	0	0
Refused	0	6	1	7
Other	0	0	0	0
Completed interview	437	543	536	1516
Response rate (%)	%		%	%
Proportion of outlets enumerated that were screened	97.8	94.5	97.3	96.4
Proportion of outlets meeting screening criteria that were interviewed**	99.8	98.7	99.1	99.2
* The number of outlets meeting the screening criteria is defined as the sum of the number of outlets stocking antimalarials at the time of the survey and the number of outlets without antimalarials in stock at the time of the survey, but who had antimalarials in stock at some time in the 3 months previous to the survey ** Response rate was calculated as outlets where final interview status was "Completed interview" or "Partially completed interview" as a percentage of all outlets meeting the screening criteria (i.e. flow diagram reference D divided by C).				

3.2 Availability of antimalarial drugs

Table 3.2.1 Availability of antimalarials among all outlets on the day of survey, by outlet type								
	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of outlets that had:	N=428	N=353	N=781	N=408	N=293	N=15781	N=657	N=17142
Any AM	91.1 (85.7, 94.6)	93.8 (89.5, 96.4)	92.7 (89.3, 95.1)	44.3 (36.6, 52.3)	31.4 (21.0, 44.1)	1.1 (0.6, 1.9)	25.1 (18.1, 33.6)	3.4 (2.6, 4.5)
Any ACT	86.6 (80.5, 91.0)	91.4 (86.0, 94.8)	89.5 (84.9, 92.7)	28.9 (22.4, 36.5)	18.4 (12.4, 26.4)	0.2 (0.1, 0.3)	15.4 (10.7, 21.7)	1.7 (1.3, 2.2)
• ASMQ	65.8 (54.9, 75.3)	49.7 (30.0, 69.5)	56.2 (42.2, 69.2)	28.4 (22.0, 35.9)	17.0 (11.4, 24.7)	0.2 (0.1, 0.3)	13.4 (8.8, 20.0)	1.5 (1.1, 2.0)
Malarine	0.7 (0.3, 1.7)	0.3 (0.05, 2.1)	0.5 (0.2, 1.2)	27 (21.1, 33.8)	15.7 (10.3, 23.2)	0.2 (0.1, 0.3)	12 (7.7, 18.3)	1.4 (1.1, 1.9)
A+M	65.7 (54.7, 75.2)	49.7 (30.0, 69.5)	56.1 (42.2, 69.4)	0.7 (0.2, 2.1)	1.3 (0.4, 3.9)	0.02 (0.01, 0.06)	2.5 (0.8, 7.4)	0.2 (0.1, 0.4)
• DHA+PPQ	21.4 (14.0, 31.2)	43.5 (25.6, 63.2)	34.6 (23.4, 47.9)	1.5 (0.6, 3.8)	1.9 (0.9, 3.9)	0.01 (0.001, 0.05)	2.1 (1.1, 3.8)	0.2 (0.1, 0.3)
• Other ACT	0.5 (0.1, 3.1)	0.0 -	0.2 (0.03, 1.3)	0.7 (0.2, 2.0)	0.2 (0.1, 0.8)	0.02 (0.01, 0.06)	0.4 (0.1, 1.5)	0.05 (0.02, 0.1)

Continued on next page

	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of outlets that had:	N=428	N=353	N=781	N=408	N=293	N=15781	N=657	N=17142
Non-artemisinin therapy	60.8	61.0	60.9	19.9	19.8	0.7	14.2	1.9
	(52.1, 68.9)	(55.5, 66.2)	(56.1, 65.5)	(14.9, 26.1)	(12.7, 29.6)	(0.3, 1.4)	(8.3, 23.3)	(1.3, 2.9)
• Chloroquine	55.9	60.8	58.8	18.5	19.5	0.7	13.1	1.8
	(44.2, 66.9)	(55.0, 66.2)	(52.8, 64.5)	(13.6, 24.7)	(12.4, 29.1)	(0.3, 1.4)	(7.9, 21.0)	(1.2, 2.8)
• SP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	-	-	-	-	-	-	-	-
• Quinine	12.7	0.0	5.1	2.1	0.1	0.04	1.2	0.1
	(8.3, 18.9)	-	(3.0, 8.4)	(0.8, 5.5)	(0.02, 0.8)	(0.01, 0.2)	(0.4, 3.5)	(0.06, 0.3)
• Quinine injection	0.8	0.0	0.3	1.5	0.2	0.01	1.2	0.1
	(0.3, 2.1)	-	(0.1, 0.9)	(0.5, 4.7)	(0.02, 0.8)	(0.00, 0.05)	(0.4, 3.5)	(0.04, 0.2)
Any Artemisinin monotherapy	13.9	4.2	8.1	7.6	3.6	0.1	4.0	0.5
	(10.2, 18.7)	(0.7, 20.5)	(4.3, 14.6)	(4.9, 11.6)	(1.6, 8.0)	(0.02, 0.6)	(2.5, 6.4)	(0.3, 0.8)
• Oral artemisinin monotherapy	0.0	0.0	0.0	1.2	1.3	0.1	0.03	0.1
	-	-	-	(0.5, 2.9)	(0.3, 4.9)	(0.02, 0.6)	(0.01, 0.3)	(0.04, 0.5)
• Non-oral artemisinin Monotherapy	13.9	4.2	8.1	6.9	2.3	<0.001	4.0	0.3
	(10.2, 18.7)	(0.7, 20.5)	(4.3, 14.6)	(4.2, 10.9)	(1.1, 4.7)	(0.0, 0.002)	(2.5, 6.4)	(0.2, 0.5)

Table 3.2.2 Availability of antimalarials among all outlets with antimalarials in stock on the day of survey, by outlet type

	Public Health Facility	VMW	Total PHF/VMW	Pharmacy / Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of outlets that had:	N=428	N=353	N=781	N=408	N=293	N=15781	N=657	N=17142
Any AM	91.1	93.8	92.7	44.3	31.4	1.1	25.1	3.4
	(85.7, 94.6)	(89.5, 96.4)	(89.3, 95.1)	(36.6, 52.3)	(21.0, 44.1)	(0.6, 1.9)	(18.1, 33.6)	(2.6, 4.5)
Among outlets that had any antimalarials in stock:	N=383	N=319	N=702	N=155	N=89	N=150	N=174	N=568
Any ACT	95.1	97.4	96.5	68.2	58.8	16.3	61.8	49.2
	(91.5, 97.2)	(95.5, 98.6)	(94.4, 97.8)	(55.6, 78.7)	(47.4, 69.3)	(9.3, 27.0)	(49.5, 72.8)	(38.8, 59.7)
• ASMQ	72.3	53.0	60.6	67.0	54.4	15.1	54.0	45.3
	(60.6, 81.6)	(32.5, 72.6)	(46.1, 73.4)	(54.5, 77.5)	(44.1, 64.3)	(8.9, 24.6)	(41.8, 65.8)	(35.6, 55.4)
Malarine	0.7	0.3	0.5	63.5	50.2	14.4	48.3	41.8
	(0.3, 1.9)	(0.1, 2.2)	(0.2, 1.3)	(52.2, 73.5)	(39.9, 60.5)	(8.4, 23.7)	(38.4, 58.3)	(33.9, 50.1)
A+M	72.1	53.0	60.5	1.6	4.2	1.6	10.2	5.0
	(60.4, 81.4)	(32.5, 72.6)	(46.1, 73.4)	(0.5, 4.6)	(1.4, 11.9)	(0.4, 6.1)	(3.3, 27.2)	(2.1, 11.5)
• DHA+PPQ	23.5	46.4	37.4	3.5	5.9	0.7	8.3	4.7
	(15.4, 34.1)	(26.6, 67.4)	(24.8, 51.9)	(1.4, 8.7)	(3.0, 11.6)	(0.1, 4.6)	(4.1, 16.4)	(2.6, 8.3)
• Other ACT	0.5	0.0	0.2	1.7	0.8	1.9	1.6	1.6
	(0.1, 3.4)	-	(0.02, 1.4)	(0.6, 4.7)	(0.2, 2.6)	(0.6, 5.8)	(0.4, 6.1)	(0.7, 3.8)

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	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Non-artemisinin therapy	66.8	65.1	65.7	46.9	63.3	62.6	57.2	57.2
	(57.1,75.2)	(59.8,70.0)	(60.8,70.4)	(36.2,57.9)	53.4, 72.3)	(42.5,79.1)	(38.7,73.9)	(45.3,68.3)
• Chloroquine	61.3	64.8	63.4	43.6	62.2	61.3	52.7	54.3
	(48.0,73.1)	(59.4,69.9)	57.2, 69.3)	(33.3,54.6)	(52.5,71.0)	(41.0,78.2)	(37.0,67.9)	(43.0,65.2)
• SP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	-	-	-	-	-	-	-	-
• Quinine	13.9	0.0	5.5	4.9	0.4	3.8	4.8	4.0
	(9.1, 20.6)	-	(3.2, 9.1)	(1.8, 12.7)	(0.1, 2.5)	(1.4, 10.1)	(1.9, 11.4)	(2.2, 7.3)
• Quinine injection	0.8	0.0	0.3	3.6	0.4	0.7	4.8	2.8
	(0.3, 2.4)	-	(0.1, 1.0)	(1.1, 11.0)	(0.1, 2.5)	(0.1, 4.7)	(1.9, 11.4)	(1.5, 5.1)
Any Artemisinin monotherapy	15.3	4.5	8.7	17.9	11.4	10.2	16.1	14.2
	(11.3,20.3)	(0.8, 21.7)	(4.7, 15.7)	(11.8,26.3)	(5.0, 24.2)	(1.7, 42.4)	(9.5, 26.0)	(8.4, 23.1)
• Oral artemisinin monotherapy	0.0	0.0	0.0	2.9	4.1	10.1	0.1	4.2
	-	-	-	(1.2, 6.8)	(1.0, 14.7)	(1.7, 42.5)	(0.02, 0.9)	(1.1, 14.5)
• Non-oral artemisinin monotherapy	15.3	4.5	8.7	16.1	7.4	0.1	16.0	10.2
	(11.3,20.3)	(0.8, 21.7)	(4.7, 15.7)	(10.2,24.5)	(3.5, 14.5)	(0.02, 0.2)	(9.4, 25.9)	(6.4, 16.0)

3.3 Stock outs of antimalarials

Table 3.3.1 Disruption in stock in the past three months of antimalarials and rapid diagnostic tests, by outlet type

	Public Health Facility	VMW	Total PHF/VMW	Pharmacy / Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of outlets that had disruption in stock in the past three months of any:	N=394	N=345	N=739	N=210	N=103	N=208	N=256	N=777
Any ACT	29.8 (22.3, 38.6)	33.3 (26.7, 40.6)	31.9 (27.1, 37.2)	49.8 (38.1, 61.6)	39.5 (31.4, 48.3)	14.0 (7.9, 23.9)	55.7 (48.5, 62.8)	40.6 (34.1, 47.5)
• Any ASMQ/DHA-PPQ	0.5 (0.1, 1.5)	0 -	0.2 (0.1, 0.6)	1.8 (0.8, 4.4)	1.5 (0.5, 4.0)	1.7 (0.6, 4.8)	3.6 (1.6, 7.8)	2.5 (1.3, 4.5)
Malarine	0.5 (0.1, 1.8)	1.0 (0.2, 5.1)	0.8 (0.2, 2.9)	45.5 (34.7, 56.8)	30.6 (21.8, 41.2)	10.9 (6.4, 17.9)	46.9 (39.0, 55.0)	34.5 (29.2, 40.2)
A+M	24.6 (16.8, 34.6)	18.9 (11.9, 28.7)	21.1 (15.5, 28.1)	2.9 (1.5, 5.5)	2.0 (0.7, 5.6)	2.0 (0.8, 5.0)	7.6 (3.6, 15.2)	4.4 (2.4, 7.7)
DHA-PPQ	5.6 (3.1, 9.9)	14.5 (8.8, 22.9)	11.0 (7.2, 16.4)	4.3 (2.0, 9.0)	5.9 (2.2, 14.8)	2.6 (1.1, 6.4)	7.6 (3.2, 8.4)	5.2
Non-artemisinin therapy	9.9 (6.6, 14.7)	32.4 (25.5, 40.2)	23.7 (19.1, 29.0)	19.1 (13.3, 26.7)	18.3 (9.7, 31.9)	43.4 (27.1, 61.2)	31.1 (23.8, 40.9)	(24.1, 39.1)
• Chloroquine	9.0 (5.7, 13.7)	32.4 (25.5, 40.2)	23.2 (18.6, 28.6)	18.5 (12.8, 26.0)	16.5 (8.2, 30.5)	40.7 (26.3, 57.0)	30.2 (22.6, 39.1)	29.4 (22.8, 37.0)
Rapid diagnostic tests	4.0 (2.1, 7.3)	3.6 (1.8, 7.0)	3.8 (2.3, 6.0)	21.0 (14.6, 29.3)	16.5 (9.6, 26.9)	3.4 (1.6, 7.4)	19.1 (12.6, 27.8)	14.7 (11.4, 18.7)

3.4 Cost and affordability to patients of antimalarials

Table 3.4.1 Cost to patients of antimalarials, by outlet type								
	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	%	%	%	%	%	%	%	%
	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)
Proportion of ASMQ distributed free of cost (by volumes of AETDs)	94.6 (647)	99.0 (174)	95.9 (821)	0.2 (128)	0.0 (43)	0.0 (40)	0.0 (97)	0.1 (308)
	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]
Median price of a full course of an AETD [tablets]:	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)
• Any ACT	0.00	0.00	0.00	1.42	1.97	1.62	2.03	1.72
	[0.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[1.22, 2.03]	[1.23, 2.03]	[1.23, 1.83]	[1.42, 3.25]	[1.22, 2.43]
	(752)	(417)	(1169)	(134)	(51)	(39)	(121)	(345)
• Any ASMQ	0.00	0.00	0.00	1.42	1.97	1.62	2.03	1.62
	[0.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[1.22, 2.03]	[1.23, 2.03]	[1.23, 1.83]	[1.42, 2.64]	[1.22, 2.01]
	(631)	(173)	(804)	(121)	(43)	(36)	(93)	(293)
A+M	0.00	0.00	0.00	0.99	1.97	1.48	0.99	0.99
	[0.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[0.99, 1.72]	[1.97, 1.97]	[1.11, 1.75]	[0.00, 1.72]	[1.72, 1.97]
	(628)	(172)	(800)	(3)	(3)	(3)	(12)	(21)
Malarine	0.00	0.00	0.00	1.42	1.48	1.62	2.01	1.63
	[0.00, 0.00]	-	[0.00, 0.00]	[1.22, 2.03]	[1.22, 2.03]	[1.23, 1.83]	[1.48, 2.84]	[1.22, 2.03]
	(3)	(1)	(4)	(118)	(40)	(33)	(81)	(272)
• DHA+PPQ	0.00	0.00	0.00	2.77	7.20	2.77	4.43	7.20
	[0.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[1.39, 3.60]	[7.20, 7.20]	-	[2.46, 8.31]	[2.46, 8.31]
	(121)	(244)	(365)	(10)	(6)	(1)	(24)	(41)
• Other ACT	-	-	-	9.08	9.08	7.26	2.72	9.08
	-	-	-	[7.26,13.62]	[9.08,13.62]	[7.26,13.62]	[2.72, 9.08]	[2.72,13.62]
	(0)	(0)	(0)	(3)	(2)	(2)	(4)	(11)

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	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	%	%	%	%	%	%	%	%
	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]
Median price of a full course of an AETD [tablets]:	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)
Non-artemisinin therapy	0.00	1.23	0.00	0.49	0.49	0.49	0.74	0.62
	[0.00, 0.00]	[1.23, 1.23]	[0.00, 0.00]	[0.49, 0.74]	[0.37, 0.74]	[0.41, 0.74]	[0.59, 1.23]	[0.41, 0.74]
	(76)	(5)	(81)	(67)	(37)	(30)	(46)	(180)
Chloroquine, the 'most popular' non-ACT antimalarial treatment in Cambodia	0.00	1.23	0.00	0.49	0.49	0.49	0.74	0.49
	[0.00, 0.00]	[1.23, 1.23]	[0.00, 0.00]	[0.49, 0.74]	[0.37, 0.74]	[0.41, 0.74]	[0.49, 1.23]	[0.41, 0.74]
	(60)	(5)	(65)	(64)	(36)	(30)	(41)	(171)
Any Artemisinin monotherapy	0.00	0.00	0.00	29.56	23.65	3.78	23.65	23.65
	[0.00, 0.00]	-	[0.00, 0.00]	[17.74,29.56]	[20.69,23.65]	[2.37, 4.73]	[14.78,23.65]	[14.78, 23.65]
	(37)	(1)	(38)	(27)	(9)	(4)	(25)	(65)
• Oral artemisinin monotherapy	0.00	0.00	0.00	2.96	1.58	3.78	2.37	2.76
	-	-	-	[1.67, 3.15]	-	[2.37, 4.73]	-	[2.37, 4.73]
	-	-	-	(5)	(1)	(3)	(1)	(10)
• Non-oral artemisinin monotherapy	0.00	0.00	0.00	29.56	23.65	14.78	23.65	23.65
	[0.00, 0.00]	-	[0.00, 0.00]	[20.69,29.56]	[20.69,23.65]	-	[17.24,23.65]	[20.69,29.56]
	(37)	(1)	(38)	(22)	(8)	(1)	(24)	(55)

	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
Median price of AETD ACT treatment dose, by brand name relative to the minimum legal daily wage in Cambodia (\$1.48)	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio
Any ACT	-	-	-	1.0	1.3	1.1	1.4	1.2
• Any ASMQ	-	-	-	1.0	1.3	1.1	1.4	1.1
• DHA+PPQ	-	-	-	1.9	4.9	1.9	3.0	4.9
Median price of a full course adult first-line treatment [ASMQ] relative to international reference price (\$3.85)	-	-	-	0.4	0.5	0.4	0.5	0.4
Median price of a full course adult first-line treatment [DHA-PPQ] relative to international reference price (\$5.18)	-	-	-	0.5	1.4	0.5	0.9	1.4
Median price of a full course of an adult equivalent ACT treatment dose, by A+M relative to the minimum legal daily wage in Cambodia (\$1.48)	-	-	-	0.7	1.3	1.0	0.7	0.7
Median price of a full course of an adult equivalent ACT treatment dose, by Malarine relative to the minimum legal daily wage in Cambodia (\$1.48)	-	-	-	1.0	1.0	1.1	1.4	1.1
	N/A	N/A	N/A	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
				N=208	N=103	N=208	N=254	N=773
Proportion of outlets that offer credit to consumers for antimalarials	-	-	-	15.9	31.7	36.7	40.8	33.2
	-	-	-	(9.0, 26.5)	(18.7, 48.2)	(21.1, 55.7)	(31.6, 50.6)	(24.6, 43.0)

3.5 Volumes of antimalarials

Table 3.5.1 Volumes of antimalarials sold or distributed in the past two weeks, by outlet type								
	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	%	%	%	%	%	%	%	%
Any ACT	19.5	6.7	26.2	4.6	1.2	0.3	8.9	14.9
• Any ASMQ	16.8	4.5	21.2	4.6	1.2	0.3	7.7	13.7
A+M	16.8	4.5	21.2	0.1	0.0	0.0	0.3	0.4
Malarine	-	0.0	0.0	4.2	1.2	0.3	7.3	12.9
• DHA+PPQ	2.7	2.2	4.9	0.0	0.0	0.0	1.2	1.2
• Other ACT	-	-	-	0.0	0.0	0.0	0.0	0.0
Non-artemisinin therapy	2.5	0.5	3.0	12.7	23.5	2.3	11.2	49.6
• Chloroquine	2.5	0.5	3.0	12.6	23.5	2.3	11.0	49.3
• SP	-	-	-	-	-	-	-	-
• Quinine	0.0	-	0.0	0.0	0.0	0.0	0.2	0.2
Any Artemisinin monotherapy	4.5	0.0	4.5	0.8	0.1	0.1	0.8	1.8
• Oral artemisinin monotherapy	0.0	0.0	0.0	0.5	0.0	0.1	0.0	0.7
• Non-oral artemisinin monotherapy	4.5	0.0	4.5	0.3	0.1	0.0	0.8	1.1

Table 3.5.2 Volumes of antimalarials sold or distributed in the past two weeks, within outlet type

	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	%	%	%	%	%	%	%	%
Any ACT	73.7	93.1	77.9	25.5	4.9	10.3	42.4	22.5
• Any ASMQ	63.5	62.1	63.2	25.4	4.8	10.3	36.7	20.6
• A+M	63.5	62.1	63.2	0.5	0.0	0.0	1.6	0.6
• Malarine	0.0	0.0	0.0	23.1	4.8	10.3	35.1	19.5
• DHA+PPQ	10.2	31.1	14.7	0.1	0.1	0.0	5.6	1.8
• Other ACT	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1
Non-artemisinin therapy	9.4	6.9	8.9	70.1	94.7	84.5	53.8	74.8
• Chloroquine	9.4	6.9	8.9	69.6	94.7	84.5	52.8	74.3
• SP	-	-	-	-	-	-	-	-
• Quinine	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.3
Any Artemisinin monotherapy	16.9	0.0	13.3	4.4	0.4	5.2	3.8	2.7
• Oral artemisinin monotherapy	0.0	0.0	0.0	3.0	0.0	5.2	0.1	1.0
• Non-oral artemisinin monotherapy	16.9	0.0	13.3	1.4	0.4	0.0	3.7	1.7

3.6 Provider knowledge and perceptions

Table 3.6.1 Provider knowledge of first line treatment and health danger signs, by outlet type								
Provider Knowledge and Perceptions	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of providers that:	N=394	N=345	N=739	N=210	N=103	N=208	N=256	N=777
Correctly state the recommended first-line treatment for uncomplicated malaria	91.7 (87.0, 94.8)	92.3 (86.4, 95.8)	92.1 (88.0, 94.8)	80.7 (74.3, 85.8)	52.4 (35.5, 68.8)	14.7 (10.1, 20.8)	67.5 (55.0, 78.0)	53.5 (43.2, 63.6)
	NA	NA	NA	N=210	N=103	N=208	N=256	N=777
Can list at least one danger sign in a child that requires referral to a public health facility:	-	-	-	78.2 (67.2,86.3)	69.1 (57.0,79.0)	48.2 (39.9,56.6)	75.4 (67.3,82.0)	67.4 (62.6,72.0)
• Convulsions	-	-	-	37.0 (28.6,46.3)	34.8 (22.1,50.1)	15.4 (8.2,27.0)	37.2 (29.4,45.9)	30.5 (26.2,35.2)
• Vomiting	-	-	-	22.1 (16.7,28.5)	29.2 (20.4,39.9)	21.9 (14.8,31.2)	34.2 (27.8,41.2)	27.4 (23.9,31.1)
• Unable to drink/breastfeed	-	-	-	20.1 (13.0,29.8)	13.8 (6.7,26.3)	10.1 (4.9,19.7)	17.2 (12.1,23.7)	15.5 (12.0,19.7)
• Excessive sleep/difficult to wake up	-	-	-	38.0 (29.1,47.8)	20.4 (13.8,19.2)	25.0 (19.2,31.7)	28.4 (20.3,38.1)	28.8 (23.1,35.3)
• Unconscious/coma	-	-	-	28.5 (20.3,38.5)	20.5 (12.0,32.7)	4.0 (2.0,8.0)	22.9 (17.4,29.4)	18.4 (14.7,22.7)
* Private sector providers in target provinces recommending appropriate treatment for malaria	-	-	-	N=195 80.2 (70.7,87.1)	N=103 59.2 (48.6,69.1)	N=207 7.2 (4.3,11.6)	N=255 68.3 (60.6,75.1)	N=760 51.4 (43.0,59.7)

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Table 3.6.2 Provider perceptions of antimalarials, by outlet type								
	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
	N=386	N=344	N=730	N=209	N=102	N=205	N=255	N=771
Agree with the statement, "Most customers request an antimalarial by brand name or generic name."	6.9	4.7	5.6	22.7	22.2	44.3	9.3	23.7
	(1.5, 26.4)	(1.0, 19.9)	(1.9, 15.3)	(17.3, 29.2)	(14.3, 32.7)	(31.5, 57.9)	(5.7, 14.9)	(18.2, 30.4)
	N=322	N=344	N=666	N=194	N=99	N=206	N=249	N=748
Agree with the statement, "I decide which antimalarial medicine most customers receive."	96.2	95.7	95.9	85.2	83.7	60.0	95.2	81.4
	(83.3, 99.2)	(76.1, 99.3)	(86.5, 98.8)	(78.7, 90.0)	(73.4, 90.5)	(47.1, 71.6)	(90.9, 97.5)	(75.6, 86.0)
Proportion of providers that:	N=394	N=345	N=739	N=210	N=103	N=208	N=256	N=777
Believe an ACT is the most effective antimalarial medicine for treating uncomplicated <i>P. falciparum</i> malaria	90.1 (85.4,93.3)	94.3 (89.2,97.1)	92.7 (88.9,95.2)	71.8 (62.0,80.0)	63.6 (51.7,74.0)	11.9 (5.9,22.4)	63.7 (58.2,68.9)	50.3 (44.2,56.3)
Believe chloroquine is the most effective antimalarial medicine for treating <i>P. vivax</i> malaria	76.4 (70.1,81.8)	81.1 (70.9,88.2)	79.3 (72.9,84.4)	65.2 (55.7,73.6)	49.5 (33.5,65.7)	7.6 (4.5,12.5)	59.0 (48.2,69.0)	44.4 (37.1,51.9)
Report most frequently recommending an ACT to customers for treatment of <i>P. falciparum</i> malaria	94.3 (90.1,96.8)	93.7 (88.5,96.7)	94.0 (90.4,96.2)	74.2 (60.7,84.3)	59.2 (48.6,69.1)	7.1 (4.3,11.5)	68.4 (60.8,75.2)	50.8 (42.7,58.9)
Report most frequently recommending chloroquine to customers for treatment of <i>P. vivax</i> malaria	67.8 (58.1,76.3)	79.9 (69.8,87.2)	75.2 (67.5,81.5)	60.6 (51.4,69.2)	48.9 (32.2,65.9)	5.9 (3.5,9.8)	56.2 (46.8,65.1)	41.7 (34.6,49.2)

3.7 Expired stock of antimalarials and storage conditions

Table 3.7.1 Outlets with expired stock and storage conditions, by outlet type								
	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of outlets that:	N=383	N=319	N=702	N=155	N=89	N=150	N=174	N=568
had expired stock of at least one								
ACT	6.5	21.3	15.5	10.1	19.2	4.2	7.7	8.5
	(4.0, 10.4)	(14.5, 30.2)	(10.7, 21.8)	(6.2, 16.1)	(10.6, 32.4)	(1.7, 10.0)	(4.2, 13.7)	(5.5, 12.9)
ASMQ or DHA-PPQ	6.5	21.3	15.5	10.1	19.2	4.2	7.7	8.5
	(4.0, 10.4)	(14.5, 30.2)	(10.7, 21.8)	(6.2, 16.1)	(10.6, 32.4)	(1.7, 10.0)	(4.2, 13.7)	(5.5, 12.9)
• Malarine	0.4	0.3	0.4	1.0	16.4	3.1	6.4	7.4
	(0.1, 1.5)	(0.1, 2.2)	(0.1, 1.2)	(6.1, 16.0)	(9.1, 27.8)	(1.2, 7.7)	(3.2, 12.4)	(4.6, 11.5)
• A+M	4.8	18.0	12.8	0.0	1.9	1.1	0.6	0.8
	(2.6, 8.6)	(11.1, 27.7)	(7.9, 20.1)	-	(0.7, 5.0)	(0.2, 5.9)	(0.1, 2.3)	(0.3, 1.8)
• DHA-PPQ	1.6	3.5	2.7	0.1	1.0	0.0	0.8	0.4
	(0.6, 4.1)	(2.0, 6.0)	(1.9, 3.9)	(0.03, 0.3)	(0.2, 4.8)	-	(0.3, 2.3)	(0.2, 1.0)
Non-artemisinin therapy	0.9	0.0	0.4	1.0	1.5	1.2	2.1	1.5
	(0.3, 2.8)	-	(0.1, 1.1)	(0.3, 3.0)	(0.2, 10.1)	(0.2, 7.6)	(0.4, 9.8)	(0.4, 5.2)
Any Artemisinin monotherapy	6.6	4.5	5.3	3.3	0	0.1	2.6	1.7
	(3.0, 13.9)	(0.8, 21.7)	(1.9, 14.3)	(1.2, 8.5)	-	(0.02, 0.2)	(1.1, 6.0)	(0.9, 3.4)
	N=381	N=316	N=697	N=154	N=89	N=149	N=173	N=565
Proportion of outlets that had acceptable storage conditions for medicines	93.9	97.2	95.9	95.4	94.2	82.5	94.7	91.1
	(86.3, 97.4)	(93.5, 98.8)	(92.2, 97.9)	(87.6, 98.4)	(84.9, 97.9)	(67.5, 91.4)	(89.7, 97.4)	(84.8, 94.9)

3.8 Malaria Microscopic and Rapid Diagnostic Tests

Table 3.8.1 Availability of malaria microscopic tests and rapid diagnostic tests, by outlet type								
Malaria Testing Availability	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of outlets that had:	N=394	N=345	N=739	N=210	N=103	N=208	N=256	N=777
Any test	95.4	96.9	96.3	62.2	44.9	4.7	63.5	44.2
	(91.8, 97.4)	(93.4, 98.6)	(93.9, 97.8)	(49.3, 73.7)	(30.1, 60.7)	(2.7, 8.2)	(54.9, 71.3)	(38.3, 50.2)
	N=391	N=341	N=732	N=210	N=103	N=208	N=256	N=777
Microscopic blood testing facilities	22.5	0.5	9.1	22.5	9.3	0.9	23.5	15.3
	(18.8, 26.6)	(0.2, 1.6)	(6.6, 12.3)	(13.7, 34.6)	(4.4, 18.7)	(0.2, 5.2)	(13.2, 38.4)	(9.7, 23.4)
	N=394	N=345	N=739	N=210	N=103	N=207	N=256	N=776
Rapid diagnostic tests	93.9	96.9	95.7	51.1	44.2	4.8	43.7	34.0
	(90.1, 96.3)	(93.4, 98.6)	(93.2, 97.3)	(39.8, 62.3)	(29.6, 59.9)	(2.7, 8.3)	(31.8, 56.5)	(28.5, 40.0)

Table 3.8.2 Volumes of malaria diagnostic tests and rapid diagnostic tests, across outlet types								
Volumes of Malaria tests sold or distributed in the previous week	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	%	%	%	%	%	%	%	%
Microscopic blood testing facilities	10.5	0.0	10.6	4.8	0.5	0.0	0.7	5.9
Rapid diagnostic tests	22.2	22.9	45.1	15.1	4.2	1.3	17.9	38.5

Table 3.8.3 Volumes of malaria diagnostic tests and rapid diagnostic tests, within outlet type								
Volumes of Malaria tests sold or distributed in the previous week	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	%	%	%	%	%	%	%	%
Microscopic blood testing facilities	32.2	0.1	19.0	24.0	9.6	0.0	3.7	13.3
Rapid diagnostic tests	67.8	99.9	81.0	76.0	90.4	100.0	96.3	86.7

Table 3.8.4 Cost of malaria diagnostic tests and rapid diagnostic tests to patients, by outlet type								
	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	N/A	N/A	N/A	N_RDTs=108	N_RDTs=59	N_RDTs=5	N_RDTs=120	N_RDTs=292
Median private sector price of microscopy tests [IQR]	-	-	-	0.74	0.49	2.46	0.74	0.74
	-	-	-	[0.49, 0.86]	[0.37, 0.49]	[2.46, 2.46]	[0.74, 1.48]	[0.49, 1.23]
	N/A	N/A	N/A	N_RDTs=108	N_RDTs=59	N_RDTs=5	N_RDTs=120	N_RDTs=292
Median private sector price of RDT [IQR]	-	-	-	0.49	0.62	0.49	0.49	0.49
	-	-	-	[0.49, 0.74]	[0.49, 0.74]	[0.49, 0.86]	[0.36, 0.99]	[0.49, 0.74]

3.9 Cocktails

Table 3.9.1 Availability and presentation of cocktails, by outlet type

	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of providers that state the outlet:	N/A	N/A	N/A	N=408	N=293	N=15781	N=657	N=17142
Provides cocktails	-	-	-	14.2	17.6	1.3	13.1	2.3
	-	-	-	(10.0, 19.8)	(9.9, 29.4)	(0.7, 2.4)	(8.2, 20.2)	(1.4, 3.6)
Proportion of providers that state cocktails are:	N/A	N/A	N/A	N=198	N=95	N=226	N=228	N=747
Pre-made	-	-	-	0.0	2.2	29.8	0.6	11.1
	-	-	-	-	(0.7,7.1)	(20.4,41.4)	(0.1,2.8)	(6.9,17.2)
Prepared when customers come for treatment	-	-	-	98.6 (96.5,99.4)	92.3 (82.1,96.9)	51.2 (40.4,61.9)	98.1 (95.2,99.3)	80.9 (73.5,86.6)
Both	-	-	-	1.4 (0.6,3.5)	5.5 (1.8,15.6)	19.0 (10.8,31.3)	1.3 (0.4,4.1)	8.0 (4.7,13.5)
Proportion of providers that state cocktails are obtained from:	N/A	N/A	N/A	N=198	N=95	N=226	N=228	N=747
Other providers	-	-	-	0.3	1.6	27.9	1.0	10.5
	-	-	-	(0.1,1.7)	(0.6,4.3)	(19.6,38.0)	(0.4,2.9)	(7.4,14.9)
Wholesalers	-	-	-	0.6	0.9	10.5	0.8	4.2
	-	-	-	(0.1,3.8)	(0.2,3.7)	(6.2,17.2)	(0.1,4.5)	(2.7,6.7)
Made in the outlet	-	-	-	99.4	97.5	57.7	98.2	83.9
	-	-	-	(96.2,99.9)	(92.7,99.2)	(44.9,69.5)	(95.2,99.3)	(76.0,89.5)

Continued on next page

	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of providers that:	N=393	N=343	N=736	N=209	N=103	N=208	N=256	N=776
Cut blister packs or sell partial packs of antimalarials	27.0 (20.9,34.2)	29.3 (16.0,47.3)	28.4 (18.5,40.9)	10.3 (5.9,17.2)	11.7 (6.1,21.2)	12.4 (4.3,30.7)	20.9 (10.7,36.8)	15.2 (9.2,24.1)
Reasons for selling cut blisters of partial packs	N=107	N=125	N=232	N=25	N=10	N=24	N=45	N=104
• Partial packs are sufficient to treat the patient	50.9 (35.3,66.3)	58.8 (41.7,74.0)	55.9 (42.5,68.4)	33.1 (9.8,69.3)	16.4 (3.2,54.0)	51.1 (23.2,78.3)	49.3 (30.3,68.5)	46.2 (30.3,62.9)
• Easier for patient to take the medicine	32.5 (19.7,48.5)	15.0 (3.4,30.1)	21.3 (12.2,34.4)	47.6 (23.1,73.4)	59.4 (31.6,82.3)	15.8 (4.1,45.2)	42.8 (29.2,57.5)	33.7 (19.6,51.5)
• Use to make cocktails	0.0	0.0	0.0	1.6 (0.3,9.5)	0.0	29.3 (18.3,43.4)	0.0	11.7 (4.4,27.5)
• Small/insufficient stock	16.6 (10.4,25.3)	26.4 (15.7,41.0)	22.8 (15.6,32.0)	8.5 (3.3,20.1)	2.7 (0.7,10.0)	0.0	0.0	1.9 (0.5,3.0)
• Requested by patient	0.0	0.2 (0.1,0.6)	0.1 (0.03,0.4)	3.2 (0.5,18.1)	0.0	2.2 (0.2,17.2)	0.7 (0.2,2.7)	1.5 (0.4,5.7)
• Full blister or pack is too expensive for patient	0.0	0.0	0.0	0.0	21.4 (6.1,53.2)	1.6 (0.3,8.0)	7.3 (2.1,22.0)	5.0 (1.9,12.5)
• It is more profitable to sell partial blister or pack	0.0	0.0	0.0	6.0 (0.9,31.0)	0.0	0.0	0.0	0.7 (0.1,5.5)

3.10 Provider Awareness

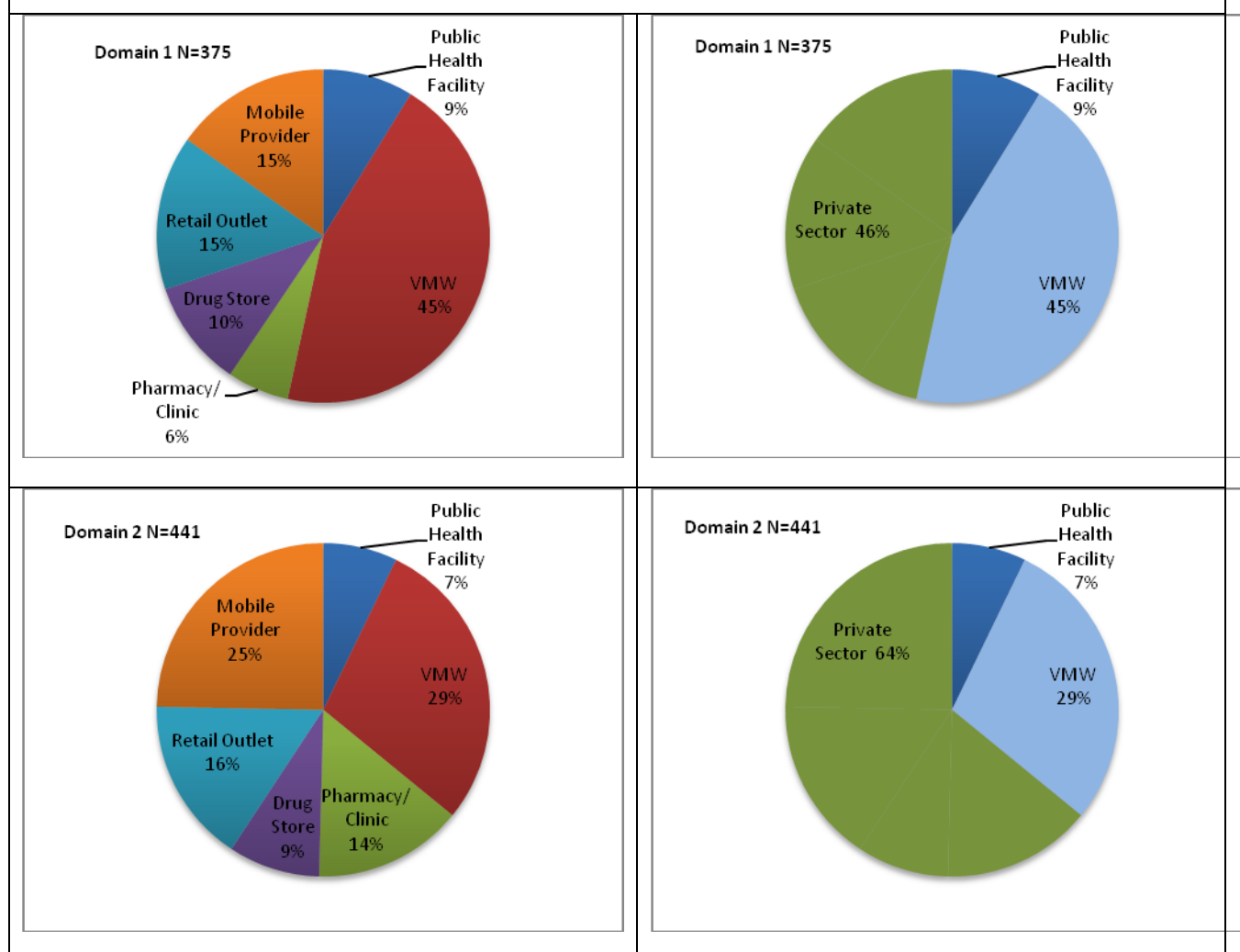
Table 3.10.1 Provider awareness of artemisinin resistance containment efforts

	Public Health Facility	VMW	Total PHF/VMW	Pharmacy/ Clinic	Drug Store	Retail Outlet	Mobile Provider	Total Private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of providers that:	N=394	N=345	N=739	N=210	N=103	N=208	N=256	N=777
Heard about activities to stop the spread of antimalarial drug resistance [in this area of Cambodia]	65.8 (58.3,72.5)	56.1 (42.8,68.5)	59.9 (50.9,68.2)	70.1 (62.6,76.6)	37.3 (26.0,50.3)	24.4 (17.0,33.6)	57.8 (46.2,68.6)	48.8 (39.7,58.0)
Know some antimalarial drugs are banned in Cambodia	50.6 (43.6,57.6)	41.5 (26.7,57.9)	45.0 (34.1,56.5)	64.3 (53.1,74.1)	48.9 (33.3,64.6)	18.4 (11.5,28.1)	50.8 (44.1,57.5)	44.1 (37.4,51.1)
Proportion of providers that:	N=221	N=201	N=422	N=147	N=60	N=50	N=141	N=398
Report that oral artemisinin monotherapies are banned	34.3 (26.1,43.5)	32.0 (22.7,42.9)	33.0 (26.2,40.5)	64.5 (53.0,74.6)	72.9 (49.7,88.0)	36.5 (25.6,49.0)	40.9 (32.5,49.8)	51.3 (45.1,57.5)

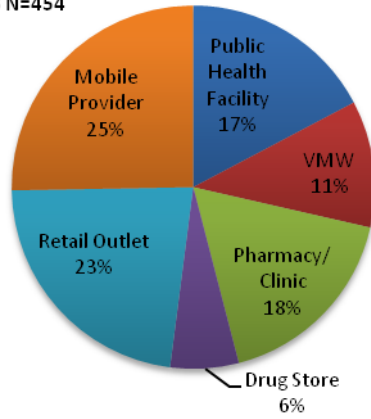
4. Results – 2011 findings across domains

4.1 Availability of antimalarial drugs

Figure 4. Distribution of outlets with at least one antimalarial in stock, by domain, 2011



Domain 3 N=454



Domain 3 N=454

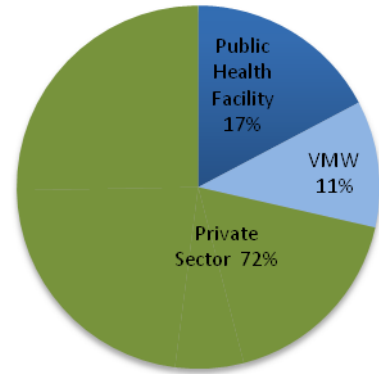


Table 4.1.1 Availability of antimalarials among all outlets on the day of survey, by domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Among all outlets, proportion of outlets that had:	N=271	N=3886	N=183	N=5953	N=327	N=7303
Any AM	89.5 (85.9,92.3)	7.3 (4.2,12.4)	94.2 (86.2,97.7)	5.1 (3.8,6.9)	93.5 (86.8,96.9)	2.8 (1.8,4.2)
Any ACT	81.8 (75.1,87.0)	4.5 (2.4,8.2)	93.5 (85.8,97.1)	2.8 (2.0,3.9)	91.2 (82.9,95.6)	1.2 (0.8,1.8)
• ASMQ	0.3 (0.1,1.3)	4.0 (2.0,8.0)	59.9 (36.0,79.8)	2.5 (1.8,3.6)	82.2 (68.3,90.8)	1.2 (0.8,1.8)
Malarine	0.0 -	3.8 (1.9,7.6)	1.6 (0.5,4.9)	2.4 (1.6,3.4)	0.1 (0.01,0.8)	1.0 (0.7,1.6)
A+M	0.3 (0.1,1.3)	0.2 (0.1,0.4)	59.6 (35.8,79.6)	0.3 (0.2,0.6)	82.2 (68.3,90.8)	0.1 (0.04,0.5)
• DHA+PPQ	81.8 (75.1,87.0)	0.8 (0.5,1.4)	37.9 (15.5,66.9)	0.3 (0.2,0.8)	9.3 (4.2,19.3)	0.1 (0.03,0.2)
• Other ACT	0.0 -	0.2 (0.5,0.3)	0.0 -	0.2 (0.04,0.6)	0.4 (0.1,2.7)	0.02 (0.01,0.1)
Non-artemisinin therapy	59.3 (53.0,65.3)	4.8 (2.6,8.9)	69.2 (59.0,77.8)	3.1 (2.3,4.3)	57.4 (49.8,64.6)	1.5 (0.8,2.9)
• Chloroquine	59.2 (53.0,65.0)	4.8 (2.6,8.9)	67.9 (56.8,77.4)	2.9 (2.1,4.1)	53.8 (43.6,63.6)	1.4 (0.7,2.8)
• SP	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
• Quinine	2.5 (1.3,4.6)	0.0 -	4.0 (1.5,10.3)	0.2 (0.1,0.4)	7.0 (3.4,13.9)	0.1 (0.1,0.4)
• Quinine injection	0.1 (0.05,0.5)	0.0 -	0.8 (0.2,4.0)	0.1 (0.01,0.3)	0.1 (0.03,0.6)	0.1 (0.05,0.2)
Any Artemisinin monotherapy	0.7 (0.4,1.4)	1.0 (0.5,2.0)	5.1 (2.5,10.1)	0.7 (0.5,1.2)	13.4 (6.4,26.0)	0.4 (0.2,0.8)
• Oral artemisinin monotherapy	0.0 -	0.01 (0.002,0.02)	0.0 -	0.2 (0.1,0.5)	0.0 -	0.1 (0.03,0.7)
• Non-oral artemisinin monotherapy	0.7 (0.4,1.4)	1.0 (0.5,2.0)	5.1 (2.5,10.1)	0.6 (0.4,1.0)	13.4 (6.4,26.0)	0.3 (0.1,0.5)
Any cocktail	-	3.6 (2.1,5.9)	-	3.0 (2.3,3.9)	-	2.0 (1.0,4.0)

Table 4.1.2 Availability of antimalarials among all outlets with antimalarials in stock on the day of survey, by domain

	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Among all outlets, proportion of outlets that had:	N=271	N=3890	N=183	N=5953	N=327	N=7304
Any AM	89.6 (85.9, 92.4)	7.3 (4.2, 12.3)	94.2 (86.2, 97.7)	5.1 (3.8, 6.9)	93.5 (86.8, 96.9)	2.8 (1.8, 4.2)
Among outlets with at least one AM in stock, proportion of outlets that had:	N=244	N=131	N=174	N=267	N=284	N=170
Any ACT	91.4 (87.3, 94.2)	61.3 (56.2, 66.3)	99.2 (96.9, 99.8)	56.1 (46.1, 65.6)	97.5 (93.8, 99.0)	44.6 (30.7, 59.5)
• ASMQ	0.4 (0.1, 1.4)	55.2 (46.4, 63.7)	63.6 (36.5, 84.1)	50.2 (36.6, 60.8)	87.9 (75.9, 94.4)	41.8 (28.6, 56.2)
Malarine	0.0 -	52.8 (44.4, 61.1)	1.7 (0.5, 5.2)	46.6 (36.6, 56.9)	0.1 (0.01, 0.8)	38.1 (27.8, 49.6)
A+M	0.4 (0.1, 1.4)	2.0 (1.4, 2.8)	63.3 (36.3, 83.9)	5.7 (3.0, 10.4)	87.9 (75.9, 94.4)	5.2 (1.4, 17.4)
• DHA+PPQ	91.4 (87.3, 94.2)	11.2 (9.9, 12.6)	40.2 (16.6, 69.3)	6.6 (3.1, 13.6)	10.0 (4.4, 20.9)	2.9 (0.9, 8.7)
• Other ACT	0 -	3.2 (2.5, 4.1)	0.0 -	3.0 (0.7, 11.9)	0.4 (0.1, 2.9)	0.8 (0.2, 3.5)
Non-artemisinin therapy	66.3 (60.7, 71.4)	66.6 (61.6, 71.3)	73.4 (65.5, 80.0)	61.2 (53.7, 68.2)	61.4 (53.5, 68.8)	54.1 (35.5, 71.6)
• Chloroquine	66.1 (60.7, 71.1)	66.6 (61.6, 71.3)	72.1 (63.1, 79.6)	57.3 (50.1, 64.3)	57.6 (47.0, 67.5)	51.1 (33.6, 68.4)
• SP	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
• Quinine	2.7 (1.4, 5.1)	0 -	4.2 (1.6, 10.9)	3.2 (1.2, 8.4)	7.5 (3.6, 15.0)	5.0 (2.6, 9.5)
• Quinine injection	0.2 (0.05, 0.5)	0 -	0.8 (0.2, 4.3)	1.2 (0.3, 5.0)	0.2 (0.03, 0.7)	3.8 (2.1, 7.0)
Any Artemisinin monotherapy	0.8 (0.4, 1.6)	13.8 (11.7, 16.4)	5.4 (2.6, 10.8)	14.6 (9.0, 23.0)	14.3 (6.8, 27.7)	14.1 (6.2, 29.0)
• Oral artemisinin monotherapy	0.0 -	0.1 (0.02, 0.4)	0.0 -	3.8 (1.6, 9.1)	0.0 -	5.0 (0.9, 23.8)
• Non-oral artemisinin monotherapy	0.8 (0.4, 1.6)	13.8 (11.7, 16.4)	5.3 (2.6, 10.8)	11.8 (7.3, 18.5)	14.3 (6.8, 27.7)	9.1 (4.2, 18.4)

4.2 Stock outs of antimalarials

Table 4.2.1 Disruption in stock in the past three months of antimalarials and rapid diagnostic tests, by domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of outlets that had no disruption in stock in the past three months of any:	N=267	N=170	N=178	N=365	N=294	N=242
Any ACT	36.5	62.4	27.6	45.0	31.9	35.2
	(32.7, 40.4)	(51.3, 72.3)	(19.2, 37.9)	(37.2, 53.2)	(23.6, 41.5)	(28.3, 43.3)
Any ASMQ/DHA-PPQ	0.0	14.9	0.0	1.4	0.4	0.9
	-	(11.9, 18.6)	-	(0.5, 3.4)	(0.1, 1.3)	(0.2, 4.3)
Malarine	0.1	47.6	2.1	36.9	0.3	31.4
	(0.03, 0.5)	(38.5, 56.8)	(0.4, 10.9)	(28.7, 46.0)	(0.1, 1.6)	(25.1, 38.5)
A+M	0.0	6.6	23.5	6.9	30.8	3.0
	-	(5.1, 8.5)	(15.4, 34.1)	(3.9, 11.9)	(22.5, 40.6)	(1.0, 9.2)
DHA-PPQ	36.3	24.6	4.4	4.6	1.4	2.3
	(32.6, 40.3)	(21.0, 28.6)	(1.6, 11.8)	(2.1, 9.8)	(0.5, 3.8)	(1.1, 5.1)
Non-artemisinin therapy	37.6	33.2	18.0	35.3	19.4	29.1
	(34.6, 40.6)	(28.2, 38.6)	(13.8, 23.2)	(27.8, 43.6)	(11.3, 31.3)	(18.8, 42.2)
• Chloroquine	37.6	33.2	17.6	31.9	18.8	27.9
	(34.6, 40.6)	(28.2, 38.6)	(13.5, 22.7)	(25.5, 39.1)	(10.7, 31.0)	(18.1, 40.3)
Rapid diagnostic tests	6.4	15.0	3.0	17.1	2.8	13.7
	(4.0, 10.1)	(13.5, 16.7)	(1.1, 8.2)	(12.8, 22.5)	(1.1, 6.5)	(9.2, 20.0)

4.3 Cost and affordability to patients of antimalarials

Table 4.3.1 Cost to patients of antimalarials, by domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	%	%	%	%	%	%
Distribution of free drugs:	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)
Proportion of ASMQ distributed free of cost (by volumes of AETDs)	- (2)	0.0 (54)	99.1 (301)	0.2 (157)	94.6 (518)	0.0 (97)
	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]
Median price of a full course of an AETD:	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)
Any ACT	0.00	1.97	0.00	1.62	0.00	1.42
	[0.00, 0.00]	[1.31, 2.77]	[0.00, 0.00]	[1.22, 2.43]	[0.00, 0.00]	[1.01, 2.03]
	(243)	(73)	(359)	(171)	(567)	(101)
• Any ASMQ	0.00	1.83	0.00	1.48	0.00	1.23
	[0.00, 0.00]	[1.31, 2.22]	[0.00, 0.00]	[1.22, 2.03]	[0.00, 0.00]	[1.01, 2.03]
	(2)	(51)	(299)	(148)	(503)	(94)
A+M	0.00	1.97	0.00	1.11	0.00	0.99
	[0.00, 0.00]	-	[0.00, 0.00]	[0.99, 1.72]	[0.00, 0.00]	[0.86, 1.72]
	(2)	(1)	(296)	(13)	(502)	(7)
Malarine	-	1.83	0.00	1.48	0.00	1.31
	-	[1.23, 2.22]	[0.00, 0.00]	[1.22, 2.03]	-	[1.10, 2.03]
	(0)	(50)	(3)	(135)	(1)	(87)
• DHA+PPQ	0.00	7.20	0.00	2.77	0.00	2.77
	[0.00, 0.00]	[2.77, 8.31]	[0.00, 0.00]	[2.22, 8.31]	[0.00, 0.00]	[2.77, 4.43]
	(241)	(19)	(60)	(17)	(64)	(5)
• Other ACT	-	13.62	-	9.08	-	2.72
	-	[7.26, 13.62]	-	[7.26, 9.08]	-	[2.72, 13.62]
	(0)	(3)	(0)	(6)	(0)	(2)
Non-artemisinin therapy	0.00	0.49	0.00	0.74	0.00	0.74
	[0.00, 0.80]	[0.41, 0.74]	[0.00, 0.00]	[0.37, 1.23]	[0.00, 0.00]	[0.49, 1.48]
	(24)	(42)	(31)	(90)	(26)	(48)
Chloroquine, the 'most popular' non-ACT antimalarial treatment in Cambodia	0.00	0.49	0.00	0.74	0.00	0.74
	[0.00, 1.23]	[0.41, 0.74]	[0.00, 0.00]	[0.37, 1.23]	[0.00, 0.00]	[0.25, 0.99]
	(19)	(42)	(23)	(87)	(23)	(42)

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	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]
Median price of a full course of an AETD:	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)	(N of AMs)
Any Artemisinin monotherapy	0.00	23.65	0.00	14.78	0.00	17.24
	[0.00, 0.00]	[23.65,29.56]	[0.00, 0.00]	[9.86, 20.69]	[0.00, 0.00]	[4.73, 23.65]
	(3)	(16)	(13)	(29)	(22)	(20)
• Oral artemisinin monotherapy	-	3.15	-	2.37	-	2.76
	-	-	-	[1.67, 2.96]	-	[2.37, 4.73]
	(0)	(1)	(0)	(4)	(0)	(5)
• Non-oral artemisinin monotherapy	0.00	23.65	0.00	17.74	0.00	23.65
	[0.00, 0.00]	[23.65,29.56]	[0.00, 0.00]	[14.78,22.17]	[0.00, 0.00]	[17.24,23.65]
	(3)	(15)	(13)	(25)	(22)	(15)

Table 4.3.2 Affordability of antimalarials to patients, by domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
Median price of a full course of an adult equivalent ACT treatment dose, by brand name relative to the minimum legal daily wage in Cambodia (\$1.48)	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio
Any ACT	-	1.3	-	1.1	-	1.0
• Any ASMQ	-	1.2	-	1.0	-	0.8
• DHA+PPQ	-	4.9	-	1.9	-	1.9
Median price of a full course adult first-line treatment [ASMQ] relative to international reference price (\$3.85)	-	0.5	-	0.4	-	0.3
Median price of a full course adult first-line treatment [DHA-PPQ] relative to international reference price (\$5.18)	-	1.4	-	0.5	-	0.5
	N/A	% (CI)	N/A	% (CI)	N/A	% (CI)
	Ratio	Ratio	Ratio	Ratio	Ratio	Ratio
Median price of a full course of an adult equivalent ACT treatment dose, by A+M relative to the minimum legal daily wage in Cambodia (\$1.48)	-	1.3	-	0.8	-	0.7
Median price of a full course of an adult equivalent ACT treatment dose, by Malarine relative to the minimum legal daily wage in Cambodia (\$1.48)	-	1.2	-	1.0	-	0.9
		N=169		N=362		N=242
Proportion of outlets that offer credit to consumers for antimalarials	-	52.9	-	39.5	-	27.6
	-	(40.6, 64.7)	-	(29.2, 50.8)	-	(15.6, 44.0)

4.4 Volumes of antimalarials

Table 4.4.1 Volumes of antimalarials sold or distributed in the past two weeks for the entire country, by domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	%	%	%	%	%	%
Any ACT	2.7	1.9	12.6	6.0	10.8	7.0
• Any ASMQ	0.0	1.7	10.8	5.3	10.5	6.6
A+M	0.0	-	10.8	0.1	10.5	0.3
Malarine	-	1.7	0.0	5.2	-	6.0
• DHA+PPQ	2.7	0.2	1.9	0.7	0.4	0.4
• Other ACT	-	0.0	-	0.0	-	0.0
Non-artemisinin therapy	1.3	10.3	1.6	31.1	0.0	8.2
• Chloroquine	1.3	10.3	1.6	31.0	0.0	8.1
• SP	-	-	-	-	-	-
• Quinine	0.0	-	0.0	-	0.0	-
Any Artemisinin monotherapy	0.0	0.0	0.3	0.8	4.2	1.0
• Oral artemisinin monotherapy	0.0	0.0	0.0	0.6	0.0	0.1
• Non-oral artemisinin monotherapy	0.0	0.0	0.3	0.2	4.2	0.9

Table 4.4.2 Volumes of antimalarials sold or distributed in the past two weeks within each domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	%	%	%	%	%	%
Any ACT	16.5	11.6	24.1	11.5	34.6	22.4
• Any ASMQ	0.0	10.7	20.5	10.2	33.5	21.1
A+M	0.0	-	20.5	0.2	33.5	1.0
Malarine	-	10.7	0.0	10.0	-	19.1
• DHA+PPQ	16.5	0.9	3.6	1.3	1.2	1.2
• Other ACT	-	0.0	-	0.0	-	0.1
Non-artemisinin therapy	8.1	63.5	3.1	59.3	0.1	26.3
• Chloroquine	8.1	63.5	3.1	59.0	0.1	25.7
• SP	-	-	-	-	-	-
• Quinine	0.0	-	0.0	-	0.0	-
Any Artemisinin monotherapy	0.1	0.2	0.5	1.5	13.3	3.2
• Oral artemisinin monotherapy	0.0	0.0	0.0	1.1	0.0	0.4
• Non-oral artemisinin monotherapy	0.1	0.2	0.5	0.4	13.3	2.8

4.5 Provider knowledge and perceptions

Table 4.5.1 Provider knowledge of the first line treatment and danger signs, by domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of providers that:	N=267	N=170	N=178	N=365	N=294	N=242
Correctly state the recommended first-line treatment for uncomplicated malaria	92.6 (85.2, 96.4)	54.5 (50.4, 58.5)	88.1 (78.9, 93.7)	63.6 (55.8, 70.7)	93.9 (87.7, 97.1)	49.5 (35.5, 63.7)
		N=170		N=365		N=242
Can list at least one danger sign in a child that requires referral to a public health facility:	-	62.6 (59.4, 65.7)	-	72.9 (67.0, 78.2)	-	66.1 (58.9, 72.6)
• Convulsions	-	29.5 (27.8, 31.2)	-	26.7 (22.6, 31.1)	-	32.2 (26.0, 39.0)
• Vomiting	-	23.9 (21.6, 26.2)	-	26.5 (21.5, 32.3)	-	28.3 (23.5, 33.6)
• Unable to drink/breastfeed	-	15.9 (13.4, 18.7)	-	10.7 (7.2, 15.6)	-	17.2 (12.2, 23.7)
• Excessive sleep/difficult to wake up	-	24.1 (19.9, 28.9)	-	39.9 (34.9, 45.1)	-	25.3 (17.8, 34.6)
• Unconscious/coma	-	15.1 (13.4, 17.0)	-	16.4 (10.6, 24.5)	-	19.6 (14.5, 26.0)

Table 4.5.2 Provider Perceptions of antimalarials, by domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
	N=267	N=169	N=177	N=362	N=286	N=240
Agree with the statement, "Most customers request an antimalarial by brand name or generic name."	0.4 (0.1, 1.4)	53.5 (46.3, 60.6)	1.7 (0.4, 6.9)	24.1 (18.6, 30.6)	10.4 (3.2, 29.0)	18.7 (12.2, 27.5)
	N=263	N=166	N=162	N=352	N=241	N=230
Agree with the statement, "I decide which antimalarial medicine most customers receive."	99.6 (98.4, 100.0)	67.8 (65.5, 70.0)	99.7 (97.6, 100.0)	84.5 (79.7, 88.4)	91.7 (74.0, 97.7)	82.4 (73.2, 89.0)
	N/A	N=170	NA	N=365	NA	N=225
* Private sector providers in target provinces recommending appropriate treatment for malaria	-	49.2 (45.4, 53.0)	-	54.7 (44.7, 64.3)	-	50.4 (38.2, 62.6)
Proportion of providers that:	N=267	N=170	N=178	N=365	N=294	N=242
believe an ACT is the most effective antimalarial medicine for treating uncomplicated <i>P. falciparum</i> malaria	94.7 (89.5, 97.4)	53.3 (48.0, 58.5)	89.0 (80.4, 94.1)	53.6 (45.2, 61.9)	93.6 (87.4, 96.9)	48.5 (40.1, 56.9)
believe chloroquine is the most effective antimalarial medicine for treating <i>P. vivax</i> malaria	90.1 (87.7, 92.8)	53.6 (50.5, 56.7)	80.4 (68.7, 88.5)	50.5 (41.5, 59.5)	72.8 (62.2, 81.2)	40.5 (30.6, 51.3)
report most frequently recommending an ACT to customers for treatment of <i>P. falciparum</i> malaria	94.2 (88.6, 97.1)	49.2 (45.4, 53.0)	90.2 (81.2, 95.1)	54.7 (44.7, 64.3)	95.9 (91.0, 98.2)	50.0 (38.0, 61.2)
report most frequently recommending chloroquine to customers for treatment of <i>P. vivax</i> malaria	89.3 (86.4, 91.6)	54.2 (49.4, 58.8)	78.5 (65.6, 87.5)	52.3 (43.8, 60.7)	66.1 (53.1, 77.1)	35.6 (26.8, 45.6)

4.6 Malaria Microscopic and Rapid Diagnostic Tests

Table 4.6.1 Availability of malaria microscopic tests and rapid diagnostic tests, by domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of outlets that had:	N=267	N=170	N=178	N=365	N=294	N=242
Any test	94.1	45.6	98.2	49.4	96.5	42.0
	(89.6, 96.7)	(44.3, 46.9)	(91.4, 99.6)	(39.0, 59.9)	(92.3, 98.5)	(34.2, 50.2)
Microscopic blood testing facilities	N=263	N=170	N=178	N=365	N=291	N=242
	6.1	9.8	6.7	13.1	11.8	17.1
	(4.8, 7.8)	(8.0, 12.1)	(3.4, 12.8)	(7.8, 21.3)	(7.3, 18.7)	(9.0, 29.9)
Rapid diagnostic tests	N=267	N=170	N=178	N=365	N=294	N=241
	94.1	43.7	97.5	42.7	95.7	29.1
	(89.6, 96.7)	(40.9, 46.5)	(91.2, 99.3)	(32.1, 54.1)	(91.0, 98.0)	(22.6, 36.7)

Table 4.6.2 Volumes of malaria microscopic tests and rapid diagnostic tests, domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	%	%	%	%	%	%
Microscopic blood testing facilities	0.8	4.1	19.0	4.8	11.3	7.8
Rapid diagnostic tests	58.0	37.2	28.4	47.8	47.7	33.3

Table 4.6.3 Volumes of malaria microscopic tests and rapid diagnostic tests, domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	%	%	%	%	%	%
Microscopic blood testing facilities	0.2	1.1	5.4	1.4	4.9	3.4
Rapid diagnostic tests	16.2	10.4	8.1	13.6	20.8	14.5

Table 4.6.4 Cost of malaria diagnostic tests and rapid diagnostic tests to patients, by domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	N/A	N=29	N/A	N=53	N/A	N=46
Median private sector price of microscopy tests [IQR]	-	0.74	-	0.74	-	0.74
	-	[0.49, 0.74]	-	[0.49, 1.23]	-	[0.49, 1.23]
	N/A	RDTs N=71		RDTs N=150		RDTs N=71
Median private sector price of RDT [IQR]	-	0.49	-	0.49	-	0.49
	-	[0.49, 0.74]	-	[0.49, 0.74]	-	[0.49, 0.74]

4.7 Cocktails

Table 4.7.1 Availability and presentation of cocktails, by domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of providers that state the outlet:	N/A	N=3886	N/A	N=5953	N/A	N=7303
Provides cocktails	-	3.6	-	3.0	-	2.0
	-	(2.1,5.9)	-	(2.3,3.9)	-	(1.0,3.9)
Proportion of providers that state cocktails are:	N/A	N=162	N/A	N=337	N/A	N=248
Pre-made	-	15.4 (13.7,17.2)	-	8.2 (4.9,13.4)	-	11.4 (6.0,20.9)
Prepared when customers come for treatment	-	81.9 (76.9,86.0)	-	85.7 (78.8,90.7)	-	79.2 (68.6,87.0)
Both	-	2.8 (0.9,8.6)	-	6.1 (4.0,9.2)	-	9.3 (4.7,17.7)
Proportion of providers that state cocktails are obtained from:	N/A	N=162	N/A	N=337	N/A	N=248
	-	6.0	-	7.3	-	12.2
	-	(2.9,11.7)	-	(4.6,11.6)	-	(7.8,18.5)
Other providers	-	10.3	-	4.5	-	3.4
	-	(8.6,12.3)	-	(2.1,9.5)	-	(1.5,7.5)
Wholesalers	-	84.0	-	88.2	-	82.4
	-	(81.4,86.2)	-	(81.5,92.6)	-	(70.9,90.1)
Made in the outlet	-		-		-	

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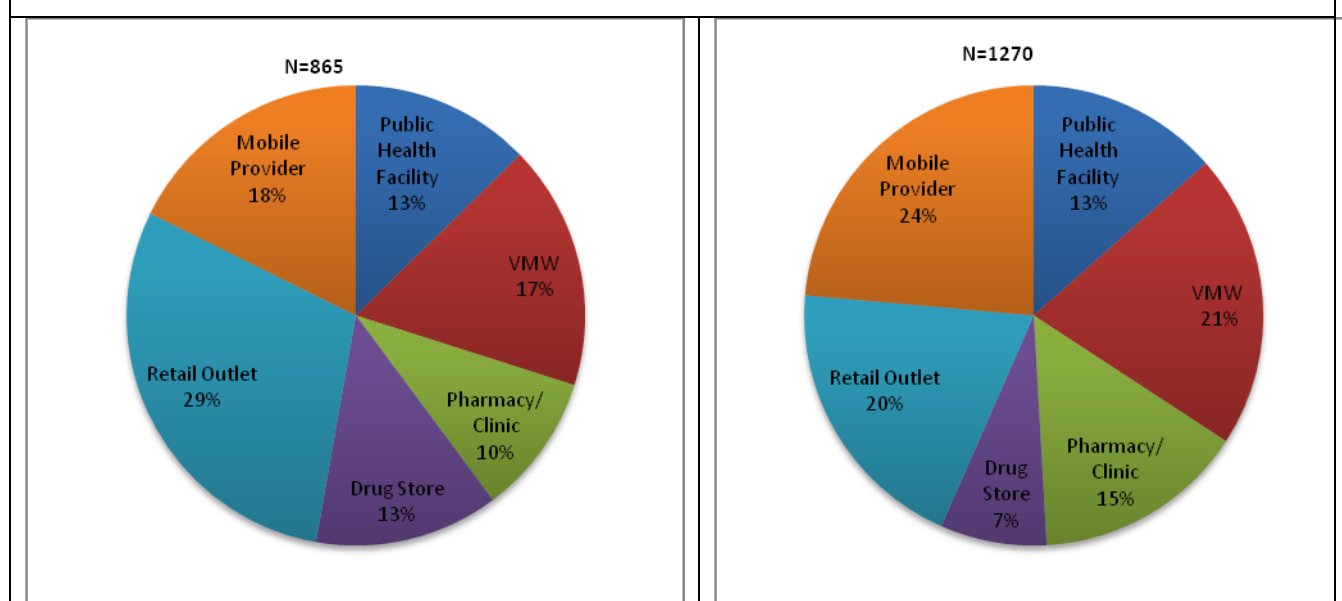
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of providers that:	N=267	N=169	N=175	N=365	N=294	N=242
Cut blister packs or sell partial packs of antimalarials	67.4 (48.8,81.8)	12.9 (10.8,15.4)	20.1 (8.2,41.6)	12.3 (7.7,19.1)	12.5 (6.5,22.8)	16.6 (8.1,31.2)
Reasons for selling cut blisters of partial packs:	N=134	N=26	N=45	N=44	N=53	N=34
Full blister or pack is too expensive for patient	0.0 -	2.2 (0.5,9.0)	0.0 -	21.1 (12.0,34.3)	0.0 -	1.7 (0.2,13.5)
It is more profitable to sell partial blister or pack	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	1.0 (0.1,7.8)
Cut or partial is sufficient	63.9 (45.3,79.1)	23.4 (15.1,34.4)	39.3 (26.9,53.3)	18.6 (9.6,32.9)	47.5 (23.8,72.3)	54.3 (36.7,70.8)
Small/insufficient stock	20.2 (17.6,23.2)	16.7 (12.4,22.1)	45.4 (24.4,68.2)	0.0 -	10.8 (3.7,27.5)	0.0 -
Easier for patient to take the medicine	15.7 (5.5,37.6)	56.4 (44.9,67.3)	15.3 (4.2,43.0)	48.7 (32.5,65.1)	41.8 (21.4,65.4)	28.4 (13.7,49.8)
Request by patient	0.2 (0.04,0.8)	1.3 (0.3,6.0)	0.0 -	8.7 (2.5,26.1)	0.0 -	0.0 -
for cocktail	0.0 -	0.0 -	0.0 -	3.0 (1.0,8.4)	0.0 -	14.6 (5.5,33.7)

4.8 Provider Awareness

Table 4.8.1 Provider awareness of artemisinin resistance containment efforts, by domain						
	Domain 1		Domain 2		Domain 3	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of providers that state the outlet:	N=267	N=170	N=178	N=365	N=294	N=242
Heard about activities to stop the spread of antimalarial drug resistance [in this area of Cambodia]	82.9 (78.2,86.7)	50.1 (47.4,52.7)	59.2 (43.3,73.4)	56.3 (51.5,60.9)	48.3 (38.4,58.3)	45.8 (33.1,59.0)
Know some antimalarial drugs are banned in Cambodia	64.2 (57.8,70.1)	55.0 (52.5,57.5)	49.3 (31.5,67.2)	53.7 (48.2,59.2)	32.8 (19.4,49.9)	38.7 (30.4,47.8)
Proportion of providers that:	N=189	N=95	N=87	N=198	N=146	N=105
Report that oral artemisinin monotherapies are banned	45.6 (35.2,56.4)	65.1 (62.3,67.7)	23.4 (15.6,33.6)	51.4 (40.2,62.5)	22.8 (16.2,43.4)	48.1 (39.0,57.4)
Report cocktails are banned	0.0	0.0	3.5 (1.5,8.3)	0.7 (0.1,4.7)	1.5 (0.3,7.2)	0.0

5. Results – 2009, 2011 trends over time

Figure 5. Distribution of outlets with at least one antimalarial in stock, 2011



Outlets with an antimalarial in stock (to show for executive summary pie chart)

	2009	2011 (N=1270)
PHF	12.6	13.5
VMWs	17.9	20.7
Pharmacy/ Clinic	9.8	14.9
Drug Store	12.9	7.5
Retail outlet	29.3	19.8
Mobile provider	17.5	23.6

5.1 Availability of antimalarial drugs

	2009				2011			
	PHF	VMW	Total PHF/VMW	Total private	PHF	VMW	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Among all outlets, proportion of outlets that had:	N=211	N=203	N=414	N=7013	N=428	N=353	N=781	N=17142
Any AM	85.0 (75.5, 91.2)	91.1 (84.7, 95.0)	88.4 (82.9, 92.3)	7.2 (5.7, 8.9)	91.1 (85.7, 94.6)	93.8 (89.5, 96.4)	92.7 (89.3, 95.1)	3.4 (2.6, 4.5)
Any ACT	83.6 (74.0, 90.1)	86.3 (76.4, 92.5)	85.1 (78.5, 89.9)	4.5 (3.7, 5.5)	86.6 (80.5, 91.0)	91.4 (86.0, 94.8)	89.5 (84.9, 92.7)	1.6 (1.3, 2.2)
• ASMQ	82.9 (73.3, 89.5)	80.8 (68.0, 89.3)	81.7 (73.3, 87.9)	4.2 (3.4, 5.0)	65.8 (54.9, 75.3)	49.8 (30.1, 69.5)	56.2 (42.3, 69.2)	1.5 (1.1, 2.0)
Malarine	3.5 (1.0, 11.6)	0.2 (<0.1, 1.6)	1.7 (0.6, 4.5)	3.8 (3.1, 4.7)	0.7 (0.3, 1.7)	0.3 (0.05, 2.1)	0.5 (0.2, 1.2)	1.4 (1.1, 1.9)
A+M	81.3 (72.0, 88.0)	80.8 (68.0, 89.3)	81.0 (72.4, 87.4)	0.7 (0.5, 1.0)	65.7 (54.7, 75.2)	49.8 (30.1, 69.5)	56.1 (42.2, 69.2)	0.2 (0.1, 0.4)
• DHA+PPQ	2.8 (1.1, 7.1)	5.8 (0.9, 30.4)	4.5 (1.0, 18.2)	0.5 (0.3, 0.8)	21.4 (14.0, 31.2)	43.5 (25.6, 63.2)	34.6 (23.4, 47.9)	0.2 (0.1, 0.3)
• Other ACT	0.0 --	0.6 (0.2, 2.4)	0.3 (0.1, 1.3)	0.3 (0.2, 0.6)	0.5 (0.1, 3.1)	0.0 --	0.2 (0.03, 1.3)	0.1 (0.02, 0.1)
Non-artemisinin therapy	40.7 (30.3, 52.0)	55.1 (38.5, 70.7)	48.8 (36.1, 61.6)	3.3 (2.2, 4.8)	60.8 (52.1, 68.9)	61.0 (55.5, 66.2)	60.9 (56.1, 65.5)	1.9 (1.3, 2.9)
• Chloroquine	29.7 (22.4, 38.2)	4.4 (2.1, 8.8)	15.6 (11.8, 20.2)	2.0 (1.5, 2.6)	55.9 (44.2, 66.9)	60.7 (55.0, 66.2)	58.8 (52.8, 64.5)	1.8 (1.2, 2.8)
• SP	0.0 --	0.0 --	0.0 --	0.0 --	0.0 --	0.0 --	0.0 --	0.0 --
• Quinine	16.3 (10.2, 25.0)	0.3 (<0.1, 2.0)	7.4 (5.1, 10.6)	1.4 (0.7, 2.8)	12.7 (8.3, 18.9)	0.0 --	5.1 (3.0, 8.4)	0.1 (0.1, 0.3)
• Quinine injection	3.5 (1.6, 7.4)	0.0 --	1.6 (0.6, 3.7)	0.3 (0.2, 0.6)	0.8 (0.3, 2.1)	0.0 --	0.3 (0.1, 0.9)	0.1 (0.04, 0.2)
Any Artemisinin monotherapy	29.6 (19.6, 42.1)	66.6 (49.9, 80.0)	50.3 (36.4, 64.1)	2.0 (1.4, 2.9)	13.9 (10.2, 18.7)	4.2 (0.7, 20.6)	8.1 (4.3, 14.6)	0.5 (0.3, 0.8)
• Oral artemisinin monotherapy	0.0 --	3.7 (1.6, 8.1)	2.0 (0.9, 4.5)	1.5 (0.9, 2.3)	0.0 --	0.0 --	0.0 --	0.1 (0.04, 0.5)
• Non-oral artemisinin monotherapy	29.6 (19.6, 42.1)	63.8 (47.4, 77.5)	48.7 (34.9, 62.7)	0.7 (0.5, 1.1)	13.9 (10.2, 18.7)	4.2 (0.7, 20.6)	8.1 (4.3, 14.6)	0.3 (0.2, 0.5)

Table 5.1.2 Availability of antimalarials among all outlets with antimalarials in stock on the day of survey, over time (2009-2011)

	2009				2011			
	PHF	V MW	PHF/VMW	Total private	PHF	VMW	PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Among all outlets, proportion of outlets that had:	N=211	N=203	N=414	N=7013	N=428	N=353	N=781	N=17142
Any AM	85.0 (75.5, 91.2)	91.1 (84.7, 95.0)	88.4 (82.9, 92.3)	7.2 (5.7, 8.9)	91.1 (85.7, 94.6)	93.8 (89.5, 96.4)	92.7 (89.3, 95.1)	3.4 (2.6, 4.5)
Among outlets with at least one AM in stock, proportion of outlets that had:	N=180	N=186	N=366	N=499	N=383	N=319	N=702	N=568
Any ACT	98.4 (96.2, 99.3)	94.7 (87.8, 97.8)	96.3 (92.0, 98.3)	62.9 (54.7, 70.4)	95.1 (91.5, 97.2)	97.4 (95.5, 98.6)	96.5 (94.4, 97.8)	49.2 (38.8, 59.7)
• ASMQ	97.5 (94.5, 98.9)	88.7 (73.5, 95.7)	92.4 (82.6, 96.9)	57.9 (50.2, 65.3)	72.3 (60.6, 81.6)	53.1 (32.5, 72.7)	60.6 (46.2, 73.5)	45.3 (35.6, 55.4)
Malarine	4.1 (1.2, 13.5)	0.3 (0.0, 1.8)	1.9 (0.7, 5.2)	52.9 (45.1, 60.5)	0.7 (0.3, 1.9)	0.3 (0.1, 2.2)	0.5 (0.2, 1.3)	41.8 (33.9, 50.1)
A+M	95.7 (91.1, 97.9)	88.7 (73.5, 95.7)	91.6 (81.7, 96.4)	9.4 (6.5, 13.4)	72.1 (60.4, 81.4)	53.1 (32.5, 72.7)	60.6 (46.1, 73.4)	5.0 (2.1, 11.5)
• DHA+PPQ	3.3 (1.3, 8.4)	6.4 (0.9, 32.9)	5.1 (1.1, 20.4)	7.2 (4.8, 10.6)	23.5 (15.4, 34.1)	46.4 (26.5, 67.4)	37.3 (24.8, 51.8)	4.7 (2.6, 8.3)
• Other ACT	0.0 --	0.7 (0.2, 2.7)	0.4 (0.1, 1.5)	4.2 (2.3, 7.5)	0.5 (0.1, 3.4)	0 --	0.2 (0.03, 1.4)	1.6 (0.7, 3.8)
Non-artemisinin therapy	47.9 (37.0, 59.0)	60.5 (41.1, 77.1)	55.1 (41.2, 68.3)	45.5 (36.5, 54.8)	66.8 (57.1, 75.2)	65.0 (59.8, 70.0)	65.7 (60.8, 70.4)	57.2 (45.3, 68.3)
• Chloroquine	35.0 (27.2, 43.6)	4.8 (2.3, 9.8)	17.6 (13.2, 23.0)	27.4 (21.8, 33.7)	61.3 (48.0, 73.1)	64.8 (59.3, 69.9)	63.4 (57.2, 69.2)	54.3 (43.0, 65.2)
• SP	0.0 --	0.0 --	0.0 --	0.0 --	0.0 --	0.0 --	0.0 --	0.0 --
• Quinine	19.2 (12.3, 28.6)	0.3 (0.1, 2.3)	8.3 (5.8, 11.8)	20.0 (11.6, 32.2)	13.9 (9.1, 20.6)	0 --	5.5 (3.2, 9.1)	4.0 (2.2, 7.3)
• Quinine injection	4.2 (1.9, 8.8)	0 --	1.8 (0.7, 4.3)	4.6 (2.6, 8.1)	0.8 (0.3, 2.4)	0 --	0.3 (0.1, 1.0)	2.8 (1.5, 5.1)
Any Artemisinin monotherapy	34.8 (23.9, 47.7)	73.1 (52.7, 86.9)	56.9 (41.5, 71.0)	28.4 (22.3, 35.4)	15.3 (11.3, 20.3)	4.5 (0.8, 21.7)	8.7 (4.7, 15.7)	14.2 (8.4, 23.1)
• Oral artemisinin monotherapy	0.0 --	4.0 (1.7, 9.0)	2.3 (1.0, 5.2)	20.3 (13.9, 28.8)	0 --	0 --	0.0 --	4.2 (1.1, 14.5)
• Non-oral artemisinin monotherapy	34.8 (23.9, 47.7)	70.0 (50.2, 84.4)	55.1 (39.8, 69.5)	10.4 (7.9, 13.5)	15.3 (11.3, 20.3)	4.5 (0.8, 21.7)	8.7 (4.7, 15.7)	10.2 (6.4, 16.0)

Table 5.1.3 Availability of diagnostic tests, over time (2009-2011)								
	2009				2011			
	PHF	VMW	Total PHF/VMW	Total private	PHF	VMW	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
	N=183	N=189	N=372	N=643	N=394	N=345	N=739	N=777
Any test	83.3	76.7	79.5	51.9	95.4	96.9	96.3	44.2
	(70.3, 91.4)	(61.9, 86.9)	(71.3, 85.8)	(42.5, 61.1)	(91.8, 97.4)	(93.4, 98.6)	(93.9, 97.8)	(38.3, 50.2)
	N=185	N=188	N=373	N=644	N=391	N=341	N=732	N=777
Microscopic	36.9	0.5	16.2	26.2	22.5	0.5	9.1	15.3
	(26.0, 49.3)	(0.1, 2.0)	(12.3, 21.1)	(20.3, 33.0)	(18.8, 26.6)	(0.2, 1.6)	(6.6, 12.3)	(9.7, 23.4)
	N=183	N=189	N=372	N=643	N=394	N=345	N=739	N=777
RDT	74.0	76.7	75.6	34.2	93.9	96.9	95.7	34.0
	(59.5, 84.7)	(61.9, 86.9)	(66.2, 82.9)	(25.7, 43.9)	(90.1, 96.3)	(93.4, 98.6)	(93.2, 97.3)	(28.5, 40.0)

5.2 Stock outs of antimalarials

	2009				2011			
	PHF	VMW	Total PHF/VMW	Total private	PHF	VMW	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of outlets that had no disruption in stock in the past three months of any:	N=182	N=189	N=371	N=438	N=391	N=338	N=729	N=532
Any ACT	65.4	39.4	50.5	34.7	70.0	66.4	32.2	63.2
	(55.2, 74.3)	(29.5, 50.3)	(41.5, 59.4)	(27.1, 43.1)	(61.2, 77.5)	(59.0, 73.1)	(27.4, 37.5)	(56.6, 69.3)
	N=174	N=177	N=351	N=308	N=368	N=304	N=672	N=300
Any ASMQ/DHA-PPQ	100.0	98.1	98.9	97.8	99.5	100	99.8	93.3
	--	(88.4, 99.7)	(93.3, 99.8)	(95.3, 99.0)	(98.4, 99.9)	--	(99.4, 99.9)	(87.8, 96.5)
	N=7	N=5	N=12	N=372	N=6	N=3	N=9	N=448
Malarine	84.2	0.0	53.3	37.3	62.9	25.3	61.3	61.6
	(47.3, 97.0)	--	(19.7, 84.2)	(28.8, 46.6)	(25.8, 89.2)	(2.4, 82.3)	(21.9, 89.9)	(54.3, 68.4)
	N=180	N=179	N=359	N=85	N=290	N=83	N=373	N=59
A+M	66.8	40	51.7	25.2	67.9	65.2	66.5	40.7
	(56.8, 75.6)	(29.7, 51.4)	(42.4, 60.8)	(17.2, 35.3)	(57.1, 77.2)	(51.2, 77.0)	(58.1, 73.9)	(28.0, 54.9)
	N=9	N=29	N=38	N=43	N=114	N=265	N=379	N=74
DHA-PPQ	77.7	61.4	65.8	87.7	77.9	70.9	72.6	24.0
	(48.4, 92.8)	(59.5, 63.2)	(54.9, 75.3)	(76.2, 94.1)	(68.4, 85.1)	(62.1, 78.4)	(65.5, 78.8)	(12.2, 41.7)
	N=107	N=92	N=199	N=328	N=285	N=297	N=582	N=436
Non-artemisinin therapy	64.5	65	64.8	34.7	85.5	59.4	31.4	53.0
	(50.9, 76.2)	(51.2, 76.7)	(56.9, 72.0)	(28.3, 41.8)	(79.3, 90.1)	(50.2, 67.9)	(25.2, 38.3)	(44.7, 61.1)
	N=89	N=11	N=375	N=649	N=280	N=296	N=576	N=417
• Chloroquine	64.9	47.5	62.7	36.0	86.4	59.3	68.6	47.0
	(50.9, 76.8)	(19.5, 77.1)	(51.3, 72.9)	(29.2, 43.5)	(80.0, 91.0)	(50.1, 67.8)	(61.6, 74.9)	(38.4, 55.8)
					N=370	N=344	N=714	N=382
Rapid diagnostic tests					94.3	70.0	79.2	48.6
					(90.5, 96.6)	(54.7, 81.9)	(69.3, 86.6)	(42.6, 54.6)

5.3 Cost and affordability to patients of antimalarials

Table 5.3. 1 Cost to patients of antimalarials, by domain

	2009				2011			
	PHF	VMW	PHF/VMW	Total private	PHF	VMW	Total PHF/VMW	Total private
			%	%			%	%
Distribution of free drugs:								
Proportion of ASMQ distributed free of cost (by volumes of AETDs)	100.0	100.0	100.0	1.4	94.6	99.0	95.9	0.1
Median price of a full course of an AETD:								
Any ACT	0.00	0.00	0.00	1.22	0.00	0.00	0.00	1.56
	.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[0.98, 1.96]	[0.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[1.10, 2.21]
	386	331	717	458	752	417	1169	345
• Any ASMQ	0.00	0.00	0.00	1.22	0.00	0.00	0.00	1.47
	.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[0.86, 1.71]	[0.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[1.10, 1.84]
	377	300	677	396	631	173	804	293
A+M	0.00	0.00	0.00	1.47	0.00	0.00	0.00	1.56
	.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[1.22, 1.96]	[0.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[0.89, 1.79]
	372	299	671	58	628	172	800	21
Malarine	0.00	1.22	0.00	1.22	0.00	0.00	0.00	1.47
	.00, 0.00]	[1.22, 1.22]	[0.00, 0.00]	[0.86, 1.71]	[0.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[1.10, 1.84]
	5	1	6	338	3	1	4	272
• DHA+PPQ	0.00	0.00	0.00	2.20	0.00	0.00	0.00	6.53
	.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[1.65, 2.76]	[0.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[2.23, 7.54]
	9	29	38	39	121	244	365	41
• Other ACT	--	0.00	0.00	2.26	-	-	-	8.23
	--	[0.00, 0.00]	[0.00, 0.00]	[1.81, 2.26]	-	-	-	[2.47, 12.35]
	0	2	2	23	0	0	0	11
Non-artemisinin therapy	0.00	0.00	0.00	0.47	0.00	1.12	0.00	0.56
	.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[0.24, 6.17]	[0.00, 0.00]	[1.12, 1.12]	[0.00, 0.00]	[0.37, 0.67]
	94	79	173	98	76	5	81	180
Chloroquine, the 'most popular' non-ACT antimalarial treatment in Cambodia	0.00	0.00	0.00	0.28	0.00	1.12	0.00	0.45
	.00, 0.00]	--	[0.00, 0.00]	[0.24, 0.47]	[0.00, 0.00]	[1.12, 1.12]	[0.00, 0.00]	[0.37, 0.67]
	52	0	52	58	60	5	65	171

	2009				2011			
	PHF	VMW	Total PHF/VMW	Total private	PHF	VMW	Total PHF/VMW	Total private
	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]	Median [IQR]
Median price of a full course of an AETD:			(N of AMs)	(N of AMs)			(N of AMs)	(N of AMs)
Any Artemisinin monotherapy	0.00	0.00	0.00	4.70	0.00	0.00	0.00	21.44
	[0.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[3.14, 14.70]	[0.00,0.00]	[0.00,0.00]	[0.00,0.00]	[13.40,21.44]
	63	131	194	181	37	1	38	65
• Oral artemisinin monotherapy	0.00	0.00	0.00	3.76	-	-	-	2.50
	--	[0.00, 0.00]	[0.00, 0.00]	[3.14, 4.70]	-	-	-	[2.14,4.29]
	0	10	10	121	0	0	0	10
• Non-oral artemisinin monotherapy	0.00	0.00	0.00	20.58	0.00	0.00	0.00	21.44
	[0.00, 0.00]	[0.00, 0.00]	[0.00, 0.00]	[14.70, 26.46]	[0.00,0.00]	[0.00,0.00]	[0.00,0.00]	[18.76,26.80]
	63	121	184	60	37	1	38	55

5.4 Volumes of antimalarial drugs

Table 5.4.1 Volumes of antimalarials sold or distributed in the past two weeks across sectors, over time (2009-2011)

	2009		2011	
	Total PHF/VMW	Total private	Total PHF/VMW	Total private
	%	%	%	%
	26.1	45.9	26.2	14.9
• Any ASMQ	25.9	35.2	21.2	13.7
	24.5	3.3	21.2	0.4
	1.4	31.9	0.0	12.9
• DHA+PPQ	0.2	8.2	4.9	1.2
• Other ACT	0.0	2.4	-	0.0
Non-artemisinin therapy	0.8	18.5	3.0	49.6
• Chloroquine	0.4	15.4	3.0	49.3
• SP	-	-	-	-
• Quinine	0.0	0.4	0.0	0.2
Any Artemisinin monotherapy	1.8	6.9	4.5	1.8
• Oral artemisinin monotherapy	0.1	6.3	0.0	0.7
• Non-oral artemisinin monotherapy	1.8	0.6	4.5	1.1

Table 5.4.2 Volumes of antimalarials sold or distributed in the past two weeks within sectors over time (2009-2011)

	2009				2011			
	PHF	VMW	Total PHF/VMW	Total private	PHF	VMW	Total PHF/VMW	Total private
	%	%	%	%	%	%	%	%
Any ACT	90.6	91.1	90.9	64.4	73.7	93.1	77.9	22.5
• Any ASMQ	89.2	91.1	90.3	49.4	63.5	62.1	63.2	20.6
A+M	77.9	91.1	85.2	4.6	63.5	62.1	63.2	0.6
Malarine	11.3	0.0	5.0	44.8	0.0	0.0	0.0	19.5
• DHA+PPQ	1.4	0.0	0.6	11.6	10.2	31.1	14.7	1.8
• Other ACT	--	0.0	0.0	3.4	0.0	0.0	0.0	0.1
Non-artemisinin therapy	3.1	2.4	2.7	25.9	9.4	6.9	8.9	74.8
• Chloroquine	3.1	--	1.4	21.6	9.4	6.9	8.9	74.3
• SP	--	--	--	--	--	--	--	--
• Quinine	0.0	--	0.0	0.6	0.0	0.0	0.0	0.3
Any Artemisinin monotherapy	6.3	6.4	6.4	9.7	16.9	0.0	13.3	2.7
• Oral artemisinin monotherapy	--	0.4	0.3	8.8	0.0	0.0	0.0	1.0
• Non-oral artemisinin monotherapy	6.3	6.0	6.1	0.9	16.9	0.0	13.3	1.7

5.5 Provider knowledge and perceptions

Table 5.5.1 Provider knowledge of the first line treatment and danger signs and perceptions, over time (2009-2011)

	PHF	VMW	Total PHF/VMW	Total private	PHF	VMW	Total PHF/VMW	Total private
	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)	% (CI)
Proportion of providers that:	N=185	N=187	N=372	N=642	N=394	N=345	N=739	N=777
Correctly state the recommended first-line treatment for uncomplicated malaria	96.4 (92.0, 98.4)	95.8 (88.6, 98.5)	96.1 (91.3, 98.3)	68.7 (62.6, 74.3)	91.7 (87.0, 94.8)	92.3 (86.4, 95.8)	92.1 (88.0, 94.8)	53.5 (43.2, 63.6)
Proportion of providers that:	N=185	N=190	N=375	N=649	N=394	N=345	N=739	N=777
believe an ACT is the most effective antimalarial medicine for treating uncomplicated p. falciparum malaria	93.7 (89.1, 96.4)	90.1 (80.9, 95.1)	91.6 (86.0, 95.1)	50.5 (42.3, 58.8)	90.1 (85.4, 93.3)	94.3 (89.2, 97.1)	92.7 (88.9, 95.2)	50.3 (44.2, 56.3)
report most frequently recommending an ACT to customers for treatment of p. falciparum malaria	94.7 (90.4, 97.1)	90.1 (82.6, 94.6)	92.1 (87.6, 95.0)	52.7 (42.6, 62.7)	94.3 (90.1, 96.8)	93.7 (88.5, 96.7)	94.0 (90.4, 96.2)	50.8 (42.7, 58.9)

6. Conclusions

The *ACTwatch* survey methodology allows for the measurement of anti-malarial availability and prices in a standardized way, on a nationally representative sample of outlets, with multiple steps to ensure data quality. Despite the study's strengths, the outlet survey data presented here have several limitations.

1) Providers may have had incentives to mis-report certain information, such as whether they stocked any anti-malarials, or specific anti-malarial categories, especially given the recent crack-down by Cambodian authorities to close illegally operating outlets and the enforcement of the ban on sales of oral artemisinin monotherapy [24]. In one area that was visited, a crackdown had just occurred 2 weeks prior to the survey and a number of outlets were reportedly closed down for not having a license to sell medicines. Although interviewers stressed that they were not connected with any regulatory body, antimalarial availability and stocks may have been under-reported.

2) Volumes were based purely on provider recall. Given the lack of sales records in most private outlets, this was felt to be the most logistically feasible method for estimating volumes, but it is likely that some recall bias was present. Furthermore, in Cambodia, a number of unbranded packages of antimalarials were found in outlets. These unbranded drugs, mainly chloroquine in retail outlets, were missing information on strength from their packaging, as well as other distinguishing features such as manufacturer and country of manufacturer. When strength information is not available, price and volumes information cannot be calculated, as it is impossible to calculate AETDs in the absence of the strength. Given this, it is likely that the extent to which chloroquine contributes to national volumes is underestimated. Given these unbranded drugs are found in retail outlets, the true contribution of drug shops and village shops to national volumes is also underestimated. In addition, VMWs also typically stock unlabeled chloroquine in a plastic bag. While there are similar challenges identifying the strength, interviewers were able to rely on dosing charts used by the VMWs, which had the strength listed.

3) Adult equivalent treatment dose calculations were used when calculating prices and volumes. This has the advantage of allowing direct comparability between drugs. However, it should be noted that in practice many customers will be obtaining drugs for children and/or purchasing incomplete doses [26]. As a result, the price actually paid per customer may be considerably lower than the median price per AETD. Similarly, the actual number of customers to whom each drug was sold will be considerably higher than the volume of AETDs dispensed. It should also be noted that AETD prices presented in this paper do not include additional fees that may have been incurred for customers, such as consultation fees or service charges.

4) A number of additional questions were included in the outlet survey to capture cocktail availability and provider practices. When providers were asked about availability of 'tnam psom', a variety of samples were then collected, including pre-packed cocktails containing numerous loose tablets, cocktails made at the time of the visit from a combination of loose tablets and cut blisters but also, a full course of A+M or malarine and paracetamol, as well as partial courses of these drugs. Given these field observations, and collection of actual cocktail samples, it was concluded that the provider report on cocktail availability was not very reliable and data should not be used to draw any conclusions on

prescribing behaviour since we were unable to establish whether or not we're talking about a full course plus other drugs, or a small plastic baggy of various pills.

5) Recording the price of RDTs in the public sector was also challenging. Under national policy, public health facilities typically charge 2000 Riel (US\$0.50) as a service fee for administration of the test. This information was challenging to record for interviewers, given the audit sheet asks about the price of the test, rather than the service fee. While some interviewers recorded that that test was free and used comment boxes to state that a service fee was charged, many continued to record the cost of the service fee as the price. Given the complexity of this situation, since the RDT is not a product that could even be obtained for free and is not distributed without the service fee, data is not presented on price in public health facilities.

6) Data were only collected during the peak malaria transmission season. Seasonal variation is expected, especially in Cambodia where there is marked seasonal transmission.

6.1 Availability

When observing stocking rates for all public health facilities and village malaria workers, availability of ACTs in 2011 was around 86% and 91% respectively. In the private for profit sector, overall availability of ACTs was lower. Less than one third of pharmacies (29%), drugs stores (18%) or mobile providers (15%) stocked ACTs. Availability of non-artemisinin therapies in the private sector was similar to ACT availability, with 20% of pharmacies, drugs stores and 14% of mobile providers stocking non-artemisinin therapies. Few general retailers stocked any antimalarials (1%). Oral artemisinin monotherapies were available in 0.2% of public not-for-profit sector and 1.6% of the private sector.

Availability of any ACT was high for the public-not-for profit sector antimalarial stocking outlets, across all three domains (91%-99%). However, there was variation in availability for different types of ACTs in the public not-for-profit sector. DHA-PPQ was significantly more available in domain 1 (91%) (where it is the first line treatment) as compared to zone 2 (40%) or zone 3 (10%). In contrast, ASMQ was rarely available in the public-not-for-profit sector in zone 1 (0.4%), as compared to domain 2 (64%) and domain 3 (88%). In the private sector, there were few differences in availability of any Malarine across domains (42%-55%) or DHA-PPQ (3%-11.2%).

While there was little change in ACT availability between 2009 and 2011 the public not-for-profit sector (96% to 97%), there were substantial declines in the private sector (from 63% in 2009 to 49% in 2011) of private sector outlets stocking antimalarials. Availability of non-artemisinin therapy increased (46% to 57% of private sector outlets stocking antimalarials). While 20% of outlets stocking antimalarials in the private sector stocked oral artemisinin monotherapy in 2009, this decreased to 4.2% in 2011.

6.2 Price

ACT treatments were free in public health facilities and village malaria workers. In the private sector, the price of ACTs was \$2.03. The price of Malarine, the private sector socially-marketed ACT, was sold nationally at a subsidized price in the private sector (\$1.63). Where DHA-PPQ was found in the private sector, this cost \$7.20. The price of the most popular antimalarial, chloroquine, was less expensive than either Malarine or DHA-PPQ, at \$0.74.

6.3 Market share

Market share data highlight the dominant role of the private sector in both 2009 and 2011, where around 70% of all antimalarials pass through the private sector. However, there were changes over time in terms of the volumes of ACTs and non-artemisinin therapies sold. In the private sector in 2009, ACTs comprised of 43% of the volumes while non-artemisinin therapy comprised of 19% of antimalarials sold or distributed in the last week. In contrast, in 2011, most of the antimalarials sold through the private sector were non-artemisinin therapies in 2011 (47%) as compared to ACTs (14.5%). In 2009, there were concerning amounts of oral artemisinin monotherapies in the private sector (6% of the total market) but in 2011, this decreased to <1%.

ACTs comprised of 70% of the total volume of antimalarials distributed across all sectors in 2009. This decreased to 41% in 2011.

6.4 Provider knowledge

Provider knowledge was lower in the private sector (50%) than in the public not-for-profit sector (93%). Other studies have shown that medicine seller knowledge of drugs and doses, particularly in the private sector, is often poor [13, 15, 16]

6.5 Diagnostic testing

Diagnostic testing with a microscopic test cost \$0.74 in the private sector and \$0.49 for an RDT. Almost one in four facilities stocked a microscopic test in the private sector, and 44% of facilities stocked RDTs. In the public not for profit sector, 22% of public health facilities stocked microscopic blood tests and 94% stocked RDTs. Almost all village malaria workers stocked RDTs (97%).

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8. Appendices

8.1 Survey Team

Table 8.1.1 List of staff members involved in the survey in Cambodia, 2011

Name	Responsibility/role
Long Dianna	Strategic Information Director
Phok Sochea	Country Program Coordinator
Emily Carter	Technical Associate
Phou Mean	Research Coordinator
Keo Kosal	Research Assistant-team1 & team2
Chea Vannak	Research Assistant-team5 & team6
Noun Nisay Kosal	Supervisor-team 1
Prak Bunna	Supervisor-team 2
Yous Samrith	Supervisor-team 3
Sok Seila	Supervisor-team 4
Ros Vireythun	Supervisor-team 5
Chhoy Sophea	Supervisor-team 6
Chem Vuthy	Quality Controller- team 1
Pech Chanra	Quality Controller- team 2
Hean Sambath	Quality Controller- team 3
Chan Sovandany	Quality Controller- team 4
Pa Sotheary	Quality Controller- team 5
Long Dalinna	Quality Controller- team 6
Ly Srey Mom	Interviewer - team 1
Hoy Piseth	Interviewer - team 1
Loeung Samoeun	Interviewer - team 1
Chinn Ravy	Interviewer - team 1

(continued on next page)

Name	Responsibility/role
Van Sodaneath	Interviewer - team 1
Srou Lihim	Interviewer - team 2
Kea Chanthorn	Interviewer - team 2
Chan Sovottha	Interviewer - team 2
Vann Sarem	Interviewer - team 2
Thorn Reaksmi	Interviewer - team 2
Thorn Reaksmei	Interviewer - team 3
Sem Seyla	Interviewer - team 3
Meak Ramet	Interviewer - team 3
Khim Soklida	Interviewer - team 3
Sin Daliya	Interviewer - team 3
Nou Samnith	Interviewer - team 4
Heng Sokleng	Interviewer - team 4
That Phy Sopheak	Interviewer - team 4
Pou Pheak	Interviewer - team 4
Ven Veasna	Interviewer - team 4
Kriel Tina	Interviewer - team 5
Chun Sokhan	Interviewer - team 5
Koung Pheara	Interviewer - team 5
Kim Srey Sor	Interviewer - team 5
Heng Keahong	Interviewer - team 5
Sun Lim	Interviewer - team 6
Neat Thida	Interviewer - team 6
Lun Sopheap	Interviewer - team 6
Sim Vantha	Interviewer - team 6
Pou Yati	Interviewer - team 6

8.2 Outlet types

Table 8.2.1 Description of outlet types visited for this survey

Outlet Types	N	Description
Public Health Facility	454	
Referral hospital	30	A secondary health care facility. Hospitals that provide health services to people in their coverage area through complementary packaged activities (CPA). Medical consultation, diagnostic testing, and prescription medicines are available. Referral hospitals operate at the district level.
Health centre	358	A primary health care facility. Commune-level health facility which provides health services to people in their coverage area with minimum packaged activities (e.g. prescription medicine and diagnosis).
Former district hospital	15	A primary health care facility that was formerly a district hospital but is now functioning as a health centre, but may be better equipped and provide more services than a typical health centre.
Health post	28	A primary health care facility. A commune-level health facility that provides services to complement health centre activities for people in the coverage area of the health centre, but who are not able to access the health centre. It provides health services of minimum packaged activities.
Village malaria worker	383	A volunteer selected by villagers, officially recognized and trained by CNM to provide malaria diagnosis (RDT) and ACT treatment at their village with monitoring and supervision by CNM.
Pharmacy/Clinic	429	
Private hospital/clinic	24	A privately owned health facility that offers treatment and diagnosis for a range of illnesses at a commercial rate. All private hospitals and clinics must be licensed by the MOH and are staffed by qualified health practitioners.
Clinical pharmacy/pharmacy	67	These are legal outlets selling a wide variety of medicines. They are licensed under the name of a trained pharmacist. Most pharmacies are located in Phnom Penh. They receive their drug supply from company representatives who distribute directly to most provincial capitals and district towns. They provide diagnostic testing, treatment, and prescription medicines to patients. Clinical pharmacies are licensed by MoH and identified by a pharmacy signboard with the provider's name.
Depot A*	13	Depots are licensed, legal, outlets registered under the name of a pharmacist of medical assistant. Depot A is permitted to sell 60 kinds of essential drugs. Pharmacy depots are located in urban areas like provincial or district towns.
Depot B*	65	Depots are licensed, legal, outlets registered under the name of a pharmacist of medical assistant. Depot B is permitted to sell 20 kinds of essential drugs. Pharmacy depots are located in urban areas like provincial or district towns.
Cabinet*	256	These are divided into "legal" clinics, including all licensed medical providers who display the blue medical cross indicating to the public the presence of a qualified medical person), and "illegal" clinics operated by unlicensed private providers. The legal clinic is registered under a licensed medical doctor who does not have another job. The license for operating the clinic is obtained from the MoH. The illegal clinics, which form the majority of private medical practices in the country, are operated by unlicensed practitioners or the clinic itself is not registered at the MoH. This category includes polyclinics, clinics, and consultation rooms.
NGO/Mission hospital	4	Not-for-profit health facilities which work closely with provincial health departments. These facilities provide diagnosis and treatment of a range of illnesses at a reduced or no cost.
Drug Store	306	

Drug store	306	Drugs stores display the green pharmacy cross (which indicates to the public the presence of a qualified pharmacist or drug seller) without having a license. This category includes drug stalls in rural markets and shops whose main business is selling medicines. Some drug vendors may buy their supply from legal pharmacies or pharmacy depots. Drug stores are smaller than pharmacies.
Mobile Provider	709	
Mobile provider	709	Found mostly in rural areas, mobile providers travel by motorbike. They typically work within a radius of their home or a base venue. They are not registered, hence are identified by asking the village chief of mobile providers that may reside or work within the community. They provide medical treatment and diagnosis, and also sell anti-malarial drugs and other medicines to individuals and stores.
Retail outlet	16,314	
Grocery store	4,742	Grocery stores are usually small home-based businesses whereby the front of the house is used to sell goods, including food, beverages, household items, and some health products.
Village Shop		
Village shop	11,572	Village shops are smaller than grocery stores, and sell a limited range of goods. They include food/drink, household items, and some health products.

*Source: Assessment of Official Private Providers and Delivery of Health Care Services to Children under Five, Program for Appropriate Technology (PATH), Cambodia, 2002.

8.3 Government recommended first-line treatment for uncomplicated malaria

Since 2000, co-blistered artesunate and mefloquine (a WHO-recommended but not prequalified ACT) has been the first line treatment for *P. falciparum* malaria and chloroquine the first line treatment for *P. vivax* malaria. In 2009, CNM switched the first-line treatment in zone 1 to co-formulated ACT dihydroartemisinin-piperaquine (DHA+PPQ) as part of the containment programme for addressing the emergence and spread of multi-drug resistance along the Thai and Cambodia border. Cambodia's second-line treatment for *P. falciparum* malaria is quinine combined with tetracycline. Before treatment, confirmation of malaria infection using microscopy or rapid diagnostic test (RDT) is recommended.

8.4 Sample size calculation

The required sample size is calculated in 3 steps:

1. The required number of outlets with antimalarials in stock on the day of the survey
2. The number of outlets that must be enumerated to arrive at this number of anti-malarial-selling outlets ("gross sample size")
3. The number of clusters² that must be visited to arrive at this number of outlets (operational sample size).

1. Required number of outlets

The required sample size for a single domain is calculated using the following formula:

$$n = \frac{Deff \times \left(Z_{1-\alpha} \sqrt{2P(1-P)} + Z_{1-\beta} \sqrt{P_1(1-P_1) + P_2(1-P_2)} \right)^2}{(P_1 - P_2)^2}$$

where:

n = desired sample size for the survey

P_1 = the estimated value of the key indicator in private outlets

P_2 = the expected value of the key indicator in public outlets

$P = (P_1 + P_2)/2$

$Z_{1-\alpha}$ = the standard normal 1- α quintile corresponding to an α (type I) error with a one-sided test

$Z_{1-\beta}$ = the standard normal 1- β quintile corresponding to the power of the test

Deff = the design effect for cluster sampling

The required sample size has been calculated on the basis of the following values of the key parameters:

P_1 = the value of the key outcome indicator (percent of private outlets with ACT among outlets with any anti-malarials) at baseline = 70% and 56% in domains 1 & 2 combined and domain 3 respectively

P_2 = the expected value of the indicator in public outlets; a 20 percent difference will be desired (assuming that a 20% difference is the minimum necessary to justify the importance in public health policy terms)

$P = (P_1 + P_2)/2$

$P_2 - P_1$ = the change in availability from public to private outlets is 20 percent (the minimum level of change felt to be needed to justify continuing the intervention on public health grounds)

$Z_{1-\alpha} = 1.64$ corresponding to an α (type I) error of 5% with a one-sided test

$Z_{1-\beta} = 0.84$ corresponding to a power of test at 80% (or a type II error of 20%)

Deff = 2 (estimated from baseline data)

² A cluster in this study is defined as a geographical area or enumeration unit with approximately 10,000 to 15,000 inhabitants. In the case of Cambodia, this corresponds to a commune

This gives a conservative number of 222 outlets in domains 1 & 2 and 462 outlets in domain 3, the denominator of the indicator, which is the number of outlets having any kind of anti-malarial stocks at the time of the survey.

2. Number of outlets that must be enumerated

The estimated gross sample size (number of outlets enumerated) needed for the ACT availability indicator is determined by the following formula:

$$N = n_1 / P_{am}$$

where P_{am} is the proportion of outlets having anti-malarial stocks at the time of the survey among all outlets enumerated. In this equation, the data and assumptions are as follows: N = desired sample size of all outlets for monitoring availability indicators, $n_1 = 222$ in domains 1 & 2 and 462 in domain 3, is the number of outlets with anti-malarial stocks at the time of the survey, the design effect is estimated at 2; α is 5%; β is 20%; and we want to measure a 20 percent difference.

We have used average values derived from ACTwatch baseline outlet survey data. These data indicate that 7.5% of the outlets in domains 1 & 2 and 6.8% of the outlets in domain 3, on average, have anti-malarials in stock at the time of the survey. By applying these percentages to the above formula, a total number of 2,960 outlets in domains 1 & 2 and 6,794 outlets in domain 3 must be interviewed in order to detect a 20 percent difference in ACT availability between public and private outlets, for each of the domains separately.

3. Number of clusters

To convert the gross sample size into the number of clusters, we apply the estimated average number of outlets per cluster (n_{outlet}). The number of outlets needed to reach the required number of outlets with anti-malarials in stock may be different for the three domains depending on the average number of outlets per cluster (n_{outlet}) and the percentage of outlets with anti-malarials (P_{am}) in domains 1, 2 and 3 separately.

8.5 Sampling weights

Sampling weights are needed to analyze the survey data if PPS cluster sampling is applied. Otherwise, bias may be introduced in the calculated statistics if the communes are very different in size. If a complete sampling frame is available for applying PPS sampling, with the measure of size being the population, sampling weights are easy to calculate. Assuming that the distribution of the outlets is proportional to the population within each sampling stratum and that a Booster Sample is applied, then for all the outlets enumerated in the selected sub-district not including the public health facilities and the Part One pharmacies (there is a separate weighting procedure for these weights shown later), sampling weight is the inverse of the selection probability of the selected sub-district, calculated as:

$$W_{hi} = \frac{\sum M_{hi}}{n_h M_{hi}}$$

where

W_{hi} = the sampling weight for the i th selected sub-district/commune of stratum h ,

$\sum M_{hi}$ = the total number of population (or total number of households) in the stratum h

n_h = the number of communes selected in stratum h , and

M_{hi} = the number of population (or number of households) in the i th selected sub-district/commune of stratum h

If no explicit stratification is used in the sample selection, then $h=1$.

The sampling weight for all the public health facilities and Part One pharmacies, which are included in the sample from the entire district including the ones in the selected sub-district, is calculated similarly but with the above parameters replaced by district level characteristics:

$$W_{hj}^* = \frac{\sum M_{hj}^*}{n_h^* M_{hj}^*}$$

where

W_{hj}^* = the sampling weight for the j th selected district (a district is selected if one or more of its sub-districts are selected in the sample) of stratum h ,

$\sum M_{hj}^*$ = the total number of population (or total number of households) in stratum h

n_h^* = the number of districts selected in stratum h , and

M_{hj}^* = the number of population (or number of households) in the j th selected district of stratum h

With the above calculated district level weights (posterior weights because there is no direct selection of districts in the sampling procedure), a Booster Sample outlet should be counted only once in the data analysis even if two or more sub-districts/communes are selected from the same district.

The above calculated sampling weights are cluster-wide weights. This means that all the outlets interviewed in the same sub-district/commune share the same sampling weight, for both public health facilities and all other facilities.

8.6 Assumptions for calculating Adult-Equivalent Treatment Doses (AETDs)

Introduction

Antimalarial medicines are manufactured in a variety of active pharmaceutical ingredients, dosage forms, strengths and package sizes. To analyze prices and volumes across products with different characteristics, they are standardized using the AETD. Indicators based on price and volume data, namely market share and antimalarial prices, are presented in terms of AETDs.

Assumptions for calculating AETDs

One AETD is defined as the number of milligrams (mg) of an antimalarial drug required to treat a 60 kilogram (kg) adult. For each antimalarial medicine category, the number of mg in one AETD is set to what was recommended in the treatment guidelines for uncomplicated malarial in areas of low drug resistance issued by the WHO. Where WHO treatment guidelines did not exist, AETDs were based on peer reviewed research, or the product manufacturer's recommended treatment course for a 60kg adult. A list of AETDs by antimalarial category prepared by PSI for the ACTwatch project was reviewed and updated by the Independent Evaluator in April 2010. Refer to Table 9.9.1 for the list used for the baseline report.

Additional assumptions

- 1) For combination therapies, which have two or more active antimalarial ingredient packaged together (either co-formulated or co-blistered) the AETD is based on the total amount of one of the active ingredients. For ACTs, the artemisinin derivative was used as the basis of the AETD.
- 2) Co-blistered combinations are assumed to be in a 1:1 ratio of tablets, with the following exceptions:
 - Amodiaquine + Sulfadoxine + Pyrimethamine manufactured under the brand name Dualkin;
 - Artesunate + Amodiaquine manufactured under the brand names Amonate Junior and Amonate Adult;
 - Artesunate + Mefloquine manufactured under the brand names Artequin 600/1500, Artequn 300/750, A + M1, A + M2, A + M3, A + M4, A + M5, Malarine for Adults, Malarine for Teenagers, and Malarine for Children;
 - Artesunate + Sulfadoxine + Pyrimethamine manufactured under the brand names SulamonPlus 500, Malosunat, Amalar, Artescope, Farenax, Artidox, Artedar, Asunatedenk 100, Asunatedenk 200, Co-arinate, Arte-Plus.
- 3) Sulfamethoxypyrazine-pyrimethamine is assumed to have the same full adult treatment dose as Sulfadoxine-pyrimethamine.

- 4) Artequick lacking strength information is assumed to contain Artemisinin 62.4mg and Piperquine phosphate 375mg.

Methods for calculating price and market share indicators

Information collected on the medicine's strength and unit size, as listed on the product packaging, was used to calculate the total amount of each active ingredient found in the package. Next, the number of AETDs in a unit was calculated.³ For monotherapies, the number of AETDs in the unit was calculated by dividing the total amount of the active ingredient contained in the unit, by the AETD (ie. by the total number of mg required to treat a 60kg adult). For combination therapies, the number of AETDs in the unit was calculated by dividing the total amount of the active ingredient that was used as the basis for the AETD by the AETD.

Calculating price indicators

Pricing indicators (Indicators 2.1-2.4) are presented in terms of the cost to patients for one AETD. For each antimalarial audited, the cost to patients for one unit was computed based on the retail selling price reported by the respondent for that product. This was then divided by the number of AETDs in the unit to get the cost to patients for one AETD. (An exception is the pediatric price indicator for quality assured ACT (Indicator 2.1) where AETDs were not used. Rather the price for a 2 year old child was calculated including only pediatric formulations whose age (weight) range includes a 2 year old (10kg) child.)

Calculating market share

For each antimalarial audited, the number of AETDs sold over the past 7 days was calculated by multiplying the number of units sold as reported by the respondent by the number of AETDs in the unit.

Market share was then calculated by summing this for all antimalarials audited belonging to a particular category, which was then divided by the sum of AETDs of all antimalarials sold.

Market share was calculated by dividing the number of AETDs of a particular antimalarial category sold by the total number of AETDs of all antimalarials sold. In cases where outlets stocked antimalarials, but some or all sales volumes were missing, we did not impute for missing values.

³The unit depends on the antimalarial medicine's dosage form. For antimalarials in tablet, suppository or granule dosage form, the unit is the package. For antimalarials in injectable dosage form, the unit is the ampoule. For antimalarials in syrup or suspension dosage form, the unit is the bottle.

