



## The private commercial sector distribution chain for antimalarial drugs in Madagascar

### Findings from a rapid assessment

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## Executive Summary

### Background

ACTwatch is a research programme funded by the Bill and Melinda Gates Foundation that aims to provide and promote evidence and recommendations for policy makers on methods to increase availability and decrease the consumer price of quality-assured Artemisinin-based Combination Therapies (ACTs) throughout the private sector. Research has been carried out in seven countries (Cambodia, Uganda, Zambia, Nigeria, Benin, Madagascar and D.R. Congo) and encompasses Household Surveys, Outlet Surveys, as well as Supply Chain Surveys and Assessments.

As is the case in many developing countries, the private sector in Madagascar plays a pivotal role in facilitating access to malaria treatment. The Household and Outlet surveys conducted in Madagascar suggest that the general population tends to seek treatment through the private sector, and that private sector outlets make up a substantial portion of outlets that carry antimalarials.

In order to design future interventions that will improve access to diagnostic and effective treatment options, it is important to understand the structure of the private sector distribution chain for antimalarials, as well as the incentives, restrictions and challenges that actors within the market face. Despite the important role of the private sector in the supply of antimalarials, there is limited rigorous evidence on the subject. This report contributes to addressing this gap for Madagascar.

### Methods

This report was prepared following qualitative data collection carried out in Madagascar in August and September 2011. A total of 40 interviews were carried out: 10 with key informants from both governmental and non-governmental organizations, and 30 with actors from across the different levels of the private sector antimalarial distribution chain. Key informants were chosen because of their knowledge of antimalarial distribution in the country, and were asked about the overall distribution chain for antimalarials and rapid diagnostic tests (RDTs) in Madagascar's private sector, as well as about their perceptions of the effectiveness of regulation and other factors affecting the price and availability of antimalarials.

Private sector actors interviewed included importers, intermediate wholesalers, terminal wholesalers, and retailers. An effort was made to capture variation in retailer type; pharmacies, depots (also known as drug shops, and referred to as such in the Outlet Survey), private health dispensaries, as well as different kinds of general retailers, were interviewed. Respondents were asked questions about the structure of the market for antimalarials and RDTs, their business practices, their relationships with suppliers and customers, stocking decisions, the level of competition and collusion in the market for antimalarials, and their perception of regulations.

In order to get a cross-section of the distribution chain, we interviewed private sector businesses operating at different levels of the supply chain in eight sites, whose locations can be classified into: accessible (3), semi-accessible (2), and remote (3).

Information from the 2010 ACTwatch Outlet Survey, conducted by PSI, was also used in this report. More specifically, the data were used to examine prices and retail mark-ups in different types of

outlets. Data collection for the outlet survey took place between April and June 2010. The Outlet Survey employs a nationally representative sample of all outlets that could sell or provide antimalarials to a consumer. It was undertaken through a census approach in 38 clusters across two malaria endemic strata, urban and rural, in Madagascar. Sampling was conducted using a one-stage probability proportion to size (PPS) cluster design, with the measure of size being the relative cluster population. Oversampling of public health facilities and registered pharmacies was conducted in administrative districts surrounding the selected clusters. Data collected during the Outlet Survey include information on antimalarial drug availability, sales volumes and selling prices, retail outlet and shopkeeper characteristics (antimalarials stocked, other drugs stocked, number of staff, education, health-related qualifications, registration status, GPS co-ordinates) as well as other areas of importance to understand the distribution chain, including each retailer's two top supply sources for antimalarials (name, location, provider type, whether they distribute, collect, or both) and antimalarial wholesale purchase prices.

Additional information included in the analysis was gathered from interviews carried out in November and December 2011 as part of a case study conducted for the Independent Evaluation of the Global Fund's Affordable Medicines Facility – malaria (AMFm) programme pilot.

## Results

The main actors in the distribution chain for antimalarials in the private sector in Madagascar are importers, wholesalers, pharmacies, and depots. Under ACTwatch wholesalers are categorized as "terminal" if they directly sell to retailers, and as "intermediate" if they buy from importers and sell to terminal wholesalers, recognizing that one business may play both of these roles. Both intermediate and terminal wholesalers operate and are part of the chain in Madagascar, but it seemed from the interviews conducted that most importers sell directly to pharmacies and depots. The survey also revealed that actors often play more than one role in the distribution chain: importers often act as intermediate wholesalers, buying antimalarials from one another to meet particular orders; pharmacies will frequently act as terminal wholesalers, by selling to other pharmacies or depots.

Both pharmacies and depots sell ACTs with roughly the same percentage mark-up (around 38%). Generally, pharmacies add the same percentage mark-ups to their non-artemisinin therapies (nATs) as well. Although depots often add much higher mark-ups to other kinds of antimalarials (up to 80% on nAT tablets), they seem to keep mark-ups on ACTs low. This is probably because the great majority of their ACT stock is Actipal (a socially marketed ACT), which has a recommended retail price printed on the package. Despite the fact that mark-ups for nATs are high at depots, absolute mark-ups are relatively low, which means retail prices remain low.

There were two types of highly subsidized ACTs available in the private sector in Madagascar at the time of data collection: Actipal, a branded type of Artesunate-Amodiaquine (ASAQ) from Population Services International (PSI), and various ASAQ and Artemether-Lumefantrine (AL) products provided through the Global Fund's AMFm programme. Their distribution chains are similar to those of non-subsidized ACTs, starting out from top-level wholesalers and making their way down to pharmacies and depots. Rapid Diagnostic Tests (RDTs) are rarely found in the private sector in Madagascar.

The informal sector plays a substantial role in the antimalarial market. The overwhelming majority of antimalarials found in informal sector outlets at the time of the Outlet Survey in 2010 were chloroquine. A key question is whether co-paid ACTs will replace chloroquine in formal and informal outlets.

Cost of transport seems to be a key determinant of mark-up levels. Limited accessibility of remote areas, particularly during the rainy season, was a point of concern for private sector actors. This is particularly important given the fact that the majority of the Malagasy population lives in rural areas.

The Ministry of Health carries out inspections in retail outlets. However, these inspections were reported to occur more frequently in accessible locations than in remote areas. Furthermore, capacity is low; there were only two pharmacist inspectors working for the National Medications Agency of Madagascar (Direction de l'Agence du Médicaments de Madagascar or DAMM) at the time this study was carried out. They are responsible for monitoring nearly 200 pharmacies, as well as approximately 2000 depots.

There are limitations to the findings presented in this report. As is the case in any study with a limited number of respondents, issues of generalisability are a concern. However, great effort was made to ensure that interviews were carried out with a wide range of actors. Key informants came from both governmental and non-governmental organizations. Actors at all levels of the distribution chain were interviewed, and at the retail level, five different kinds of outlets were surveyed. Actors were interviewed in a total of eight locations, encompassing accessible, semi-accessible, and remote areas. It is worth noting that the findings on mark-ups from retailers from this rapid assessment of the distribution chain were consistent with the data collected using randomized sampling and a large number of respondents in the ACTwatch Outlet Survey.

Further, it is important to interpret results with caution, due to the yet to be determined effects of the AMFm programme on supply and demand of antimalarials, as well as other ongoing changes in the dynamic regulatory, political and economic environments. Future outlet and household surveys will further complement the data collected for the present report and shed greater light on the subject.

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Data and background information from the ACTwatch 2008/2009 Household Survey and the 2010 Outlet Survey are also included in this analysis. We are grateful to Dr. Kate O’Connell, ACTwatch Principal Investigator, and Mr. Jacky Raharinjatovo, the Madagascar Country Programme Coordinator, for facilitating use of these data.

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The views expressed in the reports remain those of the authors. Any questions, comments or data requests should be directed to the research team based at the LSHTM, by contacting Sergio Torres Rueda ([sergio.torresrueda@lshtm.ac.uk](mailto:sergio.torresrueda@lshtm.ac.uk)).

## Abbreviations

ACT	Artemisinin-based Combination Therapy
AETD	Adult Equivalent Treatment Dose
AL	Artemether-Lumefantrine
AMFm	Affordable Medicines Facility- malaria
AMM	Autorisation de Mise sur le Marché (Marketing Authorisation)
AMT	Artemisinin Monotherapies
ASAQ	Artesunate-Amodiaquine
CHAI	Clinton Health Access Initiative
CHW	Community Health Worker
DAMM	Direction de l'Agence du Médicaments de Madagascar (National Medicines Agency of Madagascar)
LSHTM	London School of Hygiene and Tropical Medicine
nAT	Non-Artemisinin Therapies
OTC	Over the counter
PNLP	Programme National de Lutte contre le Paludisme (National Malaria Control Programme)
PSI	Population Services International
RDT	Rapid Diagnostic Tests
SALAMA	Centrale d'Achats de Médicaments Essentiels et Générique (Central Medical Store for Essential and Generic Medicines)
SP	Sulfadoxine-Pyrimethamine
WHO	World Health Organization



# 1. Background

## 1.1. ACTwatch

This report is part of ACTwatch, a research programme funded by the Bill and Melinda Gates Foundation that aims to provide and promote evidence and recommendations for policy makers on methods to increase availability and decrease the consumer price of quality-assured Artemisinin-based Combination Therapies (ACTs) throughout the private sector. Research for ACTwatch has been carried out jointly by Population Services International (PSI) and the London School of Hygiene and Tropical Medicine (LSHTM) in seven countries: Benin, Cambodia, D. R. Congo, Madagascar, Nigeria, Uganda, and Zambia. LSHTM has been responsible for carrying out Supply Chain Surveys, and PSI has conducted Retail Outlet Surveys and Household Surveys.

## 1.2. Country Profile

Located in the Indian Ocean east of Mozambique, Madagascar is the world's fourth largest island. Roughly two-thirds of the population lives below the poverty line (INSTAT and ICF Macro 2005); at US\$421 Madagascar's GDP per capita is among the lowest in the world (World Bank 2012). An estimated 77% of the country's nearly 22 million inhabitants live in rural areas (INSTAT and ICF Macro 2010; CIA Fact Book 2012).

Generally, the climate in Madagascar is subtropical, with a dry season from roughly May to October, and a hot rainy season between November and April. The climate in the country varies dramatically between regions. The East coast receives rain practically year-round and is prone to cyclones, the south is arid, and the highlands have a generally cool climate. Consequently, incidence of malaria varies greatly between regions and seasons.

Since 2006, the National Malaria Control Programme, (Programme National de Lutte Contre le Paludisme or PNL) guidelines have recommended artesunate-amodiaquine (ASAQ) as first-line treatment for uncomplicated malaria. Artemether-lumefantrine (AL) is recommended as second-line treatment, with oral quinine as an alternative. Quinine is recommended for cases of severe malaria.

## 1.3. Malaria Treatment in Madagascar

As is the case in many developing countries, the private sector in Madagascar plays a pivotal role in facilitating access to malaria treatment. In order to design future interventions that will improve access to diagnostic and treatment options, it is key to understand the structure of the private sector distribution chain for antimalarials, as well as the incentives, restrictions and challenges that market actors face. Despite the important role of the private sector in the provision of antimalarials, there is limited rigorous evidence on the subject. This report contributes to addressing this gap for Madagascar.

The results of the ACTwatch Outlet and Household Surveys provide a useful backdrop against which to explore the role of the private sector distribution chain in the distribution of antimalarials in Madagascar. The 2008/2009 Household Survey (ACTwatch Group 2008/2009) found that nearly half of children under the age of five with a fever were treated promptly with an antimalarial; 45% were treated the same day or the day after the onset of the fever. However, only about 2% of those receiving prompt treatment were treated with ASAQ. It is important to note that malaria treatment is largely presumptive; only 6% of children under five with a fever received a malaria diagnosis.

The private sector was an important provider of fever treatment. Among children treated with an antimalarial, 33% received their medicine from a pharmacy or depot, 24% from a private health facility, and 17% at grocery stores. The overall share of the private retail sector in the provision of antimalarials to children under five with fever was 62%, compared to 27% for the public sector. Of those who received treatment with ACTs, 48% obtained them from the private sector and 45% from the public sector. More specifically, 37% obtained ACTs from public health facilities, and 30% from pharmacies and depots<sup>1</sup>. ACTs were not obtained from general retailers such as grocery stores.

Chloroquine was the most commonly acquired antimalarial among those seeking treatment for fever in children under the age of five: 71% of children under five who were treated with an antimalarial received chloroquine, followed by quinine (21%), and ACTs (7%). The household survey also provided insight into the decision-making process around treatment-seeking behaviour: the majority of caregivers (60%) cited proximity to the home as the reason why they chose a particular treatment source, followed by availability of drugs (19%), inexpensive or free treatment (8%), and good reputation (8%).

The ACTwatch Outlet Survey (ACTwatch Group 2010), conducted between April and June 2010, further suggests strong links between access to malaria treatment and the private sector in Madagascar. Nearly 100% of pharmacies and 97% of depots carry antimalarials, as well as 87% of private-for-profit facilities and 31% of general retailers. General retailers play a significant role in the sale of medications in Madagascar, even though they are not legally authorized to do so. Antimalarials in Madagascar can be found in a variety of types of general retailers, described in greater detail below. General retailers account for 73% of all outlets with at least one antimalarial in stock. In total, private sector outlets account for 81% of all outlets with at least one antimalarial in stock.

The household and outlet surveys suggest that the general population tends to seek treatment through the private sector, and that private sector outlets make up the majority of outlets that carry antimalarials. However, the surveys also suggest that the treatment offered by the private sector is largely inappropriate as first-line treatment is only found in a fraction of establishments. Given this background, it is crucial to understand the antimalarial distribution chain serving the private sector.

It is important to note that the Household and Outlet Surveys were conducted before the start of the Affordable Medicines Facility—malaria (AMFm) programme, and therefore the supply and demand of antimalarials in Madagascar may have changed between these surveys and the current study. The AMFm programme was signed into action in Madagascar in May 2010. The programme, funded by the Global Fund, is a pilot initiative to expand effective malaria treatment by introducing highly subsidized ACTs through the private sector in seven countries: Ghana, Kenya, Uganda, Tanzania (mainland and Zanzibar), Nigeria, Niger and Madagascar. First-line buyers in Madagascar began ordering co-paid ACTs in September 2010. A quantitative evaluation of the impact of the project is currently underway and conclusive results are not yet available, however several private sector actors mentioned that since the start of AMFm the market share of ACTs has greatly increased. The ACTwatch Outlet Survey conducted at the end of 2011 and the Household Survey 2012 will be able to provide further clarity on this.

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<sup>1</sup> Depots are authorized outlets in the private sector often found in rural and remote areas. They will be described in greater detail in Section 3.1.

A second event that would have likely altered the supply of and demand for antimalarials in Madagascar was the proposed ban on chloroquine. The ban, which had been set to prohibit the sale of chloroquine products for malaria treatment to the general public as of January 2012, was withdrawn in late December 2011 after the legislation service of the Ministry of Health opposed it. A respondent mentioned that this was due to pressure from importers who still had large stocks of chloroquine to sell that would have gone to waste if the measure had been introduced.

## **2. Methods**

### **2.1. Qualitative Fieldwork**

This report was prepared following qualitative data collection carried out in Madagascar in August and September 2011. A total of 40 interviews were conducted.

Interviews with 10 key informants in both governmental and non-governmental organisations were conducted. Key informants were identified by review of relevant literature, as well as through discussions with PSI-Madagascar, and were chosen because of their knowledge of antimalarial distribution in the country. During the interviews, informants were asked about the overall distribution chain for antimalarials and rapid diagnostic tests (RDTs) in Madagascar's private sector, as well as about their perceptions of the effectiveness of regulations and other factors affecting the price and availability of antimalarials.

Additionally, 30 interviews were conducted with private sector actors involved in the antimalarial distribution chain. In order to gain an understanding of how antimalarials make their way down the distribution chain, interviews were carried out at all levels in the chain: importers (9), intermediate wholesalers (7), terminal wholesalers(6), and retailers (8). Importers are wholesalers who import at least one kind of antimalarial from sources outside the country, intermediate wholesalers are those who buy from importers and generally sell to other wholesalers, terminal wholesalers are those who buy from intermediate wholesalers and sell to retailers, and retailers are defined as those who sell to the general public. As will be explained further, these categories are often not rigid and one actor in the chain may play several roles. Furthermore, an effort was made to capture variation in retailer type. Consequently, different kinds of outlets with the potential to stock antimalarials were interviewed: pharmacies, depots, private health dispensaries, grocery stores (known as *épiceries*) and grocery stores with bar (*epi-bars*). See Appendix 1 for descriptions of the type of retailers included in these categories. Respondents were asked questions about the structure of the market for antimalarials and RDTs, their business practices, their relationships with suppliers and customers, stocking decisions, the level of competition and collusion in the market for antimalarials, and their perception of regulations.

In order to get a cross-section of how actors across the country viewed the distribution chain, we interviewed private sector actors in eight sites that can be categorised by degree of access as follows: accessible (3), semi-accessible (2), and remote (3). Classification of accessibility was made on the basis of ground and air links between the location and major cities, as well as size of the population. Generally, accessible locations were cities or towns of a population of over 100,000 inhabitants with ample road, air and or maritime connections to multiple national and international locations. Semi-accessible locations were generally towns with a population between 10,000 and 100,000 and with infrequent flights and/ or limited road transportation to major cities. Remote

locations had fewer than 10,000 inhabitants and had very limited road connectivity to other towns. Remote locations were also often isolated from other towns during the rainy season. The breakdown of the number of respondents by type and accessibility is shown in Table 2.1.

Respondents were interviewed by a researcher from LSHTM using a prepared semi-structured interview guide, and accompanied by a trained note taker. Respondents were given the option to have their interviews recorded. Soon after an interview, the note taker typed up the notes and, in the case of recorded interviews, checked notes against the interview recording. Notes were then checked by the interviewer and coded using Nvivo software. Notes were coded according to an analytical framework, and then summarized and synthesised to write the present report. Some participants were contacted via email in February 2012 for clarification and follow-up.

Some additional information included in the analysis was gathered from interviews carried out in November and December 2011 as part of a case study conducted for the Independent Evaluation of the AMFm programme.

*Table 2.1: Details of respondents by location*

Type of Location	Key Informants	Importers	Intermediate Wholesalers	Terminal Wholesalers	Retailers
Accessible	10	9	7	3	2
Semi-Accessible	-	-	-	2	3
Remote	-	-	-	1	3

## 2.2. Quantitative Data

Data from the 2010 Outlet Survey (ACTwatch Group 2010) were used in this analysis to examine the prices and retail mark-ups in different types of outlets. Additional results not reported here are available in the main Outlet Survey report.

### Sampling Framework<sup>2</sup>

For the purpose of the Outlet Survey, a nationally representative sample of all outlets with the potential to sell or provide antimalarials to a consumer was taken through a census approach in 38 clusters across two malaria-endemic strata, urban and rural, in Madagascar. The desired cluster size was approximately 10,000 to 15,000 inhabitants, which corresponds most closely to a commune in Madagascar. Sampling was conducted using a one-stage probability proportion to size (PPS) cluster design, with the measure of size being the relative cluster population. In each commune, a census of all public and private outlets that had the potential to sell or distribute antimalarials was conducted and outlets that stocked antimalarials at the time of the survey or in the past 3 months were invited to participate in the Outlet Survey.

In order to estimate antimalarial availability and price across different outlet types, this sample was supplemented by a booster sample of public health facilities and registered pharmacies. The use of a booster sample is a procedure common to all the ACTwatch outlet surveys to ensure adequate representation of relatively rare but important antimalarial provider types. All tertiary care, district/provincial level facilities and pharmacies were included in the administrative district of the

<sup>2</sup> More detailed information on the sampling framework and on price and mark-up calculations can be found in the ACTwatch 2010 Outlet Survey available at [www.actwatch.info](http://www.actwatch.info)

sampled commune. For health facilities at a lower level than these, simple random sampling informed their selection.

The 2010 Outlet Survey was conducted between April and June 2010. It collected data on antimalarial drug availability, sales volumes and selling prices, retail outlet and shopkeeper characteristics (antimalarials stocked, other drugs stocked, number of staff, education, health-related qualifications, registration status, GPS co-ordinates) as well as other variables of importance to understand the distribution chain, including each retailer's two top supply sources for antimalarials (name, location, provider type, whether they distribute, collect, or both) and antimalarial wholesale purchase prices.

In order to arrive at a complete picture of the distribution chain for antimalarial drugs, data relevant to the retail level are also presented for six mutually exclusive categories of retailers: public health facilities, pharmacies, private health facilities, grocery stores (including épiceries, épi-bars, and épi-gargotes), community agents, and other outlets (gargotes, bars and others).

### Calculating purchase price and mark ups

Antimalarial price data are reported for five dosage forms, namely tablets, oral liquids, injectables<sup>3</sup>, suppositories and granules; and three antimalarial categories<sup>4</sup> namely ACT, artemisinin monotherapies (AMT) and non-artemisinin therapies (nAT). ACTs were further sub-divided into World Health Organization (WHO)-prequalified ACT and non-WHO-prequalified ACTs.

Antimalarial price data were calculated on the basis of an adult equivalent treatment dose (AETD). An AETD was defined as the number of milligrams (mg) of an antimalarial drug needed to treat a 60kg adult (refer to Appendix 2 for data used during calculations of AETDs). The number of mg/kg used to calculate one AETD was defined as what was, at the time of the study, recommended for a particular drug combination in the treatment guidelines for uncomplicated malaria in areas of low drug resistance issued by the WHO. Where WHO treatment guidelines did not exist, AETDs were based on product manufacturers' treatment guidelines. In the case of ACTs as the treatment consists of 2 or more active antimalarial ingredients packaged together (either co-formulated or co-blistered), the strength of the artemisinin-based component was used as the principal ingredient for the AETD calculations. Information collected on both 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.

Retail purchase prices and mark-ups were also calculated using price data collected during the ACTwatch Outlet Survey. When calculating summary estimates for purchase prices and mark-ups, there was a need to weight outlet survey data to allow for (a) the difference in sampling probabilities due to variation in the size of strata, (b) the oversampling for the booster, and (c) the sampling strategy which involves a census of retail outlets in the communes of varying size selected using PPS. Strata specific weights were calculated for each sub-district sampled in each of the two strata. Appendix 3 provides a detailed description of the calculations performed and weights used.

Retail percentage mark-ups were calculated for each product as the difference between selling price and purchase price, divided by purchase price. Absolute mark-ups per AETD were calculated for each

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<sup>3</sup> Liquid and powder injectables form a single category

<sup>4</sup> Antimalarial drugs intended for prophylaxis and drug combinations not used to treat malaria but that contain an ingredient with antimalarial action were excluded from analysis

product as selling price minus purchase price. Data were collected in local currencies and converted to their US\$ equivalent using the average interbank rate during the data collection period<sup>5</sup>.

Indicators are reported using the median and inter-quartile range (IQR) by outlet type, which are relevant for describing distributions likely to be skewed.

### 3. Structure of the antimalarial distribution chain

#### 3.1. Formal Private Sector<sup>6</sup>

In the past, some antimalarials were produced domestically in Madagascar. The local manufacturer Farmad produced *Paludar*, a brand of Sulfadoxine-Pyrimethamine (SP) as well as *Quinine Resorcin Farmad*, a brand of quinine. Although these products were still in the market at the time when qualitative fieldwork was carried out, Farmad has since ceased production of all antimalarials. Branded chloroquine used to be produced by the local manufacturer Niphar but the company stopped production sometime between 2002 and 2004. As of February 2012, it appears that there is no domestic production of antimalarials in Madagascar.

The process of importation of medication is overseen by the Direction de l'Agence du Medicament de Madagascar (DAMM), the drug regulatory authority from the Ministry of Health. All medications need to have an *Authorisation de Mise sur le Marché* (AMM), an approval from the DAMM stating that the product is fit to be sold in the Malagasy market, before importation. Respondents mentioned that the process of applying for AMM can often take between four and five months, with one respondent mentioning it can take up to a year. If a product changes name and packaging, even if the manufacturer and chemical composition of the drug remain the same (as was the case with Coarsucam and ASAQ Winthrop), a new AMM needs to be obtained. An AMM is valid for a 5-year period, after which the importer or manufacturer has to request a renewal.

Importers interviewed, by and large, did not have sole distribution rights with particular foreign manufacturers. Two importers mentioned having sole distribution rights for specific products, one with a Chinese manufacturer that produced a new injectable artesunate product, and the other for a non-specified generic antimalarial with an Indian manufacturer. By August 2011, both importers were waiting for the DAMM to approve their AMM requests for their products and had yet to begin importing the medications. Most major importers bought antimalarial products from a number of different suppliers. Although having access to a wide variety of products was repeatedly mentioned as an important business goal, some importers also stated that they tend to be reasonably faithful to particular suppliers, at least partly because the process of registering with a new manufacturer is time consuming. Importers most frequently mentioned buying medications from manufacturers in France, Mauritius, China and India.

Reports of the number of importers in the country ranged between 33 and 40. All importers mentioned selling to pharmacies, and the majority also mentioned selling to depots. Only a few importers cited selling to intermediate wholesalers, and there was only one case of sole distribution

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<sup>5</sup> The average exchange rate during the data collection period for retail purchase prices (26 April to 22 June) was 2161.13750 Malagasy Ariary to US\$1.

<sup>6</sup> For the purposes of this report, businesses in the formal private sector are defined as those that are authorised to sell prescription medications, namely pharmacies, depots, and private health facilities.

rights between an importer and an intermediate wholesaler. Some intermediate wholesale businesses were partially owned by local pharmacists.

Purchase of antimalarial medications by an individual in Madagascar, as stipulated by the Ministry of Health, requires a prescription from a health practitioner. However, antimalarials, as well as other drugs, are often sold without prescriptions. In the formal private sector, pharmacies, depots and health dispensaries are allowed to sell prescription medications. There are about 200 registered pharmacies in Madagascar and they are required by law to have an in-house pharmacist as part of their staff. Pharmacies sell to individual consumers and frequently also sell to depots. There is evidence of some horizontal trading between pharmacies, especially at times of stock-outs. There is also evidence suggesting pharmacies sell directly to the informal sector, which consists of general retailers, street vendors, and itinerant salespeople, which are not licensed by the government to dispense antimalarials.

Depots are authorised points of drug distribution that can operate without an in-house pharmacist. About 2000 depots operate in Madagascar. They were conceived as a way to extend healthcare to peri-urban and rural areas; regulations state that depots are only allowed to operate outside of a 5-mile radius of the closest pharmacy. However, a respondent mentioned that there are exceptions to this rule, citing the example of a mid-sized town on the East coast of Madagascar where both a pharmacy and a depot operate<sup>7</sup>. Even though depots are allowed to function without an in-house pharmacist, the person running the depot needs to have attained at least secondary level education and has to have been trained as a pharmacist in the region. There are some restrictions on the kinds of drugs that depots are allowed to sell. However, these restrictions do not include any antimalarial treatments.

Although depots, just as pharmacies, are permitted to sell prescription-only medicines, it was acknowledged by respondents at all levels of the chain and in government, that in practice, members of the public can easily buy medications at the depot and pharmacy level without a prescription. Depots, by and large, sell only directly to consumers, although there is also evidence to suggest that depots sell to informal sector outlets as well.

As mentioned earlier, actors often transacted simultaneously at different levels of the chain. Wholesalers that import most of their products may also buy certain stock from other importers in order to satisfy orders for particular clients, hence acting like intermediate wholesalers. No wholesalers interviewed acted solely as terminal wholesalers, that is to say that they buy from a non-importing wholesaler and sell to retail outlets. However, some pharmacies interviewed were classified as terminal wholesalers, as they both sell to the general public and supply nearby depots.

It is important to note that there were discrepancies in answers from some respondents. For example, the owner of a pharmacy in a semi-accessible area mentioned that he only sells to the general public and never to depots. However, two depots in remote areas mentioned the pharmacy as one of their suppliers.

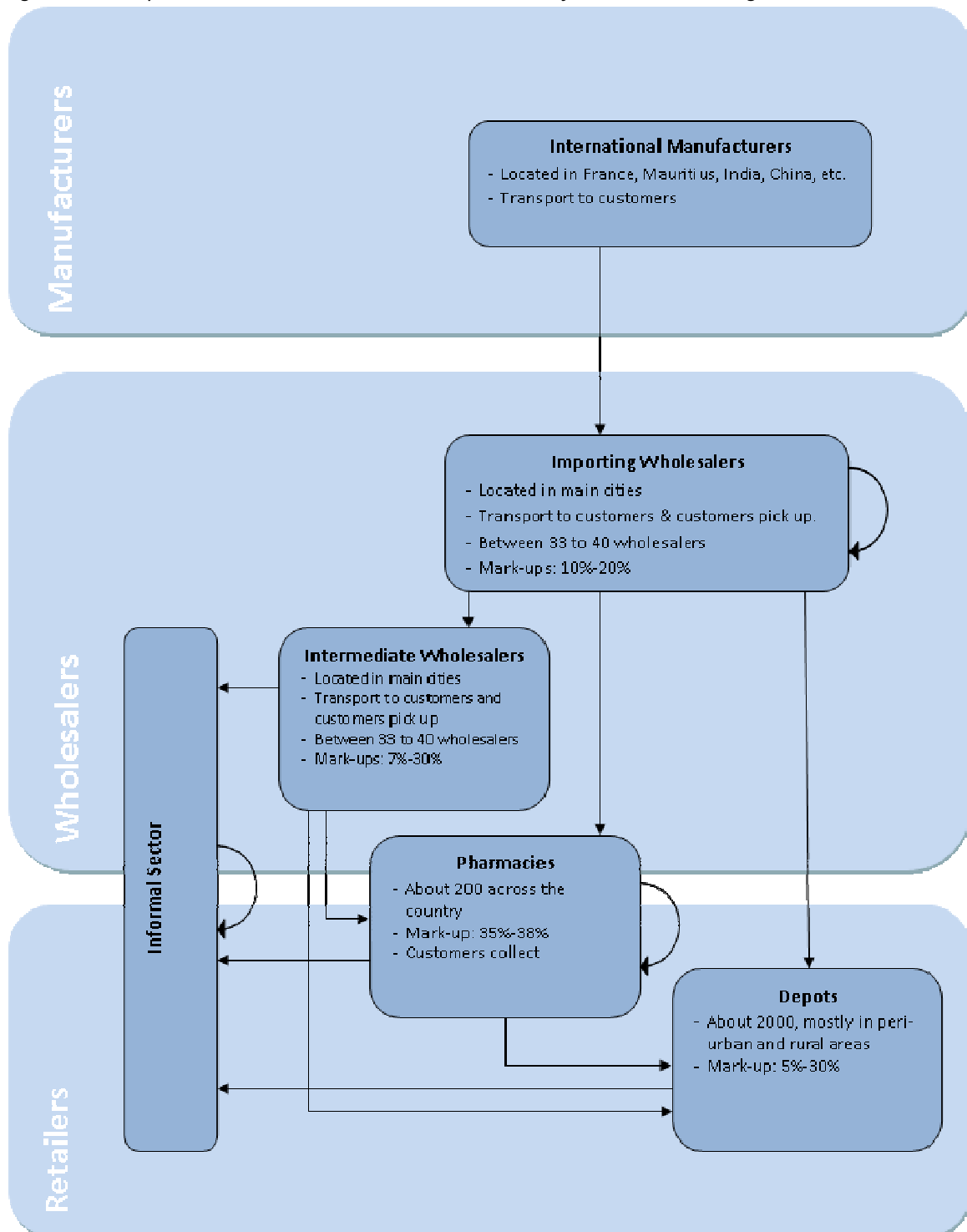
Attempting to buy at the highest possible level of the chain seemed to be a common business strategy. As mentioned above, nearly all importers, the majority of which are located in Antananarivo, sell to depots, which are located in rural areas. Since the cost of transportation is

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<sup>7</sup>It is unclear whether the respondent was suggesting that the exception was authorized by the pertinent authorities, or whether the rule was not followed nor the penalty enforced.

variable, and is not always paid for by the wholesaler, some depots have opted to cut costs by travelling to Antananarivo or Antsiranana to buy directly from importers. There were also mentions of depots acting collectively and buying in bulk in Antananarivo in order to reduce costs. Transportation costs of antimalarials were mentioned to be high, as antimalarials are in highest demand in the rainy season when transport is more limited and consequently often more expensive.

Figure 3.1: The private commercial sector distribution chain for antimalarial drugs





### 3.2. Informal Sector<sup>8</sup>

Nearly all respondents acknowledged that there was an informal sector providing pharmaceutical products in Madagascar. Perceptions of the size and influence of the informal sector varied between respondents. Some estimated that no more than 20% of products that make their way to the consumer pass through the informal sector, whereas others estimated that the figure could be higher than 50%. As cited above, there is evidence from both the household survey and the outlet survey suggesting the presence of the informal sector in antimalarial sales is substantial. The ACTwatch Household Survey reported that 17% of fever treatments for children under the age of 5 were sought from the informal sector (ACTwatch Group 2008-2009). Furthermore, the Outlet Survey showed that informal sector outlets account for 61% of all outlets with at least one antimalarial in stock, and 31.8% of all antimalarial AETDs sold or distributed were sold by general retailers, none of whom are legally authorised to do so (ACTwatch Group 2010).

The precise distribution chain for products that end up in the informal sector is not entirely clear from the research conducted. Two members of the informal sector, both retailers, were interviewed: an epi-bar in an accessible area and an épicerie in a semi-accessible area. The only antimalarial they sold was *Nivaquine*, an inexpensive brand of chloroquine very commonly sold by general retailers.

The respondent at the epi-bar did not specify her supply source, mentioning that different itinerant salesmen come by on a frequent basis to offer her medications. She said she did not know her suppliers' names or contact information. The second informal sector respondent, the épicerie, mentioned buying her stock at a registered pharmacy in the same town.

These two different responses suggest that there are various pathways through which medications find their way into the informal sector. As the respondent at the epi-bar exemplified, it may not be unheard of for retailers to know little about the person supplying them with medications. In the 2010 Outlet Survey, a number of retailers were only able to describe their supplier by stating their ethnic origin, such as Betsileo. However, it is unclear whether this was because they genuinely did not know their suppliers, or because they did not want to reveal information about a supplier who they know to be operating outside the law. The responses from the respondent at the épicerie suggest that pharmacies may also be leaking medications into the informal sector, which is forbidden by law.

Responses from the formal sector distribution chain suggest that leakage occurs at other points throughout the chain as well. Several respondents blamed depots for being the largest contributors to the informal sector. One respondent in a pharmacy said she did not sell to depots partly because she did not trust them to not sell to the informal sector further down the line. Of the depots interviewed only one acknowledged selling to the informal sector. The respondent mentioned selling to a man who then resells in a remote location further into the bush, where no depots are available.

Another respondent, an intermediate wholesaler in an accessible area, mentioned that intermediate wholesalers are also selling to the informal sector, turning a blind eye to regulations that state that medications can only be sold to pharmacies and depots that can prove being certified, by giving their tax identification number (or *Numéro d'Identification Fiscale*, NIF).

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<sup>8</sup> For the purposes of this report, businesses in the informal sector are defined as those that are not authorised to sell prescription medications. These include épiceries, epi-bars, epi-gargotes, and gargotes, among others.

A number of other pathways through which drugs are channelled into the informal sector were suggested by respondents. One respondent mentioned that containers of medications have been stolen at customs in ports like Toamasina. Another said that medications were sometimes stolen from health facilities. Furthermore, a third respondent mentioned that given Madagascar's extended unmonitored coastline, containers full of untaxed merchandise, including medications, easily arrive in the country from places like China and India.

### 3.3. Co-paid ACTs in the distribution chain

#### AMFm

Subsidized ACTs are available in Madagascar's private sector in part through phase 1 of the AMFm pilot which is housed by the Global Fund. The Principal Recipient of the AMFm grant in Madagascar is SALAMA, the central medical store for the public sector, in partnership with the Project Management Unit of the Ministry of Health (*Unité de Gestion du Projet*, or UGP).

SALAMA, with the support of the Clinton Health Access Initiative (CHAI) and the PNL, facilitated agreements between Malagasy first-line buyers and the Global Fund in order to secure a steady supply of co-paid ACTs into the country. Six out of a total of eight first-line buyers had their first orders of subsidized ASAQ and AL products approved by the Global Fund between September and October 2010. The other two first-line buyers had their orders approved in January 2011 and April 2011. Although some orders were received in Madagascar as early as October 2010, the majority of the first-line buyers' initial orders arrived in country in January and February 2011. Despite some initial reluctance by first-line buyers and other actors to participate due to the reduced profit margins inherent in selling highly subsidized products, it was reported by key informants and private sector actors that co-paid ACTs can be found throughout the distribution chain in locations across the country. Respondents also reported that ACTs have grown in popularity among the public and have taken up a significant share of the market.

Several supporting interventions were carried out to increase the outreach of co-paid ACTs. An official national launch was held in January 2011 in Antananarivo, which was reported by several media outlets. Interventions aimed at educating health practitioners, pharmacists and CHWs were also designed and implemented. These included tailored training sessions where participants were educated on issues relating to malaria case management, pharmacovigilance, and ACTs. Promotional materials were distributed, such as prescription pads, pens, posters, T-shirts and hats. These materials contained three main messages: that there was new treatment for malaria that was effective, inexpensive, and available.

In addition, a campaign to reach the general public was designed. Radio spots were recorded and broadcast in eight different dialects. A TV spot was also produced and broadcast nationwide, beginning in April 2011. However, in May 2011 the DAMM banned radio and TV advertising of ACTs, citing a law that states that products that require a prescription cannot be advertised directly to the general public.

#### PSI

Co-paid ACTs are also available in the private sector via PSI. *ACTipal* is a socially-marketed co-blister pack of ASAQ for children under the age of five which was introduced by PSI in mid-2008 with funding from UNITAID, the Global Fund and USAID. It is sold at the community level through community health workers (CHWs), as well as through the private sector, via pharmacies and

depots. Packaging of *ACTipal* varies depending on whether it is delivered through CHWs or through the private sector.

The methods of distribution also vary by outlet type. *ACTipal* destined for the community level is distributed to a specific point of distribution in the area. These can be NGO offices, shops, or private individuals' offices, among others, from which CHWs can purchase their *ACTipal* supplies. For the private sector, ACTs are overbranded<sup>9</sup> by the local pharmaceutical manufacturer, Niphar. PSI then sells them to top-level wholesalers who in turn sell to intermediate wholesalers, pharmacies and depots.

PSI employs two means to try to maintain a low retail price for *ACTipal*. The first is by stating the recommended price for the drug on the packaging. The second is by relying on distribution supervisors to monitor the availability and price of the medications at the retail level. Although these supervisors are not in a position to enforce the recommended retail price on a retailer, they can play a role in sensitizing retailers on the social nature of the initiative and report findings back up the chain.

## 4. Stocking Decisions and Constraints

Prices offered, habit, and distance were most frequently stated by respondents as reasons for choosing particular suppliers, as was the availability of credit.

### 4.1. Credit

All of the importers interviewed mentioned offering credit to their clients. Further down the chain, the willingness to offer credit varied depending on factors such as trust and a long-standing relationship with the client. In some instances, wholesalers in accessible areas seemed less willing to offer depots credit and were more strict on payment terms; some wholesalers mentioned not allowing depots to pay by cheque, and not making loans to depots altogether. The credit terms offered by the majority of wholesalers across the chain were 30 days. However, some had different timeframes for the repayment of the credit: between 15 and 60 days. Most credit offered was interest-free. By and large, retailers did not offer credit to their clients.

### 4.2. Transport

Issues relating to transportation within Madagascar were not frequently mentioned explicitly as factors influencing the choice of supplier. However, in practice, a supplier's decision to cover the cost of transport is used to entice clients and is sometimes perceived as a discount. There seems to be great variation in the arrangements for the transportation and delivery of antimalarials. While some wholesalers stated that they never deliver and that buyers have to pick up orders, a large portion of wholesalers have a degree of flexibility when it comes to covering the cost of transport. There is generally space for negotiation between the seller and the buyer in this regard. Whether or not the seller pays for the cost of transportation seems to depend on a number of factors, including the loyalty of the client, the distance, the urgency with which the order is needed, and the size of the order. The method of transport also varied depending on location and capacity. Whereas some

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<sup>9</sup> Overbranding is a practice where pharmaceutical products manufactured and packaged in primary and secondary packaging (e.g. blister packs) by one business are given additional external packaging (e.g. informational wallet), often to provide simplified, country-specific information on dosing regimens and branding.

larger wholesalers have their own vehicles, regular delivery routes and regional hubs, others send the orders via colis-express (a courier service that goes to the provinces), taxi-brousse (inter-city transport system), or even by plane. Transport costs seemed to be of particular concern for depots, given their often remote locations.

The cost of transportation seemed to acquire particular salience for the sale of antimalarials. As one wholesaler based in Antananarivo mentioned, the profit margin when selling antimalarials (especially with AMFm co-paid ACTs) is very low, so if a client orders only antimalarials, then the cost of transportation falls on the buyer. However, if a client were to place a mixed order of antimalarials and other, more lucrative, products the seller may be required to cover the cost.

### 4.3. Sources of Financing

None of the retailers, and only one of every ten wholesalers interviewed mentioned that they financed their stock through bank loans. Most businesses said they financed their stock through their own means. The majority of those with access to bank credit were located in accessible areas. However, as stated above, most wholesalers at the top of the chain offer credit to their clients as an alternative source of financing.

### 4.4. Costs

Stocks, transportation, and employee salaries were most frequently stated by respondents as the most significant costs in running their businesses. One respondent mentioned that the cost of hiring pharmacists is particularly high; most pharmacists are trained abroad and few return to the country, making demand for their labour generally high.

Although no taxes are paid on any medications in Madagascar, importers do incur costs associated with clearing customs when medications first enter the country such as storage fees, unloading fees, and transit fees. Data provided by a respondent show that a first-line buyer had to pay fees of 2.48% of the estimated sale price of an order of 166,480 individual treatment packages of Sanofi's ASAQ<sup>10</sup>. However, this rate is not constant for all orders. Although the majority of the fee seems to be calculated as a percentage of the estimated sale value and the weight of the order, there are some smaller fees that are standard across all orders.

## 5. Pricing Decisions and Sales

### 5.1. Mark-ups

Data on wholesale mark-ups were collected through interviews at different levels of the distribution chain. Retail mark-ups were calculated from data collected in the ACTwatch Outlet Survey, which is a much larger and representative survey of outlets for which estimates are therefore more precise. However, it is important to note that the Outlet Survey was conducted before the AMFm programme was introduced. Retailers interviewed as part of the distribution chain rapid analysis were also asked about their mark-ups. Their responses are compared in the analysis below.

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<sup>10</sup> Broken down as follows: 34,000 adults doses, 63,360 child doses, 40,320 small child doses, and 28,800 baby doses. The total value of the orders was 4,148 euro (11,654,925.96 MGA), and the total weight of the order was 2,072 kgs. The expected sale price for the order was 39,029,600 MGA. The total fees paid were 969,147.15 MGA.

### Wholesale mark-ups:

Respondents were asked what mark-ups they added to their products and, more specifically, to their antimalarials. Answers varied according to the respondent's position in the distribution chain. Respondents at the top of the chain reported adding mark-ups ranging from 10% to 20%. The majority of respondents said that the same mark-up was applied across the board for all products, including antimalarials, with the only exception being co-paid ACTs, discussed below. Only one respondent mentioned changing the mark-up depending on the kind of medication; because the price of AL is higher than that of ASAQ, he never gives AL a mark-up higher than 10%, whereas the mark-up for ASAQ is between 10% and 15%.

Intermediate wholesalers reported mark-ups ranging from 7% to 30%. The majority of intermediate wholesalers interviewed reported adding the same mark-up regardless of the buyer. However, one respondent, an intermediate wholesaler in an accessible area, described using a tiered pricing scale, adding a 7% mark-up when selling to pharmacies, 12% when selling to depots, and 20% when selling to large organizations, such as NGOs or faith-based organisations. It is unclear how common this third-degree price discrimination is among intermediate wholesalers.

### Retail mark-ups:

Mark-ups added by retailers varied greatly depending on the type of outlet. Pharmacies reported adding a mark-up of between 35% and 38% on all medications. Some said that the range is determined by the law, while others said that it is agreed upon by the syndicate of pharmacists. Where the mark-up lies within that 35%-38% range seems to depend on the accessibility of the pharmacy's location. Pharmacies in Antananarivo, for example, add a 35% mark-up whereas those in the provinces add 38%. There were diverging understandings among respondents as to the nature and legal status of the mark-up ranges. Whereas some respondents in government and NGOs, as well as some wholesalers, mentioned that the range was determined by the law, other wholesalers mentioned that the range was agreed upon by a syndicate of pharmacists but was not legally binding.

These figures are consistent with data collected in the ACTwatch Outlet Survey (see Table 5.1), which found a median mark-up on ACT tablets in pharmacies of 38.3% and on non-ACT antimalarial tablets of 38.2%. The only exceptions were injectable treatments, which carried an average mark-up of 42.9%. Injectable treatments also had the widest inter-quartile range of any antimalarial sold at a pharmacy: 20.1 – 81.3.

Depots interviewed mentioned adding a range of different mark-ups. Whereas one depot in a remote area reported adding about 20% to all products across the board, another one said the mark-up varied depending on the source of the products. The respondent said that the mark-up was often only 5% unless the products were bought from one particular pharmacy in the closest big city. In that case, the mark-ups could be as high as 30%. The difference in mark-ups may be explained by whether the cost of transportation is paid for by the buyer or the seller.

The data on depots from the Outlet Survey show a variation in percentage price mark-ups depending on the kind of antimalarial. The median percentage mark-up for ACTs is 38.9%, which is roughly similar to that of the pharmacies, and the IQR remains narrow (25.0 – 42.9). The median percentage mark-ups for all nATs is considerably higher at 66.7%. Median percentage mark-ups nAT tablets were 80%, and had a wide IQR of (42.9 – 150.0). Although the qualitative results do not necessarily reflect the high percentage mark-ups that were found in the Outlet Survey, they do suggest that variation in

mark-ups is large, given the varying cost of transportation that is incurred when delivering medications to remote locations.

The variation in mark-ups between ACTs and nATs at the depot level can likely be explained by the fact that around 90% of ACTs found in depots were *ACTipal*, the subsidised ACT distributed by PSI. As mentioned earlier, *ACTipal* has the recommended retail price printed on the box and PSI carries out routine supervision to monitor whether prices are being respected. It is also worth noting that even though the percentage mark-ups for nAT, particularly for tablets, were high, the absolute mark-ups were relatively low, at US\$ 0.15 (see Appendix 4). Half of nAT tablets sold at the depot level were chloroquine, whose retail price is generally very low. Given the low price, depots can therefore add a mark-up that is high in percentage terms, but low in terms of an absolute mark-up, and still sell the product.

The same may be true for general retailers that overwhelmingly sell chloroquine: the ACTwatch outlet survey found that out of all outlets stocking antimalarials, over 99% stocked nATs. Out of those nATs found at the general retailer level, 98.7% were chloroquine. The median percentage mark-up for nATs was 66.7% and ACTs made up about 1% of antimalarials found in general retailers.

The observations from the two general retailers in the informal sector interviewed in the supply chain survey were consistent with the data from the outlet survey. Both outlets interviewed mentioned only selling Nivaquine, a brand of chloroquine. The epi-bar in an accessible area added a mark-up of 56%, and the épicerie in a semi-accessible area added a mark-up of 45%. Although both of these mark-ups are below the median percentage mark-up from the Outlet Survey, they are still within the IQR for nAT tablets (42.9-150.0).

The distribution chain for AMFm co-paid ACTs in the private sector largely functions in the same way as for other antimalarials. However, the mark-up added by importers is not a percentage of purchase price, but rather a fixed amount. The agreement between the Global Fund and first-line buyers was to apply a “reasonable margin”, which was set at 150 Malagasy Ariary (USD 0.07). There are no recommended retail prices for co-paid ACTs, but according to respondents wholesalers, pharmacies and depots are adding roughly the same mark-up that they would to any other antimalarial product. As described above, this can vary according to remoteness of a retail outlet. Given the low profit margin on these medicines, most importers are not offering to pay for the cost of transportation, which can often be a negotiated aspect of a sale for other medications that yield higher profits.

Table 5.1: Retail level percent price mark-ups on antimalarials, by outlet type (%)

ANTIMALARIAL TYPE <sup>1</sup> Formulation			RETAILER CATEGORIES <sup>2</sup>					
			PHARMACIES N=50	PRIVATE HEALTH FACILITIES <sup>3</sup> N=61	DRUG STORES N=235	GENERAL RETAILERS N=1387	PUBLIC HEALTH FACILITIES N=492	COMMUNITY HEALTH WORKERS N=30
All ACT	All	Median	38.1	0.0	38.9	50.0	0.0	50.0
		IQR	25.0-38.8	0.0-0.0	25.0-42.9	33.3-50.0	0.0-0.0	0.0-100.0
		(n)	(107)	(82)	(124)	(14)	(1478)	(30)
	Tablet	Median	38.3	0.0	38.9	50.0	0.0	50.0
		IQR	17.6-38.8	0.0-0.0	25.0-42.9	33.3-50.0	0.0-0.0	0.0-100.0
		(n)	(105)	(82)	(124)	(14)	(1478)	(30)
	Oral liquid	Median	38.1	-	-	-	-	-
		IQR	38.1-38.1	-	-	-	-	-
		(n)	(2)	-	-	-	-	-
Quality-assured ACT	All products were tablets	Median	38.1	0.0	38.9	50.0	0.0	50.0
		IQR	7.9-38.6	0.0-0.0	25.0-42.9	33.3-50.0	0.0-0.0	0.0-100.0
		(n)	(90)	(73)	(123)	(14)	(1332)	(29)
Non quality-assured ACT	All	Median	38.8	0.0	60.0	-	0.0	0.0
		IQR	38.1-38.8	0.0-0.0	60.0-60.0	-	0.0-0.0	0.0-0.0
		(n)	(17)	(9)	(1)	-	(146)	(1)
	Tablet	Median	38.8	0.0	60.0	-	0.0	0.0
		IQR	38.8-38.8	0.0-0.0	60.0-60.0	-	0.0-0.0	0.0-0.0
		(n)	(15)	(9)	(1)	-	(146)	(1)
	Oral liquid	Median	38.1	-	-	-	-	-
		IQR	38.1-38.1	-	-	-	-	-
		(n)	(2)	-	-	-	-	-
AMT	All	Median	38.9	0.0	31.4	-	-	-
		IQR	38.9-38.9	0.0-0.0	31.4-31.4	-	-	-
		(n)	(4)	(2)	(1)	-	-	-
	Tablet	Median	-	0.0	-	-	-	-
		IQR	-	0.0-0.0	-	-	-	-
		(n)	-	(1)	-	-	-	-
	Injectable	Median	38.9	0.0	31.4	-	-	-
		IQR	38.9-38.9	0.0-0.0	31.4-31.4	-	-	-
		(n)	(4)	(1)	(1)	-	-	-
nAT	All	Median	38.2	66.7	66.7	66.7	7.7	66.7
		IQR	17.3-62.3	28.6-100.0	42.9-112.1	50.0-100.0	0.0-35.1	66.7-66.7
		(n)	(274)	(113)	(705)	(1438)	(573)	(2)
	Tablet	Median	37.9	60.0	80.0	66.7	0.0	66.7
		IQR	14.3-44.3	20.0-66.7	42.9-150.0	50.0-100.0	0.0-0.0	66.7-66.7
		(n)	(189)	(58)	(468)	(1436)	(377)	(2)
	Oral liquid	Median	39.2	31.4	50.0	-	-	-
		IQR	38.0-39.2	20.0-42.9	37.3-60.0	-	-	-
		(n)	(12)	(2)	(17)	-	-	-
	Injectable	Median	42.9	69.8	57.9	20.0	35.0	-
		IQR	20.1-81.8	40.0-100.0	40.0-81.8	20.0-100.0	34.8-35.8	-
		(n)	(73)	(53)	(220)	(2)	(196)	-

1 ACT: artemisinin-based combination therapy; AMT: artemisinin monotherapy; nAT: non artemisinin therapy; RDT: Rapid diagnostic test for malaria. 2 As these are weighted medians, medians are not the average of the middle two ordered observations for instances where there are an even number of observations. Note: 10 of 5587 (0.2%) purchase price observations (4 in pharmacies, 2 in private health facilities, 1 in drug stores, 3 in general retailers) were set to missing due to mark-ups in excess of 1000% which were likely due to errors during data collection. 3 This category of retailer includes both for-profit and not-for-profit health facilities. Source: Additional analysis of data collected in the ACTwatch Outlet Survey (ACTwatch Group 2010).

## 5.2. Sales

Respondents were asked about the importance of antimalarials to their overall sales. By and large, importers and intermediate wholesalers said that although antimalarials made up a sizeable percentage of their stock in terms of volume, revenue earned from their sale constituted a very minor percentage of their total earnings. The great majority of respondents, who ventured to estimate what percentage of their revenue came from antimalarial sales, mentioned a figure from less than 1% to 10%. Answers from terminal wholesalers and retailers tended to be more diverse. One respondent mentioned that the volume to earnings ratio for antimalarial sales did not only apply to co-paid ACTs, but that prices of all antimalarials sold were relatively low.

Most respondents agreed that sale of antimalarials varied throughout the year with highest sales coinciding with the rainy season, which runs approximately between December and March. However, malaria transmission occurs year round in certain parts of the country, most notably in the East coast. Consequently, several respondents in this part of the country stated that their sales were relatively consistent throughout the year with lower sales recorded only between May and August.

When asked about the most commonly sold antimalarial, respondents offered a variety of different answers, although ACTs and Paludar (SP) were most frequently named. Some wholesalers mentioned that rolling out new products in the provinces is a difficult endeavour, as people are perceived to be particularly set in their habits of buying certain medications. One respondent suggested that the popularity of Paludar is in large part due to the fact that it has been around for a long time. However, respondents also agreed that the low purchasing power of the population restricts the choice of medication and influences people's choices; some respondents mentioned selling less chloroquine since the arrival of co-paid ACTs and attributed the change to the AMFm advertising campaign (which was later banned by the DAMM).

It is interesting to note that the answers given by respondents on the most commonly sold antimalarials were quite different from the findings of the ACTwatch 2008/2009 household survey, which found that chloroquine was the most frequently used antimalarial for treatment of fever for children under five, and the 2010 outlet survey which found that chloroquine accounted for 57% of antimalarial AETDs sold or distributed through both public and private sector outlets (ACTwatch Group 2008-2009; ACTwatch Group 2010). It is key to note that the 57% was entirely composed of private sector sales. The discrepancy may be due to a number of factors, including the fact that 28 out of 30 outlets interviewed for the present study were part of the formal sector, as well as the implementation of AMFm, which occurred after the Household Survey and Outlet Survey were conducted.

When respondents were asked what antimalarial they thought was most effective for treatment, the majority mentioned ACT, for both children and adults. A minority of respondents mentioned SP and quinine.

## 5.3. RDTs

No private sector actors interviewed, neither wholesalers nor retailers reported selling RDTs at the time of interview. It was the general consensus that presence of RDTs in the private sector is extremely limited. One respondent interviewed for the AMFm Independent Evaluation case study mentioned that, due to their high retail price, the only private sector outlets that carry RDTs are those that cater towards expatriates. Data from the Outlet Survey confirm these findings; RDTs were



only stocked by 12% of private health facilities and were not found elsewhere (ACTwatch Group 2010).

## 6. Regulations and Enforcement

The DAMM's inspections of pharmacies and depots are carried out intermittently; their frequency seems to be related to the accessibility of the location. The majority of respondents in accessible areas mentioned that inspections took place about once a year. There was, however, a range in answers, with one respondent mentioning being inspected three times per year, and another one once every 4 years. Respondents located in semi-accessible areas suggested that the frequency of inspections was between once a year and once every 5 years. In remote areas, most respondents said they had never been inspected since opening, and one mentioned that in 15 years the depot had been inspected twice. The ad hoc basis on which inspections are carried out is likely related to the fact that, by mid-2011, the DAMM only had two trained pharmacist inspectors in charge of inspecting dozens of wholesalers, 200 pharmacies, and over 2000 depots. Respondents mentioned that when inspections took place, inspectors checked the cleanliness of the pharmacy, expiration date on products, and price mark-ups, among other requirements.

Regulations concerning storage of medications include stipulations on the temperature at which medications are stored, exposure to the sun, air circulation, distance between the medications and the walls, maximum height of shelves containing medications, and minimum distance between the floor and shelves, among others. Although by and large, respondents were aware of the norms required to handle and sell medications, some respondents at the lower end of the chain were unaware that any norms existed. In general, respondents found the law to be sensible, but the enforcement to be lacking. Few respondents mentioned hearing of other businesses being fined or closed down for not complying with regulations.

A key informant mentioned that the DAMM also carries out quality controls when drugs first arrive in the country and that there are subsequent random pharmacological checks thereafter. The respondent mentioned that in the past these controls have shed light on the inadequacy of some manufacturers, citing the example of a shipment of 100mg chloroquine tablets that in practice only contained 60mg of chloroquine.

Most respondents agreed that counterfeit antimalarials have not been a major problem in the country, although one respondent said that there was trafficking of expired products. Rather, it was the dubious origin of antimalarials found in the informal sector, as well as the condition of sales, that troubled some respondents. According to some of the interviewees, some neighbourhoods in major cities around the country have, for decades, been well known for the extensive presence of street vendors who specialize in selling medications. Respondents frequently brought up sub-optimal storage conditions, such as vendors leaving drugs out in the sun for long periods of time, as causes for concern. Furthermore, respondents mentioned that the existence of such markets is well known by the general population and is probably also known by government officials.

Although most respondents saw the informal sector as fierce and unfair competition, some respondents implied that there was a sense of economic dependency between the informal and formal sectors. A respondent from a depot in a remote area mentioned that the informal sector was

“killing” her business, but that at the same time she needed the money that she earned from selling to actors in the informal sector in order to maintain her business.

Respondents interviewed for this ACTwatch report did not mention having seen co-paid ACTs in the informal sector. However, it is worth noting that one respondent interviewed as part of the AMFm Independent Evaluation case study reported having heard that co-paid ACTs were being sold in the informal market in two towns in the East Coast of Madagascar. Furthermore, due to Madagascar’s physical isolation from the rest of the African continent, several respondents suggested that co-paid ACTs were unlikely to be channelled out of the country and sold in places where no subsidy programmes presently exists.

## 7. Conclusions

The main actors in the distribution chain for antimalarials in the private sector in Madagascar are importers, wholesalers, pharmacies, and depots. Under ACTwatch wholesalers are categorized as “terminal” if they directly sell to retailers, and as “intermediate” if they buy from importers and sell to terminal wholesalers, recognizing that one business may play both of these roles. Both intermediate and terminal wholesalers operate and are part of the chain in Madagascar, but it seemed from the interviews conducted that most importers sell directly to pharmacies and depots. The survey also revealed that actors often play more than one role in the distribution chain: importers often act as intermediate wholesalers, buying antimalarials from one another to meet particular orders; pharmacies will frequently act as terminal wholesalers, by selling to other pharmacies or depots.

Both pharmacies and depots sell ACTs with roughly the same percentage mark-up (around 38%). Generally, pharmacies add the same percentage mark-ups to their nATs as well. Although depots often add much higher mark-ups to other kinds of antimalarials (up to 80% on nAT tablets), they seem to keep mark-ups on ACTs low. This is probably because the great majority of their ACT stock is ACTipal (the socially marketed ACT), which has a recommended retail price printed on the package. Despite the fact that mark-ups for nATs are high at depots, absolute mark-ups are relatively low, which means retail prices remain low.

There are two types of highly subsidized ACTs currently available in the private sector in Madagascar: ACTipal, a branded type of ASAQ from PSI, and various ASAQ and AL products provided through the Global Fund’s AMFm programme. Their distribution chains are similar to those of non-subsidized ACTs, starting out from top-level wholesalers and making their way down to pharmacies and depots. RDTs seem to be very rarely found in the private sector in Madagascar.

The informal sector plays a substantial role in the antimalarial market. The overwhelming majority of antimalarials found in informal sector outlets at the time of the outlet survey in 2010 consisted of chloroquine. A key question is whether co-paid ACTs will replace chloroquine in formal and informal outlets.

Cost of transport seems to be a key determinant of mark-up levels. Limited accessibility of remote areas, particularly during the rainy season, seems to be a point of concern for private sector actors. This is particularly important given the fact that the majority of the Malagasy population lives in rural areas.

The Ministry of Health carries out inspections in retail outlets. These inspections were reported to occur more frequently in accessible locations than in remote locations. However, capacity is low; there were only two pharmacist inspectors working for the DAMM at the time this study was carried out. They are responsible for monitoring nearly 200 pharmacies, as well as approximately 2000 depots.

There are limitations to the findings presented in this report. As is the case in any study with a limited number of respondents, issues of generalizability are a concern. However, great effort was made to ensure that interviews were carried out with a wide range of actors. Key informants came from both governmental and non-governmental organizations. Actors at all levels of the distribution chain were interviewed, and at the retail level, five different kinds of outlets were surveyed. Actors were interviewed in a total of eight locations, encompassing accessible, semi-accessible, and remote areas. It is worth noting that the findings on mark-ups from retailers from this rapid assessment of the distribution chain were consistent with the data collected using randomized sampling and a large number of respondents in the ACTwatch Outlet Survey.

Further, it is important to interpret results with caution, due to the yet to be determined effects of the AMFm programme on supply and demand of antimalarials, as well as other ongoing changes in the dynamic regulatory, political and economic environments. Future Outlet and Household surveys will further complement the data collected for the present report and shed greater light on the subject.

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## 9. Appendices

### Appendix 1: Descriptions of Retail Outlets (ACTwatch Group 2010)




Public Health Facilities	531	Description
National university hospital centre		
Regional hospital	32	Public health facilities provide prescription medicine and medical consultations and/or malaria diagnosis. They are manned by qualified health practitioners. The health delivery system consists of a four-step pyramidal system. The lowest level health centres are CBS1 (manned by a nurse or health worker) and CBS2 (manned by a doctor). District hospitals form the next level and offer emergency surgery and comprehensive obstetrical care. Regional hospitals offer secondary referral services and university hospitals offer comprehensive national referral services.
District hospital		
Community health centre, with doctor [ <i>centre de santé de base (CSB) niveau 2</i> ]	344	
Community health centre, without doctor [ <i>centre de santé de base (CSB) niveau 1</i> ]	155	
		
Centre Hospitalier de District	Centre de Sante de Base niveau 2 (CSB 2)	Centre de Sante de Base niveau 1 (CSB 1)




Private, not for profit facilities	7	Description
Non-Governmental Organization (NGO) Health Centre	7	Non-governmental organizations that provide medical consultations, diagnoses, and prescription medicines at a nominal cost.
		
Faith Based Organization Health Centre	Non-Governmental Organization (NGO) Health Centre	Non-Governmental Organization (NGO) Health Centre

Community health workers	226	Description
NGO	78	A network of volunteers that provide health education and promotion to families in their villages. They are supervised by NGOs.
Non NGO	148	A network of volunteers that provide health education and promotion to families in their villages. They are supervised by the government.
		
NGO Community agent	NGO Community agent	Governmental Community agent

Pharmacy	69	Description
Registered pharmacy	69	Registered pharmacies are licensed by the National Drug Authority (NDA) and sell prescription medicines at a commercial rate. These pharmacies are typically located in urban areas and sell all classes of medicines (A, B and C). Oversight is provided by a pharmacist. These outlets are highly regulated by the National Drug Authority and the Pharmacists' Council.
		
Registered Pharmacy	Registered Pharmacy	Registered Pharmacy

Drug Store	263	Description
Rural pharmacy [ <i>dépôt de médicament</i> ]	263	Typically located in rural areas, these are small pharmacies that are licensed by the NDA and sell only over the counter medicines at a commercial rate. These outlets are manned by qualified health dispensers/practitioners.
		
Dépôt de médicament	Dépôt de médicament	Dépôt de médicament

Private for Profit	87	Description
Private clinic	35	Private clinics are smaller than hospitals and include a consultation and/or an examination room. These facilities provide medicines at commercial rates and only sell class B and C medicines. These outlets are manned by qualified health dispensers/practitioners (doctors, nurses, clinical officers) and are registered by the Ministry of Health.
Private practice [ <i>médecin libre</i> ]	52	These are qualified and trained doctors with their own practice, who provide medical consultation services. These are registered with the Ministry of Health, though it is recognized that an unknown proportion of ' <i>médecins libre</i> ' are not registered. These doctors provide consultations, prescribe medicines, and may sell products provided by NGOs at a subsidized price.
		
Private clinic	Private practice	Private practice

General retailer	5,586	Description
Grocery store [ <i>epicerie</i> ]	4,161	Small businesses which sell food, beverages, and household products. Grocery stores may also sell medicines, usually antipyretics. They are unlicensed.
Grocery store with bar [ <i>epi bar</i> ]	649	A grocery store that includes a bar providing alcoholic beverages.
Grocery store with <i>gargote</i> [ <i>epi-gargote</i> ]	243	A grocery store that includes a <i>gargote</i> , selling food for customers to eat at the outlet.
Bar	191	Bars are outlets that sell alcoholic beverages. In Madagascar, some bars are known to sell medicines.
<i>Gargote</i>	333	<i>Gargotes</i> are wooden stalls which sell food/fast-moving consumer goods. There is a small area for customers to sit and eat; this is what distinguishes <i>gargotes</i> from other informal outlets such as kiosks.
Other	9	Includes market sellers.
		
Grocery store with bar	Grocery store	Grocery store with <i>gargote</i>

## Appendix 2: Calculating AETDs: antimalarial treatment and equivalent adult treatment dose (ACTwatch Group 2009)

Antimalarial Category	Dose used for calculating 1 AETD (mg to treat a 60kg adult)	Generic product used for AETD mg dose value for combination therapies	Notes	Source
Amodiaquine	1800mg			WHO Use of Antimalarials, 2001
Amodiaquine-Sulfadoxine-Pyrimethamine	1800mg	Amodiaquine		WHO Model Formulary, 2008
Arteether	1050mg			WHO Use of Antimalarials, 2001
Artemether	960mg			WHO Use of Antimalarials, 2001
Artemether-Lumefantrine	480mg	Artemether		WHO Model Formulary, 2008
Artemisinin-Naphthoquine	2400mg	Artemisinin	Manufacturer Guidelines for this product are 1000mg Artemisinin in a single dose. Such a short ACT regimen is highly suspect. This treatment dose is based upon the WHO Artemisinin-MQ recommendation of a total dose of 40mg/kg.	WHO Use of Antimalarials, 2001
Artemisinin-Piperaquine	576mg	Artemisinin	Treatment dose based on Artemisinin-Piperaquine-Primaquine value, below.	As below
Artemisinin-Piperaquine-Primaquine	576mg	Artemisinin		Tangpukdee, N. et al. 2008. Efficacy of <i>Artequick</i> versus artesunate-mefloquine in the treatment of acute uncomplicated falciparum malaria in Thailand. The Southeast Asian Journal of Tropical Medicine and Public Health. 39(1): 1-8 <a href="http://imsear.hellis.org/handle/123456789/33676">http://imsear.hellis.org/handle/123456789/33676</a>
Artesunate	960mg			WHO Use of Antimalarials, 2001
Artesunate-Amodiaquine	600mg	Artesunate		Manufacturer Guidelines ( <i>Winthrop/Coarsucam – Sanofi Aventis</i> )
Artesunate-Halofantrine	600mg	Artesunate	Relatively uncommon combination; dosing information is difficult to find and the value here is based on the Artesunate-Amodiaquine, Artesunate-SP, and Artesunate-Mefloquine values.	-



<b>Antimalarial Category</b>	<b>Dose used for calculating 1 AETD (mg to treat a 60kg adult)</b>	<b>Generic product used for AETD mg dose value for combination therapies</b>	<b>Notes</b>	<b>Source</b>
Artesunate-Lumefantrine	600mg	Artesunate	Relatively uncommon combination; dosing information is difficult to find and the value here is based on the Artesunate-Amodiaquine, Artesunate-SP, and Artesunate-Mefloquine values.	-
Artesunate-Mefloquine	600mg	Artesunate		Manufacturer Guidelines ( <i>Artequin Adult – Mepha</i> )
Artesunate-Piperaquine	600mg	Artesunate	Relatively uncommon combination; dosing information is difficult to find and the value here is based on the Artesunate-Amodiaquine, Artesunate-SP, and Artesunate-Mefloquine values.	-
Artesunate-Pyronaridine	600mg	Artesunate	Relatively uncommon combination; dosing information is difficult to find and the value here is based on the Artesunate-Amodiaquine, Artesunate-SP, and Artesunate-Mefloquine values.	-
Artesunate-Sulfadoxine-Pyrimethamine	600mg	Artesunate		Manufacturer Guidelines ( <i>Co-arinat – Dafra</i> )
Atovaquone-Proguanil	3000mg	Atovaquone		Manufacturer Guidelines ( <i>Malanil – GSK</i> )
Chloroquine	1500mg			WHO Model Formulary, 2008
Chloroquine-Sulfadoxine-Pyrimethamine	1500mg	Chloroquine		WHO Model Formulary, 2008
Chlorproguanil-Dapsone	360mg	Chlorproguanil		Manufacturer Guidelines ( <i>LapDap – GSK</i> )
Dihydroartemisinin	480mg			Manufacturer Guidelines ( <i>Cotecxin – Holleypharm; MALUether – Euromedi</i> )

<b>Antimalarial Category</b>	<b>Dose used for calculating 1 AETD (mg to treat a 60kg adult)</b>	<b>Generic product used for AETD mg dose value for combination therapies</b>	<b>Notes</b>	<b>Source</b>
Dihydroartemisinin-Amodiaquine	360mg	Dihydroartemisinin	Relatively uncommon combination; dosing information is difficult to find and the value here is based on the most common Dihydroartemisinin-combinations with sources listed below.	-
Dihydroartemisinin-Halofantrine	360mg	Dihydroartemisinin	Relatively uncommon combination; dosing information is difficult to find and the value here is based on the most common Dihydroartemisinin-combinations with sources listed below.	-
Dihydroartemisinin-Lumefantrine	360mg	Dihydroartemisinin	Relatively uncommon combination; dosing information is difficult to find and the value here is based on the most common Dihydroartemisinin-combinations with sources listed below.	-
Dihydroartemisinin-Piperaquine	360mg	Dihydroartemisinin		Manufacturer Guidelines ( <i>Duo-cotecxin – Holleypharm</i> )
Dihydroartemisinin-Piperaquine-Trimethoprim	256mg	Dihydroartemisinin		Manufacturer Guidelines ( <i>Artecxin – Medicare Pharma; Artecom – Ctonghe</i> )
Dihydroartemisinin-Pyronaridine	360mg	Dihydroartemisinin	Relatively uncommon combination; dosing information is difficult to find and the value here is based on the most common Dihydroartemisinin-combinations with sources listed below.	-
Dihydroartemisinin-Sulfadoxine-Pyrimethamine	360mg	Dihydroartemisinin		Manufacturer Guidelines ( <i>Dalasin – Adams Pharma</i> )
Dihydroartemisinin-Mefloquine	360mg	Dihydroartemisinin		Manufacturer Guidelines ( <i>Meflodisin – Adams Pharma</i> )

Antimalarial Category	Dose used for calculating 1 AETD (mg to treat a 60kg adult)	Generic product used for AETD mg dose value for combination therapies	Notes	Source
Halofantrine	1500mg		This dose is for halofantrine hydrochloride as the strength is normally reported in this manner. The total dose for halofantrine base is 1398 mg.	Manufacturer Guidelines ( <i>Halfan – GSK</i> )
Hydroxychloroquine	2000mg			Manufacturer Guidelines ( <i>Plaquenil – Sanofi Aventis</i> )
Mefloquine	1000mg			WHO Use of Antimalarials, 2001
Mefloquine-Sulfadoxine-Pyrimethamine	1000mg	Mefloquine		WHO Use of Antimalarials, 2001
Primaquine	45mg		This dose is for the gametocytocidal treatment of <i>P. falciparum</i> .	WHO Model Formulary, 2008
Quinacrine	2212mg		Recommendations for malaria treatment are very dated. This value is the treatment regimen for giardiasis, which has also been used in the treatment for malaria.	Gardner, T. B. and Hill, D. R. 2001. Treatment of Giardiasis. Clinical Microbiology Reviews. 14(1): 114-128 <a href="http://cmr.asm.org/cgi/content/full/14/1/114#T2">http://cmr.asm.org/cgi/content/full/14/1/114#T2</a>
Quinimax	10500mg			Manufacturer Guidelines ( <i>Quinimax – Sanofi Aventis</i> )
Quinine	12600mg		This dose is for quinine sulphate, a salt, as quinine strengths are normally reported for salts. The total dose for quinine base based on 24mg/kg is 10080mg for a 60kg adult.	WHO Model Formulary, 2008
Quinine-Sulfadoxine-Pyrimethamine	12600mg	Quinine	This dose is for quinine sulphate, a salt, as quinine strengths are normally reported for salts. The total dose for quinine base based on 24mg/kg is 10080mg for a 60kg adult.	WHO Model Formulary, 2008
Sulfadoxine-Pyrimethamine	1500mg	Sulfadoxine		WHO Model Formulary, 2008

## Appendix 3: Description of Calculations Performed and Weights Used<sup>11</sup>

### Why weight

Weighting of outlet survey data was necessary to allow for 1) difference in sampling probabilities due to variation in the size of strata, 2) the oversampling for the booster, and 3) the sampling strategy which involves a census of outlets in the subdistricts of varying size selected using PPS. Weights which are based on sampling probabilities are the appropriate weights to calculate. Weights should be calculated by the strata by which sampling was done (urban/rural for new IE surveys, region/endemicity/etc for older ACTWatch surveys).

### How to calculate weights for the main sample

Calculate weights for each subdistrict. The weight for subdistrict,  $i$ , within stratum  $j$  is given by

$$w_{ij} = \frac{N_j}{n_j \times N_{ij}}$$

where

$N$  is the population (of the stratum,  $N_j$ , or of the subdistrict,  $N_{ij}$ )

$n_j$  is the number of subdistricts sampled in the stratum

Note that  $n_j$  must be in this formula because the probability that a subdistrict is selected from a given stratum depends on the number of subdistricts selected from the stratum; the probability that a given subdistrict is selected goes up the more subdistricts are sampled from the stratum.

As a check that weights have been calculated correctly:  $\sum w_{ij} \times N_{ij}$  should give the total population of stratum  $j$ .

### How to calculate weights for the booster sample

Posterior, or conditional, weights are calculated for booster areas (see Annex 2 for details), by stratum, as below

$$w_{kj} = \frac{N_j}{n_j \times N_{kj}}$$

where

$k$  is the  $k^{\text{th}}$  booster geographical unit (e.g. district)

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<sup>11</sup> Source: From unpublished calculations used in the ACTwatch Outlet Survey (ACTwatch Group 2010).

## NOTE

In the data set for analysis of AMFm baseline outlet surveys, we will have 2 different weight variables: *wt1* for analyses which include booster sample information, and *wt2* for analysis of market share, where we analyse information from the main sample subdistricts only..In general, PHFs and POPs which are found in the main sample subdistrict will have district-level weights in *wt1* (calculated using the approach ‘How to calculate weights for the booster sample’ mentioned just above this box) and subdistrict-level weights in *wt2* (calculated according to ‘How to calculate weights for the main sample’ on the previous page). In other words, all outlets within a given subdistrict will share the same value of *wt2*, but may have different values of *wt1* depending on whether they are booster outlet types or not.

$N$  is the total stratum-specific population in the country,  $N_j$ , or in the booster geographical unit,  $N_{kj}$  )

$n_j$  is the number of booster geographical units partially or wholly in stratum  $j$

### Special cases

**Special case 1:** PHFs and POPs were enumerated within different geographical units.

Calculate separate weights for PHFs and for POPs, ensuring that  $k$  is the appropriate geographical unit for each outlet type

**Special case 2:** A sample, not a census, of PHFs and POPs was taken, within geographical units

Multiply stratum-specific weights by

$$\frac{O_{kj}}{B_{kj}}$$

where

$O_{kj}$  is the total number of PHFs/POPs in booster geographic unit  $k$  in stratum  $j$

$B_{kj}$  is the number of PHFs/POPs enumerated in booster geographic unit  $k$  in stratum  $j$

**Special case 3:** The list of PHFs and/or POPs was out-of-date, resulting in more or fewer outlets being enumerated than were listed.

Do not adjust weights

**Special case 4:** All PHFs and/or POPs in the whole country were enumerated.

Weight using the ratio of country to main sample population, by stratum

## Appendix 4: Purchase Price and Absolute Mark-ups for Antimalarials

### Purchase price of antimalarials and RDTs

Purchase price is the price paid by businesses for their most recent purchase of an antimalarial product from their suppliers, and is reported in terms of the median price (in US dollars) per AETD. Retail purchase prices presented here reflect the antimalarial purchase prices paid by specific outlet types to their suppliers.

Table A4.1: Purchase price per AETD (US\$), retail level

ANTIMALARIAL TYPE <sup>1</sup> Formulation			RETAILER CATEGORIES <sup>2</sup>					
			PHARMACIES N=51	PRIVATE HEALTH FACILITIES <sup>3</sup> N=66	DRUG STORES N=235	GENERAL RETAILERS N=1386	PUBLIC HEALTH FACILITIES N=493	COMMUNITY HEALTH WORKERS N=40
All ACT	All	Median	5.54	0.02	0.08	0.09	0.00	0.05
		IQR	3.40-8.05	0.00-0.09	0.07-0.40	0.07-0.19	0.00-0.00	0.00-0.09
		(n)	(108)	(90)	(126)	(15)	(1485)	(40)
	Tablet	Median	5.55	0.02	0.08	0.09	0.00	0.05
		IQR	3.40-9.44	0.00-0.09	0.07-0.40	0.07-0.19	0.00-0.00	0.00-0.09
		(n)	(106)	(90)	(126)	(15)	(1485)	(40)
	Oral liquid	Median	5.18	-	-	-	-	-
		IQR	5.18-5.18	-	-	-	-	-
		(n)	(2)	-	-	-	-	-
Quality-assured ACT	All products were tablets	Median	6.36	0.06	0.08	0.09	0.00	0.05
		IQR	5.54-14.34	0.00-0.09	0.07-0.40	0.07-0.19	0.00-0.00	0.00-0.07
		(n)	(91)	(80)	(125)	(15)	(1339)	(39)
Non quality-assured ACT	All	Median	3.40	0.00	2.78	-	0.00	2.78
		IQR	3.40-5.18	0.00-0.00	2.78-2.78	-	0.00-0.00	2.78-2.78
		(n)	(17)	(10)	(1)	-	(146)	(1)
	Tablet	Median	3.40	0.00	2.78	-	0.00	2.78
		IQR	3.40-3.40	0.00-0.00	2.78-2.78	-	0.00-0.00	2.78-2.78
		(n)	(15)	(10)	(1)	-	(146)	(1)
	Oral liquid	Median	5.18	-	-	-	-	-
		IQR	5.18-5.18	-	-	-	-	-
		(n)	(2)	-	-	-	-	-
AMT	All	Median	15.99	0.00	19.43	-	-	-
		IQR	15.99-15.99	0.00-0.00	2.49-19.43	-	-	-
		(n)	(5)	(2)	(2)	-	-	-
	Tablet	Median	-	0.00	2.49	-	-	-
		IQR	-	0.00-0.00	2.49-2.49	-	-	-
		(n)	-	(1)	(1)	-	-	-
	Injectable	Median	15.99	0.00	19.43	-	-	-
		IQR	15.99-15.99	0.00-0.00	19.43-19.43	-	-	-
		(n)	(5)	(1)	(1)	-	-	-
nAT	All	Median	3.69	3.74	0.62	0.21	1.75	0.42
		IQR	0.21-8.79	0.21-5.15	0.17-5.68	0.17-0.21	0.00-3.72	0.42-0.42
		(n)	(273)	(126)	(707)	(1440)	(575)	(3)
	Tablet	Median	0.43	0.21	0.21	0.21	0.00	0.42
		IQR	0.19-8.76	0.17-0.23	0.12-0.52	0.17-0.21	0.00-1.75	0.42-0.42
		(n)	(186)	(64)	(469)	(1438)	(375)	(3)
	Oral liquid	Median	5.05	1.79	2.51	-	-	-
		IQR	5.05-5.18	0.81-2.78	1.39-4.72	-	-	-
		(n)	(12)	(2)	(17)	-	-	-
	Injectable	Median	5.83	4.86	6.41	7.29	3.74	-
		IQR	3.30-9.18	3.89-7.29	4.86-7.58	4.86-7.29	3.72-7.54	-
		(n)	(75)	(60)	(221)	(2)	(200)	-

<sup>1</sup> ACT: artemisinin-based combination therapy; AMT: artemisinin monotherapy; nAT: non artemisinin therapy; RDT: Rapid diagnostic test for malaria. <sup>2</sup> As these are weighted medians, medians are not the average of the middle two ordered observations for instances where there are an even number of observations. Note: 10 of 5587 (0.2%) purchase price observations (4 in pharmacies, 2 in private health facilities, 1 in drug stores, 3 in general retailers) were set to missing due to mark-ups in excess of 1000% which were likely due to errors during data collection. <sup>3</sup> This category of retailer includes both for-profit and not-for-profit health facilities. Source: Additional analysis of data collected in the ACTwatch Outlet Survey (ACTwatch Group 2010).

## Absolute mark-ups on antimalarials (US\$)

In general, the absolute mark-up is calculated as the difference between the selling price and the purchase price per AETD and is reported in US dollars. As with the percent mark-up, it captures both the costs of doing business and profit to the seller. The retail absolute mark-up was calculated using the retail selling price and purchase price collected during the ACTwatch Outlet Survey. Data were collected in local currencies and converted to their US\$ equivalent using the average interbank rate for the duration of the fieldwork period.

Table A4.2: Absolute price mark ups on antimalarials, retail level (US\$)

ANTIMALARIAL TYPE <sup>1</sup> Formulation			RETAILER CATEGORIES <sup>2</sup>					
			PHARMACIES N=51	PRIVATE HEALTH FACILITIES <sup>3</sup> N=64	DRUG STORES N=235	GENERAL RETAILERS N=1386	PUBLIC HEALTH FACILITIES N=493	COMMUNITY HEALTH WORKERS N=40
All ACT	All	Median	1.97	0.00	0.06	0.09	0.00	0.05
		IQR	0.90-2.43	0.00-0.04	0.03-0.11	0.05-0.09	0.00-0.00	0.02-0.09
		(n)	(107)	(87)	(126)	(15)	(1485)	(40)
	Tablet	Median	1.32	0.00	0.06	0.09	0.00	0.05
		IQR	0.68-2.61	0.00-0.04	0.03-0.11	0.05-0.09	0.00-0.00	0.02-0.09
		(n)	(105)	(87)	(126)	(15)	(1485)	(40)
	Oral liquid	Median	1.97	-	-	-	-	-
		IQR	1.97-1.97	-	-	-	-	-
		(n)	(2)	-	-	-	-	-
Quality- assured ACT	All products were tablets	Median	2.22	0.00	0.06	0.09	0.00	0.05
		IQR	0.05-4.81	0.00-0.04	0.03-0.11	0.05-0.09	0.00-0.00	0.02-0.09
		(n)	(90)	(78)	(125)	(15)	(1339)	(39)
Non quality- assured ACT	All	Median	1.32	0.00	1.67	-	0.00	0.00
		IQR	1.32-1.97	0.00-0.00	1.67-1.67	-	0.00-0.00	0.00-0.00
		(n)	(17)	(9)	(1)	-	(146)	(1)
	Tablet	Median	1.32	0.00	1.67	-	0.00	0.00
		IQR	1.32-1.32	0.00-0.00	1.67-1.67	-	0.00-0.00	0.00-0.00
		(n)	(15)	(9)	(1)	-	(146)	(1)
	Oral liquid	Median	1.97	-	-	-	-	-
		IQR	1.97-1.97	-	-	-	-	-
		(n)	(2)	-	-	-	-	-
AMT	All	Median	6.22	0.00	6.11	-	-	-
		IQR	6.22-6.22	0.00-0.00	6.11-6.11	-	-	-
		(n)	(4)	(2)	(1)	-	-	-
	Tablet	Median	-	0.00	-	-	-	-
		IQR	-	0.00-0.00	-	-	-	-
		(n)	-	(1)	-	-	-	-
	Injectable	Median	6.22	0.00	6.11	-	-	-
		IQR	6.22-6.22	0.00-0.00	6.11-6.11	-	-	-
		(n)	(4)	(1)	(1)	-	-	-
nAT	All	Median	0.84	1.31	0.42	0.14	0.03	0.28
		IQR	0.13-5.59	0.14-3.64	0.14-3.38	0.14-0.17	0.00-1.30	0.28-0.28
		(n)	(268)	(119)	(706)	(1440)	(574)	(3)
	Tablet	Median	0.14	0.14	0.15	0.14	0.00	0.28
		IQR	0.03-0.66	0.05-0.14	0.09-0.31	0.14-0.17	0.00-0.00	0.28-0.28
		(n)	(182)	(62)	(469)	(1438)	(375)	(3)
	Oral liquid	Median	1.98	0.45	1.27	-	-	-
		IQR	1.97-1.98	0.35-0.56	0.96-1.74	-	-	-
		(n)	(12)	(2)	(17)	-	-	-
	Injectable	Median	3.50	3.60	4.08	1.46	1.33	-
		IQR	1.80-5.83	1.94-5.83	2.92-4.66	1.46-4.86	1.30-2.59	-
		(n)	(74)	(55)	(220)	(2)	(199)	-

<sup>1</sup> ACT: artemisinin-based combination therapy; AMT: artemisinin monotherapy; nAT: non artemisinin therapy; RDT: Rapid diagnostic test for malaria. <sup>2</sup> As these are weighted medians, medians are not the average of the middle two ordered observations for instances where there are an even number of observations. Note: 10 of 5587 (0.2%) purchase price observations (4 in pharmacies, 2 in private health facilities, 1 in drug stores, 3 in general retailers) were set to missing due to mark-ups in excess of 1000% which were likely due to errors during data collection. <sup>3</sup> This category of retailer includes both for-profit and not-for-profit health facilities. Source: Additional analysis of data collected in the ACTwatch Outlet Survey (ACTwatch Group 2010).